4. a) Distinguish between co–precipitation and post-precipitation.

   b) What weight of manganese is present in 2.38 g of Mn_3O_4?

   c) What is the pH of a solution prepared by dissolving 1 gm of p-nitrophenol (M.wt = 139.11 , Ka = 6.2×10^{-8}) in 250 mL.

   d) Calculate the pH of a solution prepared by adding 25 mL of 0.1 M sodium hydroxide to 30 mL of 0.2 M acetic acid (Ka = 1.75×10^{-5})

5. a) Write briefly on "lewis acid-base theory".

   b) Explain the principles of the theory of neutralization indicators.

   c) If the initial reading of a burette is 0.04 ml, the final one is 20.08 ml and the uncertainty in each reading is ± 0.04%, what is the uncertainty in the volume delivered?

   d) A buffer solution is 0.2 M in acetic acid and in sodium acetate. Calculate the change in pH upon adding 1.0 mL of 0.1 M hydrochloric acid to 10 mL of this buffer solution. (K_a=1.75×10^{-5})

(At.wts: O = 15.999 , Cl = 35.453 , K = 39.102 , Mn = 54.938
I = 126.904 , Ba = 137.34 , Pb = 207.19).

****

Good Luck

Examiners: **Prof. Dr. Hassan Sedaira**
Prof. Dr. Elham Y. Hashem

Faculty of Science

Chemistry Department

26 May 2024

Time allowed: 2 hours.

Final Exam of Analytical Chemistry

For Nanotechnology 2nd Level Students (C – 204)

.....

Answer the following questions: (50 degree)

1- Define the following:

i- Gravimetric factor ii- Peptization

iii- Buffer solution iv- Digestion

2- a- Write briefly on acid-base indicator.
b- Define the ionic strength and find the ionic strength of a mixture containing 0.02 M KBr and 0.01 M Na_2SO_4.

3- a- Explain the Volhard titration of chloride. This method must be used in acid solution. Why?
b- Find the pH of solution prepared by dissolving 12.43 g of tris (FM = 121.135) plus 4.67 g of trihydrochloride (FM = 157. 596) in 1 litter of solution. ($pK_a = 8.075$).

4- Calculate the pH of solution obtained by reacting 50 ml each of 0.1 M NH_4OH and 0.1 M HCl (K_b = 1,8x10-5 , K_w= 1.0x10-14).

5- A buffer solution is 0.2 M in acetic acid and in sodium acetate. Calculate the change in pH upon adding 10 ml of 0.10 M sodium hydroxide to 100 ml of this solution (pk_a = 4.76).

.....

.....

Good Luck

Examiner: Prof. D. Elham Y. Hashem

Chemistry Department
Faculty of Science
Assiut University

June, 2024
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 outlined in the answer sheet not here)

1-When the pH of water droplets become below 5, the ------ dominates SO_2 oxidation. Whereas, above pH 5, ------ or other catalytic reactions dominate the same oxidation.

a) O_3 & H_2O
b) O_3 & H_2O_2
c) H_2O_2 & O_3
d) $HO^{\bullet}$ & O_3

2-What is the end product of combined mechanistic pathways (B&C) sequence in the microbial DDT degradation?

a) 4-Chlorophenyl acetate
b) 4-Chlorobenzoate
c) 4-Chloroacetophenone
d) 4-Chlorobenzaldehyde

3-Choose the preferred IUPAC name for Parathion insecticide?

a) O,O-Diethyl O-(4-nitrophenyl) phosphoro-thioate
b) O,O-Dimethyl-O-p-nitrophenyl phosphoro-thioate
c) Diethyl 2-[(dimethoxyphosphorothioyl) sulfanyl]butanedioate
d) O,O-Diethyl O-(4-nitrosophenyl) phosphoro-thioate

4-Pick out the wrong statement regarding to hydroxyl radical?

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

5-Furans can be formed at temperature of ----- by strong heating of ----- having boiling point range ----- in the presence of oxygen.

a) 325-366 °C & polychlorinated biphenyls (PCBs) & 300-310 °C
b) 250-450°C & polychlorinated biphenyls (PCBs) & 325-366 °C
c) 310-360°C & 2,4-dichlorophenoxyacetic acid (2,4-D) & 290-320 °C
d) 300-350°C & chlorinated cyclohexane and cyclopentadiene & 200-300 °C

6-What is going on when the sun rises at the end of the polar winter over antarctic zone?

a) The Cl_2 molecule is broken down by solar radiation producing two chlorine $Cl^{\bullet}$
b) Nitric acid is incorporated into the polar stratospheric clouds (PSC)
c) Both HCl and $ClONO_2$ react with each other to produce Cl_2 and HNO_3.
d) The chlorine radicals start a catalytic chain reactions of ozone destruction

7-Amongst the given set of solvents, which is the most preferred solvent in synthesis of pharmaceutical drugs?

a) Methylene chloride
b) Pentanol
c) Cyclohexane
d) Tetrahydrofuran

8-Organophosphate pesticides ----- in fatty tissues and these chemicals ----- within days or weeks, thus are ----- found in food chains.

a) decompose & concentrate& seldom
b) seldom & concentrate& decompose
c) concentrate& decompose & seldom
d) decompose & seldom & concentrate

9-Abstraction of the loose oxygen atom from ozone molecule is characteristic of all of the following species *EXCEPT* -----.

a) $HO^{\bullet}$
b) $NO_2^{\bullet}$
c) $Cl^{\bullet}$
d) $NO^{\bullet}$

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

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

ملحوظة: الأختبار مكون من أربعة صفحات

11-In order to increase triazine-herbicides efficiencies, the 2-chlorine atom should replaced by -----, while variations in ----- extends the range of biological activity and persistence.

a) amino-or methyl-group & methyl-or amidic groups
b) methyl-group & alkyl side chains
c) alkyl amino side chains & methoxy-or thiomethyl groups
d) methoxy-or thiomethyl groups & alkyl amino side chains

12-Which of the following is the best reaction sequence used for adipic acid synthesis starting from benzene?

