**Mansoura University** | **First term Exam, 3/1/2016**

**Faculty of Science** | **2nd level**

**Physics Department** | **Time allowed: 2 hours**

**Full mark: 80 marks**

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**Subject : physics** | **Course : 221ف Physical optics**

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**Answer the following questions:**

1- a) Give the optical arrangement to get Fraunhofer diffraction pattern using a rectangular single slit. Discuss this diffraction pattern. Drive the formula of intensity distribution of the resultant pattern.

(19 marks)

b) A grating with 6000 lines/cm is illuminated with monochromatic light at normal incident, the second order spectral line is observed to be deviated through $30^{\circ}$. Calculate the wavelength of the spectral line.

(8 marks)

2- a) Give a brief account, with an explanatory diagram of the optical arrangement of Fabry-Perot system of multiple- beams interference. Drive an expression for the intensity distribution in transmission for this system when the two coated plate are of same transmission coefficient T and of same reflectivity R. Sketch schematic diagram for the intensity distribution.

(20 marks)

b) Drive Malus law of the intensity of polarized light transmitted through analyzer.

(7marks)

3- a) Demonstrate an explanatory diagram of the optical arrangement of Young's double slits experiment. Drive the necessary formulae for the brightness and darkness conditions.

(10marks)

b) Give an experiment to determine the thickness of a thin sheet of transparent material using Fresnel's biprism. Drive the necessary formula.

(8 marks)

c) A water film ( $\mu = 1.33$ ) in air is 3000 $A^{\circ}$ thick if it is illuminated with white light at normal incidence. What color will appears to be in reflected light?

(8 marks)

Good Luck

Prof. Dr. Taha Sokkar

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| **Mansoura University**<br>**Faculty of Science**<br>**Dept. of Chemistry**<br>**Subject:** ***Chem 231*** | | **First Term**<br>**2nd Year Chem.& Biochem. Students**<br>**Time Allowed: 2 hours**<br>**Date : 10/ 1/ 2016** |

## Answer All The following Questions:

## 1. A) Select the Correct Answer: [ 10 Marks]

**1-To differentiate between 2-pentanone and 3-pentanone the best reagent used is :**

a) $K_2Cr_2O_7/H_2SO_4$ b) Zn-Hg/HCl c) $I_2$/NaOH d) LiAlH

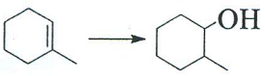
**2- Which of the following reagents should be used to convert hex-3-yne to (E)-hex-3-ene:**

a) $H_2$, Pt b) Na, $NH_3$ c) $H_2$, Lindlar's catalyst d) $H_2SO_4$, $H_2O$

**3-Which of the following compounds give geometrical isomerism:**

a) Vinylchloride b)1,1-dichloroethene c) trichloroethene d) 1,2-dichloroethene

**4- What is the suitable reagent for this reaction**



a)$KMnO_4$ b) $B_2H_6$/ $H_2O_2$ c) $Hg(OAc)_2$/ NaOH d)HBr / KOH

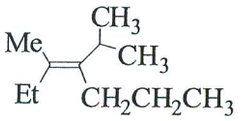
**5- What is the best reagent for following reaction:** $CH_3COCl \longrightarrow CH_3CHO$

a) NaBH4 b) LiAlH4 c) $LiAlH(O^tBu)_3$ d) PCC

**6- Which of the following alkenes gives 2mole of acetic acid by treatment with alkaline $KMnO_4$ :**

a) 2-butene b) 1-butene c) 1-methylpropene d) 2-methylpropene

**7- The geometry of the following compound is...**



a) cis- b) trans- (c) E- (d)Z-

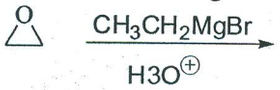
**8-The addition of $Br_2$ to toluene gives:**

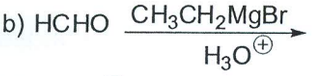
a) *o*-bromotoluene b)*m*-bromotoluene
c) benzylbromide d) no one of them

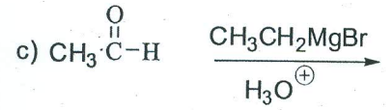
**9- The reaction of aldehydes with hydroxylamine.HCl gives the corresponding:**

