Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry (Ch333)
Course(s): Petroleum Chemistry

First Term
3rd Level Chemistry Students
Date: Jan. 2016
Time Allowed: 2 Hours
Full Mark: **60** Marks

Answer All Questions

Question 1 (20 Marks)

A) Fill in the spaces: [15 Marks]

1- ----------is used for the determination of the molecular weight of crude oil and based on the principle that the boiling point of a pure liquid changes on contamination with any foreign material.

2- The improved quality of the gasoline produced by catalytic cracking is due to the formation of ---------- and ---------- which have a high octane values.

3- A diesel fuel has specific gravity 0.87 and aniline point 79°C. The diesel index of fuel is ------

4- In the hydrofining processes, the sulphur compounds are removed by converting them into ---------- by reaction with ---------- in the presence of catalyst.

5- Specific refraction = ----------.

6- The higher the pour point of crude oil, the higher will be the ----------.

7- The presence of metals in crude oil is undesirable because---------- & ----------.

8- A sample of gasoline is found to have the same antiknock characteristic as a mixture of 75 parts of 2,2,4-trimethyl pentane and 25 parts of *n*-heptane by volumes. The octane number of gasoline is----------.

9- By adding ----------gm of crude oil to 100 gm camphor, the freezing point for the mixture decreased by 0.0018°C and the average molecular weight of crude oil was 260.

10- Mercaptans which are present in fractions boiling above about 100°C can be removed by treatment with ----------.

B) Compare the following information for three types of crude oil? Which is better? Explain? [5 Marks]

Crude Oil	API	%S	T_B,°F
1	22	1.5	450
2	35	1.2	520
3	47	2.7	600

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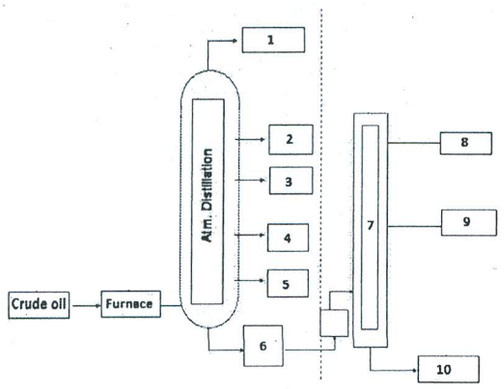
Question 2 (20 Marks)

A) Write down the fractional distillation products of crude oil. [5 Marks]



B) Describe briefly the industrial applications of various fractions obtained from petroleum? [5 Marks]

C) Discuss the phenomenon of knocking? Can it be inhibited by the addition of certain chemicals? Explain? [4 Marks]

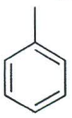
D) Why kerosene does not use in motor engine? [2 Marks]

E) Predict the products of acid-catalyzed tetramerization of propene? Give a suitable mechanism? [4 Marks]

Question 3 (20 Marks)

A) Provide a suitable mechanistic pathway for each of the following transformations: [12 Marks]

i) $CH_3CH_2CH_2CH_2CH_3 \xrightarrow{Pt/Alumina} CH_3{\cdot}\overset{\overset{CH_3}{|}}{\underset{\underset{H}{|}}{C}}-CH_2{\cdot}CH_3$

ii) $CH_3(CH_2)_5CH_3 \xrightarrow{Pt/Alumina}$ 

iii) $CH_3{\cdot}CH{=}CH_2 \xrightarrow[base]{Cl_2/H_2O} CH_3$

B) Compare between the different types of catalysts used in the catalytic cracking processes? [4 Marks]

C) What is the function of lubricating oils? Give the scientific explanation for the importance of separating each of the following components from lubricating oils: [4 Marks]

1- Bitumen 2- Waxes 3- Aromatics

With best wishes ***Dr. Ahmed El-Mekabaty***

Mansoura University Faculty of Science Chemistry Department Subject: Gravimetric analysis Course(s): Chem. 311		First Term, final exam 3rd level Chemistry Students . Time Allowed: 2 hours Full Mark: 80 Marks Date :, 14 January, 2016

