Faculty of Science **9 June 2022**

Chemistry Department **Time allowed: 2 hours**

Final Examination of Introductory Quantitative Analysis

For 2nd Level Students (C – 240)

Answer the following questions:

Section A : Final Examination (50 degree)

I – Write (true) or (false) in front of the following statements :

(20 degree , 1 degree for each)

1- EDTA is a tetraprotic acid ..... ( )
2- EDTA is a tetradentate ligand ..... ( )
3- The complexation equilibria with EDTA are a pH – dependent ..... ( )
4- Eriochrome Black T is a metal ion sensitive indicator ..... ( )
5- Argentometric titrations are used universally for metal ions determination ..... ( )
6- The end point in Liebig method is detected by the appearance of a temporary turbidity. ( )
7- Liebig method is used for the determination of Cl^- and Br^- ions ..... ( )
8- Diphenyl amine is a redox indicator ..... ( )
9- Fluorescein is an adsorption indicator ..... ( )
10- Mohr method is carried out in strong alkaline media ..... ( )
11- Precision is defined as the closeness of the measured value to the true value. ..... ( )
12- Methyl orange is a precipitate indicator. .... ( )
13- Q – test tells us whether two standard deviations are significant different from each other. ..... ( )
14- Buffer solutions resist the change in pH upon adding weak acid or weak base ..... ( )
15- Autoproteolysis is the self- ionization of a solvent to give cation and anion ..... ( )
16- Random error can be discovered and corrected ..... ( )
17- Standard deviation is a measure how closely the data are clustered about the mean ... ( )
18- Post- precipitation is the impurities collected on the product while a precipitate is standing in mother liquor ..... ( )
19- Ionic strength is a measure of the concentration of some ions in solution. ..... ( )
20- Bronsted- Lowry acid is a substance that donate protons. ..... ( )

II- Choose the correct answers: **(30 degree , 2 degree for each)**

21- Calculate the solubility of AgCl in g /L.

a) $1.6x10^{-2}$ b) $1.6x10^{-3}$ c) $1.6x10^{-4}$ d) $1.6x10^{-5}$

22- What is the pAg in a solution obtained by mixing 45 ml of 0.1 M $AgNO_3$ and 55 ml 0.1 M NaCl .

a) 5.92 b) 6.92 c) 7.92 d) 2.00

23- What is the potential of a solution obtained by adding 5.0 ml 0.1 M Ce^{4+} to 5.0 ml 0.3 M Fe^{2+} solution.

a) 0.732 v b) 0.742 v c) 0.752 v d) 0.762 v

24- Given that, K_f for ML^{2+} complex is $1x10^8$, what is the pM in a soluti on obtained by mixing equal volumes of 0.2 M solution for each of M^{2+} and L.

a) 3.5 b) 4.5 c) 5.5 d) 6.5

25- Calculate the molarity of a concentrated $HCLO_4$ acid solution that is 70 % (wt/wt) and specific gravity 1.668 .

a) 11.6 b) 10.6 c) 9.6 d) 8.6

26- What weight of $K_2Cr_2O_7$ is required to prepare 1.0 L of 0.1 N so lution

($Cr_2O_7^{--} + 14\ H^+ + 6e^- = 2\ Cr^{3+} + 7\ H_2O$)

a) 4.9 g b) 4.8 g c) 4.7 g d) 4.6 g

27- Calculate the titer of 0.1 M EDTA in mg $CaCO_3$ / ml.

a) 7 b) 8 c) 9 d) 10

28- Calculate the potential of a solution obtained by reacting 10 ml each of 0.2 M Fe^{2+} and 0.2 M Ce^{4+}.

a) 0.83 v b) 1.49 v c) 0.77 v d)1.19 v

29- In a titration of strong acid with weak base, the pH at the equivalent point is .....

a) acidic b) neutral c) alkaline d) non of these

30- Find the pH of a solution prepared by dissolving 10 g of potassium hydrogen phthalate (M.wt = 204.22) and 12 g of disodium phthalate (M. wt = = 210.09) in 50 ml of water, ($pKa_2 = 5.04$).

a) 5.26 b) 5.47 c) 6.47 d) 6.00

31- Find the ionic strength of 0.01M Na_2SO_4 .

a) 0.03 b) 0.01 c) 0.05 d) 0.00

32- An amine, RNH_2, has a pK_b of 4.20, what is the pH of a 0.20 M solution of the base?

a) 12.00 b) 12.55 c) 11.00 d)11.55

33- How many milliliters of 0.5 M NaOH should be added to 10 g of tris-hydrochloride to give a pH of 7.60 in a final volume of 250 ml? (pKa = 8.075 , .M.wt = 157.596) .

a) 21.6 ml b) 19.6 ml c) 31.6 ml d) 41.6 ml

34- The pH of 0.1 M CH_3COONa solution ($K_a = 1.75x10^{-5}$) is .....

a) 8.89 b) 9.89 c) 10.89 d) 11.89

35- A buffer solution that is 0.2 M in acetic acid and 0.2 M in sodium acetate, calculate the change in pH upon adding 1.0 ml of 0.1 M HCL to 10 ml of the buffer solution ($pK_a = 4.76$)

a) – 0.05 b) – 0.02 c) + 0.02 d) + 0.05

.....

$Ksp\ (AgCl) = 1.2x10^{-10}$

$E^o_{Fe3+,\ Fe2+} = 0.77$ v

$E^o_{Ce4+,\ Ce3+} = 1.61$ v

At.Wt : Ca = 40.08 , K = 39.102 , Cr = 51.996 , Ag = 107.870 ,

O = 15. 999 , C = 12.011 , Cl = 35.453 , H = 1.00797

Section B: Oral Examination **(10 degree)**

I – Write (true) or (false) in front of the following statements :

(1 degree for each)

36- Silver thiocyanate is less soluble than silver chloride .... ( )

37- Volhard method can be used for Cl^- determination without any precautions ...... ( )

38- The electrode potential is the measure of the tendency of a half- reaction to give off or gain proton .... ( )

39- The molality is the number of gram molecular weights of a solute dissolved 1000 g of solution .... ( )

40- The concentration units mg /L and ppm are the same .... ( )

41- Equivalent point is the point at which the reaction is observed to be complete .... ( )

42- Peptization is the reverse of coagulation .... ( )

43- Arrhenius acid-base theory is applicable only in water .... ( )

44- Relative uncertainty compares the size of the absolute uncertainty with the size of its associated measurement .... ( )

45- The greater the standard deviation, the good in the precision .... ( )

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Good Luck

Examiners : Prof. Dr. Hassan Sedaira

Prof. Dr. Elham Y. Hashem

Assiut University **June 2022**
Faculty of Science **Time: 3 hours**
Chemistry Department

Final Exam for Computational Chemistry (C234)

Answer all the following questions: (The exam is in **three** pages)

Question One: Choose the correct answer for each of the following: (25 Marks)

1. ..... doesn't have electron correlation.

   a) CIS b) HF c) DFT d) a and b

2. The basis set 6-31++G contains polarised functions on .....

   a) hydrogen atoms only b) non-hydrogen atoms only

   c) hydrogen and non-hydrogen atoms d) no atoms

3. The basis set ..... is triple zeta.

   a) 3-21G* b) 6-311G c) 6-31+G(3df,3dp) d) b and c

4. The basis set ..... has diffuse functions for all atoms.

   a) 6-31G(d) b) 6-311+G(d) c) 6-311+G(d,p) d) 6-31++G(d)

5. ..... is not based on the HF method.

   a) DFT b) CISD c) CCSD(T) d) All the preceding

6. ..... is the most accurate method in this group.

   a) DFT b) CCSD(T) c) HF d) CCSDT

7. ..... is the fastest method in this group.

   a) DFT b) CCSD c) MP2 d) PM6

8. A transition state has ..... imaginary frequency/frequencies.

   a) no b) one c) two d) more than one

9. ..... cannot be used for modelling UV-Vis spectra.

   a) HF b) Molecular mechanics c) DFT d) a and b

10. ..... have no imaginary frequencies.

    a) Reactants b) Products c) Transition states d) a and b

11. The ..... approximation states that the kinetic energy of nuclei is zero.

    a) Born-Oppenheimer b) Slater c) Hartree d) Fock

12. The Schrödinger equation can be solved exactly for .....

    a) **H** b) $\mathbf{He^+}$ c) $\mathbf{H_2^+}$ d) all the preceding

Question Two: Put **(T)** for true and **(F)** for false for the following: (25 Marks)

1. A saddle point has no negative frequencies.
2. Dispersion corrected DFT methods are appropriate for modelling non-covalent interactions.
3. CID has single and double excitations.
4. *Ab initio* methods rely on parameters from experiment.
5. CCSD is faster than DFT methods.
6. CCSD has electron correlation.
7. The force constant is the first energy derivative of the potential energy.
8. The solution of the Schrödinger equation for the hydrogen atom is the atomic orbitals: 1S, 2S, 2P, ...
9. HF is a single reference method.
10. Individual electrons are represented by different columns in the Slater determinant.
11. HF is appropriate for simulating bond dissociation.
12. Electron correlation is crucial for simulating chemical reactions.
13. Polarization functions improve the flexibility of the basis set.
14. Diffuse functions have very small exponents.
15. Diffuse functions are needed for long range interactions.
16. CIS is more accurate than CISD.
17. DFT is more accurate than CCSD.
18. MP2 is more accurate than HF.
19. 6-31G(d) is more flexible than 6-31G.
20. DFT methods are not appropriate for aromatic molecules.
21. Molecular mechanics simulates each atom as one particle.
22. DFT is more accurate than molecular mechanics.
23. Molecular mechanics relies on experimental parameters.
24. Classical mechanics can simulate UV spectra.
25. Molecular mechanics is faster than DFT.

Atomic numbers: H = 1, He = 2, C = 6

Good Luck **Dr. Ahmed A. K. Mohammed**

13. A wave function must .....

a) be antisymmetric b) conform to Pauli exclusion principle

c) a and b d) neither a or b

14. ..... suggested that the electron–electron repulsion in the Hamiltonian, which is the problem, is replaced with an effective field.

a) Fock b) Hartree c) Slater d) a and b

15. Hartree's wave function .....

a) is antisymmetric b) conforms to Pauli exclusion principle

c) a and b d) neither a or b

16. ..... proposed writing the wave function as a Slater determinant.

a) Fock b) Hartree c) Slater d) Max Born

17. In the Hartree-Fock method, the wave function of benzene is described by ..... Slater determinant(s).

a) **1** b) **6** c) **12** d) **72**

18. The energy of ..... will always be higher than the true energy.

a) HF b) DFT c) CCSD(T) d) MP2

19. ..... is appropriate for modelling chemical reactions.

a) HF b) CIS c) CCSD d) b and c

20. ..... can be used for geometry optimization.

a) HF b) DFT c) Molecular mechanics d) All the preceding

21. ..... is widely used to study organic reactions, biological processes, and solid-state materials.

a) HF b) DFT c) CCSD d) Full-CI

22. ..... is the most flexible basis set it this group.

a) STO-6G b) 6-311G(d) c) 6-31G(d) d) 6-31++G

23. A wavefunction of a molecule contains information about .....

a) position of nuclei b) momentum c) total energy d) all the preceding

24. An important limitation to DFT is .....

a) high cost b) lack of electron correlation

c) poor treatment of long range interactions d) all the preceding

25. ..... basis sets are recommended for modelling van der Waals interactions.

a) Polarized b) Diffused c) Double zeta d) Minimal

Assuit University Faculty of Science Chemistry Department		Time: 2 hrs Course Code: C-210

Final Examination of Biochemistry (210 C)
For Second Year Industrial Students

Answer the following questions: (50 Marks)

Q1: Write True (T) or False (F) in front of the following statements in Table.

(15 marks, 1 Mark for each)

1- All carbohydrates are polyhydroxy aldehydes or ketones or compounds that hydrolyze to produce them.
2- Glucose provides energy for the brain and ½ of energy for muscles and tissues.
3- Animals, plants and fungi are examples of eukaryotic cells.
4- Diasteriomers are stereoisomers that are not enantiomers.
5- Epimers, two sugars that different only in the configuration around one carbon atom.
6- Chiral centers are carbon atoms which have 5 different atoms bonded to it.
7- A reducing sugar is a sugar with an aldehyde group that reduces a metallic oxidizing agent.
8- A strong oxidizing agent such as HNO_3 can oxidize the aldehyde and the alcohol groups.
9- Cellulose is a polymer of glucose that forms plant cell walls.
10- Maltose is a disaccharide with an a(1, 4) glycosidic link between (C_1 , C_4) OH of 2 glucoses.
11- Amino acids bind with each other by glycosidic bond to produce proteins.
12- Reduction of glucose by Tolen's reagent produces glyconic acid.
13- In fish protamine combined with DNA to form nucleoprotein.
14- Monosaccharide has 2^{n-1} stereoisomers.
15- The different in the rearrangement of the amino acid in any protein causes problems in genetic formula and diseases.

