Mansoura University Faculty of Science Physics Department		**First Term Exam.** Date: **1-1-2012** Time allowed : **2 hours** Full Mark: **80 Mark**
Subject: **Physics**		Course: **221 ف Physical Optics**

Answer the Following Questions

[1]a- Demonstrate an explanatory diagram of the optical arrangement of Young's experiment on interference. Drive the theory of interference for this experiment. **[10 Marks]**

b- Explain how you can determine the thickness of a thin sheet of transparent material using Fresnel's biprism. **[8 Marks]**

c- Good fringes were observed with Michelson interferometer with monochromatic light, when the movable mirror is shifted 0.015 mm, a shift of 50 fringes is observed. What is the wavelength of light used. **[8 Marks]**

[2] a- Discus Fraunhofer diffraction using a rectangular slit. Drive an expression for the intensity distribution of the observed diffraction pattern. **[15 Marks]**

b- A parallel beam of monochromatic light is allowed to be incident normally on a plane spectra grating having 6000 lines/cm and a second order spectral line is observed to be deviated through 30^{o} Calculated the wavelength of the spectral line. **[12 Marks]**

[3]a- Explain with the necessary theory of interference in thin films due to reflected light. **[9 Marks]**

b- How can you obtain polarized light by refraction? **[9 Marks]**

c- In a Jamin's refractometer, two evacuated tubes each of length 20 cm are placed in the two beams. A gas at a known temperature and pressure is slowly and 100 fringes cross the centre of the field of view. Calculate the refractive index of the gas. (where the used source have wavelength $\lambda = 5460\ A^{o}$). **[9 Marks]**

Good Luck

Examiners: Prof. Dr. Taha Sakkar, Prof. Dr. Eman seisa , Prof. Dr. Mohamed Kabeel

Mansoura University
Faculty of Science
Chemistry Department
Subject: Kinetic theory of gases and phase rule.
Chem. 242

2nd Level Students
Chemistry Program
Date : January 2011
Time Allowed: 2 hours
Full Mark: 80 Marks

1- Question (1) **(20 marks)**

Sketch the phase diagrams of the followings:

a. Partially miscible solid solution. (7 Marks)

b. Formation of a compound with the congruent melting point. (7 Marks)

c. Sulphur and phosphorous. (6 Marks)

2- Question (2) **(20 marks)**

Write on:

a. Solid-gas equilibria. (7 Marks)

b. Intermetallic compounds. (7 Marks)

c. Efflorescence and deliquescence. (6 Marks)

3- Question (3) **(20 marks)**

a) Show by equations **ONLY** the following:

i. Transnational kinetic energy. (3 Marks)

ii. Virial Equations of real gases. (3 Marks)

iii. Van der Walls equation of real gas. (3 Marks)

iv. Most probable speed, mean speed, root-mean square speed. (3 Marks)

b) Calculate the Van der Walls constants for O_2 using Tc = -118.4 °C and Pc = 50.1 atm. (8 Marks)

4- Question (4) **(20 marks)**

a) Write on the following:

i. Collision frequency of different and identical molecules. (7 Marks)

ii. Velocity distribution in one and three dimensions. (7 Marks)

b) For molecular oxygen at 25 °C calculate the collision frequency $Z_{A(A)}$ and the collision density Z_{AA} at a pressure of 1 bar. If the collision diameter of oxygen is 3.61×10^{-10} m. (atomic weight of O = 16, $N_A = 6.022 \times 10^{23}$) (6 Marks)

Prof. Dr. Mohmed Emai
Prof. Dr. Abdel Rahman Salal

المستوى الثاني - كيمياء - ٢٤١ كيمياء فيزيائية

Mansoura University
Faculty of Science
Chemistry Department
Course: Physical Chemistry
Date : 20/ 01/ 2012

First term Examination
Subject: Chemistry (241)
Second level
Full Mark : 60 Marks
Time Allowed : 2hours

Answer the Following Questions: (60 marks)

2- وضح حل المسائل في ورقة الإجابة 3- الامتحان في صفحتين

I)Choose the response that best complete each statement: (27marks)

1. Which process is accompanied by a decrease in entropy of the materials?
a) expansion of a gas into a vacuum b) solution formation
c) crystal formation d) diffusion of solute molecules into a region of low solute concentration

2- The condensation of any gas to a liquid is expected to have
a) positive ΔH and a positive ΔS b) a positive ΔH and a negative ΔS
c) a negative ΔH and a negative ΔS d) a negative ΔH and a positive ΔS

3- The entropy of the universe:
a) is zero. b) remains constant. c) is always increasing. d) is also decreasing.