Answer The Following Questions

(Atomic Weights:C=12, O=16, H=1.0, Fe=55.85, Ca=40, Ba=137.3, Mg=24.3, Cl=35.5,Br=79.9, I=126.9)

1) List with examples three approaches used to improve the selectivity of 8-hydroxyquinoline as an organic precipitant (6marks)

2) Circle the correct answer: (20marks)

I) The analyte is considered trace constituent if its amount is:
a) 0.1% b) 0.1- 0.01% c) less than0.01% d) higher than 0.1%

II) Suppose you wish to determine the amount of iron in a sample. Which of the following compounds provides the greatest sensitivity?
a) Fe b) FeO c) Fe_2O_3 d) Fe_3O_4

III) Amount of water required to dissolve 0.1g of CaC_2O_4. (Ksp= 2.3×10^{-9}) is closed to
a)1.63 L b) 3.26 L c) 16.3L d) 163L

IV) A 0.360 g sample of an organic compound containing carbon, hydrogen and oxygen was burnt in excess oxygen. When the gases evolved were passed through anhydrous $CaCl_2$ its mass increased by 0.216 g. The remaining gases, when bubbled through a NaOH solution, increased its mass by 0.528 g. The empirical formula of the compound is:
a) CH_2O b) C_2H_2O c) CH_3O d) C_2HO_2

V) A certain barium halide exists as the hydrated salt $BaX_2.2H_2O$, where X is the halogen. 0.2650 g of this barium salt was treated with excess sulfuric acid. Mass of precipitate ($BaSO_4$) obtained is 0.2533 g. X. may be
a) F^- b) Cl^- c) Br^- d) I^-

VI) Heating 3.478 of $MgCl_2.nH_2O$ until constant weight yields 1.630g. n is closest to
a) 2 b) 4 c) 5 d) 6

3) A sample containing only $CaCO_3$ and $MgCO_3$ is ignited to CaO and MgO. The mixture of oxides weighs exactly half as much as the carbonate sample. Calculate the percentage of $CaCO_3$ in the sample (4marks)

4) Discuss the physical and chemical phenomena causing exothermic and endothermic changes in DTA (3marks)

5) Define the following: (12marks)
Activity coefficient, Gathering agent, DTA and DTG Salt effect, Homogeneous precipitation, Volatilization methods

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6) Give reasons for: (10 marks)

a) Ammonia solution is used for dissolution of AgCl but not AgI

b) Use of great excess of precipitant is harmful

c) Thermocouple and groove material should be carefully chosen to insure accurate thermal analysis data

d) Although H_2SO_4 is strong acid, the pH can't be ignored in the precipitation of sulfates.

7).The thermogram for a 22.16 mg sample of $MgC_2O_4 \cdot H_2O$ shows two steps: a loss of 3.06 mg from 100–250°C and a loss of 12.24 mg from 350–550°C. For each step, identify the volatilization product and the solid residue that remains. (5marks)

8) Complete the following: (20marks)

a) To overcome colloidal stability you should ....., ..., ..., ...

b) Co-precipitation occurs in several ways, ..., ..., ..., their effect can be minimized by ....., ..., ...

c) In highly supersaturated solutions, ... occurs much faster than .....

d) Factors affecting particle size are, ..., ..., ..., ...

e) Volatilization analysis of borate takes place through the distillation of ..... In .....medium, while silica is volatilized to.....using.....in the presence of.....

f) Thermogravimetric instrumentation should include several basic components, such as ....., ..., ..., ..., ...