1		3		5		7		9		11		13		15	
2		4		6		8		10		12		14			

Q2: Show in details the difference between the following items (Only Four).

(12 Marks, 3 Mark for each)

A- Eukaryotic cells – Prokaryotic cells.
B- DNA – RNA.
C- Collagen – Elastin.
D- Globins – Protamine.
E- Triacylglycerols – Waxes.

Q3: Choose the correct answer and write it in the table (Only eleven).

(11 Marks, 1 Mark for each)

1- …….. is glycoprotein present in human red cell membrane.
a) Proteoglycans b) Plasma Proteins c) Enzymes d) Glycphorin

2- Glycine is a simple one of ……. acids.
a) Halogen b)Carboxyl c) Amino d)Hydroxyl

3- ……. are excreted extracellulary in some plants and animals.
a) Glycerol b) Phosophilipids c)Waxes d) Enzymes

4- After meal, HCl formation …….. leading to excess biocarbonate in blood.
a) increases b) decreases c) reduces d) lowers

5- Alanine is an …… amino acids.
a) Neutral b) Acidic c) More acidic d) Basic

6- ……. is a polysaccharide formed from poly glucose monomers in plants.
a) Ammonia b) Lactose c) Starch d) Fructose

7- Types of RNA are……
a) Messenger RNA b) Transfer RNA c) Ribosomal RNA d) All of above

8- Elastin have …… directions due to presence of desmosine.
a) 1 b) 2 c) 3 d) 4

9- Hydroxylation of xenobiotics …….. their polarity and solubility.
a) increases b) decreases c) reduces d) lowers

10-…… are examples of eukaryotic cells.
a) Animals b) Plants c) Fungi d) All Of The Above

11-…… are combined with heme to form hemoglobin.
a) Lysine b) Arginine c) DNA d) Histones

12-Amino acids have …….. as function groups.
a) Carboxylic, Amino b) Only Amino
b) Carboxylic, Amide d) Only Carboxylic

1		**3**		**5**		**7**		**9**		**11**	
2		**4**		**6**		**8**		**10**		**12**	

Q4: Write the mechanism of the following items (12 Marks, 3 Mark for each)

A- Xeniobiotics metabolism.
B- HCl formation.
C- Enzyme action.
D- Ketosis.

انتهت الاسئلة..... بالتوفيق
الممتحن / د. أماني عبدالرحمن عثمان

Assiut University **June. 2022**
Faculty of science
Department of chemistry

Inorganic chemistry (1) (220 Chem.)

Answer the following questions: **(25 Marks)**

A- Mark with (x) for the wrong statement or (√) for the correct statements of the following :

ملحوظة : يتم طمس(تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

1- Metallic character increases from Boron to Aluminium. ( )
2- HF Can be handled in glass vessels. ( )
3- Flourine is lower in reactivity than group (VII) elements. ( )
4- Lithium is higher in electronegativity than Flourine. ( )
5- Reactivity of HBr is lower than HI. ( )
6- The reaction of $PCl_5 + H_2O$ leads to the formation of $H_3PO_4 + HCl$. ( )
7- Potasssium salts conduct electricity more than Lithium salts. ( )
8- Solubility of Lithium salts is higher than calcium salts. ( )
9- Fereons does not cause any damage to ozone layer. ( ) .
10- Helium is diatomic . ( )
11- In pure water beryllium salts are acidic. ( )
12- Carbon is limited to form a maximum of five covalent bonds. ( )
13- HOCl is less acidic than $HClO_4$. ( )
14- Pb (II) is less stable than Pb (IV).( )
15- Graphite conducts electricity less than Diamond. ( )
16- Boric acid acts as strong monobasic acid in presence of glycerol. ( )
17- The reaction of HCOOH + HCl is the preparation reaction for CO.( )
18- Cesium salts conducts electricity more than Lithium salts. ( )
19- Ozone can act as both reducing and oxidizing agent. ( )
20- The Acidity of HCl is higher than HF. ( )
21- NH_3 reacts with chlorine and the products are independent on the amount of chlorine.( )
22- Reaction of CaF_2+ HCL is the preparation for HF. ( )
23- Permanent hardness due to the presence of $Mg(HCO_3)_2$ or $Ca(HCO_3)_2$. ( )
24- Potassium is harder than Cesium .( )
25- Oxygen is never more than divalent. ( )

انظر خلفة ←

B- Choose the correct answers from the following: **(25 Marks)**

ملحوظة : يتم طمس(تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

26 – The presence of the following salts causes temporary hardness of water

(A) Na_2CO_3 (B) $NaHCO_3$ (C) $CaHCO_3$

27- The compound used in space capsules to remove CO_2 and produce O_2 is

(A) KO_2 (B) K_2O (C) K_2O_2

28- The following element belongs to the halogen groups

(A) Astatine (B) Tellurium (C) Indium

29- The reaction of lithium nitride with water gives

(A) $LiOH+NO_2$ (B) $LiOH+NH_3$ (C) $LiOH + N_2$

30- The reaction of fluorine with water gives

(A) $HF+ O_2$ (B) HF +HOF (C) HFO_2

31- Xenon reacts directly with fluorine (ratio of F_2:Xe 5:1) gives

(A) $Xe F_2$ (B) $Xe F_4$ (C) $Xe F_6$

32- Tin is an element belongs to

(A) Group (IV) A (B) Group (V) A (C) Group (III)

33- The following element does not form clathrate compounds

(A) Ne (B) Ar (C) Kr

34- The gas called laughing gas and used as a mild anaesthetic is

(A) N_2O (B) NO (C) NO_2

35- In laboratory H_2O_2 can be prepared by the action of the following acid on BaO_2.

(A) HCl (B) H_2SO_4 (C) HNO_3

36- The mixture of CO , N_2 called

(A) Water gas (B) Producer gas (C) coal gas

37- The Diagonal relationship in periodic table exists between

(A) B and Si (B) Be and Mg (C) Li and Al

38- The hydration energy of the Group (IIA) ions is greater than for Group IA due to the

(A) Increased charge (B) Increased electro-affinity (C) Both of them

39- One factor of the following influences complex formation

(A) Low ionization energy (B) Small highly charged ions (C) High electronegativity

40- The increasing tendency to form univalent compound of group (IIIA) on descending the group is due to

(A) Increased size (B) inert pair effect (C) both A and B

41- Oxidation of NH_3 by NaOCl is the method of preparation of

(A) N_2H_4 (B) NH_2OH (C) HNO_3

42- The following gas is poisonous due to the formation of the complex with hemoglobin in the blood

(A) H_2S (B) NH_3 (C) CO

43- Heating of BaO in excess of O_2 at 400-500°C gives

(A) $Ba + O_3$ (B) BaO_2 (C) Ba_2O_3

44- Heating of NH_4NO_3 gives

(A) $N_2O + H_2O$ (B) $N_2 + H_2O$ (C) $NH_3 + H_2O$

45- The compound of fluorine and oxygen is called

(A) Oxide of fluorine (B) Fluoride of oxygen (C) Not Formed

46- Reaction of $CaO + H_2O$ gives $\longrightarrow$

(A) $Ca(OH)_2$ only (B) $Ca(OH)_2 + H_2$ (C) Not A or B

47- Reaction of $PbS + O_3$ gives

(A) $PbO + SO_2$ (B) $PbSO_4$ (C) $PbSO_4 + O_2$

48- Rb is an element of the

(A) Alkaline earth elements (B) chalcogens (C) alkali metals

49- The colour of NO_2 is brown it turns paler on cooling and becomes a colourless solid due to the formation of

(A) N_2O_4 (B) N_2O_3 (C) not A or B

50- The thermite reaction is the reaction between

(A) Aluminuim and oxygen (B) Boron and oxygen (C) Nitrogen and oxygen

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انظر خلفة ←

Answer the following questions: (Oral exam) (10 Marks)

C- Mark with (x) for the wrong statement or (√) for the correct statements of the following :

ملحوظة : يتم طمس(تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

51- H_2O_2 can act as both reducing and oxidizing agent. ( )

52- HF has low melting point. ( )

53- Melting point of diamond is high and the structure is harder than graphite. ( )

54- Iodine exhibits oxidation numbers of (+III), (+V) and (+VII). ( )

55- Compounds formed by halogens and metals are ionic. ( )

56- Oxygen is the highest electronegative element in the periodic table. ( )

57- Cs is more reactive than K. ( )

58- coal gas is made by blowing air through red hot coke. ( )

59- NH_2COONH_4 is the structure of urea. ( )

60- The reaction of B_2H_6+ Mg_3B_2 and H_3PO_4 leads to the formation of H_3BO_3. ( )

"Good Luck "

Examiner

Prof. Dr. Dina M. Fouad

Assiut University Faculty of Science Chemistry Department	Final Examination Industrial Methods of Analysis for 2nd Year Students (C-205) (Industrial Chemistry Programme)	Second Semester June 2022 Time: 2 hour

Answer the Following Questions: (60 Marks)

Q.1: Choose the Correct Answer: (50 Marks)

1- Ion selective electrode are unaffected by ..... of the solution.
(A) colour (B) turbidity (C) color or turbidity (D) None

2- Potentiometric methods of analysis are based on the measurement of the ..... of electrochemical cells.
(A) current (B) time (C) potential (D) None

3- Which of the following is not a reference electrode?
(A) Standard Hydrogen Electrode (B) Silver /Silver chloride Electrode
(C) Saturated Calomel Electrode (D) Electrode or Ion-Selective Electrode

4- ..... arises from difference in rate of migration of anion and cations of the bridge salt and the electrolytes in the electrodes solutions.
(A) Cell Potential (B) Electrode potential
(C) Liquid junction potential (D) None

5- In which of the following systems inert metallic electrodes are used?
(A) Fe^{3+}/ Fe^{2+} (B) Hg^{2+} / Hg^{0} (C) A & B (D) None

6- Glass ion selective electrode is a type of ..... electrode.
(A) Reference (B) Non-crystalline membrane
(C) Crystalline Membrane (D) A & B

7- At ..... levels the glass membrane is more responsive to other cations, such as Na^+ and K^+
(A) more basic pH (B) more acidic pH (C) Neutral pH (D) None

8- The first commercial glass electrodes were manufactured using Corning 015, a glass with a composition that is approximately .....
(A) 18% Na_2O , 10% CaO and 72% SiO_2 (B) 22% Na_2O , 6% CaO and 72% SiO_2
(C) 24% Na_2O , 6% CaO and 70% SiO_2 (D) None

9- The resulting difference in potential between the two surfaces of the glass is .....
(A) The boundary potential (B) Reference electrode potential
(C) Asymmetry Potentials (D) None

10- To eliminate the bias caused by....., calibration of the glass electrode in standard solutions covering the pH range in which measurements are desired.
(A) The boundary potential (E_b) (B) Reference potential (E_{ref})
(C) The asymmetry potential (E_{asy}) (D) None

11- Which of the following is the advantage of glass pH electrode?
(A) Potential affected by the presence of oxidizing or reducing agents
(B) Selective for polyvalent cations .
(C) Operates over a wide pH range (D) Slow response

12- Which of the following is (are) the advantage(s) of ion exchanger used liquid membrane electrode?

(A) Low ion selectivity (B) Low-ion exchanger capacity

(C) High solubility in sample solution (D) Availability in high purity

13- Liquid-membrane electrode in which the ..... is held in a polyvinyl chloride gel has been developed for Ca^{+2}.

(A) Tridodecylmethylammonium chloride (B) Valinomycin

(C) Tetradodecyl ammonium nitrate (D) di-(n-decyl) phosphate

14- The potential of a glass indicator electrode (E_{ind}) is given by .....

(A) $E_{ind} = E_b - E_{ref} - E_{asy}$ (B) $E_{ind} = E_b - E_{ref} + E_{asy}$

(C) $E_{ind} = E_b + E_{ref} - E_{asy}$ (D) $E_{ind} = E_b + E_{ref} + E_{asy}$

15- In fluoride ion selective electrode, the membrane consists of a slice of a single crystal of .....