4. A reaction with a ΔG° = -30 kJ/mol:
a) has a K = 0 b) has a positive K but K < 1 c) has a negative K d) has a K > 1 e) has a K = -30 kJ/mol

5- According to the first law of thermodynamics, the total amount of energy in the universe
a) is always increasing b) is always decreasing c) varies up and down d) is constant

6- Which of the following quantities can be determined directly from the slope of a lnP versus 1/T representation?
a) Equilibrium constant b) Molar volume in gas phase. c) Temperature of boiling d) Enthalpy of vaporization

7- Which of the following is true for the reaction, $H_2O(l) \Leftrightarrow H_2O(g)$ at 100°C and 1 atm ?
a) ΔH=0 b) ΔS=0 c) ΔH=ΔU d) ΔH=TΔS e) none of these

8- Which of the following is true about isothermal free expansion of a gase?
a) ΔU = 0 b) dT = 0 c) $P_{ext}dV = 0$ d) All

9. The net work accomplished by an engine undergoing adiabatic compression is equal to
a) A) ΔU B) - Δ U C) q D) –q

10. Which of the following reactions is spontaneous at relatively low temperatures?
a) $NH_4Br(s) + 188\ kJ \rightarrow NH_3(g) + Br_2(l)$ b) $NH_3(g) + HCl(g) \rightarrow NH_4Cl(s) + 176\ kJ$
c) $2\ H_2O_2(l) \rightarrow 2\ H_2O(l) + O_2(g) + 196\ kJ$

11. There are two properties of a reacting system that determine whether a process at constant pressure and temperature can occur spontaneously. These are:
A) Kinetic and potential energy change B) Heat and work
C) Energy change and enthalpy change D) Enthalpy change and Entropy

12- Which one of the following statements is NOT correct?
a) When ΔG for a reaction is negative, the reaction is spontaneous.
b) When ΔG for a reaction is positive, the reaction is nonspontaneous.
c) When ΔH for a reaction is negative, the reaction is never spontaneous.
d) When ΔH for a reaction is very positive, the reaction is not expected to be spontaneous.

13- Does work create heat?

a) Heat creates work
b) There is equivalence between them
c) There is equivalence between temperatures
d) Can energy be destroyed?

14- In a reversible process the system:

a) is always close to equilibrium states
b) is close to equilibrium states throughout, except at the beginning and end
c) is close to equilibrium states only at the beginning and end
d) might never be close to any equilibrium state

15- Identify the INCORRECT statement below:

a) The symbol H refers to the enthalpy, or "heat content" of the system.
b) The ΔH of a reaction tells one the heat liberated or absorbed under constant pressure reaction conditions.
c) The internal energy change of a system equals the heat absorbed minus the work done by the system.
d) The second law states that ΔS of a system increases in any spontaneous process.

16- At constant pressure and temperature, if the total entropy change for the system and surroundings during some process is positive then the free energy change for the process is:

a) Positive b) negative c) zero d) impossible to tell

17- The reason why reactions come to an equilibrium point instead of going entirely to products is:

a) The attractive and repulsive forces between molecules balance at exactly that point.
b) The reaction is only endothermic at that point.
c) The reaction is only exothermic at that point.
d) The free energy change of mixing has a minimum when both reactant and product are present

18- Which of the following quantities can be taken to be independent of temperature?

a) ΔH b) ΔS c) ΔG d) K_p (equilib constant)

1) a, b, c, d 2) only b and c 3) only a and b 4) only c and d 5) a, b and c

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Question II: (10 marks)

1. Drive the relation between the change in entropy and the volume. (5marks)

2. Drive the relation $\Delta G = RT \ln K_{eq}$. (5marks)

Question III: (23 marks)

