

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
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Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

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Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

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- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
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- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

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Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions-increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat,calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)

b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)

b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور/ أبو الحجاج عبدالعزيز هرماس
الدكتور/ مصطفى حسن وهدان

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
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Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

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(10 marks)

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Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
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Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



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- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
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- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
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Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

[illegible][illegible][illegible]

Answer the following questions

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second semester 2017-18

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Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

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انظر ملفه بغير علامة

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- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
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Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

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- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Q.4: (a) Draw phototube

[illegible]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

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Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

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الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

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انظر ملفه بغيره على

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Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

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Good luck Dr. Atef .H.Ali

(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

[illegible]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

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Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

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Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

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b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور/ أبو الحجاج عبدالعزيز هرماس
الدكتور/ مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
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(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
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- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
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 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
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Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
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- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
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Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(b) Draw the graphite furnace atomizer.

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(b) Why are there two monochromators in a fluorometer?

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Q.4: (a) Draw phototube

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(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

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Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
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4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (✗) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions-increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat,calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

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الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
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Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

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انظر ملفه بغير علامة

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Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
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- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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Q.4: (a) Draw phototube

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Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

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Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

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Date: 29-5-2018

Faculty of Science

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Chemistry Department

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Good luck Dr. Atef .H.Ali

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains several horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grooves per 1 cm. What is length of this grating to resolve the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
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Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number = 6.022×10^{23} , atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \text{ } \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4 \text{ s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromatros in a flutometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains faint horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grooves per 1 cm. What is length of this grating to resolve the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat
- Resin catalyst
- chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.

ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following

i) Describe the function of pot and tank furnaces in glass manufacture. Give three causes responsible for glass devitrification and three processes used for its repairing.

iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (✗) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.
(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, $g \text{ value} = 2$).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of 2×10^{-4} M Zn^{2+} is 1.81 μA . Using the DME characteristics, $m = 2.0$ mg/s and $t = 4$ s. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains faint horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (✗) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions-increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Noureldin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an example for:

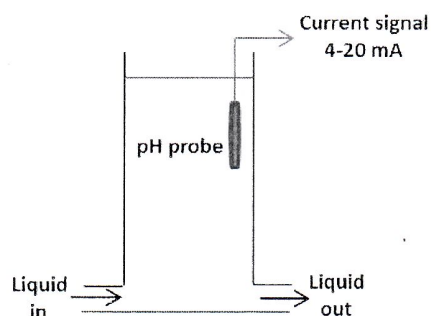
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

- Temperature to resistance.
- Temperature to voltage.
- Analog signal to digital signal.
- Pressure to displacement.

2. A thermistor is a transducer that converts:

- Temperature to resistance.
- Temperature to voltage.
- Analog signal to digital signal.
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- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
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 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
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III- Answer **Only Six** of the following questions: (16.5 marks)

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- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
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- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, g value = 2).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

**The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa**

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
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$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

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2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

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- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromatros in a flutometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains several horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

(The page contains faint horizontal lines, suggesting it was part of a lined notebook or document.)

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

3. LVDT is a device that converts:

- (a) Temperature to resistance. (b) Temperature to voltage.
(c) Displacement to electrical signal. (d) Pressure to displacement.
-

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance. (b) Temperature to voltage.
(c) Analog signal to digital signal. (d) Pressure to displacement.
-

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate. (b) Temperature.
(c) Relative humidity. (d) Pressure.
-

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor (b) Pressure sensor.
(c) Level sensor. (d) Radiation pyrometer.
-

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection. (b) Light intensity, pressure, and level.
(c) Pressure, level, and temperature. (d) Flow detection, cleaning, and level.
-

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor. (b) Thermostat.
(c) LVDT. (d) Magnetic flow meter.
-

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV. (b) Zero voltage
(c) 80 mV. (d) 40 mV
-

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m. (b) 5 m
(c) 8 m. (d) 4.5 m
-

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Nouredin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an **example** for:

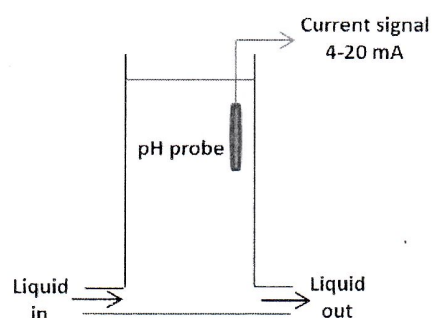
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

2. A thermistor is a transducer that converts:

- | | |
|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, $g \text{ value} = 2$).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

- (a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of $0.37 \mu\text{A}$. When 2.0 mL of $3.0 \mu\text{M}$ CZP was spiked to the sample, the peak increased to $0.80 \mu\text{A}$. Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

5.

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

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2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

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b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

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b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
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- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Final examinations for third level students (324C) in inorganic chemistry

Section A: Answer the following questions:

17 Marks

1- Choose the correct answer for **five only**:

- d^5 in octahedral complexes have high spin and ($E=0$; $E=-2\Delta_o$; $E=-2\Delta_o+2PT$)
- $[\text{Mn}(\text{CN})_6]^{4-}$ complex have unpaired electrons equal ($n=1$; $n=5$; $n=2$)
- which of metal complex ion is inert ($\text{Co}(\text{NH}_3)_6^{3+}$; $[\text{Co}(\text{CN})_6]^{3-}$; $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$)
- High spin of electron in O_h complexes have
(weak field L and small Δ_o ; weak field L and high Δ_o ; strong field L and small Δ_o ; L=ligand)
- Relation between Δ_o and Δ_t in complexes have similar metal captions and ligands
($\Delta_t = 4/9\Delta_o$; $\Delta_o = 4/9\Delta_t$; $\Delta_t = 3/5\Delta_o$)
- π - donor ligand has filled orbitals of π - symmetry and these have
($L \rightarrow M$; $M \rightarrow L$; none) electrons donation

2- Answer **three only** of the following:

- Write all steps of overall stability constant of reaction $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ with six cyanide ions.
- compare between π - donor ; π -acceptor and σ -donor ligands in MO splitting
- Compare between the MO energy level diagram of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F})_6]^{3-}$
- Explain **three only** :
i-Antibonding orbitals in M.O. ii- Overall stability constant of complexes
iii- π - donor ligands iv- LMCT and MLCT transitions

Section B: Answer the following questions:

17 Marks

1- a) Give reasons for **(four only)**:

- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is perfect octahedron while $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is not.
- $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ have different colors in dilute solutions.
- $\text{K}_3[\text{Fe}(\text{OH}_2)_6]$ is attracted most strongly to a magnet than $\text{K}_3[\text{Fe}(\text{CN})_6]$
- The magnetic moment of a tetrahedral $\text{Co}(\text{II})$ complex is 4.0 B.M.
- $[\text{Ni}(\text{CN})_4]^{2-}$ square planar but $[\text{Ni}(\text{CO})_4]$ tetrahedral
- Draw d-orbital splitting diagrams for each of $[\text{Co}(\text{NH}_3)_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$, the Δ_o values for these two complexes are approximately 120 kJ/mol and 270 kJ/mol respectively. The pairing energy of Co^{+2} is approximately 270 kJ/mol and of Co^{+3} is approximately 210 kJ/mol. using CFT
- Compare the following complexes with respect to these shape, magnetic behavior and hybrid orbitals involved $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Zn}(\text{NH}_3)_4]^{2+}$

2- a) Chose the correct answer and comment **(four only)**:

- A magnetic moment of 1.73 BM will be shown by one among the following :
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
- Para magnetic complex $[\text{NiX}_4]^{2-}$. The number of unpaired electrons in the nickel and geometry of this complex ion are (one – tetrahedral, two- tetrahedral, one-square planar).
- Which is high-spin and how many the number of electrons in low and high level in each case
 $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$ $\Delta_o \approx 250\text{kJ/mol}$ or $[\text{Mn}(\text{CN})_6]^{3-}$, $\Delta_o \approx 460\text{ kJ/mol}$

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Nouredin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an example for:

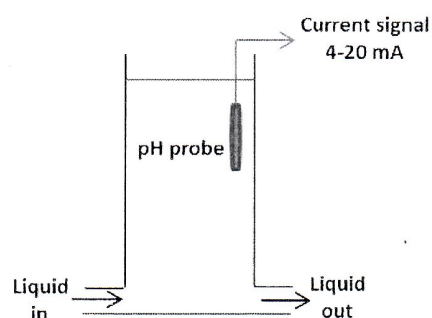
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

- Temperature to resistance.
- Temperature to voltage.
- Analog signal to digital signal.
- Pressure to displacement.