(A) lanthanum fluoride (LaF_3) (B) Europium(II) fluoride (EuF_2)

(C) LaF_3 doped with EuF_2 (D) None

16- A cell consisting of a saturated calomel electrode and a lead ion electrode developed a potential of -0.4706 V when immersed in 50.0 mL of a sample. A 5.0 mL addition of standard 0.020 M lead solution caused the potential to shift to -0.449V. Calculate the molar concentration of lead in the sample.

(A) 34.5×10^{-4} M (B) 3.45×10^{-4} M (C) 1.45×10^{-3} M (D) 2.60×10^{-3} M

17- Potentiometric titration is used when.....

(A) Endpoints are very difficult to determine (B) Colored and turbid solution

(C) Absence of a suitable indicator (D) All of them

18- In which of the following systems inert metallic electrodes are used?

(A) Fe^{3+}/Fe^{2+} (B) Hg^{2+}/Hg^0 (liquid) (C) Br_2 (liquid)/$2Br^-$ (D) All of them

19- Glass electrode is commonly used in ..... reactions.

(A) Neutralization (B) Redox (C) Precipitation (D) All of them

20- Pick out feasible indicator electrode for redox titration.

(A) Glass electrode (B) Calomel electrode

(C) Silver electrode (D) Platinum electrode

21- The unit of specific conductance (k) is .....

(A) Ohm (B) Siemen (C) $Ohm^{-1}. cm^{-1}$ (D) Ohm/cm

22- Which of the given solutions have an equal value of molar conductivity and equivalent conductivity?

(A) 1M $BaSO_4$ (B) 1M KCl (C) 1M BCl_3 (D) 1M $CaSO_4$

23- Which of the following is (are) not strong electrolyte(s)?

(A) HNO_3 (B) H_2CO_3 (C) NH_4OH (D) B &C

24- A conductivity cell has two platinum electrodes separated by a distance 1.5 cm and the cross sectional area of each electrode is 4.5 cm^2. Using this cell, the resistance of electrolytic solution was measured as 15 Ω. Find the specific conductance of the solution.

(A) 2.22 $\Omega^{-1}m^{-1}$ (B) 2.22 S m^{-1} (C) 2.22 mho m^{-1} (D) All of them

25- Which of the following equations is (are) true for molar conductivity (Λ_m)?

(A) $\Lambda_m = \Lambda^o + \beta\sqrt{C}$ (B) $\Lambda_m = \Lambda^o - \beta\sqrt{C}$

(C) $\Lambda_m = \Lambda^o + \beta/\sqrt{C}$ (D) None

26- Which of the following equations is (are) incorrect for cell constant (K_{cell})

(A) $K_{cell} = \frac{R.C.\Lambda_m}{1000}$ (B) $k = G.K_{cell}$ (C) $K_{cell} = \frac{L}{A}$ (D) None

27- Which of the following equations is (are) correct for limiting molar conductivity of CH_3COOH ($\Lambda^o_{CH_3COOH}$)?

(A) $\Lambda^o_{CH_3COOH} = \Lambda^o_{HCl} + \Lambda^o_{CH_3COONa} + \Lambda^o_{NaCl}$

(B) $\Lambda^o_{CH_3COOH} = \Lambda^o_{HCl} + \Lambda^o_{CH_3COONa} - \Lambda^o_{NaCl}$

(C) $\Lambda^o_{CH_3COOH} = \Lambda^o_{HCl} - \Lambda^o_{CH_3COONa} - \Lambda^o_{NaCl}$

(D) $\Lambda^o_{CH_3COOH} = \Lambda^o_{HCl} - \Lambda^o_{CH_3COONa}$

28- The conductance given by one cubic cm of electrolytic solution is known as .....

(A) Conductivity (k) (B) Molar conductivity (Λ_m)

(C) Equivalent conductance (Λ_{eq}) (D) None of the them

29- In the case of a weak electrolyte, ... the degree of dissociation, ... is the molar conductance.

(A) Lower , smaller (B) higher , larger (C) higher, smaller (D) None

30- Which of the following equation(s) is (are) correct for Kohlrausch's law?

(A) $\Lambda^o = n_c\Lambda^o_c + n_a\Lambda^o_a$ (B) $\Lambda^o = n_c\Lambda^o_c - n_a\Lambda^o_a$

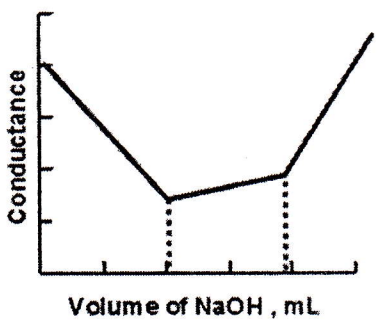
(C) $\Lambda^o = n_c/\Lambda^o_c + n_a/\Lambda^o_a$ (D) $\Lambda^o = n_c/\Lambda^o_c - n_a/\Lambda^o_a$

31- The equilibrium constant of acetic acid in an aqueous solution of concentration (C) is given by .....

(A) $K_a = \frac{C \times \Lambda_m^2}{\Lambda^o(\Lambda^o - \Lambda_m)}$ (B) $K_a = \frac{C}{\Lambda^o(\Lambda^o - \Lambda_m)}$

(C) $K_a = \frac{C}{(\Lambda^o - \Lambda_m)}$ (D) None

In answering questions 32-35, consider the following conductometric titration curve for a mixture of HCl and CH_3COOH against NaOH.



32- Before titration, which of the following statements is (are) correct?

(A) CH_3COOH does not dissociate

(B) HCl dissociates and H^+ with high ionic conductivity results in high conductance of solution

(C) HCl does not dissociate (D) A & B

33- During titration till equivalence point of HCl, which of the following statement is correct?

(A) H^+ with low ionic conductivity is replaced by Na^+ with high ionic conductivity.

(B) H^+ with high ionic conductivity is replaced by Na^+ with low ionic conductivity results in decrease in conductance.

(C) OH^- with high ionic conductivity is replaced by Na^+ with low ionic conductivity

(D) None of the above.

34- After complete neutralization of HCl, which of the following statements is (are) correct for initial addition of NaOH?

(A) HCl, CH_3COOH and small amount of CH_3COONa are present.

(B) CH_3COOH does not dissociate easily due to common ion effect of CH_3COO^- results in a slight decrease in conductance

(C) NaCl, CH_3COOH and small amount of CH_3COONa are present

(D) B & C

35- After equivalence point of CH_3COOH, which of the following statement is correct?

(A) Excess NaOH will lead to increase in conductance due to increasing of Na^+ and OH^-

(B) Excess NaCl will lead to decrease in conductance due to increasing of Na^+ and Cl^-

(C) A & B (D) None of them

36- Select the correct statement(s) for the applications of conductometric titrations.

(A) It is used to check alkalinity of water.

(B) Salt content of water can be checked by this method (Salinity).

(C) It is also used to determine end point in case of precipitation titrations

(D) All of them

37- At 25 °C, the molar conductance of 0.01 molar aqueous solution of NH_4OH is $9.54\ \Omega^{-1}cm^2mol^{-1}$ and at infinite dilution, its molar conductance is $238\ Ohm^{-1}cm^2mol^{-1}$. The degree of ionization of NH_4OH at the same concentration and temperature is .....

(A) 2.08% (B) 20.8% (C) 4.008% (D) 40.80%

38- In conductometric titration, the conductance of solution depends on .....

(A) The number and charge of free ions (B) The concentration of ions

(C) Mobility of the ions (D) All of them

39- Which of the following are the disadvantages of conductometric titrations?

(A) Colored or dilute solutions or turbid suspensions can be used for titrations

(B) Interference of high concentrations of other electrolytes

(C) Nonspecific (D) B & C

40- Which pairing of quantity and unit is incorrect?

(A) Equivalent conductance , $S\ m^2\ equiv^{-1}$ (B) Specific conductance , $S\ m^{-1}$

(C) Conductivity , $S\ m^{-2}$ (D) Molar conductivity , $S\ m^2\ mol^{-1}$

41- Which of the following is a light source of UV radiation?

(A) Tungsten lamp (B) Deuterium lamp

(C) Both (A) and (B) (D) None of the these.

42- According to Beer's law for a colored solution, which one of the following statements is <u>correct</u>?

(A) The absorbance does not change when the cell path length (cell thickness) increases.

(B) The cell path length is directly proportional to the concentration.

(C) The absorbance is directly proportional to the concentration and path length.

(D) None of the these

43- The molar absorptivity is .....

(A) a universal constant.

(B) characteristic for each substance at a particular wavelength.

(C) equal to one. (D) None of the these.

44- The permanganate ion absorbs light of wavelength close to 550 nm. Based on this information, what can you conclude?

(A) Solutions of the permanganate ion are colorless.

(B) The permanganate ion absorbs within the visible region.

(C) The permanganate ion absorbs in the ultraviolet region.

(D) The permanganate ion absorbs outside the visible region

45- Chemical deviation of Beer's Law resulting from the presence of:

(A) Higher concentration of the analyte in the solution (>10 mM).

(B) Association, or dissociation, or interaction of the analyte with the solvent.

(C) Polychromatic radiation or stray radiation.

(D) None of these.

46- Which of the following methods is used for the determination of an analyte in a complex matrix where interferences in the UV/Vis for the analyte will occur: i.e. blood, sediment, human serum, etc.

(A) Calibration curve method. (B) Gravimetric method.

(C) Standard addition method. (D) All the these.

47- A device that measures the difference between the transmitted light through the sample (I) vs. the incident light (I_0) and sends this information to the recorder in a UV/visible spectrophotometer.

(A) Wavelength Selector. (B) Signal Processor.

(C) Photoelectric Transducer. (D) Light Source.

48- An important advantage of a double-beam UV-Vis spectrophotometer over a single-beam UV-Vis spectrophotometer is that ....

(A) it requires same light source for UV-Vis radiation.

(B) it splits the light source, after passing through the monochromator, into two separate beams-one for the sample and the other for the reference.

(C) a greater range of wavelengths can be used.

(D) All the these.

49- A sample has a transmittance 0.70 in UV-Visble spectroscopy, the absorbance will be

(A) 0.200

(B) 0.800

(C) 0.155

(D) 0.551

50- A compound with a molar absorptivity of 5.0×10^4 mol^{-1} L cm^{-1} (at 700 nm) exhibits an absorbance of 0.75 when placed within a 1 cm pathlength cuvette in a UV/visible spectrophotometer. Calculate the concentration of the compound.

(A) 5.00×10^{-4} mol L^{-1}

(B) 1.50×10^{-5} mol L^{-1}

(C) 3.00×10^{-5} mol L^{-1}

(D) 7.50×10^{-3} mol L^{-1}

Q.2: Oral Exam (10 Marks)

Mark (√) for the correct statement and (X) for the wrong statement:

51- The most common application of ion-selective glass electrodes is for the measurement of pH.

52- The salt solution of KCl in glass electrode is buffered to produce a constant pH 7 Solution.

53- Glass pH electrode is only selective for monovalent and divalent cations.

54- In basic solutions, glass electrodes respond to the concentration of hydrogen ion (H^+) only.

55- An ionophore is a ligand whose exterior is hydrophilic and whose interior is hydrophobic.

56- In a potentiometric titration the reference electrode potential does not need to be known accurately.

57- For weak electrolyte molar conductivity at infinite dilution cannot be determined experimentally and by extrapolation because graph is not linear.

58- Upon carrying out the conductometric titration; the titrant used must be at least 10 times concentrated as the solution to be determined.

59- Alternating current is used to prevent electrolysis of the electrolytic solution.

60- Electrolyte molar conductivity is unaffected by dilution.

Answer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

♣♣♣ GOOD LUCK ♣♣♣

Examiner: Prof. Dr. Hossieny Ibrahim

Assiut University
Faculty of Science
Chemistry Department

Time allowed: 3hrs
June 2022

Physical Chemistry Examination 230C

Final Examination (50 Marks)

Q.1: Shade the correct answer, A, B , C or D (1 Mark each).