a) (i) CoO_2/140 Psi, (ii) H_2/Ni-Al_2O_3/800 Psi, (iii) HNO_3/Heat
b) (i) CoO_2/140 Psi, (ii) HNO_3/Heat, (iii) H_2/Ni-Al_2O_3/800 Psi
c) (i) H_2/Ni-Al_2O_3/800 Psi, (ii) CoO_2/140 Psi, (iii) HNO_3/Heat
d) (i) HNO_3/Heat, (ii) CoO_2/140 Psi, (iii) H_2/Ni-Al_2O_3/800 Psi

13-Benomyl fungicide is prepared by the reaction of ----- with ----- followed by addition of ----- and finally reaction of the later intermediate with -----.

a) cyanamide & o-$C_6H_4(NH_2)_2$ & methyl chloroformate & CH_3NCO
b) cyanamide & methyl chloroformate & o-$C_6H_4(NH_2)_2$ & C_4H_9NCO
c) methyl chloroformate & o-$C_6H_4(NH_2)_2$ & cyanamide & PhNCO
d) o-$C_6H_4(NH_2)_2$ & cyanamide & methyl chloroformate & $C_5H_{11}NCO$

14-Which of the following is not considered as chemical disposal methods of PCBs?

a) Substitution of chlorine by polyethylene glycols for 2h/N_2.
b) Hydrogen cleavage of C-Cl bond and biphenyl nucleus using copper catalyst
c) Using of $C_{10}H_8Na$ which results in the expulsion of a chloride ion
d) Using of $NaNH_2$, results in substitution of a chloride ion with NH_2

15-In the aqueous phase oxidation of SO_2, strong acids are capable of control the overall concentration of -----.

a) HSO_3^-
b) H_2O_2
c) HSO_4^-
d) H_2SO_3

16-The conversion of inactive HCl and $ClONO_2$ into active chlorine occurs at the surface of particles composed of -----.

a) H_2O_2, SO_3 & NO_2
b) H_2O, H_2SO_4 & HNO_3
c) H_2O_2, CO_2 & NO
d) H_2O, H_2SO_3 & NO

17-In the second step of Dow process for (2,4-D) synthesis, the solution must be kept alkaline and about 50% molar excess of 2,4-dichlorophenol in order to -----.

a) Minimize the formation of $HOCH_2CO_2Et$
b) Minimize the formation of $HOCH_2CO_2H$
c) Maximize the formation of $HOCH_2CO_2Na$
d) Maximize the formation of $HOCH_2CH_2OH$

18-What are the significant problems involved in the PCBs-microbial destruction methods?

a) Microbes tend to be highly selective in their dechlorination reactions
b) Microbial dechlorinations are rather slow rate acting on PCBs
c) Microbes uses the PCBs as a hydrogen source
d) Both (a) and (b)

19-At specific step of troposphere oxidation of methane, $CH_3O^{\cdot}$ radical reacts with oxygen molecule gives ----- and -----.

a) $HOO^{\cdot}$ & CH_2O
b) $CH_3OO^{\cdot}$ & $CH_3^{\cdot}$
c) $HOO^{\cdot}$ & CO
d) $HOO^{\cdot}$ & CO_2

20-Which is the aerosol mode in urban area whose particles undergoes coagulation followed by deposition of gas molecules?

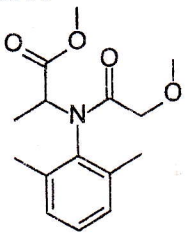
a) Nuclei mode
b) Particle mode
c) Accumulation mode
d) Coarse particles

ملحوظة: الأختبار مكون من أربعة صفحات

21-Dobson unit is the number of molecules of ozone that would be required to create a pure O_3 layer with -----.

a) 0.01 mm at 10 ˚C/1 atm
b) 0.01 mm at 0 ˚C/10 atm
c) 0.10 mm at 0 ˚C/1 atm
d) 0.01 mm at 0 ◦C/1 atm

22-Choose the name for the following acylalanine fungicide structure?



a) Triadimefon
b) Metalaxyl
c) Prochloraz
d) Furalaxyl

23-Which compound of the following is widely used as seed dressing?

a) Benomyl
b) Thiram
c) Both (a) and (b)
d) Neither (a) nor (b)

24-Which of the following is the source of secondary organic aerosols?

a) Volatile organic compounds
b) Sea spray & bubble bursting
c) Fuel combustion
d) Microbial activities

25-All the following are considered as coarse particles in airborne *EXCEPT* -----.

a) Rain
b) Mist
c) Pollen
d) oil smoke

26-Which of the following is not amongst the components of photochemical smog?

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

27- Biodegradation of ----- herbicides started by ----- reaction followed by removal of the other ring substituents by ----- to give cyanuric acid as the end product.

a) Glyphosate & dehydrochlorinated & amidohydrolases
b) Atrazine & dechlorinated & amidohydrolases
c) Captan & dehydrogenated & amidohydrolases
d) Paraquat& amidohydrolases & dechlorinated

28-Mechanistic studies of organic and inorganic ingredients used for the protection against UV-rays are, the former one work by -----, while inorganic one work by -----.

a) reflecting and scattering UV light & absorbing UV light and dissipating it as heat
b) absorbing UV light and dissipating it as heat & reflecting and scattering UV light
c) emitting all of UV light & absorbing UV light lengths shorter than 220 nm
d) scattering all of UV light & filtering most of the UV component from 120 to 220 nm

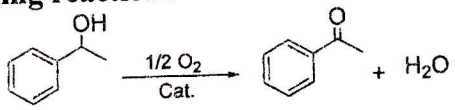
29-Why in the asymmetric synthesis of Fusilade, the incorporation of chiral centre molecule becomes late?

a) To minimize possible losses of optically active material
b) To reduce possibilities of racemization
c) To destroy of the unwanted racemate of the 2-chloropropanoic acid
d) Both (a) and (b)

30-Which of the following is true description of the albedo effect?

a) The lower the albedo, the more light the surface reflects, and the less it absorbs
b) The higher the albedo, the more light the surface reflects, and the less it absorbs
c) The higher the albedo, the more light the surface absorbs
d) The higher the albedo, the more light the surface emits.