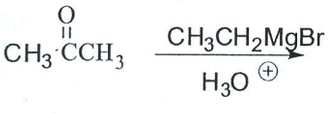
a) hydrazone b) oxime c)Schiff's base d) no reaction

**10- Which of the following reactions will yield 1-butanol.**

a) 

b) 

c) 

d) 

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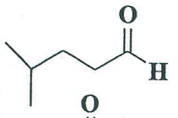
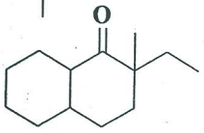
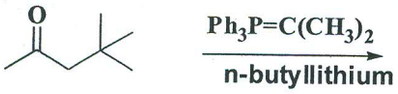
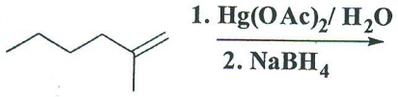
**2 A) Complete each of the following chemical equations:** **[20 Marks]**

I. 


II. 


III. 


IV 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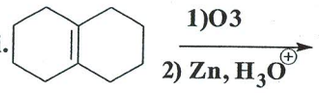
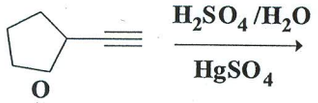
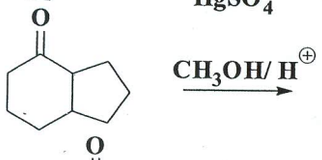
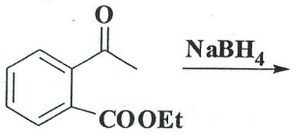
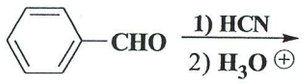
VIi. 

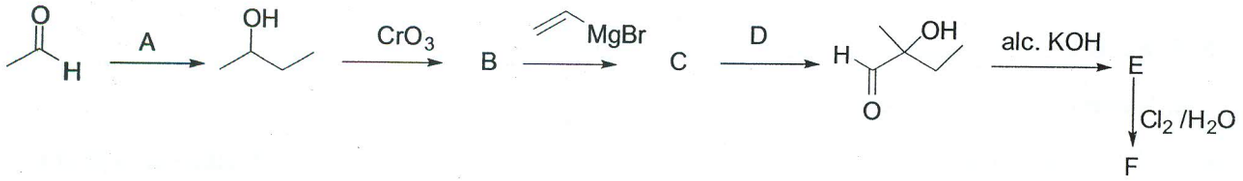

VII. 


VIII. 

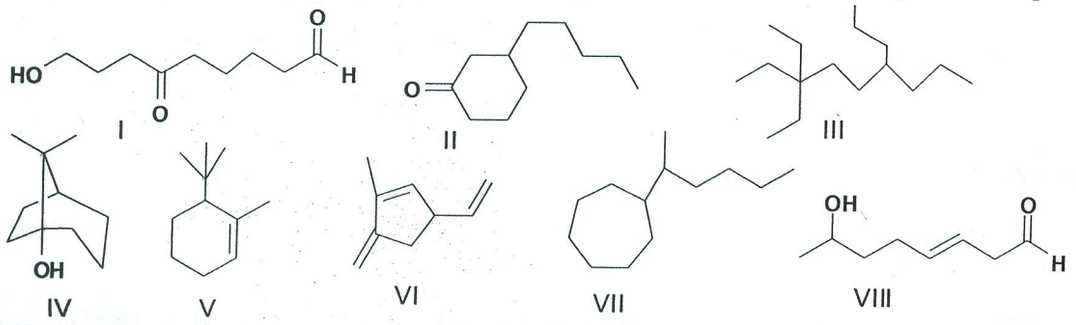

IX. 


X. 

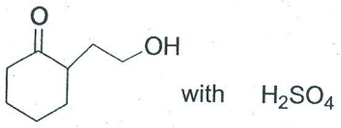

**B) Fill in the blanks left in each of the following syntheses:** **[5 Marks]**




**3. A) Name the following compounds according to IUPAC rules:** **[10 Marks].**




**B) Write the mechanism for the following reaction.** **[15 Marks].**

i. 


ii. The reaction of 2 moles of acetaldehyde with 50% NaOH.

iii. The reaction of 2 moles of 4-nitrobenzaldehyde with NaOH.

iv. The reaction of neopentylalcohol with $H_2SO_4$.

v. The reaction of propene with HBr/ $H_2O_2$.