2. A thermistor is a transducer that converts:

- Temperature to resistance.
- Temperature to voltage.
- Analog signal to digital signal.
- Pressure to displacement.

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, g value = 2).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?

- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

This image shows a full page of primary-ruled notebook paper. It features ten sets of horizontal lines across the page. Each set consists of a solid top line, a dashed middle line, and a dotted bottom line, providing a guide for letter height and placement. The paper is otherwise blank, with no handwriting or other markings.

Q.6: (a) What are the advantages of the ICP technique?

[illegible]

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains faint horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (✗) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور/ أبو الحجاج عبدالعزيز هرماس
الدكتور/ مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

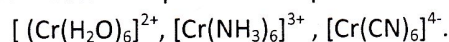
- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

iv) Which metal complex ion is expected to be subject to Jahn- Teller distortion?



v) CFSE for d^4 octahedral complex is $(-0.6 \Delta_o, -1.8 \Delta_o, -1.2 \Delta_o)$

b) Predict the number of unpaired electrons and magnetic moment for each the following

i) Tetrahedral d^6 ion ii) $[Co(H_2O)_6]^{2+}$ iii) A square – planar d^7

Section C: Answer the following questions:

16Marks

1- Name the actinide elements in the correct order. Give their symbols ,atomic numbers , electronic configurations and oxidation states. (5 Marks)

2- Answer **Only One** of the following:

a- Compare the oxidation states of the lanthanides and the actinides. (3Marks)

b- Note the different methods of separation of the lanthanides. (3Marks)

3- Comment on **Only Four** of the following (8 Marks)

a- The atomic radius of $La > Y$ while $Zr = Hf$.

b- With CO as a ligand lanthanides do not form complexes as transition metals(3d) do.

c- The colors of Ln^{3+} ions with the electronic configuration $4f^n$ is the same as those with $4f^{14-n}$.

d- Ion exchange method is the most efficient for the separation of the lanthanide ions.

e- Actinide hydroxides are more basic than the corresponding lanthanide hydroxides.

(Ti = 22 , Cr = 24 , Mn = 25 , Fe = 26 , Co =27 , Ni = 28 , Cu = 29 Zn = 30)

الممتحنون : ا/د/ محمد عبدالحكيم الجهمي – ا/د/ أمّنه سيد احمد – د/ زاهر عبدالمحسن

Good Luck

Final examinations for third level students (324C) in inorganic chemistry

Section A: Answer the following questions:

17 Marks

1- Choose the correct answer for **five only**:

- d^5 in octahedral complexes have high spin and ($E=0$; $E=-2\Delta_o$; $E=-2\Delta_o+2PT$)
- $[\text{Mn}(\text{CN})_6]^{4-}$ complex have unpaired electrons equal ($n=1$; $n=5$; $n=2$)
- which of metal complex ion is inert ($\text{Co}(\text{NH}_3)_6^{3+}$; $[\text{Co}(\text{CN})_6]^{3-}$; $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$)
- High spin of electron in O_h complexes have
(weak field L and small Δ_o ; weak field L and high Δ_o ; strong field L and small Δ_o ; L=ligand)
- Relation between Δ_o and Δ_t in complexes have similar metal captions and ligands
($\Delta_t = 4/9\Delta_o$; $\Delta_o = 4/9\Delta_t$; $\Delta_t = 3/5\Delta_o$)
- π - donor ligand has filled orbitals of π - symmetry and these have
($L \rightarrow M$; $M \rightarrow L$; none) electrons donation

2- Answer **three only** of the following:

- Write all steps of overall stability constant of reaction $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ with six cyanide ions.
- compare between π - donor; π -acceptor and σ -donor ligands in MO splitting
- Compare between the MO energy level diagram of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F})_6]^{3-}$
- Explain **three only**:
i-Antibonding orbitals in M.O. ii- Overall stability constant of complexes
iii- π - donor ligands iv- LMCT and MLCT transitions

Section B: Answer the following questions:

17 Marks

1- a) Give reasons for **(four only)**:

- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is perfect octahedron while $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is not.
- $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ have different colors in dilute solutions.
- $\text{K}_3[\text{Fe}(\text{OH}_2)_6]$ is attracted most strongly to a magnet than $\text{K}_3[\text{Fe}(\text{CN})_6]$
- The magnetic moment of a tetrahedral $\text{Co}(\text{II})$ complex is 4.0 B.M.
- $[\text{Ni}(\text{CN})_4]^{2-}$ square planar but $[\text{Ni}(\text{CO})_4]$ tetrahedral
- Draw d-orbital splitting diagrams for each of $[\text{Co}(\text{NH}_3)_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$, the Δ_o values for these two complexes are approximately 120 kJ/mol and 270 kJ/mol respectively. The pairing energy of Co^{+2} is approximately 270 kJ/mol and of Co^{+3} is approximately 210 kJ/mol. using CFT
- Compare the following complexes with respect to these shape, magnetic behavior and hybrid orbitals involved $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Zn}(\text{NH}_3)_4]^{2+}$

2- a) Chose the correct answer and comment **(four only)**:

- A magnetic moment of 1.73 BM will be shown by one among the following :
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
- Para magnetic complex $[\text{NiX}_4]^{2-}$. The number of unpaired electrons in the nickel and geometry of this complex ion are (one – tetrahedral, two- tetrahedral, one-square planar).
- Which is high-spin and how many the number of electrons in low and high level in each case
 $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$ $\Delta_o \approx 250\text{kJ/mol}$ or $[\text{Mn}(\text{CN})_6]^{3-}$, $\Delta_o \approx 460\text{ kJ/mol}$

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Nouredin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an example for:

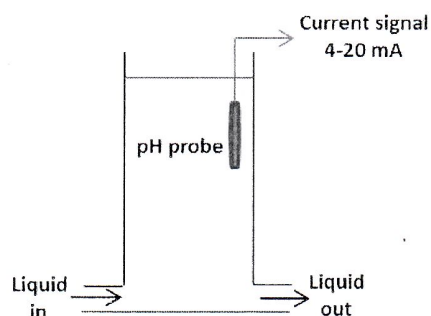
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة"

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

2. A thermistor is a transducer that converts:

- | | |
|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, $g \text{ value} = 2$).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer ***Only One*** from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer ***Only Two*** from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?

- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of 2×10^{-4} M Zn^{2+} is 1.81 μA . Using the DME characteristics, $m = 2.0$ mg/s and $t = 4$ s. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

5.

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

(The page contains faint horizontal lines suggesting ghosting or extremely light handwriting.)

(b) Why are there two monochromators in a fluorometer?

[illegible]

Q.4: (a) Draw phototube

[The page contains several horizontal dotted lines for writing.]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)



Answer Only Five of the Following Questions:

Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.

ii) Compare between the safety of glass fiber and that of asbestos.

(12 Marks)

4) Answer **TWO** of the following

i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.

iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)

b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)

b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali



Date: Saturday, 26/05/2018

Time: 2 hours

Answer the following Questions:

(50 points)

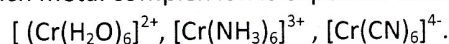
- 1) What are the main three moieties for each Nucleotide made up of ?
- 2) Discuss the steps of Plastic Production, showing the types of Moulding?
- 3) Why would a hole appear when a dilute alkali is spilt on a fabric made of Polyesters, discuss by mechanism equations ?
- 4) Explain the two stages for the formation of Urea-Formaldehyde Resins ?
- 5) Discuss the three main types of degradable plastics? Why are they degradable?
- 6) What are the two types of polyethylene? What is the structural difference between them?
- 7) Draw the structure of the Plasticizer used in manufacture of PVC, its name?
- 8) Mention examples for the thermoset and thermoplastic polymers, drawing its chemical structures?