1. The half life for the second order reactions is equal to .....
   A) $1/k_2a$ B) k_2 C) $1/k_2$ D) $2k_1a$
2. The half life for the third order reactions is equal to .....
   A) $2K_3a$ B) $3K_3a$ C) $3/2\ K_3a^2$ D) K_3C
3. The kinetic combination of hydrogen and bromine to form hydrogen bromide is an example for .....
   A) chain reactions B) opposing reactions
   C) hydrolysis reactions D) consecutive reactions
4. The K value for the first order is expressed in .....
   A) sec^{-1} B) mol sec^{-1} C) gm sec^{-1} D) mol^{-1}/ liter
5. The half life for the first order is equal to .....
   A) $1/k_3a$ B) $0.694/k_1a$ C) $0.692/k_2a$ D) $0.693/k_1$
6. For the following second order the reaction ($2A \rightarrow$ products), the rate should be proportional to .....
   A) $2CA^2$ B) $3CA^3$ C) CA^2 D) 2CA
7. For the first order reaction, n is equal to .....
   A) 2.2 B) 2.1 C) 1.45 D) 1.0
8. Plotting log k against 1/T gives a straight line of slope .....
   A) ΔERT B) ΔE/R C) $-\Delta Ea^*/2.303R$ D) ΔF/2.3R
9. For the opposing reactions the rate constant is equal to .....
   A) $2.3\log m/m\text{-}x = (k_1 + k_1') t$ B) $\ln m/m = k_1 (t)$
   C) ln m/m-x D) ln m/m-1
10. For the third order reaction .....
    A) n=3.5 B) n=3.0 C) n=2.33 D) n=2.45
11. Plotting $1/(a\text{-}x)^2$ versus t gives a straight line whose slope is.....
    A) $2k_3$ B) $2k_2$ C) $2.3/k_2$ D) $3k_3$
12. The temperature of the system increases in an.....
    A) Adiabatic compression B) isothermal expansion
    C) Adiabatic expansion D) Isothermal compression
13. Which one of the following is false?
    A) Work is a state function. B) free energy is a state function.
    C) free energy change = 0 at equilibrium D) Enthalpy is a state function

14. One heat engine works between two temperatures T_1 and T_2, its efficiency is .....

A) T_1-T_2 / T_1 B) T_2-T_1/T_2 C) T_2-T_1/T_1 D) T_1-T_2/T_2

15. A mixture of two moles of carbon monoxide and one mole of oxygen in closed system are ignited to carbon dioxide the relation between ΔH and ΔE will be .....

A) $\Delta H < \Delta E$ B) $\Delta H > \Delta E$ C) $\Delta H = \Delta E$ D) the relation depends on ΔC_P

16. The relation between C_P and C_V for a gas is .....

A) $C_P = C_V$ B) $C_V > C_P$ C) $C_P - C_V = R$ D) $C_P + R = C_V$

17. The latent heat of vaporization of a liquid at 500K and 1 atm is 10 Kcal/mole. What will be ΔE of 3 moles of the liquid at the same temperature?

A) 13.0 Kcal B) -13.0 Kcal C) 27.0 Kcal D) -27.0 Kcal

18. The work done in liter. atm. for an expansion of one mole of an ideal gas from a volume 10 liters to 30 liters at 27 °C is .....

A) 0.082 B) 16.4 C) 8.2 D) 1.64

19. According to the above question the work in calories is .....

A) 79.38 B) 16.4 C) 39.68 D) 396.88

20. If ΔG^0 for a reaction carried out in electrochemical cell has a negative sign the cell potential is .....

A) Positive B) negative C) Zero D) equal to K

21. The heats of formation of $CO_{(g)}$ and $CO_{2(g)}$ are -26.4 and -94.0 Kcal respectively, the heat of combustion of carbon monoxide will be.....

A) 26.4 Kcal B) -67.6 Kcal C)-120.4 Kcal D)52.8 Kcal

22. For an endothermic reaction, the equilibrium constant upon increasing the reaction temperature will be.....

A) Decrease B) increase C) not change D) equal to one

23. When two moles of water are boiled at 100 °C and converted into vapor at the same temperature if ΔH_{vap} = 9590 cal/mol the change in entropy will be .....

A) 25.71 B) 51.42 C) 21.76 D) 217.6

24. $-\Delta G^0$ for the reaction :X+Y→Z is -4.606 Kcal, the value of equilibrium constant at 227 °C is..... (Where R = 2 Cal/mol.K)

A) 100.0 B) 10.0 C) 2.0 D) 0.01

25. For the reaction: $H_2 + I_2 \leftrightarrow 2HI$ (ΔH =12.4 Kcal.). The heat of formation of HI will be .....

A) 12.4Kcal B) -12.4 Kcal C) -6.2 Kcal D) 6.2 Kcal

Q.2: Shade (T) for True statements or (F) for False statements (1 Mark each).

26. Plotting 1/(a-x) versus t gives a straight line whose slope is equal to $2k_2$.

27. Plotting $1/(a-x)^2$ versus t gives a straight line whose slope is equal to $2K_3$.

28. Consecutive reactions proceed from reactants to produce through one or more intermediate stages.

29. Plotting log K against 1/T gives a straight line of slope – $\Delta E_a^*/2.303R$.
30. The half life period for the first order is equal to $1/K_2a$.
31. The entropy of a gas increases by increasing its temperature.
32. The internal energy change in an isothermal expansion of a gas increases.
33. In an adiabatic compression of a gas the product PV = constant.
34. In a gaseous reaction not accompanied by a change in number of moles $\Delta H = \Delta E$.
35. The molar heat capacity of a gas at constant pressure is higher than that at constant volume.
36. Compounds for which standard heat of formation are negative are apt to be stable.
37. The enthalpy change of any reaction is the sum of heat of formation of both its reactants and products.
38. $\Delta C_P = 0$ for a certain reaction, the enthalpy of this reaction is independent on its temperature.
39. In processes carried out at constant pressure the amount of heat taken by the system is equal to the increase in its enthalpy.
40. In isothermal expansion process of a gas the work done by the gas is equal to the amount of heat taken by the gas.
41. For processes carried out at constant volume the amount of heat given to the system is directed to increase its internal energy.
42. For irreversible process the entropy of the universe decreases.
43. When any spontaneous process reaches equilibrium the free energy possess a maximum value.
44. In an isolated system where energy is constant, the entropy reaches some maximum value at equilibrium.
45. For any heat transfer process when the temperature is not uniform, the free energy reached a minimum value and the system will be at equilibrium.
46. The temperature of the system decreases in an adiabatic compression process.
47. The process in which no heat enters or leaves the system is termed as isothermal one.
48. For an exothermic reaction, its equilibrium constant increases by increasing its temperature.
49. When the value of equilibrium constant is higher or lower than zero the standard free energy change of a reaction can be used for calculating its value.
50. The value of free energy change for the reaction: X + Y → Z is greater than zero; then an increase in temperature will lead to increase the yield of the product Z.

Q.3: Oral Exam: Shade (T) for True statements or (F) for False statements (10 Marks).

51. The half life period for the second order is equal to $0.69/K_1$.
52. The half life period for the third order is equal to $3/2k_3$.
53. For the following second order reaction 2A→ products, the rate is proportional to C_A^3

54. Plotting log k against 1/T gives a straight line of slope = ΔE.
55. The enthalpy change is equal to the heat adsorbed only when the process is carried out at constant pressure.
56. The total entropy change for reversible processes is Zero.
57. Processes for which ΔH negative are said to be endothermic.
58. Each element in its slandered state is assigned entropy zero.
59. The enthalpy of formation of CO gas can be measured by direct calorimety.
60. Each element in its slandered state is assigned enthalpy zero.

GOOD LUCK

Examiners: Prof. Y. M. Temerk and Prof. R. M. Gabr

Assiut University **Jun 2022**
Faculty of Science **Time allowed: 2hrs**
Chemistry Department

Physical and Inorganic Chemistry Examination (C-250) for Second Level Students

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Section I (Physical Chemistry)

Answer the following questions: **(25 Marks)**

Q.1: Choose the correct answer A, B, C or D.

I. A heat engine absorbs heat Q_2 at temperature T_2 and rejects heat Q_1 at temperature T_1. The efficiency of this engine is:
(A) T_1-T_2/T_1 (B) T_2-T_1/T_2 (C) T_2-T_1/T_1 (D) T_1-T_2/T_2

II. Reaction, $H_{2(g)}+I_{2(g)} \rightarrow 2HI_{(g)}$; $\Delta H = 12.4$ kcal. According to this, heat of formation of HI will be
(A) 6.20 kcal/mole (B) – 12.4 kcal (C) 24.8 kcal (D) 6.20 kcal

III. The heat of formation of CO(g) and CO_2 (g) are – 26.4 kcal and – 94.0 kcal respectively. The heat of combustion of carbon monoxide will be:
(A) 26.4 kcal (B) – 67.6 kcal (C) – 120.4 kcal (D) 52.8 kcal

IV. Heat of evaporation of benzene is 7350 cal K^{-1} mol^{-1} , the change in entropy to convert 2 moles gaseous benzene to liquid at 77°C is :
(A) 42 cal K^{-1} mol^{-1} (B) -42 cal K^{-1} mol^{-1} (C) -42 cal K^{-1} (D) 42 cal K^{-1}

V. When 2 moles of water are boiled at 100 °C temperature and converted to vapor at the same temperature. Then what will be the change in entropy? H_{vap} =9590 cal./mole
(A) 25.71 (B) 51.42 (C) 21.76 (D) 217.6

Q.2: Prove that under adiabatic conditions for the expansion of an ideal gas:
PV^{γ} = constant.

Q.3: Find ΔH for the reaction: $Mg(s) + 2HCl(g) = MgCl_2(s) + H_2(g)$ from
$Mg(s) + Cl_2(g) = MgCl_2(s)$ $\Delta H = -153.2$ kcal
$H_2(g) + Cl_2(g) = 2\ HCl\ (g)$ $\Delta H = -44.12$ kcal

Q.4: Calculate ΔE for the decomposition of magnesium carbonate:
$2MgCO_{3(s)} \rightarrow 2\ MgO_{(s)} + 2\ CO_{2(g)}$ if; ($\Delta H = 52.00$ kcal) at T = 900 K and 1 atm., molar volume of $MgCO_3$ is 0.028, and MgO is 0.011 liter.

Q.5: Calculate the work done in L. atm and in calory for an expansion of one mole of an ideal gas from a volume of 10 liters to 30 liters at 27°C.

باقى الاسئلة فى الخلف

Section II (Inorganic Chemistry)

(25 Marks)

Answer the following questions

1.a) Are the following statements True (✓) or False (X).

i .H_2O has unexpected high boiling point.
ii .NO_2 is an acidic Oxide
iii.SF_6 is known but OF_6 is not.
iv. Concentrated solution of HF acid is kept in glass bottle.
v. Cesium ions conduct electricity more than lithium ions.
vi. NH_3 is a poisonous gas.

b) How you can prepare **three only** from the following:
super phosphate, water gas, NH_3, HI,
c) In each pairs of acids, state which is stronger and why?
HF and HBr, $HClO_2$ and HIO_2, H_2SO_4 and H_2SO_3.

2.a) Choose the **correct answer** and **comment**:

i) In which species does **nitrogen** exhibit its highest oxidation state
(NH_3 , NO_2^- , N_2) .

ii)Which one of the following species contains an **even** number of electrons: (NO_2,NH_4^+, NO)

iii) The species which contains **diamagnetic** properties is: (NO, O_2, N_2)

iv) Element X forms XO_2 with oxygen, the element is: (Na ,Mg ,C)
v) An element X from gr (II) reacts with Y from gr (VI) to form a compound: (X_2Y,XY,XY_2)

b) Give **three examples** of Freon's and how do they damage the environment?

c)What the types of hardness of water? How we can remove this problem?

Good Luck

Examiners: Prof. Dr. Ahmed El-Awad **and** Prof. Dr. Amna S. A. Zidan

Chemistry Department
Faculty of Science
Assiut University

June, 2022
Time: 3 hours
50 Marks

Final Exam of Green Chemistry (214C) for the 2nd Level Students

1- Choose the correct answer for all of the following? (35 Marks)

(Final answers must be depicted in the answer sheet not here)

يتم طمس (تسويد) الأجابة المختارة من قبل الطالب بأستخدام القلم الجاف فقط في نموذج الأجابة الخاص بالطالب

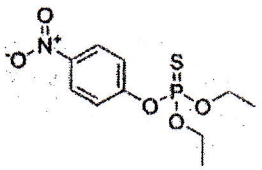
The answer chosen by the student is blurred (blackened) with the ballpoint pen only in his answer form (Bubble sheet)

1- Which of the following gases is responsible for filtering most of the UV light from 120 to 220 nm from sunlight?