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*With our Best Wishes,* Dr. Mona Elsayed & Dr. Noha Saker.

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|---|---|---|
| **Mansoura University**<br>**Faculty of Science**<br>**Chemistry Department**<br>**Course: Represented Elements**<br>**Code: Chem 221** | | **First Semester**<br>**2nd Level Chemistry**<br>**Date: 13 Jan. 2016**<br>**Time: 2 hours**<br>**Marks: 80** |

## Answer The Following Questions

**I) Comment on (7 only) of the following:-** **(28 marks)**

1) Thallous (I); $_{81}Tl^{+}$ compounds are stable.
2) The 1st Ionization Energy (1st IE) of ($_4Be$, $_7N$ and $_{10}Ne$) is high while for ($_8O$) is low.
3) The reaction of elements of Group IA with water is increasing down the group.
4) Berylium metal is amphoteric whereas aqueous solution of Be(II) is acidic.
5) Carbon monoxide is considered as good reducing agent.
6) Magnesium(II) chloride is heavily hydrated more than Barium(II) chloride.
7) Nitrogen ($N_2$)molecule is generally unreactive while Phosphorous molecule ($P_4$) is highly reactive.
8) The solubility of most of the salts of alkali group (IA) elements is decreasing down the group.
9) The acidity and pka values in the hydrolysis of one molecule and three molecules of boric acid ($H_3BO_3$).
10) Effect of increasing $CO_2$ or $O_2$ concentration on the blood pH.

.....

**II) . A- Write shortly on (4 only) of the following:-** **(20 marks)**

1) Biological importance of carbon dioxide.
2) Separation of pure silicon element (Si) from silica ore ($SiO_2$).
3) Photodissociation of nitrogen dioxide ($NO_2$) and Ozone ($O_3$) levels in sunny days.
4) Isolation of pure aluminium (Al) from bauxite ore {AlO(OH)}.
5) Production of nitric acid ($HNO_3$) by Ostwald process.
6) Bond strength of the pairs of (C-C & Si-Si) and (C-O & Si-O) bonds

.....

**II) B-Complete (4 only) of the following chemical equations:-** **(8 marks)**

1) $Ba + O_2$ (at 500 °C) $\rightarrow$ , 2) $H_3BO_3 + H_2O \rightarrow$

3) $Be_2C + H_2O \rightarrow$ , 4) $_7N^{14} + {}_0n^1 \rightarrow$

5) $Li_3N + D_2O \rightarrow$ , 6) $B_2O_3 + NH_4BF_4 \rightarrow$

.....

III. A) 1-Discuss the structure and nature of bonding for

a) Diborane ($B_2H_6$) , b) Trimethylamine $\{N(CH_3)_3\}$. ($_5B$, $_6C$, $_7N$ ) (7 marks)

2- Explain how an insulator like Silicon (Si) can be converted to semiconductors (n-type & p-type) , draw the three Figures. (5 marks)

.....

III. B) Choose the most correct answer for 8 only:- (12 marks)

1) $Li + O_2 \rightarrow$ ....., while $Rb + O_2 \rightarrow$ .....
a) Li & RbO b) $LiO_2$ & $RbO_2$ c) $Li_2O$ & $RbO_2$ d) LiOH & $RbO_2$

2) $CaC_2 + N_2 \rightarrow$ .....
a) $Ca_3N_2$ b) $CaCN_2$ + C c) $CaCN_2$ d) C

.....