Good Luck

Examiner:

Prof. Dr. Kamal I Aly

iv) Which metal complex ion is expected to be subject to Jahn- Teller distortion?



v) CFSE for d^4 octahedral complex is $(-0.6 \Delta_o, -1.8 \Delta_o, -1.2 \Delta_o)$

b) Predict the number of unpaired electrons and magnetic moment for each the following

i) Tetrahedral d^6 ion ii) $[Co(H_2O)_6]^{2+}$ iii) A square – planar d^7

Section C: Answer the following questions:

16Marks

1- Name the actinide elements in the correct order. Give their symbols ,atomic numbers , electronic configurations and oxidation states. (5 Marks)

2- Answer **Only One** of the following:

a- Compare the oxidation states of the lanthanides and the actinides. (3Marks)

b- Note the different methods of separation of the lanthanides. (3Marks)

3- Comment on **Only Four** of the following (8 Marks)

a- The atomic radius of $La > Y$ while $Zr = Hf$.

b- With CO as a ligand lanthanides do not form complexes as transition metals(3d) do.

c- The colors of Ln^{3+} ions with the electronic configuration $4f^n$ is the same as those with $4f^{14-n}$.

d- Ion exchange method is the most efficient for the separation of the lanthanide ions.

e- Actinide hydroxides are more basic than the corresponding lanthanide hydroxides.

(Ti = 22 , Cr = 24 , Mn = 25 , Fe = 26 , Co =27 , Ni = 28 , Cu = 29 Zn = 30)

الممتحنون : ا/د/ محمد عبدالحكيم الجهمي – ا/د/ أمّنه سيد احمد – د/ زاهر عبدالمحسن

Good Luck

Final examinations for third level students (324C) in inorganic chemistry

Section A: Answer the following questions:

17 Marks

- 1- Choose the correct answer for **five only**:
 - a) d^5 in octahedral complexes have high spin and ($E=0$; $E=-2\Delta_o$; $E=-2\Delta_o+2PT$)
 - b) $[\text{Mn}(\text{CN})_6]^{4-}$ complex have unpaired electrons equal ($n=1$; $n=5$; $n=2$)
 - c) which of metal complex ion is inert ($\text{Co}(\text{NH}_3)_6^{3+}$; $[\text{Co}(\text{CN})_6]^{3-}$; $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$)
 - d) High spin of electron in O_h complexes have
(weak field L and small Δ_o ; weak field L and high Δ_o ; strong field L and small Δ_o ; $L=\text{ligand}$)
 - e) Relation between Δ_o and Δ_t in complexes have similar metal captions and ligands
($\Delta_t = 4/9\Delta_o$; $\Delta_o = 4/9\Delta_t$; $\Delta_t = 3/5\Delta_o$)
 - f) π - donor ligand has filled orbitals of π - symmetry and these have
($L \rightarrow M$; $M \rightarrow L$; none) electrons donation
- 2- Answer **three only** of the following:
 - a) Write all steps of overall stability constant of reaction $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ with six cyanide ions.
 - b) compare between π - donor ; π -acceptor and σ -donor ligands in MO splitting
 - c) Compare between the MO energy level diagram of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F})_6]^{3-}$
 - d) Explain **three only** :
 - i-Antibonding orbitals in M.O.
 - ii- Overall stability constant of complexes
 - iii- π - donor ligands
 - iv- LMCT and MLCT transitions

Section B: Answer the following questions:

17 Marks

- 1- a) Give reasons for **(four only)**:
 - i) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is perfect octahedron while $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is not.
 - ii) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ have different colors in dilute solutions.
 - iii) $\text{K}_3[\text{Fe}(\text{OH}_2)_6]$ is attracted most strongly to a magnet than $\text{K}_3[\text{Fe}(\text{CN})_6]$
 - iv) The magnetic moment of a tetrahedral $\text{Co}(\text{II})$ complex is 4.0 B.M.
 - v) $[\text{Ni}(\text{CN})_4]^{2-}$ square planar but $[\text{Ni}(\text{CO})_4]$ tetrahedral
 - b) Draw d-orbital splitting diagrams for each of $[\text{Co}(\text{NH}_3)_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$, the Δ_o values for these two complexes are approximately 120 kJ/mol and 270 kJ/mol respectively. The pairing energy of Co^{+2} is approximately 270 kJ/mol and of Co^{+3} is approximately 210 kJ/mol. using CFT
 - c) Compare the following complexes with respect to these shape, magnetic behavior and hybrid orbitals involved $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Zn}(\text{NH}_3)_4]^{2+}$
- 2- a) Chose the correct answer and comment **(four only)**:
 - i) A magnetic moment of 1.73 BM will be shown by one among the following :
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
 - ii) Para magnetic complex $[\text{NiX}_4]^{2-}$. The number of unpaired electrons in the nickel and geometry of this complex ion are (one – tetrahedral, two- tetrahedral, one-square planar).
 - iii) Which is high-spin and how many the number of electrons in low and high level in each case
 $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$ $\Delta_o \approx 250\text{kJ/mol}$ or $[\text{Mn}(\text{CN})_6]^{3-}$, $\Delta_o \approx 460\text{ kJ/mol}$

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Noureldin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an **example** for:

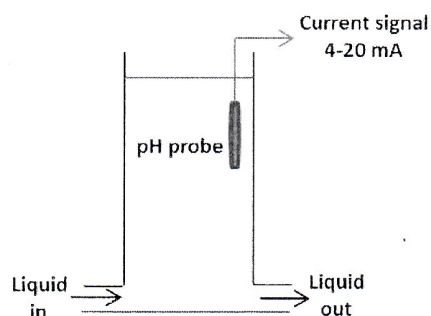
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

2. A thermistor is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, g value = 2).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?

- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

[The page contains faint horizontal dotted lines.]

(b) Why are there two monochromatros in a flutometer?

[illegible]

Q.4: (a) Draw phototube

[illegible]

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

[illegible]

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

[illegible]

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (✗) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat, calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(ii) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Answer **Four only** from the following:

Q 1 a) How dust particles enhance atmospheric corrosion? (4 marks)

b) Discuss the following: A steel piece is exposed to an aqueous solution – distinguish between chemical and electrochemical corrosion. (6 marks)

Q2 a) Explain by examples how galvanic coupling between two different metals could play contradiction roles in the corrosion process. (5 marks)

b) On cathodic polarization at 0.001 A cm^{-2} the hydrogen overvoltage $\eta_{\text{H}_2} = -0.467 \text{ V}$. What is the polarization potential of a steel specimen $E_{\text{pol}} = ? \text{ V vs. SCE}$ in a solution of pH 3.

Given $E_{\text{sat,calomel}} = 0.241 \text{ V vs. SHE}$. (5 marks)

Q3 a) Define the following terms: crevice corrosion – Graphitization- Hydrogen embrittlement (4.5 marks)

b) The corrosion current of iron rod in an aqueous solution is $15 \mu\text{A cm}^{-2}$, the rod is 2 cm diameter and is immersed to 20 cm in the solution. Calculate the corrosion rate in cm day^{-1} . (m_e of iron = 0.2893 mg/C , density = 7.8 g cm^{-3}) (5.5 marks)

Q4 a) How does alteration of environment decrease the chance of corrosion. (5 marks)

b) Explain the following i) Types of polarization (ii) Factors affecting the magnitude of the exchange current. (5 marks)

Q5 a) What are the possible cathodic reactions which might occur during corrosion? (4 marks)

b) Calculate the emf of the following cell at 25°C : $\text{Pt}; \text{Sn}^{4+} (a_+ = 0.0001), \text{Sn}^{2+} (a_+ = 0.01), \text{Ag}^+ (a_+ = 0.1); \text{Ag}$ Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

The standard reduction potentials: $E_{\text{Sn}^{2+}/\text{Sn}^{4+}}^\circ = 0.15 \text{ V}$, $E_{\text{Ag}^+/\text{Ag}}^\circ = 0.779 \text{ V}$

مع اطيب التمنيات بالتوفيق..

الدكتور / مصطفى حسن وهدان

الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس



Date: Saturday, 26/05/2018

Time: 2 hours

Answer the following Questions:

(50 points)

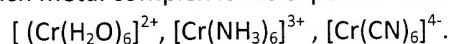
- 1) What are the main three moieties for each Nucleotide made up of ?
- 2) Discuss the steps of Plastic Production, showing the types of Moulding?
- 3) Why would a hole appear when a dilute alkali is spilt on a fabric made of Polyesters, discuss by mechanism equations ?
- 4) Explain the two stages for the formation of Urea-Formaldehyde Resins ?
- 5) Discuss the three main types of degradable plastics? Why are they degradable?
- 6) What are the two types of polyethylene? What is the structural difference between them?
- 7) Draw the structure of the Plasticizer used in manufacture of PVC, its name?
- 8) Mention examples for the thermoset and thermoplastic polymers, drawing its chemical structures?