31-What is the atom economy for the following reaction?



a) 85%
b) 86%
c) 87%
d) None of these

32-When traffic dies down, nitrogen oxides and VOCs begin to react to form -----.

a) NO
b) O_3
c) NO_2
d) Aldehydes

ملحوظة: الأختبار مكون من أربعة صفحات

33-What is the warmest layer of the atmosphere?

a) Troposphere
b) Thermosphere
c) Stratosphere
d) Mesosphere

34-Which is the type of contamination has occurs when chemicals are released by spill or underground storage tank leakage?

a) Thermal pollution
b) Water pollution
c) Radioactive contamination
d) Soil contamination

35-Pick out the correct definition of the 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.

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

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

36. Particulate matter (PM) described a very small diameter solids or liquids that remain suspended in the atmosphere.

37. Toxaphene is a chlorinated aromatic compound has functional groups representative of both ethers and phenols.

38. The O_3 gas is responsible for filtering most of the UV light from sunlight between 120 - 220 nm.

39. Dithiocarbamates function is the inhibiting enzyme activity in the fungi.

40. Glyphosate is named as (N-(phosphonoethyl) glycine, beside it is considered as a selective herbicide.

41. At stratosphere layer, radicals such as $Cl^{\bullet}$ and $Br^{\bullet}$ can abstract H atom from stable molecule.

42. Parasitic fungi live on decaying matter and largely responsible for the breakdown of animal and plant.

43. Peroxy radicals are less reactive and cannot abstract hydrogen.

44. Tridemorph fungicide is used to control powdery mildew in cereals.

45. Acidity of the droplet has not effect on the rate of SO_2 oxidation.

46. Broad-spectrum Tebuthiuron herbicide belongs to sulphonylureas type.

47. Environmental and metabolic degradation of PCBs generally proceeds quite slowly relative to most other compounds.

48. The fraction of solar energy that is reflected back to space is called the direct effect.

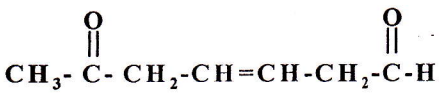
49. Diquat and Paraquat are rapidly losing their activity on contact with the soil.

50. The biochemical β-oxidation process can be degraded MCPB herbicides into 2,4,5-T.

8) When hexyne is oxidized by ozone (O_3), followed by Zn/H_2O the product is.....

a) Acetone
b) Acetic acid
c) Formic acid and pentoic acid
d) Formic acid

9) The functional groups in the following compound:



a) Alkyne, aldehyde, and ester
b) Alkene, aldehyde, and alcohol
c) Alkene, aldehyde, and ketone
d) Alkene, ketone, and alcohol

10) The bond angle of H-C-H in methane is.....

a) 109.28°
b) 120°
c) 90°
d) 180°

11) The following reaction represents.....

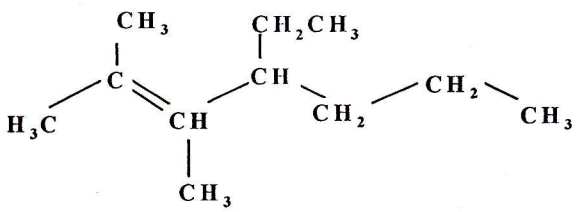
a) Addition
b) Oxidation
c) Substitution
d) Reduction

12) The thermal decomposition of calcium formate results to.....

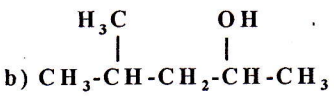
a) Formaldehyde
b) Acetic acid
c) Formic acid
d) Ethanol

<u>The second question</u>: Write the (IUPAC) name of the following compounds: **(5 marks)**

a)



b)



<u>The third question</u>: Complete the following equations for only five questions: (<u>only five</u>) **(10 marks)**

1) Ethanol + Acetic Acid $\xrightarrow{H_2SO_4}$ ----------?---------- + ----------?----------

2) 1-Propyne $\xrightarrow[H_2O]{H_2SO_4/HgSO_4}$ ----------?----------

3) 2-Bromopropane $\xrightarrow{KOH\ (aq)}$ ----------?----------

4) Ethylene $\xrightarrow{H_2SO_4}$ ----------?---------- $\xrightarrow{H_2O}$ ----------?----------

5) Ethyl Bromide $\xrightarrow{Mg/Ether\ (anhydrous)}$ ----------?---------- $\xrightarrow{H_2O}$ ---------?----------

6) 1-Pentene $\xrightarrow[Peroxide]{HBr}$ ----------?----------

7) Ethanol $\xrightarrow{K_2Cr_2O_7/H^+}$ ----------?----------

---

(Part 2: Aromatic Chemistry)

The fourth question: Write the structural formula of the following compounds: (only three) **(3 marks)**

a) p-Chlorostyrene b) o-Bromoanisole c) m-Xylene d) DDT

The fifth question: Write the steps in the mechanism for the nitration of benzene using mixture of nitric acid and sulfuric acid. **(5 marks)**

The sixth question: Complete each of the following equations: (answer only sevens) **(14 marks)**

a) Benzene + propylene $\xrightarrow{H_3PO_4}$ .....?.....

b) Toluene + Cl_2 $\xrightarrow{\triangle}$ .....?.....

c) Aniline $\xrightarrow{Br_2/H_2O}$ .....?.....

d) Ethylbenzene $\xrightarrow{KMnO_4/\ H^+}$ .....?.....

e) Bromobenzene + CH_3Br $\xrightarrow{2Na}$ .....?.....

f) Acetophenone $\xrightarrow{Zn(Hg)/HCl}$ .....?.....

g) p-Bromophenol $\xrightarrow[H_2SO_4]{HNO_3}$ .....?.....

h) Benzene sulfonic acid $\xrightarrow[Fusion]{NaCN}$ .....?.....