1) Given the following standard molar entropies, calculate ΔS in J/K for the reaction: (6 marks)

	C(c) +	$O_2(g)$ →	$CO_2(g)$
S° J/ mol.K	5.74	205.0	213.6

2) Calculate ΔG° in kJ for the reaction $3O_{2(g)} \rightarrow 2O_{3(g)}$ at 25°C if the value of K_{eq} is 6.1×10^{-58}. (5 marks)

3) What's the change in entropy when 0.7 mole of CO_2 and 0.3 mole of N_2 each at 1 bar and 25° C blend to form a homogeneous mixture at the same conditions. Assume ideal gases. (6 marks)

4) Five moles of an ideal gas expands isothermally and reversibility at 100°C to 20 times its initial volume. Find the heat flow into the system. (6 marks)

GOOD LUCK Prof. Dr. Awad I. Ahmed

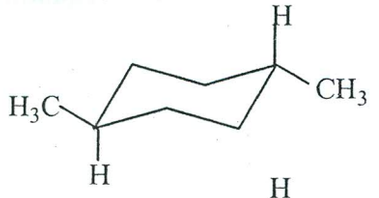
Mansoura University, *Faculty of science,* *Chemistry Department*		**Final Examination in Physical organic Chemistry 232** **Second level (Chemistry Students)**

15/ 1/ 2012 **Time Allowed: 2 hrs**

ANSWERTHE FOLLOWING QUESTIONS **Full Mark : 80 Marks**

1-i- Which is the lowest energy conformation of trans-1,4-dimethylcyclohexane? (30 Marks)

a-



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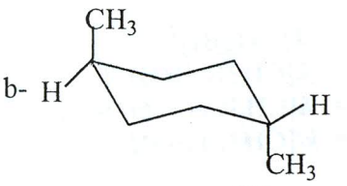

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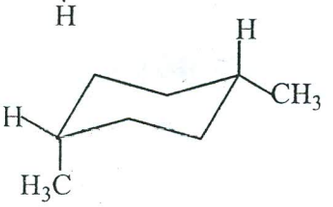

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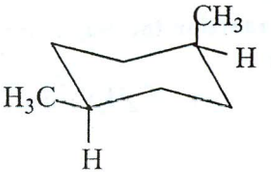


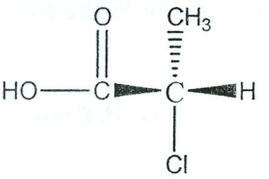
e- More than one of the above

ii- How many isomers are possible for C_3H_7Br:

a) 1 b) 2 c) 3 d) 4 e) 5

iii- Write the two chair conformations of the following and in each part designate which conformation would be the more stable a) cis-1-tert butyl-3-methylcyclohexane, b) trans -1-tert butyl-3-methylcyclohexane.

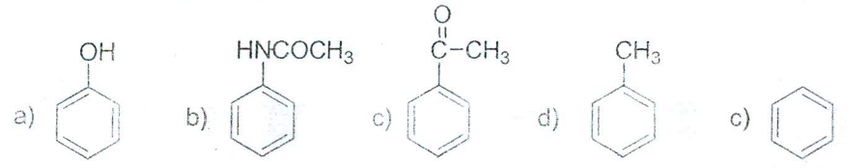
iv- Give the (R-S) desination of the structure showen.



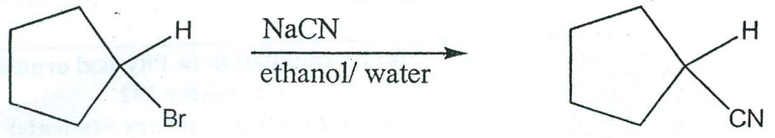
a) (R) b) (S) c) Neither, because this molecule has no stereocenter

2- i- Hydrolysis of 3-chloro-2,2-dimethylbutane yields 2,3-dimethyl-2-butanol as the major product. Explain this observation, using structural formulas to outline the mechanism of the reaction. (25 Marks)

ii- Which of the following compounds would be most reactive toward ring bromination?