Good Luck

Examiner:

Prof. Dr. Kamal I Aly

iv) Which metal complex ion is expected to be subject to Jahn- Teller distortion?



v) CFSE for d^4 octahedral complex is $(-0.6 \Delta_o, -1.8 \Delta_o, -1.2 \Delta_o)$

b) Predict the number of unpaired electrons and magnetic moment for each the following

i) Tetrahedral d^6 ion ii) $[Co(H_2O)_6]^{2+}$ iii) A square – planar d^7

Section C: Answer the following questions:

16Marks

1- Name the actinide elements in the correct order. Give their symbols ,atomic numbers , electronic configurations and oxidation states. (5 Marks)

2- Answer **Only One** of the following:

a- Compare the oxidation states of the lanthanides and the actinides. (3Marks)

b- Note the different methods of separation of the lanthanides. (3Marks)

3- Comment on **Only Four** of the following (8 Marks)

a- The atomic radius of $La > Y$ while $Zr = Hf$.

b- With CO as a ligand lanthanides do not form complexes as transition metals(3d) do.

c- The colors of Ln^{3+} ions with the electronic configuration $4f^n$ is the same as those with $4f^{14-n}$.

d- Ion exchange method is the most efficient for the separation of the lanthanide ions.

e- Actinide hydroxides are more basic than the corresponding lanthanide hydroxides.

(Ti = 22 , Cr = 24 , Mn = 25 , Fe = 26 , Co =27 , Ni = 28 , Cu = 29 Zn = 30)

الممتحنون : ا/د/ محمد عبدالحكيم الجهمي – ا/د/ أمّنه سيد احمد – د/ زاهر عبدالمحسن

Good Luck

Final examinations for third level students (324C) in inorganic chemistry

Section A: Answer the following questions:

17 Marks

- 1- Choose the correct answer for **five only**:
 - a) d^5 in octahedral complexes have high spin and ($E=0$; $E=-2\Delta_o$; $E=-2\Delta_o+2PT$)
 - b) $[\text{Mn}(\text{CN})_6]^{4-}$ complex have unpaired electrons equal ($n=1$; $n=5$; $n=2$)
 - c) which of metal complex ion is inert ($\text{Co}(\text{NH}_3)_6^{3+}$; $[\text{Co}(\text{CN})_6]^{3-}$; $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$)
 - d) High spin of electron in O_h complexes have
(weak field L and small Δ_o ; weak field L and high Δ_o ; strong field L and small Δ_o ; $L=\text{ligand}$)
 - e) Relation between Δ_o and Δ_t in complexes have similar metal captions and ligands
($\Delta_t = 4/9\Delta_o$; $\Delta_o = 4/9\Delta_t$; $\Delta_t = 3/5\Delta_o$)
 - f) π - donor ligand has filled orbitals of π - symmetry and these have
($L \rightarrow M$; $M \rightarrow L$; none) electrons donation
- 2- Answer **three only** of the following:
 - a) Write all steps of overall stability constant of reaction $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ with six cyanide ions.
 - b) compare between π - donor ; π -acceptor and σ -donor ligands in MO splitting
 - c) Compare between the MO energy level diagram of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F})_6]^{3-}$
 - d) Explain **three only** :
 - i-Antibonding orbitals in M.O.
 - ii- Overall stability constant of complexes
 - iii- π - donor ligands
 - iv- LMCT and MLCT transitions

Section B: Answer the following questions:

17 Marks

- 1- a) Give reasons for **(four only)**:
 - i) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is perfect octahedron while $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is not.
 - ii) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ have different colors in dilute solutions.
 - iii) $\text{K}_3[\text{Fe}(\text{OH}_2)_6]$ is attracted most strongly to a magnet than $\text{K}_3[\text{Fe}(\text{CN})_6]$
 - iv) The magnetic moment of a tetrahedral $\text{Co}(\text{II})$ complex is 4.0 B.M.
 - v) $[\text{Ni}(\text{CN})_4]^{2-}$ square planar but $[\text{Ni}(\text{CO})_4]$ tetrahedral
 - b) Draw d-orbital splitting diagrams for each of $[\text{Co}(\text{NH}_3)_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$, the Δ_o values for these two complexes are approximately 120 kJ/mol and 270 kJ/mol respectively. The pairing energy of Co^{+2} is approximately 270 kJ/mol and of Co^{+3} is approximately 210 kJ/mol. using CFT
 - c) Compare the following complexes with respect to these shape, magnetic behavior and hybrid orbitals involved $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Zn}(\text{NH}_3)_4]^{2+}$
- 2- a) Chose the correct answer and comment **(four only)**:
 - i) A magnetic moment of 1.73 BM will be shown by one among the following :
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
 - ii) Para magnetic complex $[\text{NiX}_4]^{2-}$. The number of unpaired electrons in the nickel and geometry of this complex ion are (one – tetrahedral, two- tetrahedral, one-square planar).
 - iii) Which is high-spin and how many the number of electrons in low and high level in each case
 $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$ $\Delta_o \approx 250\text{kJ/mol}$ or $[\text{Mn}(\text{CN})_6]^{3-}$, $\Delta_o \approx 460\text{ kJ/mol}$

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Noureldin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an **example** for:

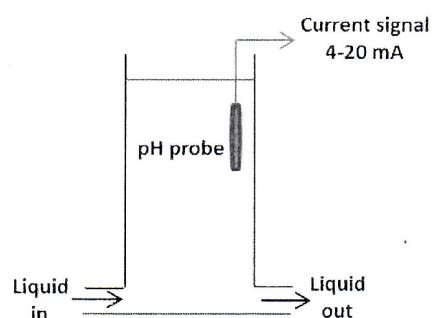
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral?**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

2. A thermistor is a transducer that converts:

- | | |
|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, g value = 2).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

**The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa**

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of 2×10^{-4} M Zn^{2+} is 1.81 μA . Using the DME characteristics, $m = 2.0$ mg/s and $t = 4$ s. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

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Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

[illegible]

Q.6: (a) What are the advantages of the ICP technique?

(b) Why are there two monochromators in a fluorometer?

This image shows a full page of primary-ruled paper. It features ten horizontal dashed lines spaced evenly down the page. On each side, there are two vertical dotted lines that serve as margins, creating a central area for writing. The paper is otherwise blank, with no handwriting or other markings.

Q.4: (a) Draw phototube

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

10

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst - chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping. (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions-increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat,calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Final Exam of advanced synthetic Organic Chemistry for 3rd chemistry students (314 C)

Answer the following questions:

Q1) Put the sign (✓) in the front of correct statement and (X) in the front of wrong statement . (11 Marks)
(Correct the wrong statement)

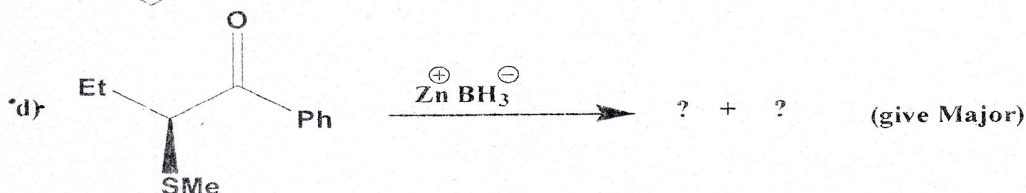
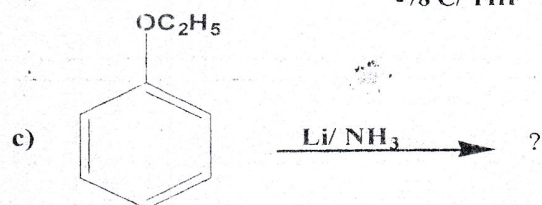
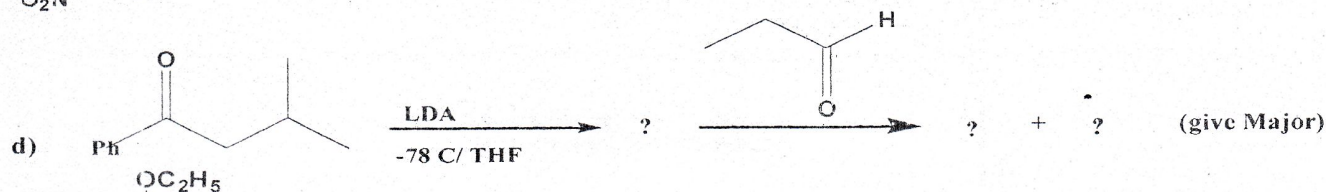
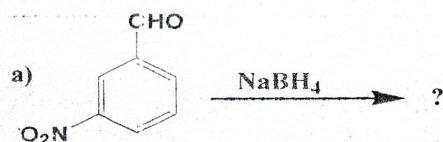
- In the nucleophilic addition to Ketones the smaller nucleophile give rise to greater distereoselectivity.
- Homogenous catalyst are not easier to remove from the reaction mixture.
- CH_3COCl is reduced to CH_3CHO by using LiAlH_4 .
- Reduction of ethylacetoacetate using NaBH_4 is a type of chemoselectivity.
- Chloromethylthioether is a reagent to protect hydroxyl groups.
- Wilkinson Catalyst reduce only the more hindered alkenes
- The reaction of CH_3CN with DIBAL-H in hexane at -70°C gave CH_3NH_2 .
- TMS enols is much more selective than Li and Boron enolates.
- The reaction of aldehyde or ketones with sec. amines give imines
- Diimide was used to convert 3-cyclohexenone to 3-cyclohexenole.
- Lindlar catalyst was used to reduce the alkynes to trans alkenes