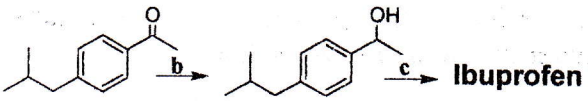
a) O_2
b) O_3
c) N_2
d) H_2O

2- Select the correct name for the following structure?

a) Carbaryl
b) Parathion
c) Rotenone
d) Paraquat



3- Choice the best reagents used in the last two steps in the following Ibuprofen synthesis scheme?



a) **b:** Ac_2O/HF, **c:** CO/Pd-Cat.
b) **b:** H_2/Cat., **c:** Ac_2O/HF
c) **b:** H_2/Cat., **c:** CO/Pd-Cat.
d) **b:** CO/Pd-Cat., **c:** H_2/Cat.

4- Incineration method used in disposal of PCBs which involves burning PCBs at a temperature of ---- in the presence of fuel oil and oxygen.

a) 1200°C for at least three seconds
b) 1200°C for at least four seconds
c) 1200°C for at least five seconds
d) 1200°C for at least two seconds

5- What is the named reaction used in step 1 of Captan-synthesis from the reaction of butadiene & maleic anhydride?

a) Aldol condensation
b) Diels–Alder reaction
c) Arndt–Eistert synthesis
d) Dieckmann condensation

6- Identify from the following the proper gas which is not responsible for acid rain?

a) SO_2
b) NO_2
c) O_3
d) HCl

7- Select the category that's mushrooms and truffles are belonging to?

a) Saprophytic Fungi
b) Parasitic Fungi
c) Synthetic Fungicides
d) Natural Fungicides

8- The compound name that's produced prior to the final product in the microbial degradations of DDT is -----.

a) 4-cholorobenzaldehyde
b) 4-choloroacetophenone
c) 4-choloro-2-methylacetophenone
d) 4-choloro-2-methylbenzaldehyde

9- In photochemical smog process, decomposition of ---- leads to the formation of O_3?

a) NO_2
b) Cl_2O_2
c) CO
d) SO_2

10- Example of being more selective herbicides in its action is ---- which is used for the control of broad-leaved weed and grasses in cotton.

a) Atrazine
b) Diquat
c) Fluometuron
d) Chlorsulfuron

ملحوظة: الأختبار مكون من خمسة صفحات

11- The showing mechanism represents the catalytic processes contributing to ozone destruction by ----.

$$X + O_3 \rightarrow XO + O_2$$

$$X' + O_3 \rightarrow X'O + O_2$$

$$XO + X'O \longrightarrow X + X' + O_2$$

$$2O_3 \rightarrow 3O_2$$

a) hydroxyl free radical
b) nitric oxide
c) chlorine and bromine species
d) inactive form of chlorine

12- Which is the best definition of cloud condensation nuclei (CCN)?

a) Particles that can become deactivated to fog or cloud droplets in the presence of a supersaturating of water vapor.
b) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of water vapor.
c) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of sulphur dioxide gas.
d) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of nitrogen dioxide gas.

13- Which of the following herbicides is widely used as total herbicides to clear land prior to planting of crops?

a) Benomyl
b) glyphosate
c) Rimsulfuron
d) Diquat

14- Identify one of the following is not amongst the components of photochemical smog?

a) O_3
b) SO_2
c) Unsaturated hydrocarbon
d) NO_2

15- Describe the end result of burning of fossil fuels?

a) Global warming
b) Melting of polar ice caps
c) Depletion of ozone layer
d) Both a and b

16- What is the process type that's inferred from the following equations?

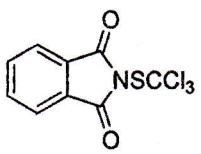
$$Cl + CH_4 \longrightarrow HCl + CH_3$$

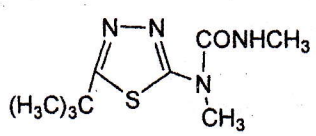
$$ClO + NO_2 \longrightarrow ClONO_2$$

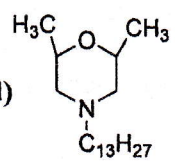
a) Inactivation of chlorine atom
b) Chlorine oxidizes by oxygen
c) Synthesis of carbon dioxide
d) Revolution of chlorine

17- Of the following compounds, which one is named Tebuthiuron?

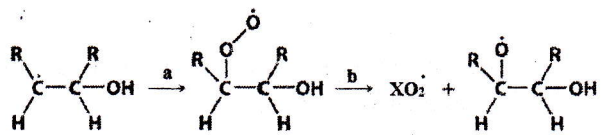
a) 

b) 

c) 

d) 

18- In the following, reaction of hydrocarbons with $OH^{\cdot}$ gives ----. This product reacts with ---- to produce $ROO^{\cdot}$-radical which in turn oxidizes XO to ----.



a) stable carbon radical, O_2, SO_2
b) carbon centered radical, O_2, NO_2
c) decompose of carbon radical, O_2, Cl_2O_2
d) inserted carbon radical, O_3, NO_2

19- Which is the green chemistry principle that demonstrates the synthetic methods should be conducted at ambient temperature and pressure?

a) Design for energy efficiency
b) Atom economy during synthesis
c) Use of renewable feedstocks
d) Reduce derivatives during synthesis

20- Which of the following statements is false regarding $^{\cdot}OH$ radical?

a) It unable to abstract hydrogen atom to produce carbon centered radicals.
b) Hydroxyl radicals do not add to CO_2, however, it adds to CO.
c) Hydroxyl radical is the prominent oxidizing species in the atmosphere.
d) Usually it reacts by adding itself to another molecule.

ملحوظة: الأختبار مكون من خمسة صفحات

21- Dissolved SO_2 is oxidized by traces of H_2O_2 and O_3, a dominant factor in forming O_3 and H_2O_2 is -----.

a) sunlight
b) strong acid
c) reaction with atomic oxygen
d) hydrogen abstraction reaction

22- What is the product from heating of 2,4,5-trichlorophenol in basic medium?

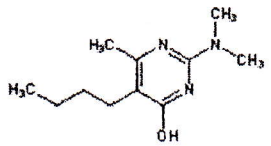
a) 2,3,7,8-Tetrachlorodibenzo-p-dioxin
b) 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane
c) 5-chloro-2-(2,4-dichlorophenoxy)-phenol
d) Octachlorodibenzo-*p*-dioxin

23- Triclosan is chlorinated aromatic compound which has two functional groups representative of both ----.

a) ethers and alcohols
b) ethers and phenols
c) ethers and amines
d) ethers and ketones

24- For the following structure, What is the fungicide-type is belonging to?

a) 1,4-Oxathiins
b) Imidazoles
c) Pyrimidines
d) Acylalanines



25- Which of the following fungicides is used as seed dressing?

a) Phenyl mercuric acetate
b) Bordeaux mixture
c) Benzimidazoles
a) Dithiocarbamates

26- Bipyridyls category is considered as ----.

a) Total herbicides
b) Selective herbicides
c) Natural Fungicides
d) Systemic fungicides

27- β-Oxidation pathway is a bio-conversion process used in the transformation of ----.

a) MCPA to MCPB
b) MCPA to MCPA
c) MCPA to MCPA
d) MCPB to MCPA

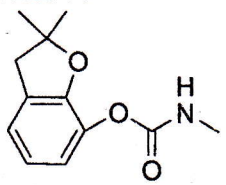
28- What is the most dangerous pollutant emitted in air during incomplete combustion of fuels?

a) CO_2
b) NO_2
c) CO
d) CH_4

29- The asymmetric centre in the Fusillade is incorporated in its synthesis in order to ----.

a) minimize possible losses of optically active material
b) reduce possibilities of racemization occurring
c) required S-enantiomer of the 2-chloropropanoic acid
d) All of above

30- Choose the name for the following insecticide structure?



a) 5-chloro-2-(2,4-dichlorophenoxy)-phenol
b) 2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate
c) *p,p'*-Dicholorodiphenyltricholoroethane
d) Dichlorodiphenyldichloroethene

31- Steps 1&2 in the Benomyl synthesis included the reaction of ---- and ---- followed by addition of ---- to methyl cyanocarbamate.

a) cyanamide & o-$C_6H_4(NH_2)_2$ & methyl chloroformate &
b) cyanamide & methyl chloroformate & o-$C_6H_4(NH_2)_2$
c) methyl chloroformate & o-$C_6H_4(NH_2)_2$ & cyanamide
d) o-$C_6H_4(NH_2)_2$ & cyanamide & methyl chloroformate

32- Which phrase does <u>Not</u> describe one of stratosphere layer features?

a) This layer has the air we breathe and the clouds in the sky.
b) It is found above the tropopause and extends up to a height of 50 km.
c) The ozone layer absorbs most of the UV radiation sends to us by the sun.
d) There are no storms or turbulence here to mix up the air, so cold, heavy air is at the bottom and warm, light air is at the top.

ملحوظة: الأختبار مكون من خمسة صفحات

33- Which of the following insecticide have low toxicity for humans and birds beside it used in household insecticides such as RAID as well as mosquito coils?

a) Allethrins
b) Parathion
c) Polychlorinated biphenyl (PCBs)
d) Methoxychlor

34- Select the best definition of nuclei mode?

a) Small particles (0.01 μm) are formed by the condensation of vapors of pollutants.
b) Small particles (0.02 μm) are formed by the condensation of liquids of pollutants.
c) Small particles (0.01 μm) are formed by the cycloaddition of vapors of pollutants.
d) Small particles (0.01 μm) are formed by the precipitation of vapors of pollutants

35- Arrange the following alteration of gases during the day starting at morning?

I. Increases the emissions of both nitrogen oxides and VOCs
II. The nitrogen oxides and volatile organic compounds begin to react forming nitrogen dioxide with increasing its concentration
III. The production of ozone is halted. The ozone that remains in the atmosphere is then consumed by several different reactions
IV. Nitrogen dioxide is broken down and its by-products form increasing concentrations of ozone

a) I , III , II , IV
b) I , IV , II , III
c) IV , II , III , I
d) I , II , IV , III

2- Answer all of the following with either (T) or (F)? (15 Marks)

36. Ultraviolet light at the wavelength 220-320 nm range is filtered from sunlight mainly by O_3 molecules.
37. Agrochemistry is a branch of chemistry concerned with the chemical needs for plant during its harvesting.
38. NO_2 molecule is the most loose oxygen than BrO.
39. The reaction of ethylene diamine with CS_2/NaOH in the presence of $MnSO_4$ will give thiram.
40. Particulate matter (PM) is the term used to describe very small diameter solids or liquids that remain suspended in the atmosphere.
41. Synthesis of 2,4-dichlorophenoxyacetic acid is carried out by the Dow process.
42. Bipyridylium salts are non-selective herbicide which is particularly effective against annual and deep-rooted perennial weeds.
43. Radical reactions with O_2 produce peroxy and hydroperoxy radicals.
44. Elemental sulfur is the oldest effective fungicides to control mildew of fruit trees.
45. Troposphere oxidation of methane initiated by a slow oxidation by HOO˙ radical.
46. Paraquat is rapidly losing its activity on contact with the soil because it becomes so strongly adsorbed.
47. Paul Crutzen theory describes that the CFC-gases are the main responsible for the ozone layer destruction.
48. The layer which is just up to 6.4 Km above the earth is stratosphere.
49. Dobson unit is the number of O_3 molecules that would be required to create a layer of O_3 with 0.001 millimeters thick at a 0°C/1atm.
50. Saprophytic fungi are responsible for the breakdown of animal and plant in soil.

ملحوظة: الأختبار مكون من خمسة صفحات

Final Exam of Green Chemistry (214C) for the 2nd Level Students

Answer all of the following with either (T) or (F)? **(10 Marks)**

(Final answers must be depicted in the answer sheet not here)

يتم طمس (تسويد) الأجابة المختارة من قبل الطالب بأستخدام القلم الجاف فقط في نموذج الأجابة الخاص بالطالب

The answer chosen by the student is blurred (blackened) with the ballpoint pen only in his answer form (Bubble sheet)

51. Polylactic acid (PLA) is a polymer prepared from fermentation of starch.

52. The stratosphere keeps 70-80% of the suns ultraviolet radiation from striking the earth.

53. Botanical insecticides break down readily in soil and are not stored in plant or animal tissue.

54. James Lovelock theory had shown that the free chlorine atoms in the atmosphere can decompose ozone.

55. Prochloraz fungicide is an example of the imidazole-type.

56. Nearly 75% of the ozone depletion in the antartic occurs by the inactive chlorine compounds.

57. Persistent organic pollutants (POPs) are organic compounds that are resistant to environmental degradation through chemical, biological and photolytic processes.