The seventh question: ***Rank the following compounds in order of increasing acid strength:*** **(3 marks)**

(p-nitro phenol, phenol, picric acid, p-methylphenol)

Good luck

Examiners: Dr/ Fatma kasem & Dr/ Maha mohamed samy

Academic : year2023/2024

Time allowed : 2 hours

Final exam. For course No. (Chem.208 nuclear and radiation)

Answer the following questions

Question No. 1

A) Calculate the mass absorption coefficient for 1 MeV Y -ray for Na I (aμ Na =2.32 , a μ I =12.03 barn/atom

B) complete the following nuclear equations $^{59}_{27}Co$(.....,α) $^{56}_{25}Mn$.

Write the complete decay equation

C) The β^- decay nuclides from $^{87}_{40}\mathbf{Se}$ form isobaric series.

What is the non-radioactive nuclide of this series.

Question No.2

A) What is the missing particle in the nuclear reaction $^{9}_{4}\boldsymbol{Be}$ $(\boldsymbol{\alpha}, \ldots.)$ $^{12}_{6}\boldsymbol{C}$.
Write the complete equation

B) $^{68}_{31}Ga$ undergoes β^- and EC modes of decay. What are the products of these alternative paths.

C) $The\ isotope\ ^{210}_{84}Po\ is\ an\ \alpha\ emitter, its\ half-life$ Is 138.4 days.
If you start with $2.87*10^{14}$ of $^{210}_{84}Po$. what is the number of atoms left after 365 days.

Question No.3

A) Define the following items

Photoelectric effect, Roentgen, annihilation process and dose equivalent

B) What is the activity of Na-22 which give a dose of 64 μ Sv/h at 1 m (na-22 emits one ¥ - ray photon of energy 1.28 MeV.

C) Write the complete decay equations for the following
B^+ decay of F-18
EC decay of Ga -67
IT of Tc-99m

Question No. 4

A) Define the following items

Compton scattering, G-value, mass stopping power

B) What is the terminal member of the naturally occurring radioactive series which begin with Th-232

C) What is the thickness of lead that would be necessary to reduce the exposure dose from ^{18}F-FDG sample by 70 %

Question No 5

A) The half-lives of Mo-99 and Tc-99m are 67 and 6 hrs. respectively and both are in transient equilibrium in a sample. if the activity of Mo-99 is 1000 Bq, what is the activity of Tc-99m (assume 87% Mo-99 decays to Tc-99m

B) What are the isotones in the following nuclides

$^{40}_{18}Ar$, $^{41}_{19}K$, $^{40}_{21}Sc$, $^{41}_{21}Sc$, and $^{90}_{40}Zr$

c) If The activity of 30 μg of Cm is 2.8 ***nCi***. What is the half-life of Cm-247

(Constants 1Ci = $3.7*10^{10}$ dps, N_A =$6.023*10^{23}$ mol^{-1}).

1 nCi = 37 Bq

Good luck

Prof. Dr. R.M.Mahfouz

Assiut university

Faculty of science

Chemistry department

Date: May / 2024

Time allowed: 3 hours

Final exam in 210 C course for second level's students

Answer the following questions: ..... (50 Marks)

Part 1 (Reaction Mechanism)..... (25 Marks)

Question One : (10 Marks)

Mark (√) or (X) for *Ten Only* the following sentences (write your answers in table):

1- Iodobezene react with KOH forming phenol.

2- In triplet carbene, the unshared electrons are paired and occupied sp hybrid orbital for bonding.

3- Carbanion stabilized by alkyl substituents by positive inductive effect and positive hyperconjugation.

4- Benzyne reacts with alkenes to yield cyclic compounds.

5- 1-Butene can exist as cis and trans isomers.

6- E1cb reaction takes place through free radical intermediate .

7- Chemoselectivity is defined as which functional group will react.

8- Isolation and chemical trapping are methods which used to confirm products.

9- CH_3CN is a suitable solvent for S_N2 mechanism.

10- In the following example, the order of increasing nucleophilicity is :

$$NH_3 > CH_3NH_2 > (CH_3)_2NH$$

11- A transition state is the lowest energy species in the reaction stepes.

Question Two : (15 Marks)

A. Choose the correct answer *Seven Only* of the following questions: (7 Marks)

1- Nucleophilic substitutions that exhibit second-order kinetic behavior are:

a. nonstereospecific and proceed with retention of configuration.

b. stereospecific and proceed with retention of configuration.

c. stereospecific and proceed with inversion of configuration.

2- Cyclopentyl bromide reacts with sodium cyanid in the precense of DMSO to give:

a. cyclopentyl cyanid

b. cyclopentene , c. cyclopentyl cyanid and cyclopentene

3- The change in hybridization of carbon in the following reaction is:

$$CH_3\underline{C}ONH_2 + P_2O_5 \rightarrow CH_3\underline{C}{\equiv}N$$

a. sp^3 to sp^2 , b. sp^2 to sp^3 , c. sp to sp^3 , d. sp^2 to sp

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4- Reaction mechanism exhibits first order kinetics , nonstereospecific and regioselective is :

a. S_N1 , b. E1 , c. S_N2 , d. E2

5- In which of the following mechanisms are alkenes the major reaction products ?

a. S_N^1 only , b. S_N^2 only , c. E1 only , d. E2 only , e. Both E1&E2

6- Which of the following anions would be the best leaving group for substitution reactions ?

a. H_3C^- , b. Cl^- , c. $TosO^-$, d. HO^-

7- Methyl bromid reacts with CH_3ONa / CH_3OH via :

a. S_N1 mechanisme , b. E1 mechanisme , c. S_N2 mechanisme , d. E2 mechanisme

8- Which alkyl halid of the following reacts with $CH_3CH_2O^-\ Na^+$ via S_N2 reaction :

a. 1-bromopropane , b. 2-bromopropane , c. 2-bromo-2-methylpropane

9- Based on Saytzeffs rule, select the most stable alkene :

a. 1-methyl cyclohexene , c. 3-methyl cyclohexene ,
b. 4-methyl cyclohexene , d. they are all of equall stability

B. Show by equations the products of the solvolysis of the following compounds in H_2O/Δ and then show which halide would react fastest? (3 Marks)

a. $(CH_3)_3C-Br$, b. $(CH_3)_3C-I$

C. Which ion in the following pair would be more resonance-stabilized ? Explain your answer with structures. (1 mark)

$CH_3CH_2CH^+CH_3$ or $CH_3-CH=CHCH_2^+$

D. Draw the equation , reaction mechanism with showing the energy diagram and type of the reaction for: (4 Marks)

1- HBr with 2-methylpropene.