Q2) Write by equations on (Four-Only) the following:

(12 Marks)

- Using of Fmoc reagent for the protection of diethyl amine
- Reduction mechanism of dimethylacetylene with Na/NH_3 .
- Oxidation of 1-butene using SeO_2 .
- The reaction mechanism for oxidation of isopropanol using DMP
- Using Chair-Like Transition state explain the formation of Cis and Trans Li enolate.

Q3) Complete the following equations (draw the stereochemical in products if found) (11 Marks)



Answer **Four only** from the following:

Q 1 a) How dust particles enhance atmospheric corrosion? (4 marks)

b) Discuss the following: A steel piece is exposed to an aqueous solution – distinguish between chemical and electrochemical corrosion. (6 marks)

Q2 a) Explain by examples how galvanic coupling between two different metals could play contradiction roles in the corrosion process. (5 marks)

b) On cathodic polarization at 0.001 A cm^{-2} the hydrogen overvoltage $\eta_{\text{H}_2} = -0.467 \text{ V}$. What is the polarization potential of a steel specimen $E_{\text{pol}} = ? \text{ V vs. SCE}$ in a solution of pH 3.

Given $E_{\text{sat,calomel}} = 0.241 \text{ V vs. SHE}$. (5 marks)

Q3 a) Define the following terms: crevice corrosion – Graphitization- Hydrogen embrittlement (4.5 marks)

b) The corrosion current of iron rod in an aqueous solution is $15 \mu\text{A cm}^{-2}$, the rod is 2 cm diameter and is immersed to 20 cm in the solution. Calculate the corrosion rate in cm day^{-1} . (m_e of iron = 0.2893 mg/C , density = 7.8 g cm^{-3}) (5.5 marks)

Q4 a) How does alteration of environment decrease the chance of corrosion. (5 marks)

b) Explain the following i) Types of polarization (ii) Factors affecting the magnitude of the exchange current. (5 marks)

Q5 a) What are the possible cathodic reactions which might occur during corrosion? (4 marks)

b) Calculate the emf of the following cell at 25°C : $\text{Pt}; \text{Sn}^{4+} (a_+ = 0.0001), \text{Sn}^{2+} (a_+ = 0.01), \text{Ag}^+ (a_+ = 0.1); \text{Ag}$ Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

The standard reduction potentials: $E_{\text{Sn}^{2+}/\text{Sn}^{4+}}^\circ = 0.15 \text{ V}$, $E_{\text{Ag}^+/\text{Ag}}^\circ = 0.779 \text{ V}$

مع اطيب التمنيات بالتوفيق..

الدكتور / مصطفى حسن وهدان

الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس



Date: Saturday, 26/05/2018

Time: 2 hours

Answer the following Questions:

(50 points)

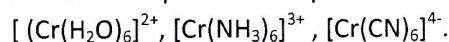
- 1) What are the main three moieties for each Nucleotide made up of ?
- 2) Discuss the steps of Plastic Production, showing the types of Moulding?
- 3) Why would a hole appear when a dilute alkali is spilt on a fabric made of Polyesters, discuss by mechanism equations ?
- 4) Explain the two stages for the formation of Urea-Formaldehyde Resins ?
- 5) Discuss the three main types of degradable plastics? Why are they degradable?
- 6) What are the two types of polyethylene? What is the structural difference between them?
- 7) Draw the structure of the Plasticizer used in manufacture of PVC, its name?
- 8) Mention examples for the thermoset and thermoplastic polymers, drawing its chemical structures?

Good Luck

Examiner:

Prof. Dr. Kamal I Aly

iv) Which metal complex ion is expected to be subject to Jahn- Teller distortion?



v) CFSE for d^4 octahedral complex is $(-0.6 \Delta_o, -1.8 \Delta_o, -1.2 \Delta_o)$

b) Predict the number of unpaired electrons and magnetic moment for each the following

i) Tetrahedral d^6 ion ii) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ iii) A square – planar d^7

Section C: Answer the following questions:

16Marks

1- Name the actinide elements in the correct order. Give their symbols ,atomic numbers , electronic configurations and oxidation states. (5 Marks)

2- Answer **Only One** of the following:

a- Compare the oxidation states of the lanthanides and the actinides. (3Marks)

b- Note the different methods of separation of the lanthanides. (3Marks)

3- Comment on **Only Four** of the following (8 Marks)

a- The atomic radius of $\text{La} > \text{Y}$ while $\text{Zr} = \text{Hf}$.

b- With CO as a ligand lanthanides do not form complexes as transition metals(3d) do.

c- The colors of Ln^{3+} ions with the electronic configuration $4f^n$ is the same as those with $4f^{14-n}$.

d- Ion exchange method is the most efficient for the separation of the lanthanide ions.

e- Actinide hydroxides are more basic than the corresponding lanthanide hydroxides.

(Ti = 22 , Cr = 24 , Mn = 25 , Fe = 26 , Co =27 , Ni = 28 , Cu = 29 Zn = 30)

الممتحنون : ا/د/ محمد عبدالحكيم الجهمي – ا/د/ أمّنه سيد احمد – د/ زاهر عبدالمحسن

Good Luck

Final examinations for third level students (324C) in inorganic chemistry

Section A: Answer the following questions:

17 Marks

1- Choose the correct answer for **five only**:

- d^5 in octahedral complexes have high spin and ($E=0$; $E=-2\Delta_o$; $E=-2\Delta_o+2PT$)
- $[\text{Mn}(\text{CN})_6]^{4-}$ complex have unpaired electrons equal ($n=1$; $n=5$; $n=2$)
- which of metal complex ion is inert ($\text{Co}(\text{NH}_3)_6^{3+}$; $[\text{Co}(\text{CN})_6]^{3-}$; $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$)
- High spin of electron in O_h complexes have
(weak field L and small Δ_o ; weak field L and high Δ_o ; strong field L and small Δ_o ; L=ligand)
- Relation between Δ_o and Δ_t in complexes have similar metal captions and ligands
($\Delta_t = 4/9\Delta_o$; $\Delta_o = 4/9\Delta_t$; $\Delta_t = 3/5\Delta_o$)
- π - donor ligand has filled orbitals of π - symmetry and these have
($L \rightarrow M$; $M \rightarrow L$; none) electrons donation

2- Answer **three only** of the following:

- Write all steps of overall stability constant of reaction $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ with six cyanide ions.
- compare between π - donor; π -acceptor and σ -donor ligands in MO splitting
- Compare between the MO energy level diagram of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F})_6]^{3-}$
- Explain **three only**:
 - Antibonding orbitals in M.O.
 - Overall stability constant of complexes
 - π - donor ligands
 - LMCT and MLCT transitions

Section B: Answer the following questions:

17 Marks

1- a) Give reasons for **(four only)**:

- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is perfect octahedron while $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is not.
- $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ have different colors in dilute solutions.
- $\text{K}_3[\text{Fe}(\text{OH})_6]$ is attracted most strongly to a magnet than $\text{K}_3[\text{Fe}(\text{CN})_6]$
- The magnetic moment of a tetrahedral $\text{Co}(\text{II})$ complex is 4.0 B.M.
- $[\text{Ni}(\text{CN})_4]^{2-}$ square planar but $[\text{Ni}(\text{CO})_4]$ tetrahedral
- Draw d-orbital splitting diagrams for each of $[\text{Co}(\text{NH}_3)_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$, the Δ_o values for these two complexes are approximately 120 kJ/mol and 270 kJ/mol respectively. The pairing energy of Co^{+2} is approximately 270 kJ/mol and of Co^{+3} is approximately 210 kJ/mol. using CFT
- Compare the following complexes with respect to these shape, magnetic behavior and hybrid orbitals involved $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Zn}(\text{NH}_3)_4]^{2+}$

2- a) Chose the correct answer and comment **(four only)**:

- A magnetic moment of 1.73 BM will be shown by one among the following :
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
- Para magnetic complex $[\text{NiX}_4]^{2-}$. The number of unpaired electrons in the nickel and geometry of this complex ion are (one – tetrahedral, two- tetrahedral, one-square planar).
- Which is high-spin and how many the number of electrons in low and high level in each case
 $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$ $\Delta_o \approx 250\text{kJ/mol}$ or $[\text{Mn}(\text{CN})_6]^{3-}$, $\Delta_o \approx 460\text{ kJ/mol}$

3. LVDT is a device that converts:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Displacement to electrical signal.
- (d) Pressure to displacement.