3) The structure of $N(SiH_3)_3$ has .....
a) triagonal b) triagonal pyramidal c) due to $sp^2$ d) a & c are correct

4) Diamond is ..... than graphite due to .....
a) harder, saturation b) $sp^2$ c) weaker, $sp^3$ d) harder, $sp^2$

5) $Pb^{2+}$ is stable than $Pb^{4+}$ due to
a) metallic character b) inert pair effect c) inertia of $6s^2$ electrons d) b & c

6) Baking powder ( ..... ) is responsible for evolution of $CO_2$ during baking
a) $NaHCO_3$ b) $Na_2CO_3$ c) $Ca(H_2PO_4)_2$ d) $CaHPO_4$

7) $H_2SO_4 + SO_3 \rightarrow$ .....
a) fuming sulphuric acid b) $H_2S_2O_7$ (oluem) c) $H_2SO_3$ d) a & b

8) Oxidation state of Cl in $HClO_4$ is
a) +1 b) +7 c) +5 d) +4

9) $^{7}_{3}Li$ isotope is used in treatment of cancer *via*.....
a) neutron capture therapy b) physiotherapy
c) chemotherapy d)electron capture therapy

10) Chlorophyll is ..... porphyrin complex, catalyse the ..... process
a) $Ca^{2+}$, gypsum b) Mg, photosynthesis
c) $Fe^{2+}$, $O_2$ storage d)$Mg^{2+}$, photosynthesis

11) .....is used as anti-acid for ulcer patients
a) $CaSO_4$ b) $MgCO_3$ c) $BaSO_4$ d) $NaHCO_3$

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*Best wishes*

*Prof. Tawfik Rakha, Prof. Sahar Mostafa. Dr. Rania Ramadan*

Mansoura University

Faculty of Science- Chemistry Department
Subject: Physical Chemistry. Chem. 242

Course (s):Kinetic theory of gases-
Phase Rule

Second Level-Program: Chemistry

Date : January 2016

Time Allowed : 2 hours

Full Mark : 80 Mark

**Answer All Questions** الأسئله على الوجهين

## Phase Rule ( 40 Mark )

**First Question :** **( 20 Mark )**

[A] Write in detail ( with examples ) on : **( 9 Mark )**

(i) Phase . (ii) Components. (iii) Degrees of freedom.

[B] Define each of the following : **( 5Mark )**

(i) Alloy (ii) Peritectic reaction . (iii) Congruent melting point.

[C] Sketch the phase diagram of two component simple eutectic system characterized by formation of a compound with congruent melting point. Label areas, lines and points of intersection denoting in each case the number of phases and degree of freedom. **( 6 Mark )**

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**Second Question :** **( 20 Mark )**

[A] Write in detail on each of the following : **( 12 Mark )**

(i) General rules for intermetallic compounds formation.

(ii) Primary and secondary solid solution .

(iii) Properties and Conditions of forming solid solution.

(iv) Efflorescence and deliquescence.

[B] Sketch the phase diagram of : **( 8 Mark )**

(i) Water system.

(ii) Two component simple eutectic system where liquids are partially miscible.

in each case label areas, lines and points of intersection denoting in each case the number of phases and degree of freedom.

## Kinetic Theory of Gases (40 marks)

**Answer all the following questions in your answer sheet and put the answers in tables:**

**First Question :** **(20 Marks)**

A) Put (√ ) for true statements and (×) for false statements then correct the mistakes:
*(2 Marks for each of the following)*

1- The value of b in Van der Waal's equation is equal to $\frac{RT_c}{8P_c}$.

2- If z = 0.9 for a certain gas and $\bar{V}_{ideal} = 30\ cm^3$, the deviation from ideal behaviour is equal to 20%.

3- The relation between the compressibility factor and density is given by $\frac{PM}{\rho RT}$.

4- For one mole of $O_2$ and $H_2$ at 25 °C the kinetic energy of $O_2$ is more than that of $H_2$.

5- At a certain temperature the $U_{rms}$ was found to be constant by increasing temperature.

6- The probability density of distribution of velocity can be obtained by dividing the probability by dU

7- Solving the equations $\left(\frac{\partial P}{\partial V}\right)_T = 0$ and $\left(\frac{\partial^2 P}{\partial V^2}\right)_T = 0$ for an equation of state giving V= ∞ means that the gas is real.

B) Compare the values of the compressibility factor for ideal gas, real gas and at the critical point. [6 marks]

**Second Question:** **(20 Marks)**

A) Complete the following statements: *(2 Marks for each of the following)*

1- The probability of distribution of velocity according to Boltzmann is given in .....direction.