58. The troposphere layer absorbs ultra-violet radiation and shields life on the earth from intense, harmful forms of energy.

59. Acidity of the droplet has effect on the rate of SO_2 oxidation.

60. Dow process used for the production of tetrachlorodioxin.

Chemistry Department
Faculty of Science
Assiut University

June 2022
Time two hours

Final Exam for Applied Industrial Chemistry Program students
Electrochemistry (C209), second semester

(F=96485 C mol^{-1}, R=8.314 J K^{-1} mol^{-1})

Answer the following:

Q1 Answer (T) for true sentences or (F) for false sentences for the following (one mark for each):

1- The amount of substance changed during electrochemical reaction is proportional to the applied potential.
2- Electrical energy is used to drive a spontaneous reaction.
3- The potential of the galvanic cell should have a positive value.
4- The potential of the galvanic cell depends on the electrolyte concentration.
5- The salt bridge is an ionic conductor in the electrochemical cell.
6- The hydrogen electrode is easily poised even in presence of traces impurities.
7- The arbitrarily assigned potential of the SHE is 1 V.
8- The amalgamated metal – metal ion electrode is working as well as pure metal electrode.
9- The potential of the calomel electrode is unstable over a long period.
10- The cell potential is depend on the temperature.
11- The concentration cell is two half cells with identical electrolyte concentration but different electrode materials.
12- The standard potential of the concentration cell is always zero.
13- The SHE is used as a primary reference electrode.
14- Construction and working of SHE is difficult.
15- Electrolysis of water is an example of galvanic cell.
16- Theenergy density of fuel cells is lower than that of batteries.
17- The power density is the maximum available power per unit mass.
18- The primary batteries are rechargeable, such as leclanché cell.
19- The chemical intercalation is the reversible inclusion of a molecule between two others moleculés.
20- The fuel cell is considered a battery in which fuel only is continuously replaced.
21- The residual product discharged by the hydrogen-oxygen cell is H_2O_2.
22- The specific capacitance of Pseudocapacitors is dependent on the specific surface area of the electrode.
23- Alkaline fuel cell is not susceptible to CO_2 contamination of the electrolyte.
24- Molten carbonate fuel cells operate at relatively low temperatures (below 100 °C).
25- The hybrid supercapacitors can yield higher energy density than symmetric supercapacitors.
26- The supercapacitors exhibit a much lower specific power than Li-ion batteries.
27- On discharging the battery, the voltage not remains constant.
28- Li-ion battery shows memory effect.

Q2 Choose the correct answer for the following (one mark for each)

1- One requirement of an electrolyte used in the salt bridge is .....

a) the mobility of anions and cations should be the same.

b) the ions of electrolyte not involved in the electrochemical change.

c) the ions do not react chemically with any species in the cell.

d) all above are correct.

2- If electrode potential of Cu^{2+}/Cu at 25°C is 0.286 V and Cu^{2+} concentration is 0.015M, the standard reduction potential is .....

a) -0.44 V b) -0.76 V c) -0.40 V d) 0.34 V

3- The relation between Gibb's free energy (ΔG) and EMF of a cell is .....

a) $E_{cell}=nF\Delta G$ b) $\Delta G = - nFE_{cell}$ c) $E_{cell} = - nF\Delta G$ d) $\Delta G= nFE_{cell}$

4- The cell potential of cadmium-copper in which Cd in contact with 0.02M Cd^{2+} and Cu in contact with 0.02M Cu^{2+} ($E°_{cell}$= 0.74V) is ..... (cell reaction: $Cd + Cu^{2+} = Cd^{2+} + Cu$)

a) 0.77 V b) 0.74 V c) 0.70 d) non of these

5- The equilibrium constant of the reaction of the above Cd-Cu cell is .....

a) $5x10^{25}$ b) $1x10^{-25}$ c) $1x10^{25}$ d) non of these

6- The standard free energy of the above Cd-Cu cell is .....

a) -142.8 kJ b) -142.8 J c) – 142.8 kcal d) non of these

7- The oxidation state of manganese in the $KMnO_4$ is

a) + 8 b) + 7 c) + 6 d) non of these

8- One advantage of the silver-silver chloride electrode is .....

a) ease of manufacture

b) usable up to 130° C.

c) with a wide of applications

d) all are correct

9- The polarity of the cathode in electrolytic cell is .....

a)positive b) negative c) negative or positive d) neutral

10- What is E° of a cell made of the following reaction? [$E°_{Fe2+/Fe}$=-0.44, $E°_{Ag+/Ag}$=0.8V]

$$Fe + 2\,Ag^{+}_{(aq)} \rightarrow Fe^{2+}_{(aq)} + 2\,Ag_{(s)}$$

a) 0.36 V b) -1.24 V c) - 0.36V d) 1.24V

11-The aqueous Li-air battery requires a protective layer on the anode to .....

a) Avoid the reaction of Li metal with H_2O

b) Prevent heat loss during operation

c) Avoid the formation of Li salts on the anode

d) Avoid mixing the Li metal with O_2

12-In fuel cells, the gas diffusion layer is provided to .....

a) Prevent flow of gases

b) Facilitate flow of gases

c) Facilitate flow of electrons

d) Increases the rate of reaction

13-According to most studies, the final discharge product of aprotic Li-O_2 batteries is .....

a) Li_2O

b) Li_2O_2

c) LiO_2

d) LiOH

14-The electrolyte used in aprotic Li-O_2 batteries is .....

a) *n*-Propanol
b) *tert*-Butyl alcohol
c) Acetic acid
d) Bis(Trifluoromethane)Sulfonimide Lithium Salt

15-Capacitance of a capacitor is the measure of its ability to .....

a) Resist flow of current
b) Store charge
c) Allow flow of current
d) None of the previous

16-The conducting polymers and metal oxides are ..... capacitors.

a) Hybrid
b) Double-layer
c) Pseudo
d) Electrolytic

17-In mixed Li-O_2 batteries, the cathode in contact with

a) The aqueous electrolyte
b) The Li-conducting membrane
c) The aprotic electrolyte
d) The Li-metal

18-The catalyst used for cathode in solid-oxide fuel cells is .....

e) Pt/C
f) La(Sr)MnO_3
g) Pt-Ru
h) Raney Ni

19-The cathodic reaction of lead-acid battery is .....

a) $Pb_{(s)} + SO^{2-}_{4(aq)} + 4H^{+}_{(aq)} + O_2 + 2e^- \rightarrow PbSO_{4(s)} + 2H_2O_{(l)}$
b) $Pb^{2+} + 2e^- \rightarrow Pb_{(s)}$
c) $PbO_{2(s)} + 4H^{+}_{(aq)} + SO^{2-}_{4(aq)} + 2e^- \rightarrow PbSO_{4(s)} + 2H_2O_{(l)}$
d) $2PbO_{2(s)} + 2NH^{+}_{4(aq)} + 2e^- \rightarrow Pb_2O_{3(s)} + 2NH_{3(aq)} + H_2O_{(l)}$

20-During the discharge of Li-ion battery, ...

a) Li-ions move from the cathode to the anode
b) Li-ions move from the anode to the cathode
c) Electrons move from the cathode to the anode
d) Both a and c

21-The residual product discharged by the direct-methanol fuel cell is .....

a) H_2O
b) CO_2
c) H_2O and CO_2
d) H_2O and CO

22-Which capacitor do stores charge electrochemically?

a) Double layer capacitors
b) Pseudocapacitors
c) Hybrid capacitors
d) All of the above

مع اطيب التمنيات
ا د ابوالحجاج عبدالعزيز هرماس
د ثروت حسن

Assiut University
Faculty of Science
Chemistry Department

Date: 18/6/2022
Time: 3 hours

Physical Chemistry-2 Examination (C-232) for 2nd Level Students

Part I: Final Exam: (50 Marks)

Q1: Shade (T) for True statements or (F) for False statements: (25 Marks; 1 Mark each)

No.	Phrase
1	Detergents are examples of solids dispersed in liquid.
2	Water-insoluble soaps favor the formation of emulsions of oil in water.
3	The colloidal silicate ions move to the cathode.
4	The isoelectric point for hemoglobin's from various sources covers a pH range from 4.3 to 5.3.
5	In benzosols, the dispersed phase is solid and the dispersion medium is benzene.
6	A silver sol may be produced by reduction of dilute silver nitrate solution with nitric acid.
7	A gel of Ca-acetate can be obtained by change of solvents.
8	An emulsifier at the water- oil interface increases the surface tension on the side of one liquid more than does on the other one.
9	In water system, ice and water can exist in equilibrium at low pressure equal to 4.58 mmHg.
10	The peritectic temperature is below hypothetical congruent melting point.
11	At metastable condition the sulphur system is three phases and one component system.
12	The eutectic systems are used in the preparation of low melting point alloys.
13	In phase diagram of $FeCl_3$-water system, the maximum (points C,E,G,I) represents the cryohydric points of various hydrates.
14	Inside the binodal curve the system is two phases and consequently F = 2.
15	At point C (at 32.4 ^{o}C) in phase diagram of Na_2SO_4-water system , $Na_2SO_4.10H_2O$ melts incongruently producing a new solid phase (rhombic Na_2SO_4).

16	The binodal curve passes through a maximum at point D, which does not coincide with the plait point P.
17	Below cryohydric point B (at -21°C) in phase diagram of NaCl-water system , the system consists of solid ice and solid $NaCl.2H_2O$ only.
18	The primary batteries are rechargeable, such as leclanché cell.
19	Standard hydrogen electrode (SHE) is a primary reference electrode while standard calomel electrode is a secondary reference electrode.
20	Alkaline fuel cells use an alkaline electrolyte such as KOH in H_2O and are generally fueled with pure hydrogen.
21	Potential of oxygen electrode depends on oxygen gas pressure and concentration of OH^- ions.
22	In the electrolytic cells, the electrons are supplied to the cell from an external battery.
23	Electrolysis is the process in which electrical energy is used to cause a non spontaneous chemical reaction to occur.
24	At STP, an 835 mL of H_2 is evolved when 2 A is passed through a water electrolysis for one hour.
25	The emf of the Cd-Cu cell in which Cd is in contact with 0.002 M $CdSO_4$ and Cu is in contact with 0.02 M $CuSO_4$ solution is 0.65 V, where ($E^\circ Cu^{2+}/Cu$ =+0.34 v, $E^\circ Cd^{2+}/Cd$ = -0.4 v).

Q 2: Shade the correct answer: A, B, C or D: (25 Marks; 1 Mark each)

No.	Phrase
26	Proteins below their isoelectric points ..... . A) move to the anode. B) move to the cathode C) sometimes move to the anode and sometimes to the cathode D) do not move either to the anode or to the cathode
27	Some gels liquify readily when shaken to form a sol which on standing turns back into a gel. The sol-gel transformation is referred to as..... . A) metathesis B) syneresis C) thixotropy D) none of these

28	The cleaning action of soap is due to ..... . A) hydrolysis of salt present in soap B) ionization of salt present in soap C) high molecular mass of soap D) emulsification properties of soap
29	The precipitating power of Al^{3+} , Na^{+} , Ba^{2+} is in the order..... . A) $Na^{+} > Ba^{2+} > Al^{3+}$ B) $Ba^{2+} > Na^{+} > Al^{3+}$ C) $Al^{3+} > Na^{+} > Ba^{2+}$ D) $Al^{3+} > Ba^{2+} > Na^{+}$
30	The surface tension of lyophilic sols is frequently ..... that of the pure medium. A) higher than B) lower than C) higher or lower than D) not different from
31	The charge on As_2S_3 sol is due to ..... . A) absorption of H^{+} ions B) adsorption of H^{+} ions C) adsorption of S^{2-} ions D) absorption of S^{2-} ions
32	The dispersed phase in emulsions are generally ..... charged. A) negatively B) positively C) sometimes positively and sometimes negatively D) none of these
33	Many elastic and non-elastic gels shrink in volume on standing, with an accompanying exudation of solvent. This process is called..... . A) thixotropy B) metathesis C) syneresis D) none of these.
34	A freshly prepared AgCl can changed to colloidal solution by ..... . A) diffusion B) peptization C) coagulation D) dissolution
35	For two component condensed system the phase rule equation is ..... . A) F = 3-P B) F = C-P+1 C) F+P = C+1 D) all of these
36	A solution of common salt has the number of components and degrees of freedom equal to ..... and ..... respectively. A) 2 and 1 B) 2 and 2 C) 2 and 3 D) 3 and 2
37	At transition point E (234 ^{o}C) in phase diagram of Na_2SO_4-water system; ..... is converted into..... . A) rhombic Na_2SO_4 into monoclinic Na_2SO_4 B) Na_2SO_4 into Na_2SO_4 R C) $Na_2SO_4.10H_2O$ into Na_2SO_4 R D) none of these
38	Zn-Mg system at any of its ..... points is an invariant system (at constant pressure). A) freezing B) congruent C) eutectic D) all of these
39	In sulphur system, the three phases ..... , ... , ... co-exist in equilibrium at triple point F (151 ^{o}C, 1290 atm.). A) S_R, S_M, S_V B) S_R, S_M, S_L C) S_M, S_L, S_V D) none of these