iii- For the reaction the major product is formed by

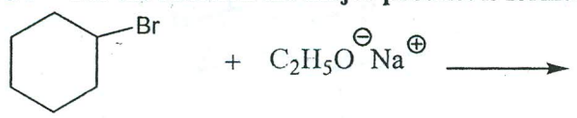


(*a*) An SN1 reaction
(*b*) An SN2 reaction
(*c*) An E1 reaction
(*d*) An E2 reaction

iv- The bimolecular substitution reaction is represented by the kinetic equation:

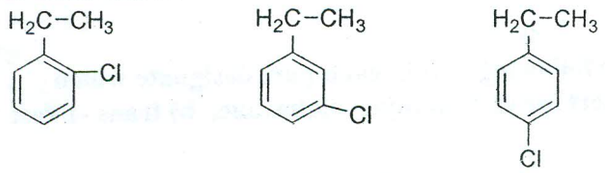
(*a*) Rate = $k[CH_3Br]^2$
(*b*) Rate = $k[CH_3Br][OH^-]$
(*c*) Rate = $k[CH_3Br] + k[OH^-]$
(*d*) Rate = $k/[CH_3Br][OH^-]$

3-i - For the reaction the major product is formed by **(25 Marks)**



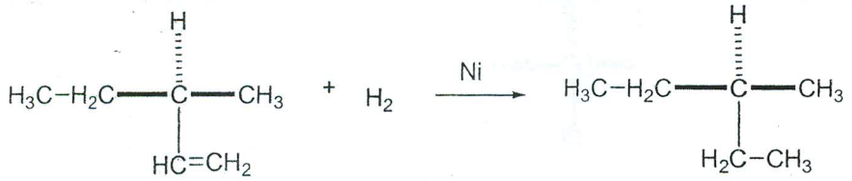
(*a*) An SN1 reaction (*b*) An SN2 reaction (*c*) An E1 reaction (*d*) An E2 reaction

ii- Which of the following compounds gives a single benzyne intermediate on reaction with sodium amide?



(*a*) 1 only (*b*) 1 and 3 (*c*) 3 only (*d*) 1 and 2

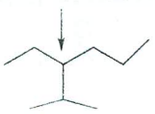
iii- Select the words that best describe what happens to the optical rotation of the alkene shown when it is hydrogenated to the alkane according to the following equation:-



a) increase c) changes sign
b) dropto zero d) stays the same

iv- Write chemical equations showing how you could prepare *m*-bromonitrobenzene as the principal organic product, starting with benzene and using any necessary organic or inorganic reagents. How could you prepare *p*-bromonitrobenzene?

v- Draw the most stable Newman projection as indicated in the following structure.



GOOD LUCK Prof.Dr. Wafaa S. Hamama

المستوى الثاني - كيمياء - اسم الكيمياء العضوية (ج) (ك ٢٤١)
كيمياء حيوية

Mansoura University
Faculty of Science
Department of Chemistry

First Semester
Date 15-01.2012
Time: Two Hours
Full Mark (60)

Exam. of Course 231(Principles of Organic Chemistry)
For 2nd Level (Chemistry Special and Chemistry/Biochemistry Students)

ANSWER THE FOLLOWING QUESTIONS

1- a-Alkenes can be converted to alkynes by bromination and two consecutive dehydrohalogenation reactions. Give mechanism with 1-butene**(10 Marks)**.

b- Carbocation rearrangements can occur upon the addition of H_2SO_4/H_2O to 3,3-dimethyl-1-butene to give 2,3-dimethyl-2-butanol as a major product. Explain with mechanism **(5 Marks)**.

c- Addition of HBr to 2-methylpropene gives only *tert*-butyl bromide, while the addition in the presence of peroxides gives anti-Markovnikov addition. Explain with mechanism **(5 Marks)**.

2- a- Based on the study of the Grignard synthesis, show how can you prepare 3-phenyl-3-pentanol **(10 Marks)**.

b-Methyloxirane undergoes ring opening with sodium ethoxide. Give the products **(5 Marks)**.

c- Acetaldehyde dimerizes in the presence of dilute sodium hydroxide at room temperature, the product is called an aldol. Explain with mechanism **(5 Marks)**.