2- cis-1-bromo-2-methylcyclopentane + EtONa/EtOH $\rightarrow$

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...(25 marks)

Part 2 Carbonyl compounds

Question three;Answer five only of the following---------- 15 marks

a-Draw the structure of the following compounds

i-2-chloro-3-methyl-butanal ii-2-butanone iii-Ethanoyl chloride

b-Reaction of propyne with i-$(BH_3)_2$/THF, ii-H_2O_2/NaOH workup

c-Predict the product and name of the following reaction

Benzene +$CH_3CH_2COCl/ALCl_3$---------- ?

d-Write the structure of the carbonylamine intermediate and enamine obtained from the reaction of propanal and dimethylamine/acdic medium

e-Complete the following reaction

$CH_3CH2CH_2Br + Ph_3P$----------> ? +n-BuLi----------> ?

f-Oxidation of primary alcohols using jones reagent

Question Four;Answer four only of the following---------- 10 marks

a-Explain the following

i-Chloroacetic acid is stronger than acetic acid

ii- Ethanal is reactive than propanal in nucleophilic addition reactions

b-Convert acetic acid to acetone phenylhydrazone

c-Complete the following reactions

CH_3CONH_2 +P_2O_5/heat----------> +DiBAL-H/n-hexane/-78C---------->

d-Reaction of CH_3COOEt with HCOOEt in EtONa/EtOH .then H2O workup

e-Predict the product and the type of the following reaction

Prop-2-enal + HCl(gas)/low temperature---------- ?

GOOD LUCK

اجمل الامنيات بالتوفيق

Prof.Dr Sh.M.Radwan *Prof,Dr.Omima Said*

اد. امیمة سعد الطوخی

اد. شعبان محمد رضوان

Assiut University

Faculty of Science
Chemistry Department

Final Examination for 2nd (Material Science and Nanotechnology Program) Structure and properties of fibrous materials (Chem. 207)

Date: Thursday, 23/05/2024 **Time: 2 hours**

Answer Six Only from the following Questions: **(50 points)**

1) Explain what you mean by Basic Comparison of Fiber Samples?
2) What are the main tests for the identification of Fibers? and discuss the properties of Metallic Fibers?
3) Discuss the Cotton fibers, its composition and its properties ? and explain the Essential properties of Textile Fibers ?
4) What you mean by : i) Fabric Production ii) Weave Terminology iii) Knitted Fabric
5) Explain what you mean by (MAN MADE SYNTHETIC FIBRE), Giving two examples with its properties?
6) How are fabrics made? What are the different characteristics of a fiber, a filament & a fabric?
7) Mention the: Advantages, Disadvantages, Uses and Care for:

i) Cotton ii) Wool iii) Silk

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly

Assiut University
Faculty of Science
Chemistry Department

June 2024
Time: 2 hours

Thermodynamics and kinetics Examination for Nano Technology Students Program (202 Chem.)

Answer FIVE ONLY from the following:

1- Discuss the kinetics of the following (giving example):

a- Opposing first order reaction.

b- Chain reaction.

2- Derive an expression for the efficiency of heat engine working between two temperatures T_1 and T_2.

3- Show how to calculate the rate constant and the half life time for the reaction: $2A \xrightarrow{K_2} B$.

4- Show how to calculate the entropy change for the following processes:

a- Isothermal and reversible expansion of a gas.

b- Processes accompanied by temperature change.

5- Discuss the effect of temperature on reaction rate.

6- For adiabatic processes, derive the following relations:

a- Volume and temperature of a gas.

b- Pressure and volume of a gas.

Prof. Rabei Gabr

Thank You

Assiut University
Faculty of Science
Chemistry Department

Date: 3/6/2024
Time: 3 hours

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

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

No.	Phrase
1	Lubricants is an example of solid dispersed in liquid.
2	Water-insoluble soaps favor the formation of emulsions of oil in water.
3	Proteins above their isoelectric points move to the cathode.
4	An emulsifier at the water- oil interface increases the surface tension on the side of one liquid more than does on the other one.
5	The viscosity of lyophilic sols is frequently lower than that of the pure medium.
6	The isoelectric point for casein from human milk covers a pH range from 4.1 - 4.7.
7	The movement of a charged sol particle through a liquid under the influence of an applied potential difference is called electroosmosis.
8	Emulsions can be broken to yield the constituent liquids by addition of appreciable quantities of electrolyte to salt out the disperse phase.
9	The same minimum temperature can be attained with freezing mixture whether adding salt to ice or ice to solution.
10	In water system, the triple point is invariant, but freezing point varies with pressure.
11	There are three invariant saturation solubility curves and only two isothermal invariant triple points in Na_2SO_4 – *NaCl* - *Water* phase diagram system at 15° C.
12	Along melting curve (CF) of S_L two phases S_M and S_L are in equilibrium. Thus, the system is monovariant.
13	All eutectic points are not triple points.
14	*Aniline* – *Phenol* – *Water* phase diagram system at lower temperature exhibits only one univariant area and two bivariant areas.
15	The mixture of metal alloys is of low melting point than pure metals which are generally form eutectic mixtures.

Assiut University
Faculty of Science
Chemistry Department

Date: 05 Jun 2024
Duration: 3 hours

Final Examination of Organic Chemistry (Aromatic and Heterocyclic Compounds, 212C) for Credited Hours Students

Answer the following questions: **(50 Marks)**

Section I : Heterocyclic Compounds (25 Marks)

First question:

A-Write in details a reaction mechanism of ***One only*** from the following: (2 Marks)

(1)Fischer synthesis of Indol (2)Skraup synthesis of Qunoline

B-Mark (√) for the right statement and the (X)for the wrong ones (***Five only***): (5 Marks)

(1)α, β-unsaturated esters can be reacted with tosylmethyl isocyanide to give thiophene.