40	The ternary system Na_2SO_4-NaCl-water at 15 °C gives the formation of..... . A) hydrate $Na_2SO_4.10H_2O$ B) anhydrous Na_2SO_4 C) both A and B D) none of these
41	Which of the following is monovariant curve? A) Fusion curve of S_M B) Solubility of KI C) Freezing point curve of Pb D) all of these
42	Which of the following systems show the formation of "binodal bond" at lower temperature? A) succinic nitrile - water - ethanol B) water - phenol - aniline C) acetic acid - water - $CHCl_3$ D) none of these
43	A current is passed through a $Ga(NO_3)_3$ solution for 1.5 hours, and after this time period the mass of metal produced was 6.5 grams. What is the current, in amperes, that is required to produce such an amount of gallium? (Ga =69.723 g/mol) A) 1.7 A B) 5.0 A C) 100 A D) 300 A
44	Which of the following expressions correctly shows the calculation of ΔG° in kJ/mol for a Voltaic cell with the half reactions shown below? $Ag^+(aq) + e^- \rightarrow Ag(s), E^\circ = +0.80V; Zn^{2+}(aq) + 2e^- \rightarrow Zn(s), E^\circ = -0.76V$ $A)\ 2.69 \times 10^{-4}$ $B)\ -232.21$ $C)\ -301.03$ $D)\ 3.86$
45	What is K for the following balanced reaction? $3Zn(s) + 2Cr^{3+}(aq) \rightarrow 3Zn^{2+}(aq) + 2Cr(s) E^\circ = 0.0218\ V$ $A)\ 1.3 \times 10^{-3}$ $B)\ 5.5$ $C)\ 163.4$ $D)\ 12.8$
46	The principal function of a fuel cell is to..... . A) Produce fuel B) Electrolyze fuel C) Produce hydrogen D) Produce electricity
47	What is the pH of the unknown acidic solution in the following cell? $H_2(1\ atm)\|Pt(s)\|H^+(x\ M)\|\|Cu^{2+}(1M)\|Cu(s), \quad E_{cell} = 0.54\ V\ at\ 25\ °C,$ $E^\circ_{Cu^{2+}/Cu} = 0.34\ V$ A) 1.7 B) 2 C) 3 D) None of these
48	At which electrode is H_2 in the electrolysis of water? A) The anode B) The electrode connected to the negative side of the battery C) The cathode D) None of the previous
49	Which of the following statements is true for the following reaction: $2Fe^{3+}(aq) + 2Br^-(aq) = 2Fe^{2+}(aq) + Br_2(l)$ ($E^\circ\ Fe^{3+}/Fe^{2+}$ =+0.77 v, $E^\circ\ Br^-/Br_2$ = +1.07 v) A) E° = -1.83 V and it is not spontaneous B) E° = -0.30 V and it is not spontaneous C) E° = +0.30 V and it is spontaneous D) E° = +1.83 V and it is spontaneous.

50	If the direction of flow of electrons in electrochemical cell is right to left, then the cell reaction is: A) Spontaneous B) Non-spontaneous C) Reversible D) Irreversible

Part II: Oral: (10 Marks)

Q3: Shade (T) for True statements or (F) for False statements: (10 Marks; 1 Mark each)

No.	Phrase
51	Shaving lather is an example of gas dispersed in liquid.
52	The function of an emulsifier is to stabilize a sol.
53	The size of the pinpoints of light seen in the ultra-microscope is an indication of the actual diameter of the particles.
54	A sol of gold moves to the positive electrode.
55	All triple points are eutectic points.
56	At point C in cooling curve of two component mixture both components solidify.
57	The system KNO_3-$AgNO_3$-H_2O at 30°C shows the formation of congruently saturating double salt KNO_3-$AgNO_3$.
58	Potential of Calomel electrode depends on the concentration of Cl-
59	The equilibrium constant for the Ag | Ag^+ || Fe^{2+} | Fe is 1.23×10^{-42} (E^o Fe/Fe^{2+} =-0.44 v, E^o Ag/Ag^+ =+0.80 v)
60	The standard free energy (ΔG^0) for Au | Au^{3+} || Ca^{2+} | Ca is -2.53×10^3 kJ/mol(E^o_{cell} =4.37 v)

Good Luck

Prof. Dr. Maher M. Girgis, Prof. Dr. Maher M. A. Hamed and Dr. Mohamed N. Abd El-Hamed.

Faculty of Science
Chemistry Department

Time: 2 hrs.
Jun 2022

Final Examination for Applied Industrial Chemistry Students (Chem 202, Organic Chemistry II)

Section A (Aromatic Compounds) **(25 Marks)**
1- Choose the correct answer a, b, c or d: (One mark each) **(15 Marks)**

1. Benzaldehyde can be prepared by oxidation of toluene by which of the following reagent?
   a) Acidic MnO2
   b) $K_2Cr_2O_7$
   c) CrO_2Cl_2
   d) basic $KMnO_4$

2. What reagents will be used in the preparation of benzaldehyde via Gattermann Koch synthesis?
   a) Carbon dioxide and HCl
   b) Carbon monoxide and HCl
   c) Oxygen and H_2SO_4
   d) Carbon monoxide and H_2SO_4

3. What is the name of the reaction of allyl aryl ethers undergo rearrangement when heated gave alkyl phenol?
   a) Clasien rearrangement
   b) Sandmeyers reaction
   c) Meerwein reaction
   d) Mannish reaction

4. Salicylaldehyde can be prepared from which of the following reactants?
   a) Phenol and chloroform
   b) Phenol, chloroform and sodium hydroxide
   c) Phenol, carbon tetrachloride and NaOH
   d) Phenol, carbon tetrachloride

5. Among the following, which one is the strongest acidic
   a) Phenol
   b) p-Nitrophenol
   c) p-Hydroxyphenol
   d) p-chlorophenol

6. Which of the following is formed when phenol is exposed to air?
   a) o-Benzoquinone
   b) p-Benzoquinone
   c) Phenoquinone
   d) o-and p-Benzoquinone

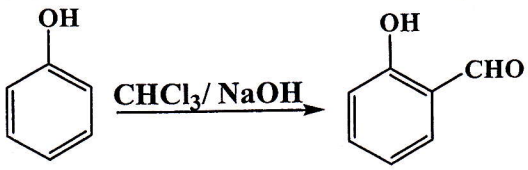
7. Which of the following reagent give monobromination with phenol?
   a. Water

b. 1,2-Dichloroethane
c. Cyclohexane
d. NaOH

8. Friedel-Crafts of phenol with acetyl chloride in absence of catalyze gave one of the following:
a) o-Acetyl phenol
b) o- and p-Acetyl phenol
c) Methyl benzoate
d) All the previous

9. What is the name of the reaction of allyl aryl ethers undergo rearrangement when heated gave alkyl phenol?
a) Clasien rearrangement
b) Sandmeyers reaction
c) Meerwein reaction
d) Mannish reaction

10. What is the name of the following reaction?



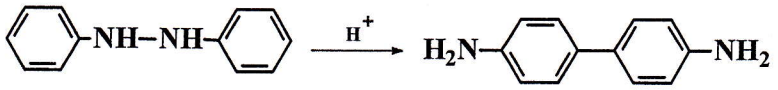
a) Gattermann Koch synthesis
b) Benzoin Condensation
c) Sandmeyers reaction
d) Reimer Tiemann reaction

11. On heating aqueous solution of benzene diazonium chloride, which of the following is formed?
a) benzene
b) chlorobenzene
c) phenol
d) aniline

12. n-Propyl phenyl ether can be prepared from which of the following reactants?
a) Phenol and n-propyl bromide
b) Sodium phenoxide and n-propenyl bromide
c) Sodium phenoxide and n-propyl bromide
d) n-propenyl bromide

13. Which of the following is most basic?
a) $C_6H_5NH_2$
b) $(CH_3)_2NH$
c) $(CH_3)_3N$
d) NH_3

14. What is the name of the following reaction?



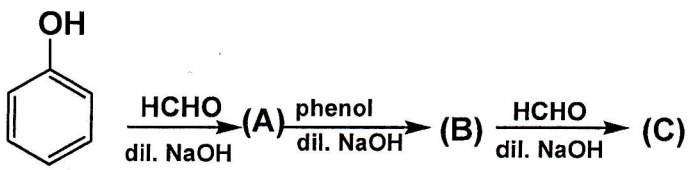
a) Clasien rearrangement
b) Benzidine rearrangement
c) Reimer-Tiemann reaction
d) Mannish reaction

15. Polynitro group undergoes displacement one of these nitro groups can be displaced by

a) KOH
b) Ethanol
c) Ammonia
d) All the previous

2- Answer the following questions **(10 Marks)**

1. Which of the following products A, B, and C for the reaction:



2. Starting with benzene, how can you prepare 2,4,6-trinitrotoluene (TNT)?
3. Synthesis of indoaniline as violet dye
4. Conversion of aniline into p-bromoaniline
5. Suggest the mechanism of benzoin condensation

Section B (Heterocyclic Chemistry) **(25 Marks)**

1- Answer the following:

a) Draw the structure of the following compounds: **(7 Marks)**

Pyrrole – thiophene – pyridine – pyrimidine - oxazole, benzofuran - thiazole.

b) Mark (only six) of the following as (√) or (X): **(6 Marks)**

i) Thiophene is stable to Lewis acids.

ii) 1,3-Azoles are not reactive towards electrophilic attack.

iii) 1,2 - Azoles are significantly less basic than 1,3- azoles.

iv) Isoxazole and isothiazole are non-basic heterocycles.

v) Quinoline and isoquinoline are two isomeric heterocycles.

vi) Diphenylamine was reacted with S/Δ to give phenothiazine.

vii) Pyrimidines are aromatic heterocycles.

2- a) Show by equations and mechanisms the preparation of the following: **(6 Marks)**

i) The Paal – Knorr synthesis of Pyrrole.

ii) Barbituric acid.

b) Complete (only six) of the following equations: **(6 Marks)**

i) Furan + acetyl nitrate → ----------

ii) 2,5- Dimethylthiophene + EtBr ($AlCl_3$) → .....

iii) Isoxazole + Br_2 → .....

iv) Pyridine + H_2O_2 (AcOH) → .....

v) Isoquinoline + HNO_3 / H_2SO_4 → .....

vi) 2- Pyridone + HNO_3 → .....

vii) Thiophene + CH_3COCl ($SnCl_4$) → .....