With Best Wishes Prof. Dr. Magdi E. Khalifa

Mansoura University
Faculty of Science
Chemistry Department
Subject: Inorganic Chemistry
Course: Chemistry (321)

Exam of first semister
3rd Year Students (Chem.)
Date: 18/01/2016
Time Allowed: 2 h
Full Mark: 60 Marks

Answer the following questions

Section A:-

Answer the following questions:-

1-. (A)- Put (√) or (x) and correct the statements *(15 Marks)*:-

i- V is active at room temperature.
ii- AgI is colorless compound.
iii- $La(OH)_3$ is more basic than $Mn(OH)_3$.
iv- Cr(II) complexes are very stable.
v- CrO_7^{2-} ion has an octahedral structure.
vi- Fe(III) salts are less stable than Mn(III) compounds.
vii- $K_4[Fe(CN)_6]$ is used for detection of nitrogen.
viii- Fe_3O_4 is a stoichiometric compound.
ix- The formula of the compound of the brown ring test is $[MnH_2O)_5NO]^+$.
x- CN is very poisnous compound.
xi- $ScCl_3.7H_2O$ changes to ScOCl by heating.
xii- Cr reacts with Cl_2 forming $CrCl_2$.
xiii- MnO_2 used as reducing agent.
xiv- Ti has a great tendency to form complexes than V.
xv- Mn(IV) compounds are very stable than Mn(II).

1- (B) Complete and balance the following equations *(15 Marks)*:-

i- Fe + CO →
ii- Cr + N_2 (heat) →
iii- AgCl + NH_3 →
iv- La + H_2O →
v- Sc + NaOH →
vi- V_2O_5 + NaOH →
vii- $Cr_2O_7^{2-}$ + OH^- →
viii- Pd + Aqua regia →
Ix $FeCl_3$ + H_2O →
x- $TiCl_4$ + H_2O →
xi- W + O_2 (heat) →
xii- Os + S →
xiii- Ru + Cl_2 →
xiv- $KClO_3$ + MnO_2 →

xv- $KMnO_4$ + conc. H_2SO_4 →

2- Comments on the following (*10 Marks*):-

i- Cu is less active than Na.
ii- Cu acetate is paramagnetic compound.
iii- Mn^{2+} complexes have pale colors.
iv- The nature of ferromagnetic compounds.
iv- TiO_2 is a yellow liquid ionic compound.

3- Write short notes on the following:- (*9 Marks*)

i- Synthesis and basic properties of titanium halides (*2.5 Marks*).
ii- Differences and similarities between chromate and dichromate (*2 Marks*).
iii- Preparation of chromium florides (*2.5 Marks*).
Iv- preparation and basic properties of Mn oxides (*2 Marks*).

4- Write shote notes on the following:- (*11 Marks*)

a- Properties of d-block elements (*2.5 Marks*).
b- Preparation of Manganese basic acetate (*2 Marks*).
c- Preparations of chromium oxides (*1.5 Marks*).
d- Extraction of Mn (*1.5 Marks*).
e- Reactivity of d-block elements (*1.5 Marks*).
f- Importance of Fe^{2+} and Fe^{3+} salts and complexes in analytical chemistry (*2 Marks*).

Good Luck and Best Wishes

P rof. Mohsen Mostafa

Mansoura University

Faculty of Science- Chemistry Department
Subject: Physical Chemistry. Chem. 341

Course (s): Electrochemistry

Program: Chemistry-Biochemistry

Third Level

Date : January 2016

Time Allowed : 2 hours

Full Mark : 60 Mark

Answer All Questions الأسئله على الوجهين

First Question : **(20 Mark)**

[A] Give reason : **(12 Mark)**

(1) Amalgam electrode sometimes is preferred than the metal electrode.

(2) Glass electrode is preferred than other electrodes for measuring solution pH.

(3) Le Clanche cell is irreversible.

(4) Selecting Pt electrode as the best choice for the standard hydrogen electrode.

(5) Deposition of transition metals (Ti, Zr, Ta) from their aqueous baths is impossible.

(6) Concentration polarization η_c decreases with raising temperature and stirring.

[B] Discuss in Detail: Activation overpotential for polarized electrode and the Tafel equation. **(8Mark)**

Second Question : **(20 Mark)**

[A] Complete : **(8 Mark)**

(1) Overvoltage η is the difference between ..... and .....

2) Ohmic overpotential originate as a result of .....