4. Bourdon tube and bellows convert:

- (a) Temperature to resistance.
- (b) Temperature to voltage.
- (c) Analog signal to digital signal.
- (d) Pressure to displacement.

5. Hygrometers or psychrometer is a transducer that produces output signal based on :

- (a) Flow rate.
- (b) Temperature.
- (c) Relative humidity.
- (d) Pressure.

6.is used for measuring very high temperature without physical contact with object to be measured.

- (a) Gas sensor
- (b) Pressure sensor.
- (c) Level sensor.
- (d) Radiation pyrometer.

7. Three applications for ultrasonic transducers in industry are:

- (a) Level, temperature, and flow detection.
- (b) Light intensity, pressure, and level.
- (c) Pressure, level, and temperature.
- (d) Flow detection, cleaning, and level.

8.is used for measuring the flow rate of the conducting fluid:

- (a) Temperature sensor.
- (b) Thermostat.
- (c) LVDT.
- (d) Magnetic flow meter.

9. A thermocouple junction produces 50 mV at 1400 °C and 10 mV at 200 °C. The net voltage produced by the thermocouple is:

- (a) 60 mV.
- (b) Zero voltage
- (c) 80 mV.
- (d) 40 mV

10. If the pressure at the sensor is 49 KPa in an open tank contains water. The level of the water is

- (a) 6 m.
- (b) 5 m
- (c) 8 m.
- (d) 4.5 m

End of Questions

Good Luck

Dr.-Ing.: Amer Abdelfattah Ali Nouredin



Assiut University

Applied Industrial Chemistry Program 2017-2018 Final Exam

Course Title : Instrumentation & Process Control

Course Code: Eng 300

Time: 2 Hours

Date: 17-5-2018



Faculty of Science
Chemistry Department

Answer The Following Questions:

Question # 1:(10 points)

Draw **the block diagram**, state **advantages**, and **disadvantages**, and give an **example** for:

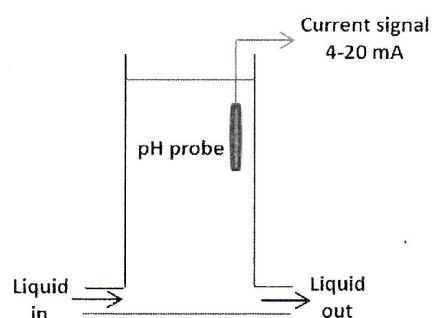
- Open loop control system.
- Closed loop control system.

Question # 2:(15 points)

- Define the following terminologies: transducer, actuator, sensor sensitivity, sensor resolution.
- Explain the operation principle of the thermistor.
- Draw a block diagram representation of a thermostatically controlled electric oven in the laboratory in the chemistry department.

Question # 3:(10 points)

- The output current range of a pH probe is from 4 to 20 mA. **What is the probe output current when pH is 6, and in the case of neutral.**
- The pH factor of a liquid is a very important factor to be controlled in chemical process control systems. The Figure shows a liquid flowing through a tank, and the pH probe measures the actual pH level. Draw the block diagram of a closed-loop control system so that it could add an acid or base to the liquid in the tank, and achieve the desired pH factor for all kinds of liquid pH factor.



Question # 4:(10X1.5=15 points)

Complete the answer table by writing the letter corresponding to the correct answer only.

في هذا السؤال المطلوب "أ" ملأ الجدول التالي بالأحرف الأبجدية المقابلة للإجابة الصحيحة وإعادة كتابة الجدول فقط في ورقة الإجابة

1.	2.	3.	4.	5.	6.	7.	8.	9.	10

1. A thermocouple is a transducer that converts:

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|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

2. A thermistor is a transducer that converts:

- | | |
|--------------------------------------|-------------------------------|
| (a) Temperature to resistance. | (b) Temperature to voltage. |
| (c) Analog signal to digital signal. | (d) Pressure to displacement. |

- (iii) Calculate the degree of uncertainty in momentum and velocity for each of the following:
- 1- An electron moves in a box with length $1.0 \text{ \AA}$.
 - 2- Hydrogen atom has weight $1.6726 \times 10^{-27} \text{ kg}$ moves in a box with length $10.0 \text{ \AA}$.
 - 3- Tennis table's ball has weight 1.0 g move in a box with length 10 cm .

$$h = 6.626 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}, e = 1.602 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}$$

III- Answer **Only Six** of the following questions: (16.5 marks)

- (a) Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- (b) Assuming that the force constant for $\text{C} \equiv \text{C}$, $\text{C} = \text{C}$ and $\text{C} - \text{C}$ are in the ratio 3:2:1 and that normal range of $\text{C} = \text{C}$ stretch absorption is $1630\text{--}1690 \text{ cm}^{-1}$, what range would you expect for $\text{C} - \text{C}$ and $\text{C} \equiv \text{C}$ stretch vibration?
- (c) Which of the following molecules can show pure rotational spectra and which can show pure vibrational spectra NH_4Cl , N_2 , HF , $\text{H}_2\text{C} = \text{CH}_2$, CH_3Cl , $\text{C}_6\text{H}_5\text{OH}$, NO , CO , SO_2
- (d) Explain the origin of Raman effect by quantum mechanical concept.
- (e) The ESR frequency for a free electron is 9000 MHz . Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, $g \text{ value} = 2$).
- (f) Write the rule of mutual exclusion, and show when CO_2 molecule will be infrared active and when Raman active.
- (g) Explain, how the electron charge cloud around an atom or molecule is distorted, when light is absorbed or emitted by the atom or molecule.

Good Luck

The Examiners: Prof. Dr. Maher M. A. Hamed
Dr. AbdelRahman A. Dahy
Dr. Mostafa F. Mostafa

Final Physical Chemistry III Examination (C-332) for Third Level Students

Answer All The following questions (I, II and III) (50 Marks)

I- Answer *Only Three* from the following: (17 Marks)

- (a) Starting from the barometric formula derive the Maxwell-Boltzmann distribution law for molecular speeds in three dimensions.
- (b) Define the viscosity and thermal conductivity of a gas, then deduce the relationship between their coefficients.
- (c) i- Explain briefly the effect of temperature and pressure of diffusion coefficient of a gas.
ii- The collision diameter of nitrogen is 3.74×10^{-8} cm at 27°C and 760 mmHg. Calculate the collision properties (L , Z_1 and Z_{11}).
- (d) Calculate the fraction of O_2 molecules at 1 atm and 27°C where kinetic energies are in the range of $E - 0.005 E$ and $E + 0.005 E$.

$R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number $= 6.022 \times 10^{23}$, atomic weight of nitrogen = 14 and oxygen = 16)

II- Answer the following two questions: (16.5 Marks)

(a) Answer *Only One* from the following:

- (i) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A , B and k are constants, is a solution for the Schrödinger equation for a particle moving into a one dimensional box between $x = 0$ and $x = a$.

1- Confirm that the accompanied energies for the particle motion inside the box can be calculated from the following relation:

$$E_n = \frac{n^2 h^2}{8ma^2}$$

2- Confirm that the normalization factor, A , for the normalized wavefunction Ψ equals to $\sqrt{\frac{2}{a}}$.

- (ii) If the solution for Schrödinger equation for a particle moving in one dimensional box, x direction, is $\Psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$, Deduce the expectation value, $\langle p_x \rangle$, and the eigen value, p_x , for the linear momentum of this particle in the ground state and outline why there is no contradiction between the two results.

(b) Answer *Only Two* from the following:

- (i) If the work function for the cesium metal is 3.43×10^{-19} J. Calculate the kinetic energy for emitted electron when exposed to light with wavelength 550 nm and what is the stopping potential in this case? What is the total emitted electrons if the total absorbed energy at the wavelength 550 nm is 1.00×10^{-3} J?
- (ii) Calculate the wavelength for an electron accelerated between potential difference 220 volt.