Oral Exam of Heterocyclic Chemistry **(5 Marks)**

Mark the following as (√) or (X) for the following sentences:

1- Pyrrole is strong basic compound
2- Furan as cyclopentene are heterocycles
3- Thiophene is less aromatic than furan
4- Indole reacts with Zn/HCl to give 2-chloroindole
5- Pyrrole reacts with AC_2O/Δ to give 3-acetylpyrrole

Oral Exam of Aromatic compounds **(5 Marks)**

Choose the correct answer a, b, c or d: (One mark each)

1. Reaction of phenol with bromine gave p-bromophenol in the presence of:
   a) 1,2-Dichloroehthane
   b) Water
   c) FeBr3
   d) None of above

2. What is the name of formaldehyde with phenol to give Phenol-Formaldehyde Resins of the following?
   a) Clasien rearrangement
   b) Sandmeyers reaction
   c) Lederer Manasse reaction
   d) Mannish reaction

3. An alkoxide will react with most aryl halides to give the corresponding ether

a) True
b) False

4. What is the name of the reaction of condensing aromatic halides and heating with copper-bronze at an elevated temperature forming biaryl:
   a) Ullmann Reaction
   b) Sandmeyer's reaction
   c) *Perkin reaction*
   d) Schiemann reaction

5. Picric acid is formed when phenol react with which of the following reactant?
   a) Formaldehyde
   b) Hydrogen
   c) Nitric acid
   d) Hydrochloric acid

Best wishes
أ.د. على عبدالحافظ
أ.د. عبدالعال جابر

Assiut University
Faculty of Science
Chemistry Department

Jun 20, 2022
Time: 3 hours

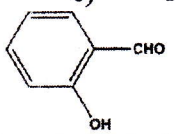
Final Examination of Organic Chemistry II (Heterocyclic & Aromatic Compounds (212C)

Answer the following questions:

First question: Choose the correct answer for the following: **(50 Mark)**

1. According to Hückel Rule the n value of benzaldehyde is

a) 0 b) 1/2 c) 1 d) 2/3

2. All the following names are correct for 

except

a) Salicyaldehyde b) *o*-hydroxybenzaldehyde c) 1,2-hydroxybenzaldehyde d) 1-formyl-2-hydroxybenzene

3. Reaction of benzaldehyde with chlorine gives .....

a) *o*-chlorobenzaldehyde b) *p*-chlorobenzaldehyde c) Benzoyl chloride d) *m*-chlorobenzaldehyde

4. Chlorine atom in chlorobenzene is ..... towards electrophilic substitution reactions

a) *ortho* directing b) *para* directing c) deactivating d) all

5. In the nitration of phenol, the following sentences are correct *except*.....

a) The electrophile is NO_2^+

b) The minor product is 2-nitrophenol

c) Three isomers are expected to be formed

d) The nitration of the formed product is slower than phenol

6. Synthesis of chloroamine T can be achieved starting from

a) *p*-toluenesulphonic acid b) *m*-toluenesulphonic acid

c) *o*-toluenesulphonic acid d) *o*-aminophenol

7. **benzenediazonium salt** $\xrightarrow{H_2O/\Delta}$ .....

a) Azobenzene b) Phenol c) Azoxybenzene d) *P*-aminophenol

8. The major product of the nitration of aniline is

a) *p*-nitroaniline b) *o*-nitroaniline c) *m*-nitroaniline d) benzenediazonium salt

9. Oxidation of ..... gives Benzoic acid

a) toluene b) ethylbenzene c) propylbenzene d) all previous

10. Fusion of Benzenesulphonic acid with NaOH gives

a) Benzoic acid b) Benzene c) Phenol d) Sod. benzensulphonate

11. Reduction of nitrobenzene using zinc and NaOH gives

a) aniline b) *N*-phenylhydroxylamine c) Hydrazobenzene d) *P*-aminophenol

12. **Benzene** $\xrightarrow[(iv)H_2O/\Delta \quad (v)HNO_3/H_2SO_4]{(i)HNO_3 \quad (ii)\ Zn/HCl \quad (iii)\ NaNO_2/HCl}$ .....

a) phenol b) thiophenol

c) benzenesulphonic acid d) picric acid

13. Kolbé Schmidt Reaction of resorcinol gives

a) 2,4-dihydroxybenzaldehyde b) 2,4-dihydroxybenzoic acid c) 2,4-dihydroxytoluene d) No reaction

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14. The correct order of basicity is

a) aniline>*p*-nitroaniline>*m*- nitroaniline > *p*-anisidine b) aniline> *m*- nitroaniline> *p*-anisidine >*p*-nitroaniline

c) *p*-anisidine>aniline> *m*- nitroaniline>*p*-nitroaniline d) *p*-anisidine> *m*- nitroaniline> aniline> *p*-nitroaniline

15. Reducation of benzenediazonium salt with Zn/HCl gives

a) Aniline b) *N*-phenylhydroxylamine c) Phenylhydrazine d) Benzidine

16. 1,3,5-tribromobenzene can be prepared from benzene by the following steps

a) (i)bromination, (ii)decarboxylation, (iii)alkylation then (iv)oxidation

b) (i) alkylation, (ii) bromination, (iii)oxidation then (iv) decarboxylation

c) (i) bromination, (ii)decarboxylation, (iii)alkylation then (iv)oxidation

d) (i) bromination, (ii) alkylation, (iii)oxidation then (iv) decarboxylation

17. The major product of the nitration of *m*-nitroethylbenzene

a) 2,3-dinitroethylbenzene b) 3,4-dinitroethylbenzene c) 3,5-dinitroethylbenzene d) 2,5-dinitroethylbenzene

18. The reagent used in Reimer Tiemann reaction of phenol is .....

a) $CH_3CL/NaOH$ b) $CCl_4/NaOH$ c) CH_3CL/HCl d) CCl_4/HCl

19. 2-cholrotoluene can be prepared from toluene using

a) Cl_2/UV light b) $Cl_2/AlCl_3$ c) $Cl_2/AlCl_3$/UV light d) Cl_2/benzene

20. The intermediate of electrophilic substitution of anisole is stabilized by .....resonating structures

a) 2 b) 3 c) 4 d) 5

21. All the following are dihydric phenols except.....

a) catechol b) pyrogallol c) resorcinol d) quinol

22. *P* –nitroaniline can be prepared from aniline by the following steps

a) (i)Ac_2O (ii) HNO_3/H_2SO_4 (iii) H_2O/H^+ b) (i) H_2O/H^+ (ii) HNO_3/H_2SO_4 (iii) Ac_2O

c) (i)Ac_2O (ii) H_2O/H^+(iii) HNO_3/H_2SO_4 d) (i)) HNO_3/H_2SO_4 (ii) (iii) Ac_2O (iii)H_2O/H^+

23. Treating hydrazobenzene with acid gives .....

a) aniline b) azobenzene c) benzilidine d) azoxybenzene

24. Sulphonic group in benzenesulphonic acid.....

a) Deactivates the further electrophic substitution reaction

b) Directs the further electrophile towards *meta* positions

c) Increases the solubility in water

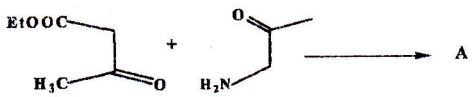
d) All the above

25. The major product of nitration of p-chlorobenzenesulfonic acid

a) 4-chloro-2-nitrobenzenesulfonic acid b) 4-chloro-3-nitrobenzenesulfonic acid

c) *p*-nitrobenzenesulfonic acid d) *p*-chloronitrobenzene

In the following reaction



26. Name of the reaction

a) Knorr b) Robinson-Gabriel c) Hantzsch d) None of them

27. The product of the reaction (A) is:

a) Pyridine b) Pyrrole c) Pyrimidine d) Pyrazole

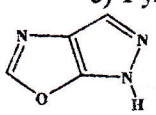
28. The electrophilic substitution of the product (A) occurs at:

a) C_2 b) C_3 c) C_2 and C_3 d) None of them

29. The reaction of 1,3-dicarbonyl compounds with thiourea in HCl/EtOH, then heat to give

a) Isoquinoline b) Quinoline c) Pyrimidine d) Isothiazole

30. The IUPAC name of this structure is:



a) 1-H-Oxazolo[5,4-c]pyrazole b) 1-H-Oxazolo[4,5-c]pyrazole

c) 1H-Pyrazolo[3,4-d]oxazole d) 1H-Pyrazolo[4,3-d]oxazole

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31. Condensation reaction of $CH_3COCH_2COCH_3$ with NH_2NH_2 to give:

a) Oxazole b) Imidazole c) Pyrazole d) Thiazole

32. Cycloaddition reaction between acetonitrile with ---------- followed by acidification during aqueous workup afford tetrazole derivatives.

a) NaOH b) $NaNH_2$ c) NaN_3

33. which of the following statement is correct ?

a) Pyrrole has less aromatic charecters than furan

b) Thiophene is a strong acid

c) Pyridine is a tertiary amine

d) Quinoline is isomer with benzene

34. Which statement below is incorrect?

a) In Imidazole,each nitrogen atoms contributes on to the π-system.

b) Pyrimidine and pyrazine are isomers

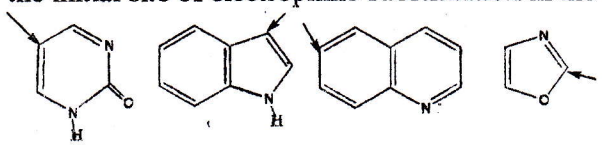
c) 5- and 3-Methylpyrazole exist as a rapidly equilibrating mixture in solution

35. Compounds are unsaturated cyclic molecules that possess additional stability as a results of the arrangement of π-electrons associated with the unsaturation of the ring system are called :

a) Heterocyclic Compounds b) Aliphatic Compounds

c) Aromatic Compounds d) All of them

36. Which formula does not show the initial site of electrophilic substituation in the ring:



(a) (b) (c) (d)

37. The reaction of 2-Butanone with phenylhydrazine/$ZnCl_2$ to give ---------- isomer indole product

a) Two b) Three c) Four d) None of them

38. Formal replacement of (CH) unit in pyridines by a nitrogen atom leads to a series of three possible isomers of:

a) Thiazines b) Diazols c) Diazines d) Triazoles

39. The molecular formula of the product obtained upon treatment of 2-chloropyrimidine with Sodium ethoxide is

a) $C_6H_8N_2O$ b) $C_8H_8N_2O$ c) $C_{10}H_8N_2O$ d) $C_6H_8NO_2$

40. The parent structures of 1,2-azoles family of heterocycles ,having a nitogen atom plus one other heteroatom in a 1,2-relationship in a five membered ring are:

a) Pyrazole, Imidazole, Oxazole b) Isoxazole, Oxazole, Imidazole

c) Pyrazole, Isoxazole, Isothiazole d) All of them

41. The general reaction of unsymmetrical diketone with hydroxylamine to give:

a) Pyrazole b) Oxazole c) Pyrrole d) Isoxazole

42. The classical synthesis of quinoline by the reaction of aniline with glycerol under acidic/ oxidative condition is called:

a) Paal-Knorr b) Fisher c) Skraup d) Knerr

43. Pyridine is virtually inert to aromatic electrophilic substitution reactions, but can be activated by convertion into:

a) *N*-Oxid b) *N*-Alkyl c) 4-Nitro d) 4-Alkyl

44. In Hantzsch synthesis of 2,4 -Dimethylthiazole,what are the two starting material required

a) α-Chloro-2-butanone + Thioacetamide b) α-Chloroacetyl acetone + acetamide

c) α-Chloroacetyl acetone + Thioacetamide d) All of them

45. Amination of isoqunoline with $NaNH_2$ is :

a) Electrophilic reaction b) Nuclophilic reaction

c) Anion reaction d) None of them

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46. In retrosynthesis analysis show the structures of the starting required to synthesize---------- are 2,5-hexadione with NH_3 .

a) 2,3-Dimethylpyrrole b) 2,5-Dimethylpyrrole c) 3,4-Dimethylpyrrol d) 4,5-Dimethylpyrrole

47. Treatment of 2,3-butadione with acetaldehyde in presence of NH_4OAc/Al_2O_3.

a) Imidazole b) Pyrazole c) pyrimidine d) Indole

48. Reaction of 4(5)methylimidazole with HCHO and $HNMe_2/H^+/EtOH$ is called:

a) Vilsemeir reaction b) Mannich reaction c) Skraup d) None of them

49. The chemical name of 1,3-diazole is :

a) Pyrazole b) Oxazole c) Imidazole d) Thiazole

50. ratio between ethyl acetoacetate,formaldehyde, and NH_3 for synthesis of pyridine is :

a) 2:1:1 mole b) 1:1:1 mole c) 2:1:2 mole d) 1:2:2 mole

<u>Second question</u>: Choose true (T) for the correct statement and false (F) for the wrong one:
(Oral, 10 Marks)

51. *o*-nitrophenol has lower melting point than *p*-isomer.
52. Reaction of benzaldehyde with NaOH giving benzyl alcohol and sod. Benzoate is known as Aldol reaction.
53. electrophilic substitution reactions of benzene is concerted reaction.
54. CF_3 is *ortho* and *para* directing group in electrophilic substitution reactions of benzene.
55. *p*-nitrophenol>Phenol>*m*-cresol>*p*-cresol is a correct order in the acidity.
56. The five membered ring can react with elecrophile at heteroatom.
57. Aromatic character is associated with planer cyclic molecules that contained 2,6,10,14(and so on)π-electrons
58. The lone pair of nitrogen in the pyridine does not share in aromaticity.
59. Quinoline are more reactive towards electrophilic substation reaction to give 2-substituents
60. N-Methylpyrrole,thiophene,furan can be metalated at C_2 position with alkyl lithium reagent

GOOG LUCK

Examiners: Prof. Dr. Adel Kamal El-Din **Prof. Dr. Zeinab Hozien,**
Dr. Ahmed A. Omar **Dr. Awad I. Said**

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