3) In the le Clanche' cell, the anode is .....and the cathode is.....and its reaction is.....

4) Maxwell distribution law is.....

5) In lead accumulator sulphation means.....

6) Reversible processes are characterized with..... i_o and .....overpotential, while irreversible processes are characterized with..... i_o and .....overpotential.

[B] Discuss the following : **(12 Mark)**

1) Liquid junction potential.

2) Metal insoluble oxide electrode.

3) Gas electrodes.

4) Oxygen overpotential.

Third Question : **(20 Mark)**

[A] **Taking :** $E^{o}_{Cu^{2+}/Cu} = 0.337$ V ; $E^{o}_{Zn^{++}/Zn} = -0.76$ V ; $\partial E/\partial T = 4.18$ V/ deg

construct a cell of the electrode pair, write electrode and cell reactions and calculate at 25°C:

E^{o}_{cell} , ΔG^{o}, equilibrium constant K ; Δ H ; Δ S **(6 Mark)**

[B] Tick (√) or (X) **(6 Mark)**

1) The rate of diffusion is directly proportional to concentration difference ($c_b - c_e$) and thickness of the diffusion layer δ. ( )

2) The number of electron transfer in an electrochemical process (n) is almost different from the oxidation number (z). ( )

3) The effective concentration (thermodynamic concentration) is molality. ( )

4) The exchange current i_o is the net current during polarization. ( )

5) Activity coefficient (γ) can be determined by using chemical cell without transference. ( )

6) For KCl solution the anion transport and cation transport number each equal. ( )

[C] Write on electrolyte concentration cells with transference. **(8 Mark)**

Good Luck

Prof.Dr. Abdel-Aziz E. Fouda **Prof.Dr. Ahlam M. Helmy**

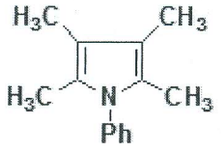
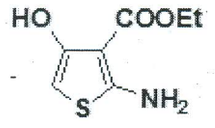
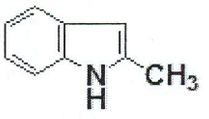
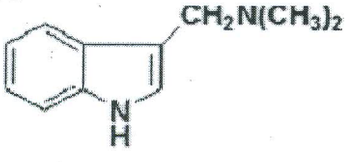
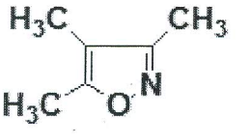
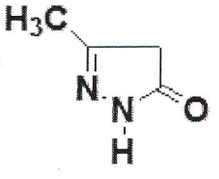
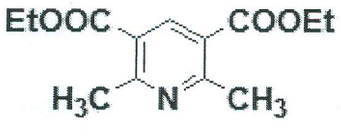
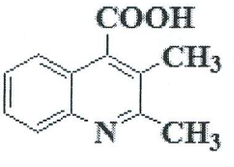
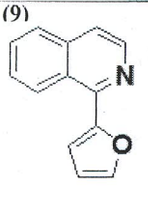
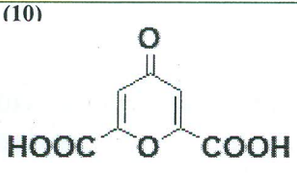
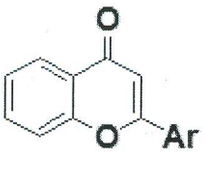
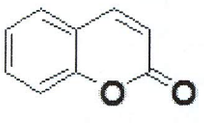
Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry
Course(s): Chem. 331 Heterocyclic Chemistry

First Term
3rd Major Chemistry
Full Mark: **60** Marks
Date: 28 January. 2016
Time Allowed: 2 hours