(2) The electrophilic substitution reactions of furan occure mainly at C_3.

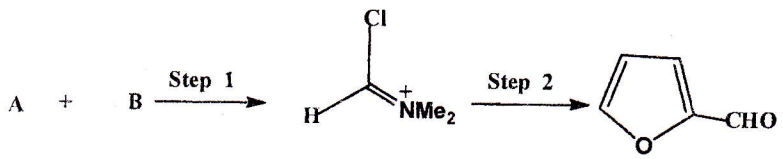
(3) Pyrrole, furan and thiophene do not containe benzene ring still they are classed as aromatic compounds,

(4) In pyrazole, one nitrogen atom contributed on electrons to the n-π system.

(5) Thiocarbonyl compounds are less nuclophile than carbonyl compounds.

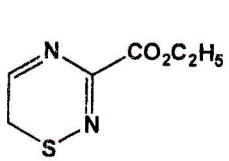
(6) 4-Methylimidazole and 5-Methylimidazol referred to as 4(5)-Methylimidazole

C-Consider the scheme below (2 Marks)

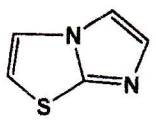


(1) Give the reactants and reagents needed to Step 1 (2)Show the mechanism to Step 2

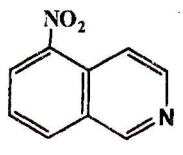
D-Write the systematic name for three only from the following (3 Marks)



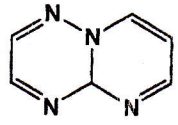
(i)



(ii)



(iii)



(iv)

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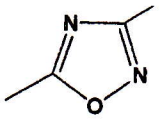
Second question:

A-Using retrosynthetic analysis, show the structures of starting material required to prepared the target molecule blow : **(3 Marks)**



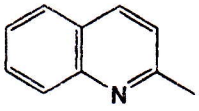
B-Complete the following sentences **(2 Mark)**

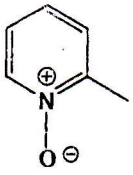
(1) The reaction of phenylhydrazine with 2-pentanone may lead to ----------isomeric indole compounds but with 1,3-cyclohexadione lead to ----------product.

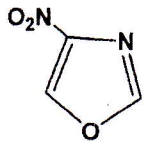
(2) Electrophilic substitution reaction of quinoline occurring at ---------- &----------

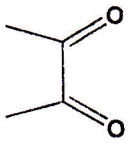
C-Complete Five only from the following: **(5 Marks)**

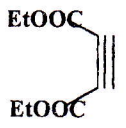
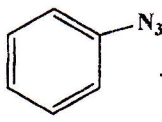
(1) $CH_3CN + NaN_3 \xrightarrow{H^+}$ ------

(2)  $\xrightarrow{\text{(i) } KNH_2 \quad \text{(ii) } PhCOOEt}$ ------

(3)  $\xrightarrow{\text{(i) } Ac_2O \quad \text{(ii) } POCl_3}$ ------

(4)  $+ CH_2O / HNMe_2 \xrightarrow{EtOH/H^+}$ ------

(5)  $+ CH_3CHO \xrightarrow{N^+H_4OAc^- / Al_2O_3}$ ------

(6)  $+$  $\longrightarrow$ ------

D-Write by equations *Thee only* what happen when: **(3 Marks)**

(1) Reaction between 3-amino-2-butanone with acetyl chloride in base, followed by $POCl_3$

(2) Treatment of quinoline with HNO_3/H_2SO_4 .

(3) Major product obtained upon treatment of 2-Formyl-5-methylthiophene with Ac_2O/HNO_3 .

(4) Heating of α- haloketone with thiourea in ethanol .

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Section II . Aromatic Compounds (25 Marks)

Third question:

A-Complete the following equations with the major product, *Four only*: (7.5 Marks)

(1) Benzene diazonium salt $\xrightarrow[\text{water}]{\Delta}$ ..... $\xrightarrow{CHCl_3/NaOH}$ ..... $\xrightarrow{KMnO_4}$ .....

(2) Toluene $\xrightarrow{Cl_2/h\upsilon}$ ..... $\xrightarrow{NaOH}$ ..... $\xrightarrow[\text{Pyridine}]{(CH_3)_3COCl}$ .....

(3) Nitrobenzene $\xrightarrow{Zn/NH_4Cl}$ ..... $\xrightarrow{H^+}$ ..... $\xrightarrow{Br_2/AlBr_3}$ .....

(4) Toluene-2-sulfonic acid $\xrightarrow{PCl_5}$ ..... $\xrightarrow{NH_3}$ ..... $\xrightarrow[(i)\Delta]{(i)KMnO_4}$ .....

(5) *m*-Cresol $\xrightarrow[ALCl_3]{(CH_3)_2CHCl}$ ..... $\xrightarrow[(ii)\ H^+]{(i)\ O_2}$ ..... $\xrightarrow[(i)\ 2\ CH_3Cl]{(i)\ NaOH\ (excess)}$ .....

(6) Trinitrophenol $\xrightarrow{PCl_5}$ ..... $\xrightarrow{NH_3}$ ..... $\xrightarrow{Ac_2O/pyridine}$ .....