Turn Over 

Q.4: Answer The Following:

(a) Write on the principle of electrochemical biosensor (Give an example).

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(b) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu A$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_p be for $v = 100 \text{ mV/s}$ and 1.2 mM DOB?

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Good Luck

Examiners: Prof. A.H.Ibrahim & Dr. Hossieny Ibrahim

Q.3: Answer The Following (Two Only):

(a) The drug Clonazepam (CZP) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CZP yielded a peak height of 0.37 μA . When 2.0 mL of 3.0 μM CZP was spiked to the sample, the peak increased to 0.80 μA . Find the concentration of Clonazepam in the sample.

b) Write on adsorptive stripping voltammetry

(c) Role of auxiliary electrode: (with drawing)

Q.2: Answer The Following (Two Only):

- (a) The limiting diffusion current that would be expected from the reduction of $2 \times 10^{-4} \text{ M Zn}^{2+}$ is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

[illegible]

- (b) Mark (✓) for the correct statement and (X) for the wrong statement
- 1) Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
 - 2) Due to Hg is oxidized; it restricts the use of electrode as cathode.
 - 3) Current is sampled twice in differential pulse polarography.
 - 4) Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
 - 5) The principle function of a potentiostat is to control potential and measure current.
 - 6) Migration is the movement of oppositely charged ions towards electrode due to electrostatic attractions, minimized by adding a supporting electrolyte to the test solution.
 - 7) For reversible systems E_{p_a} and E_{p_c} are dependent of the scan rate.

1	2	3	4	5	6	7

- (c) Compare between polarizable and nonpolarizable electrodes**

5.

Section (B) (25 Marks)



Answer The Following Questions:

Q.1: Write on the following (Three Only):

(a) Advantages of stripping voltammetry

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(b) Randles-Sevcik equation

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(c) Ilkovic equation:

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(d) Carbon electrodes (Give examples)

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(b) Draw the graphite furnace atomizer.

Q.6: (a) What are the advantages of the ICP technique?

(b) Why are there two monochromatros in a flutometer?

Q.4: (a) Draw phototube

(b) Write the equations for the spectrophotometric analysis of each of Cu^{2+} , Fe^{3+} and Fe^{2+} .

Q.5: (a) Write the slop ratio method to determine the complex formation reaction.

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[illegible]

Assiut University	Second Semester Final Examination	May 2018
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours System)	

Section (A) (25 Marks)

Answer Only Five of the Following Questions:



Q.1: (a) List the following in order of increasing energy, frequency and wave length: X-ray, Visible light, radio wave, ultraviolet light.

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(b) Which has the lower energy. Light with $\nu = 7.14 \times 10^{13} \text{ s}^{-1}$ or light with a wave number of $1.91 \times 10^4 \text{ cm}^{-1}$?

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Q.2.: (a) Diffraction grating contains 500 grates per 1 cm. What is length of this grating to resolute the two lines of Na 589, 589.2 nm (second order)

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Answer the following questions

1) "Fiberglass furnaces are divided into three distinct sections". Discuss in details the function of each section. (12 Marks)

2) i) Write on the following items used in fiberglass industry:
- Gel coat - Resin catalyst -chopped strand mat

ii) Describe with drawing the "float process" used for glass shaping . (12 Marks)

3) i) Discuss the composition and properties of the following types of glass fiber: E-glass, C-glass and S-glass.
ii) Compare between the safety of glass fiber and that of asbestos. (12 Marks)

4) Answer **TWO** of the following
i) Describe the function of pot and tank furnaces in glass manufacture.
ii) Give three causes responsible for glass devitrification and three processes used for its repairing.
iii) Write on the environmental impacts of float glass industry in terms of emissions (give also equations). (14 Marks)

Examiner

Prof. Dr. Aref A. M. Aly

Final exam

Chem 334 (Corrosion chemistry)

second semester 2017-18

Time: 3 hours

Answer Five only from the following:

Q1 : State (✓) or (×) and give the right answer if any for the following

(10 marks)

- 1- Contamination of the product is considered a direct cost of the corrosion.
- 2- Heterogeneous phases in the alloy are beneficial (مفيد) for the corrosion resistance.
- 3- The metals above the hydrogen in the electrochemical series can be liberate the hydrogen when placed in acid and therefore corrode.
- 4- Differential motion of electrolyte causes galvanic corrosion.
- 5- The exchange current is the critical current of anodic polarization.
- 6- ΔG is a measure of the tendency of a metal to corrode.
- 7- Activation polarization is caused by lower activation energy of electrode reaction.
- 8- Activation polarization for anodic or cathodic reactions-increases with current, in according with Nernst equation.
- 9- If two metals are galvanically connected in an aqueous solution, the more electropositive metal will have a tendency to corrode.
- 10- The pH of solution doesn't affect the corrosion behavior of steel.

Q 2: a) Explain the electrochemical and chemical reactions which lead to formation of rust. (4 marks)

b) Calculate the emf of the following cell at 25°C: Pt; Fe^{3+} ($a_+ = 0.0001$), Fe^{2+} ($a_+ = 0.01$), Cu^{2+} ($a_+ = 0.01$); Cu
Write the spontaneous reaction of the cell, which electrode is anode? (6 marks)

$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, \quad E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$$

Q3:a) Discuss the basic causes of corrosion. (5 marks)

b) On anodic polarization, the potential of a platinum electrode at which O_2 evolves in an electrolyte of pH = 11 is 1.35 V vs. SCE. Calculate the value of oxygen overvoltage (explain with Evan diagram). Given potential of oxygen electrode in alkaline solution is



And $E_{\text{sat,calomel}} = 0.241\text{V vs. SHE}$, consider $P_{\text{O}_2} = 1\text{ atm}$ (5 marks)

Q4:a) Explain application of electrical potential for protection of a metallic construction in the field. (5 marks)

b) The linear polarization slope at low current densities for iron in a corrosive solution is $0.5\text{ mV}/\mu\text{A cm}^{-2}$. Calculate the corrosion rate in mdd (given that Tafel constants equal to 0.1 V and m_c of iron = 0.2893 mg/C) (5 marks)

(باقى الأسئلة بالخلف)

- Q5:a) What is the inhibitor and explain how it works in metallic protection? (4 marks)
b) By using Tafel lines, how can you detect the type of inhibitor and inhibition efficiency? (6 marks)

- Q6: a) Write about the following: (i) pitting corrosion (ii) galvanic corrosion (4 marks)
b) For an active-passive anodic behavior of a metal electrode in corrosive solution, explain the following terms: critical current – primary passive potential – passive current – passive range – pitting potential- transpassive potential (6 marks)

Constants: $F=96485 \text{ C/mol}$, $R=8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس
الدكتور / مصطفى حسن وهدان

Chemistry Department

May 2018

Faculty of Science

Time: 3h

Assiut University

Final examination of 324 C (Inorganic Chemistry III) for third level

students

Answer the following questions

A) Answer the following

- i) Give three consequences in the chemistry of lanthanides due to lanthanide contraction, including the effect on the basicity of their oxides and hydroxides. (6 Marks)
- ii) Give reasons for **TWO** of the following (6 Marks)
- Decrease in complex formation ability of lanthanides in the sequence $\text{Ln}^{4+} > \text{Ln}^{3+} > \text{Ln}^{2+}$ with a specific ligand.
 - The aqueous chemistry of uranium ions is very complex.
 - Anhydrous trivalent lanthanide chlorides can not be obtained by heating the hydrated chlorides.
- iii) Describe (in the form of a scheme) the method commonly used for the extraction of scandium from its main ore. Why Sc is expected to exhibit maximum oxidation state of +3 ?. (5 Marks)

B) Answer Only Four of the following:

(17 Marks)

- 1- Compare between CFSE of Cu(II) complex ion in octahedral , tetrahedral and square planar fields.
- 2- The magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry.
- 3- Explain how the limitations of VBT and CFT were solved by MOT.
- 4- The enthalpy of hydration of Cr^{2+} ion is $-460 \text{ K cal mol}^{-1}$. In the absence of CFSE the value of enthalpy of hydration is $-435 \text{ K cal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion.
- 5- Give the spectroscopic ground term and the electronic transitions for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{CrF}_6]^{3-}$ complex ions.