2- The critical temperature according to Van der Waal's equation equals.....
3- The most important postulate of the kinetic theory deals with neglecting .....
4- A gas moving with velocity equals 500 m/s exerts a force of 2N, this gas is .....
5- The critical temperature for permanent gases is .....than room temperature.

B) Write the equations representing: *(2 Marks for each of the following)*

1- Law of corresponding state.
2- Inflection point.
3- Collision frequency.
4- Mean free path.
5- The integral in Boltzmann distribution of velocity equation.

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*Good Luck*

**Prof. Dr. Mohammed A.Morsi** **Dr. Maani.A. Hamada**

Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry
Course (s): Chem 211
Analytical chemistry

First Term
Date : January, 2016
Time Allowed : 2 hours
Full Mark : 60 Marks

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Answer FOUR ONLY of the following five questions (each 15 marks):-

- Question 1.

i) Calculate the volume of conc. nitric acid, having sp. gravity 1.42 and 69% w/w percentage concentration, required to prepare 1.00 L of 0.20 M HNO3. What is the volume of the prepared acid needed to react quantitatively with 0.0106g of $Na_2CO_3$ (H= 1.00, N=14.00, O= 16.00, Na=23.00, C=12.00).

ii) Calculate the mean, confidence limit of five determinations 57, 57.5, 55 and 61(s = 0.02, Qt =0.05). Does the value 61 rejected or not?

iii) Number of moles of 5.8 g NaCl = ....., when dissolved in 500 ml, the solution has molarity of .....(At.wt Na=23 Cl=35.5)

- Question 2.

i ) In determination of copper in copper coin, 0.7g of it was dissolved in 10ml HCl and enough KI was added, the liberated $I_2$ was titrated with 0.4M of $Na_2S_2O_4$, the volume needed was 25ml. Find the purity percent of the copper sample. Cu=63

ii) Calculate the pH of 50ml of 0.1M $CH_3COOH$ on addition of the following volumes of 0.05M NaOH:

a) 0.0 ml b) 5o ml c ) 100 ml d) 120 ml

Knowing that (Ka $_{CH3COOH}$= $1.8x10^{-5}$, pKa= 4.76)

- Question 3. Answer TWO of the followings:-

A-Prove that pH =pKa+log[salt]/[acid] for a buffer solution.

B-Discuss:-
i- Factors affecting the break on precipitation titration curves.
ii- The relationship between solubility product and the solubility of a salt.
iii- Methods used for Fe(II) determination(2methods).

C-5.0 ml of 0.10 M $Ce^{4+}$ solution is added to 5.0 ml of 0.30M $Fe^{2+}$ solution. Calculate the potential of a platinum electrode dipped in the solution relative to SHE. (E $Ce^{4+}/Ce^{3+}$ =1.61, E $Fe^{3+}/Fe^{2+}$ =0.771)

**Question 4. - Answer only three of the followings**

i) Define each of the followings:
a) Accuracy and precision
b) Self indicator.
c) Nernest equation in Redox Reactions

ii)-If you have 1M acetic acid and 0.5M sodium acetate. Calculate the necessary volumes from the two solutions to prepare 100ml buffer solution of pH = 4.

iii) Will we get a precipitate of AgI if 0.01 mg of NaI is added to 200 ml of $2x10^{-5}$ M $NaNO_3$. Ks(AgI= $1.2x10^{-16}$), At.Wts. Na=23, I=127.

iv) A 0.5 g sample containing Ca and Mg carbonates was dissolved in diluted HCl and completed with distilled water to 250 ml. 10 ml of the resulting solution were titrated with 0.01 M EDTA solution. Using EBT indicator, 19 ml of EDTA were consumed, while on using murexide indicator, 8 ml of EDTA were consumed. Calculate the percentage of both Ca and Mg carbonates in the sample. (Ca=40, Mg=24)

**- Question 5 Answer TWO of the followings**

i) How can you prepare 40% $HNO_3$ solution from 96% $HNO_3$, d=1.495g/ml, assuming density of water= 1g/ml.