3- a- The Friedel-Crafts reaction of benzene with 2-chloro-3-methylbutane in the presence of $AlCl_3$ occurs with a carbocation rearrangement. What is the structure of the product? **(10 Marks)**

b- Explain the mechanism of the electrophilic bromination of benzene **(5 Marks)**.

c- The addition reaction of bromine is used as a test for alkenes because the red color of the bromine reagent disappears when an alkene is present. Explain with mechanism **(5 Marks)**.

Good Luck

Prof.Dr. Mohamed Abbas Metwally and Prof.Dr. Sayed El-Desoky

المستوى الثاني - جيولوجيا + مجموعة البيولوجي . كيمياء العناصر الممثلة (ك ٢٢١)

Mansoura University Faculty of Science Chemistry Department Subject: Chemistry Course(s):Inorganic Chemistry, Chem 221	كلية العلوم جامعة المنصورة	First Term 2nd Level (Geology, Microbiology, Botany, Environmental, Zoology/ Chem) Date : Jan. 2012 Time Allowed: 2 hours Full Mark: 80 Marks

Answer the Following Questions

1- Comment on (10 only) of the following: (30 Mark)

1. **Liquid hydrogen is used as fuel in large booster rockets.**
2. **BF_3 is Lewis acid**
3. **White phosphorous should never be allowed to come in contact with the skin.**
4. **Lithium is similar to magnesium.**
5. **Group II elements are heavily hydrated than group I elements.**
6. **Calcium dihydrogen phosphate is used in food industry.**
7. **Nitrogen oxides are poluttants.**
8. **The great reactivity of F_2.**
9. **Photochromic eye glass is made by adding a small amount of AgCl.**
10. **H_3PO_2 is a strong reducing agent.**
11. **Aqueous solutions of Be(II) salts are acidic.**
12. **Cs^+ conducts electricity more than Li^+ in aqueous solution.**
13. **Malathion has a great effect on insects rather than human.**

P.T.O

2. Complete <u>10 only</u> of the following equations: <u>(30 mark)</u>

1. $CH_4 + H_2O_{(g)} \rightarrow$
2. $2NaCl$ (electrolysis /$CaCl_2$)$\rightarrow$
2. $CoO + B_2O_3 \rightarrow$
3. $Na_2O_2 + CO_2 \rightarrow$
4. $HF + SiO_2 \rightarrow$
5. $CaCN_2 + 5H_2O \rightarrow$
6. $CuO + NaH \rightarrow$
7. $2KClO_3 + MnO_2$ + heat $\rightarrow$
8. $CaF_2 + H_2SO_{4\ Conc.} -$ ....
9. $NaCl_{(aq)} + CO_{2(g)} + NH_{3(g)} \rightarrow$ .....
10. $H_3BO_3 + H_2O \rightarrow$
11. $B_2O_3 + P_2O_5 \rightarrow$

3. Try on <u>(4 only)</u> of the following: <u>(20 Mark)</u>

a. Contact process for production of H_2SO_4

b. Structure of B_2H_6.

c. Ostwald process for the production of HNO_3.

d. Allotropy of Carbon

e. Ortho- and para hydrogen.

f. Isolation of silicon in pure form

Mansoura university
Faculty of science
Chemistry Department
Subject: Chemistry
Course: Analytical Chemistry(211)

2nd level Chem. Students
Date: Jan. 2012
Time allowed: 2 hours
Full mark: 60 mark

Answer the following questions

1-Give an explanation for the following (20 marks)

a) Complexometric (EDTA) titration must be carried out in buffer solution
b) Mohr's method for determination of halide ion must carried in nuteral medium.
c) Color change range of an acid base indicator is depending on the solution pH .