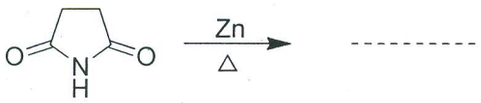
Answer All Questions

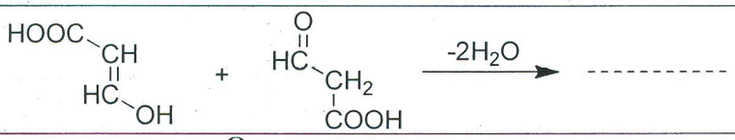
Question 1: **[30 Marks]**

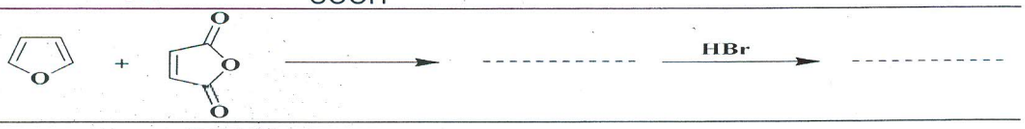
A) ***Give the suitable systematic name of the following compounds:-*** *[18 Marks]*

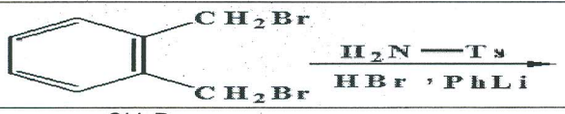
(1) 	(2) 	(3) 
(4) 	(5) 	(6) 
(7) 	8) 	(9) 
(10) 	(11) 	(12) 

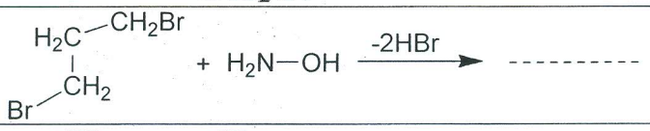
B) ***Complete the following equations with the suitable product(s)-:*** *[12 Marks]*

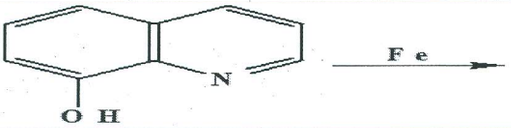
1- 

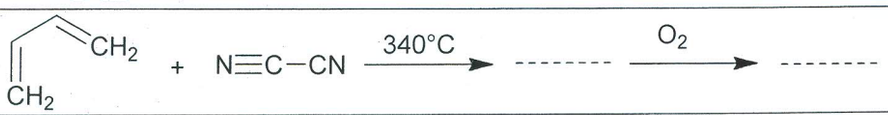
2- 

3- 

4- 

5- 

6- 

7- 

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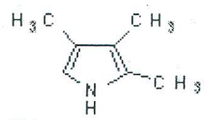
Please turn over

Question2 **[30 Marks]**

A) Inspect the following compounds then answer the following:- [18 Marks]



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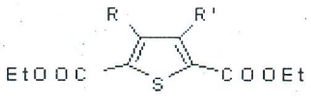

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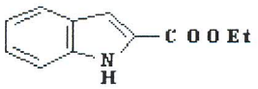

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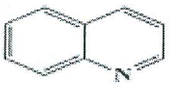

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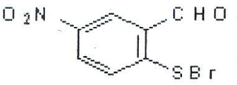

(6)

(1) Propose the Knorr Synthesis for compound (1).

(2) From the condensation of 1,2-dicarbonyl compound with thioether, how can you obtain compound (2) through Hinsberg's Procedure.

(3) From the condensation reaction of o-nitrotoluene with diethyl oxalate, how can you obtain compound (3).

(4) Draw the products of the coupling reaction of Pyrrole (4) with diazonium salts: in acid medium and in basic medium.

(5) Propose the Skraup synthesis of compound (5) starting from glycerol.

(6) Isothiazole derivatives' was prepared from compound (6) through the reaction with ammonia followed by condensation, reduction, oxidation and diazotization in the final step of the reaction, Explain?

B) Give equations to illustrate the following :- [12 Marks]

1- Ozonolysis of pyridine.
2- Bischler-Napieralski procedure for the Synthesis of Papaverine
3- Loss of aromaticity of pyrrole, furan and thiophene
4- Mannich reaction for synthesis of Gramine

With My Best Wishes : Prof. Dr. Hassan A. Etman