B- How, by equations, can you prepare from Benzene the following compounds, *Five only*? (7.5 Marks)

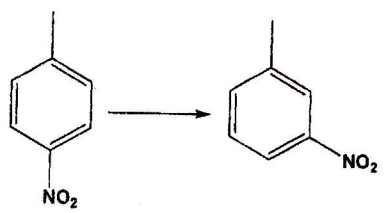
(1) *p*-Chlorobenzoic acid (2) *m*-Nitrobenzonitrile (3) *p*-Nitroaniline (major)

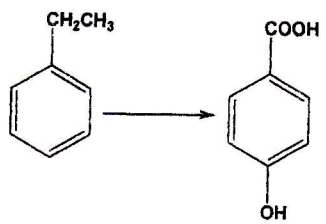
(4) Trinitrobenzene (TNB) (5) Benzidine (6) *o*-Nitroaniline (major)

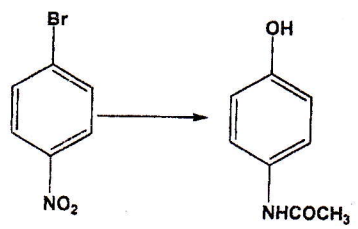
Fourth question:

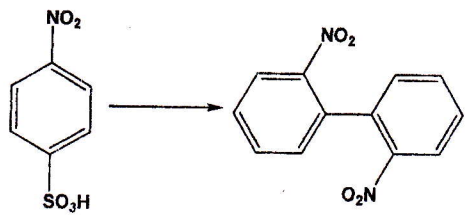
A- Provide the reagents and steps required to bring out Three only of the following conversions.

(4.5 Marks)

(1) 

(2) 

(3) 

(4) 

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B- Give the reason, ***Four only,*** of the followin, by Equations when appropriate: (4 Marks)

(1) Halogens are deactivating and *ortho/para* directors in electrophilic substitution reactions.
(2) Using Lewis acid in Friedel-Crafts alkylation of Benzene.
(3) Phenols have acidic properties.
(4) *p*-Nitrophenol is favored product in the nitration of phenol at higher temperature.
(5) 1-Nitronaphthalene is the major product of naphthene nitration.

C- Arrange the following ascendingly (low to high order) according to the giving property inside the brackets, ***Three only***: (1.5 Marks)

(1) Phenol, *p*-Nitrophenol, Picric acid, *p*-Cresole	(Acidity)
(2) Aniline, *p*-Ansidine, *p*-toludine, *N,N*-Dimethyl aniline	(Basicity)
(3) Benzene, Thiophene, Pyridine, Furan, Pyrrole	(Electrophilic substitution)
(4) Chlorobenzen, Picryl chloride, 2,4-Dinitrochlorobenzene	(Nucleophilic substitution)

تنبيه هام: سوف يعقد امتحان الشفوي اليوم الموافق 5 يونيو 2024 فى تمام الساعة 12:30 ظهراً بنفس مكان انعقاد الامتحان النهائي

GOOD LUCK

Examiners:

Prof. Dr. Zeinab Hozein *Dr. Awad Said*

الامتحان من اربع صفحات

Assiut University
Faculty of Science
Chemistry Department

May 2024
Time : 3 hours

Physical Chemistry Examination (C-230) for Second Level Students

1) Answer three only from the following (16.5 marks)

a- Derive the kinetic equation for determination the specific rate constant and half-life period for the following reaction : $2A \xrightarrow{K_2}$ products

b- Discuss the theory of absolute reaction rates

c- At 378.5 ^{0}C the half-life period for the first order thermal decomposition of ethylene oxide is 36.3 min and the energy of activation of the reaction is 52,000 cal/mol. From these data estimate the time required for ethylene oxide to be 75% decomposed at 45 ^{0}C.

d- Derive an equation for the effect of temperature on the reaction velocity

Answer following questions (33.5 marks)

2) Answer two only from the following :

a- Derive an expression for the efficiency of heat engine working between two temperatures T_1 and T_2

b- Consider the reaction $N_2 + 3H_2 \longrightarrow 2NH_3$

The standard enthalpy of formation of NH_3 = -11.04 Kcal/mol and the absolute entropies of N_2, H_2 and NH_3 are 45.7, 31.21 and 46.0 cal mol^{-1} k^{-1} respectively. Calculate ΔG^0 and K for the reaction

c- Explain, with derivation, how the free energy function of any process provides a convenient criterion for both spontaneity and equilibrium

3) Answer two only from the following :

a- For any adiabatic process, derive the following :

i) the relation between volume and temperature of a gas

ii) the relation between pressure and volume of a gas

b- An electrochemical cell consists of Zn and Cu electrodes in contact with their molar solution of the corresponding cations, its potential = 1.1 V. Calculate the standard free energy and the equilibrium constant of the cell reaction

c- Show, by derivation, how the equilibrium constant for a reaction varies with its temperature and discuss its validity with Le Chatelier's principle

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Good Luck

Examiners : Prof. Temerk and Prof. Gabr

Assiut University
Faculty of Science
Chemistry Department

May 2024
Time: 3 hours

Final Exam for Computational Chemistry (C234)

Answer the following question: (The exam is in **four** pages)

Question One: Choose the correct answer(s) for each of the following: (50 Marks)

1. …… is the lowest point in the whole PES.
   a) Local minimum b) Global minimum c) Local maximum d) Global maximum
2. The second derivative of the transition state with respect to the reaction coordinate is
   a) **0** b) **1** c) positive d) negative
3. The second derivative of a stable conformer with respect to the reaction coordinate is
   a) **0** b) **1** c) positive d) negative
4. The ….. is the second energy derivative of the potential energy with respect to reaction coordinate.
   a) force constant b) Hamiltonian c) Jacobian d) frequency
5. In the Hamiltonian operator, ….. increase(s) the energy of the molecule.
   a) kinetic energy b) e-e interaction c) e-N interaction d) N-N interaction
6. The most problematic term in the Hamiltonian operator is ……
   a) kinetic energy b) e-e interaction c) e-N interaction d) N-N interaction
7. A structure doesn't exist if its ….. derivative with respect to reaction coordinate is …
   a) first, zero b) second, zero c) second, positive d) second, negative
8. The enthalpy of a molecule can be calculate by performing ….. calculation.
   a) energy b) optimization c) frequency d) TD-DFT
9. ….. are stationary points on the potential energy surface.
   a) Reactants b) Products c) Transition states d) Saddle points
10. The ….. approximation states that the kinetic energy of nuclei is zero.
    a) Born-Oppenheimer b) Slater c) Hartree d) Fock
11. The Schrödinger equation can be solved exactly for …..
    a) **H** b) $\mathbf{He^+}$ c) $\mathbf{H_2^+}$ d) $\mathbf{Li^+}$
12. A wavefunction must …..
    a) be antisymmetric b) conform to Pauli exclusion principle
    c) a and b d) neither a or b

28. ..... is/are based on the HF method.