2-Calculate pH of the solution that results when 25ml of 0.400M NaOH is mixed with 5.0 ml of 0.06M acetic acid (Ka= 1.8×10^{-5}) . (5 marks)

3- Calculate the mean, confidance limit of five determinations 57 , 57.5 ,55 , 56 ,and 61 ($s = 0.02$, $t_s = 2.5$, $Q_t = 0.05$) the value 61 rejected or not ?. (5 marks)

4-In titration of 50 ml of tap water with 0.012M EDTA using EBT indicator , 31.63 ml of EDTA was needed to reach the end point . Calculate concentration of cacium expressed as **ppm** $CaC0_3$ (mg /l) . (5 marks)

5- Calcium was determined in dry milk sample by ignition of 1.5 mg and dissolved in acid, the solution was titrated with EDTA , it take 12.1 ml to reach end point using EBT. For determination of EDTA Molarity .0.632 mg of Zn (F.W. 65) in one liter was titrated with EDTA , 10.8 ml was used .
Calculate Ca concentration in ppm (g / Kg) . (5marks)

6- Calculate the molarity of 40% HCl (w /w) and has a density of 1.02 g/ml . Find the volume needed to prepare 500 ml of 0.20 M HCl . (5 marks)

7-Explain how to use the acid base titration curves to choose the suitable indicator For an titration . (5 marks)

8- **a-** In titration of Fe^{2+} in acidic medium with 0.0206M $K_2Cr_2O_7$, volume of $K_2Cr_2O_7$ necessary was 40.2ml according to the following equation:

$$\mathbf{6Fe^{2+} + K_2Cr_2O_7 + 14H^+ \rightarrow 6Fe^{3+} + 2Cr^{3+} + 14H^+}$$

Calculate weight of iron as mg unit. (5-marks)

b- Suppose 0.7144 gm of KHP (F.W. = 204.2) was used to standardize $Mg(OH)_2$ solution,as in the following reaction:

$$Mg(OH)_2 + 2KHC_8H_4O_4 \rightarrow Mg(KC_8H_4O_4)_2 + 2H_2O$$

If 31.18ml of $Mg(OH)_2$ was needed, what is the molarity of $Mg(OH)_2$? (5 marks)

Dr. Mohamed El-defrawy

With best wishes

المستوى الثانى - مقدمة فى الفيزياء الحيوية (فع ٢١١)

Mansoura University
Faculty of Science
Physics Department
Course code: Bio-Phys 211
Course title: General Biophysics

First semester 2011-2012
Date: 22-1-2012

2nd Level students
برامج (فيزياء حيوية- ميكروبيولوجى- كيمياء حيوان-كيمياء -كيمياء حيوية -كيمياء نبات)
Full Mark: 80
Allowed time: 2 hours

Answer all the following questions:

			Marks
1-	a-	When an animal takes a step, the leg swing naturally from the hip bone, much like a pendulum in a gravitational field. Derive an expression for the time taken of a leg to swing once a time?	7
	b-	Define the following: Depolarization – Activity of a radioactive source - Hematocrit- Heat Flux	6
	c-	If you have 4 gram of pure ^{40}K emits $2x10^5$ β- particles/sec. Calculate the decay constant λ and half life time $t_{1/2}$? (Avogadro's number $=6.02x10^{23}$).	7
2-	a-	If we have 1 mole of glucose, How much energy will be produced during metabolism?	7
	b-	Calculate the photon flux at 1 m and 2 m from a Cs ^{137} gamma source of activity 800 MBq?	6
	c-	Describe with drawing the continuous and characteristic X-rays.	7
3-	a-	Derive an expression to calculate half life time of a radioactive source.	7
	b-	Write on resonant frequency and various sensations observed by humans subjected to variations of different frequencies.	6
	c-	Explain the physical concept to measure signals from the heart using electrocardiogram. Draw and explain an ECG chart?	7
4-	a-	Compare between α - particles, β- particles and γ-rays?	7
	b-	Discuss the basic principle of magnetic resonance imaging (MRI).	6
	c-	i. Calculate the capacitance per unit area of an unmyelinated axon of membrane thickness is $b = 6 \times 10^{-9}$ m knowing that the material in the axon membrane has dielectric constant K= 7 and $\varepsilon_o = 8.85\times10^{-12}$ s/ohm-m. ii. Calculate the number of elementary charges per m^2 if the charge is $1.6x10^{-19}$C and the potential difference =70mV.	7

Best wishes:

Examiners: * د. هانى كمال د.محمد منصور د. نبيل قناوى