انظر ملفه بغير علامة

C) Answer Only Four of the following:

(16 Marks)

- 1- Using VBT, predict the number of unpaired electrons, geometry and magnetic moment value of each of the complex ions: $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
 - 2- Arrange the following pairs of complex ions on the basis of their crystal field splitting energy (Δ_o).
 $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
 $[\text{Cr}(\text{en})_3]^{3+}$ and $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$
 - 3- On the basis of CFT calculate the magnetic moment value of the $\text{K}_3[\text{Mn}(\text{CN})_6]$ complex.
 - 4- "A solution of $[\text{Co}(\text{CN})_6]^{3-}$ ion is colourless but that of $[\text{CoF}_6]^{3-}$ has a reddish colour". [Give reason]
 - 5- Explain the following, giving appropriate reasons for your answer using CFT
 - i- Tetrahedral complexes are generally high spin.
 - ii- Bis(dimethylglyoximate) nickel (ii) is experimentally known to be diamagnetic. Predict whether the complex is square planar or tetrahedral.(Atomic numbers) Mn=25 , Cr=24 , Ti=22 , Co=27 , Ni=28
-

Examiners: Prof.Dr.Aref A.M.Aly

Prof.Dr.Asmaa I .El-Said

Assiut University

Date: 29-5-2018

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

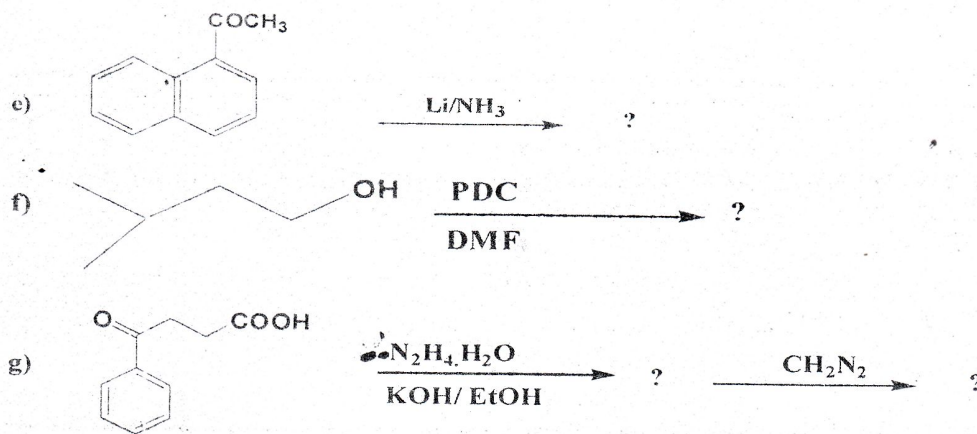
Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

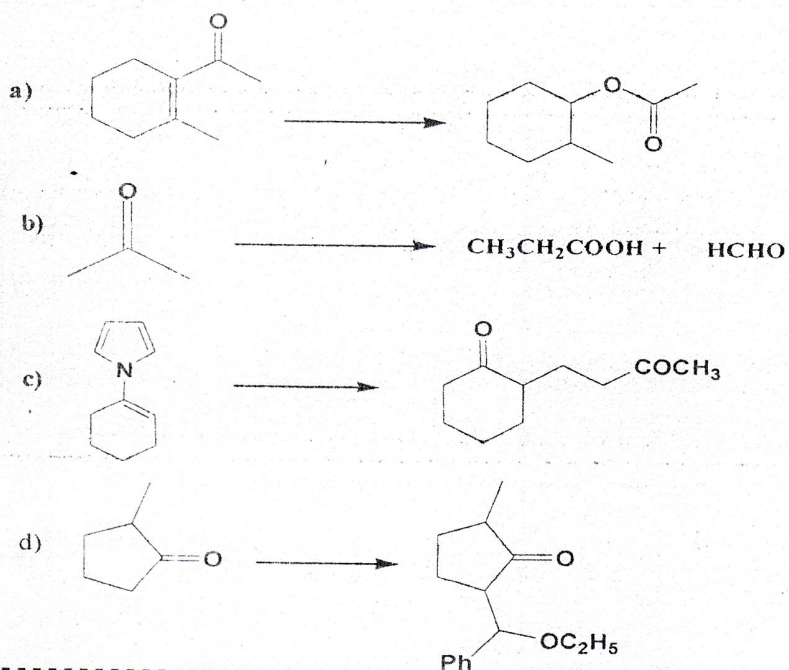
Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali



Q4) Write by equations how you can carry the following transformations (16 Marks)



Good Luck

Prof. Dr. Shahkat

Final Examination of Natural Products and Biochemistry for 312C
Students

Answer the following questions:

Section A: Natural Products Chemistry

(33 Marks)

1. Write on *FOUR* only of the following:

(11 Marks)

- a) Papaverine $\xrightarrow[\text{Conc.; hot}]{\text{KMnO}_4}$ (A) + (B) + (C) + (D)
- b) Starting with cholesterol, synthesis of 3',7-dimethylcyclopentenophenanthrene.
- c) Conversion of ethyl acetoacetate into β -farnesene.
- d) Prove by equation that oestrone has OH group phenolic.
- e) Starting with propanaldehyde, preparation of ephedrine.

2. Discuss *FOUR* only of the following:

(11 Marks)

- a) Prove by equation that linalool has tertiary hydroxyl group.
- b) Conversion of naphthalene into Diel's hydrocarbon.
- c) Prove by equations that nicotine has two moieties pyrrole and pyridine.
- d) Prove by equation that piperic acid is 3,4-methyldioxy cinnamic acid.
- e) The methods of extraction of terpenoids.

3. Explain *FOUR* only of the following points:

(11 Marks)

- a) Conversion of oestriol into oestrone and via versa.
- b) Starting with catechol, preparation of papaverine.
- c) IUPAC name of camphor, thujane, hygrine, carane and camphene.
- d) Conversion of quinoline into 1-(prop-1-enyl)benzene.
- e) Starting with limonene, synthesis of carvone.

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Answer the Following Questions:

1-a) Define the following terms : (6 Marks)

- | | |
|----------------------------------|---|
| (i) Surface excess concentration | (ii) monolayer adsorption |
| (iii) Adsorption isotherm | (iv) Lyophobic colloids (v) Dialysis (vi) Peptization |

1-b) Put (✓) or (×) for the following sentences : (5 Marks)

- | | |
|---|-----|
| (i) Chemisorption forms multilayer at low temperature | () |
| (ii) The magnitude adsorption gas is expressed as $\frac{x}{m}$ | () |
| (iii) The surface tension of water is increased by the addition of alcohols | () |
| (iv) Colloidal systems can be prepared only from organic substances | () |
| (v) During electro-osmosis neutral particles also move | () |

2)- Choose the correct answer (9 Mark)

- (i) Which of the following does not belong to colloid system,
a) Gelatin solution b) Red gold sol c) KCl solution d) Soap solution
- (ii) Tyndall's effect associated with colloidal particles is due to,
a) presence of charge b) scattering of light c) pressure increase d) concentration increase
- (iii) The protection power of lyophilic colloidal sol is expressed in terms of,
a) critical micelle concentration b) oxidation number d) coagulation value e) Gold number
- (v) Which of the following statements is incorrect regarding physisorption,
a) it occurs because of Vander wall forces b) more easily liquefiable gasses are adsorbed readily
c) it results into multimolecular layer are adsorbed readily d) Enthalpy of adsorption is low and positive
- vi) In Langmuir's model of adsorption of a gas on solid surface which of the correct statement,
a) The adsorption at a single site on the surface may involve multiple molecule at the same time
b) The mass of gas striking a given area of surface is proportional to the pressure of gas.
c) The mass of gas striking a given area of surface is independent of pressure of gas.
d) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered.

3- Write short answers on three of the following (15 Marks)

- (i) What happens when electric field is applied to colloidal solution
- (ii) On the basis of Hardy – Schulze rule explain why the coagulating power of phosphate is higher than chloride
- (iii) Factors affecting the amount of gas adsorbed on solid surface
- (iv) The type of nitrogen isotherms at -196 °C.

4- Answer three from the following (15 Marks)

- a) Relative stability of hydrophilic and hydrophobic sols
- b) Mention the methods used for preparation of sols
- c) Apply the V_a method for calculating of S_t and investigation of the porosity of solid.
- d) From adsorption isotherm of a solid catalyst, apply the BET equation for calculation of its specific surface area (S_{BET})

----- Good Luck -----

Prof. Dr. Abdel-Aziz A. Said