(ii) Comment on each of the followings statements:-
a)- The success of an EDTA titration depends upon the precise determination of the end point.
b)- The complexing action of EDTA is unselective.
c)- Methods used for detection of the end point of argentiometric titration. Give example.

iii) In titration of $Fe^{2+}$ in acidic medium with 0.0206 M K2Cr2O7, volume of $K2Cr_2O_7$ necessary was 40.2 ml according to the following equation

$$6Fe^{2+} + Cr_2O_7^{--} + 14H^+ \rightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$$

Calculate the weight of iron (in mg). (Fe = 56)



With best wishes

Prof. M. Eldefrawy — Prof. M. Akl
Signature — Signature

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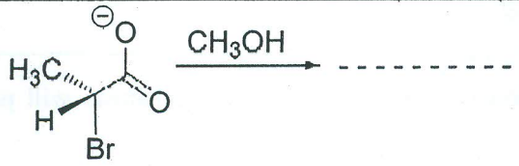
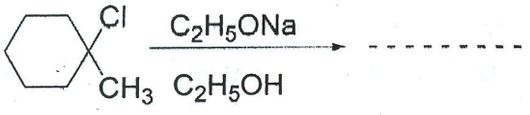
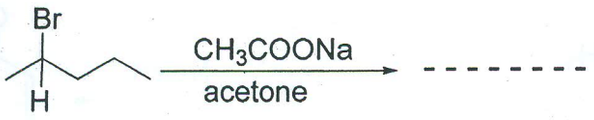
| Mansoura University<br>Faculty of Science<br>Chemistry Department<br>Subject: Chemistry<br>Course(s): Chem.232 Organic Reactions Mechanism I | First Term<br>2nd Level Chemistry Students<br>Date: Jan., 2016<br>Time Allowed: 2 Hours<br>Full Mark: 80 Marks |

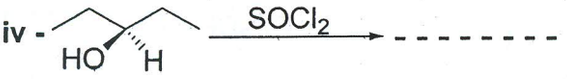
**Answer all Questions**

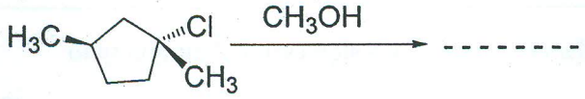
**Q1:** Give the structure of the product(s) for each of the following reactions. ***Please does not forget.to provide a complete, detailed, arrow-pushing mechanism for each one*** **(28 marks)**

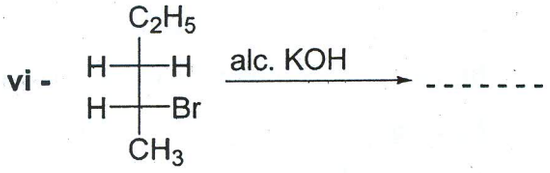
i - 

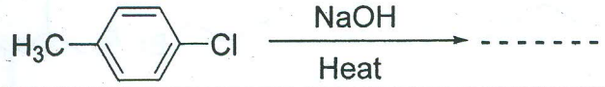

ii - 


iii - 


iv - 


v - 


vi - 


vii - 


**Q. 2 a)** in each of the following pairs of compounds decide which member that fits the description.

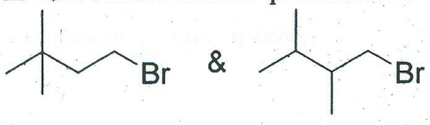
***Explain your answer*** **(16 Marks)**

i-- More reactive toward $SN^2$

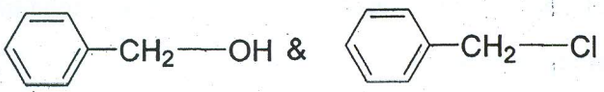
ii- Much stronger nucleophile

$CH_3COONa$ & $CH_3CH_2ONa$

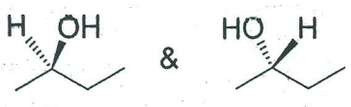
iii- Give more Zaitsev product in $E^2$ reaction