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

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

a) DFT b) CCSD(T) c) Full-CI d) CCSDT

30. ..... gives the most accurate bond strength.

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

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

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

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

a) CISD b) CCSD(T) c) DFT d) CCSD

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

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

34. ..... is appropriate for modelling chemical reactions.

a) CCSD b) CISD c) CCSD(T) d) DFT

35. ..... can be used for geometry optimization.

a) HF b) DFT c) Molecular mechanics d) PM6

36. ..... use(s) a single Slater determinant.

a) HF b) CISD(T) c) CCSD d) Full-CI

37. The advantage(s) of HF is/are .....

a) low cost b) electron correlation c) variational d) fast

38. An important limitation to DFT is/are .....

a) high cost b) lack of electron correlation

c) poor treatment of long-range interactions d) not variational

39. The advantage(s) of DFT is/are .....

a) low cost b) electron correlation c) variational d) fast

40. The advantage(s) of CCSD(T) is/are .....

a) low cost b) electron correlation c) high accuracy d) fast

41. ..... DFT methods are appropriate for modelling non-covalent interactions.

a) LDA b) Dispersion corrected c) GGA d) Hybrid

42. ..... is more accurate than HF.

a) CIS b) CCSD(T) c) CCSD d) Full-CI

43. ..... relies on experimental parameters.

a) CIS b) molecular mechanics c) semi-empirical d) HF

44. ..... is the least accurate method in this group.

a) DFT b) molecular mechanics c) semi-empirical d) HF

45. ..... is more accurate than DFT.

a) CCSD b) CCSD(T) c) CISD d) Full-CI

46. ..... functionals combine exchange from HF and DFT.

a) LDA b) Dispersion corrected c) GGA d) Hybrid

47. ..... use(s) perturbation theory.

a) CCSD b) CCSDT c) CCSD(T) d) MP2

48. ..... studies the physical movements of atoms and molecules in time.

a) Molecular dynamics b) DFT c) CCSD(T) d) PM6

49. ..... is based on classical physics.

a) Molecular mechanics b) DFT c) CCSD(T) d) PM6

50. ..... shouldn't be used for dissociation (bond) energy.

a) Molecular mechanics b) HF c) CCSD(T) d) DFT

Please insert your answers in the following table:

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

Atomic numbers: H = 1, He = 2, Li = 3, C = 6, N = 7, O = 8

Good Luck

Dr. Ahmed A. K. Mohammed

Assiut University
Faculty of Science
Chemistry Department

May, 2024
Time: 2 hours

Final Examination of Introductory Quantitative Analysis for 2nd Level Students (C–240)

Answer Four Questions Only: **(50 Mark)**

1. **a) Define the following:**
   - **i)** Chelatometric titrations.
   - **ii)** Metal ion sensitive indicators.

   b) Sulphate anion can be determined using EDTA titration. Explain.

   c) Express the titer of a 0.10 M EDTA solution in mg BaO/mL.

   d) A divalent metal M^{2+} reacts with a ligand (L) to from 1:1 complex, ML^{2+} (K_f=1x10^8). Calculate the concentration of M^{2+} in a solution prepared by mixing equal volumes of 0.2M metal ion and 0.2M ligand.

2. **a)** What are the limitations of Mohr method?

   b) What are the principles of Fajan method?

   c) Chloride in a brine solution is determined by, Volhard method. A 10mL aliquot of the solution is treated with 15 mL of standard 0.1182 M $AgNO_3$ solution. The excess silver is titrated with standard 0.101 M KSCN solution, requiring 2.38 mL to reach the red $Fe(SCN)^{2+}$ end point. Calculate the concentration of chloride in the brine solution, in g/L.

   d) Calculate the solubility of PbI_2, in g/L ($K_{sp} = 7.1 \times 10^{-9}$)

3. **a) Define the following:**
   - **i)** Electrode potential.
   - **ii)** Redox indicators.

   b) 5.0 mL of 0.10 M Ce^{4+} solution is added to 5.0 mL of 0.30 M Fe^{2+} solution. Calculate the potential of a platinum electrode dipping in the solution (relative to NHE).

   ($E^{\circ}_{Ce4+,\,Ce3+} = 1.61$ V & $E^{\circ}_{Fe3+,\,Fe2+} = 0.77$ V)

   c) Define the standard deviation and student's "t–test".

   d) The carbohyadrate content of glycoprotein (in protein with sugar attached to it) is determined to be 12.6, 11.9, 13.0, 12.7 and 12.5 g of carbohydrate per 100 g of protein in replicate analysis. Find the 50% and 90% confidence intervals for the carbohydrate content.

   (t at 50% = 0.741 , t at 90% = 2.132)

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4. a) Distinguish between co–precipitation and post-precipitation.

   b) What weight of manganese is present in 2.38 g of Mn_3O_4?

   c) What is the pH of a solution prepared by dissolving 1 gm of p-nitrophenol (M.wt = 139.11 , Ka = 6.2×10^{-8}) in 250 mL.

   d) Calculate the pH of a solution prepared by adding 25 mL of 0.1 M sodium hydroxide to 30 mL of 0.2 M acetic acid (Ka = 1.75×10^{-5})

5. a) Write briefly on "lewis acid-base theory".

   b) Explain the principles of the theory of neutralization indicators.

   c) If the initial reading of a burette is 0.04 ml, the final one is 20.08 ml and the uncertainty in each reading is ± 0.04%, what is the uncertainty in the volume delivered?

   d) A buffer solution is 0.2 M in acetic acid and in sodium acetate. Calculate the change in pH upon adding 1.0 mL of 0.1 M hydrochloric acid to 10 mL of this buffer solution. (K_a=1.75×10^{-5})

(At.wts: O = 15.999 , Cl = 35.453 , K = 39.102 , Mn = 54.938
I = 126.904 , Ba = 137.34 , Pb = 207.19).

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Good Luck

Examiners: **Prof. Dr. Hassan Sedaira**
Prof. Dr. Elham Y. Hashem