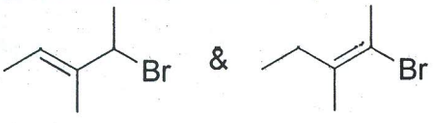
iv- More suitable good leaving group



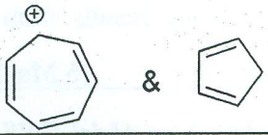
v- Considered to be (*R*)-2-butanol



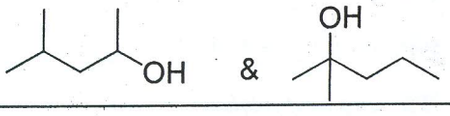
iv- More reactive toward $SN^1$



vii- is considered to be aromatic compound

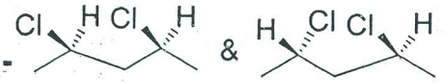


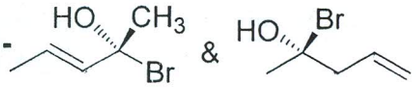
viii- More reactive toward $E^1$

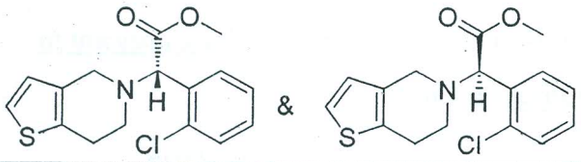


**Please Turn to Next Page**

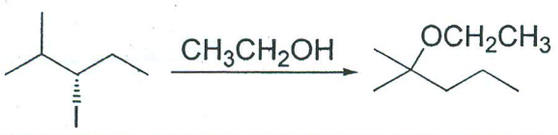
**b)** Identify the relationship in each of the following sets of molecules. Pick among the following terms: identical, enantiomers, diastereomers, and constitutional isomers, **(9 Marks)**

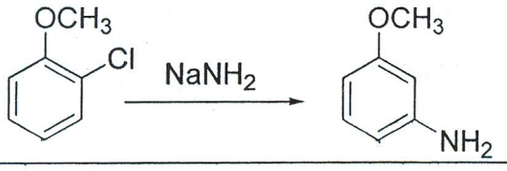
i - 

ii - 

iii - 

**Q. 3: a)** Provide a step-wise mechanism for the following reaction. A correct mechanism will provide all the arrows necessary to bring about this transformation **(8 Marks)**

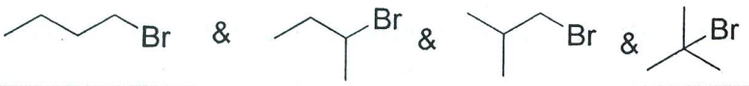
i - 

ii - 

**b)** Rank the following molecules in a decreasing order **(1 = fastest, 4 = slowest)** of their ability to

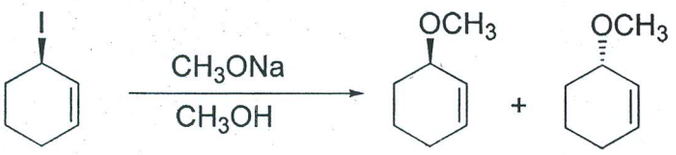
**Explain your answer** **(8 Marks)**

i - undergo $SN^2$ reaction mechanism. 

ii - undergo $E^2$ reaction mechanism. 

**c)** For 3,4-bromohexane determine the maximum number of stereoisomers. Then, using only three dimensional formulas draw and name all the possible stereoisomers and identify the relationships between molecules as enantiomers, diasterioisomers and meso compounds **(6 Marks)**

**d)** The following reaction was run with the conditions as shown and the observed product percentages were as reported below:



30 % 70 %

Provide a feasible explanation for the substitution mechanism based on the observed results from this substitution reaction **(5 Marks)**

***With my best wishes*** ***Examiner: Dr. Ebrahim Abdel-Galil***

| | | |
|---|---|---|
| Mansoura University<br>Faculty of Science<br>Physics Departement<br>Subject: Introduction to Biophysics<br>Course code: biophys221 | | First Term, Final Exam<br>2nd Students<br>Time Allowed :2 h .<br>Date :20/1/2016<br>Full Mark :80 Mark |

## *Answer all the following questions*

### I-Write short notes about each of the followings:

a) Cobalt 60 and linear accelerator

c) Classification of light atom interaction

b) Ion distribution in cell membrane

e) Acoustic impedance

f) Transducer

g) Equivalent Circuit Model for the Plasma Membrane

h) Treatment planning software

d) Compton Effect

### II-Choose the correct answer from the followings:

1) The process in which α and β rays pass close to atoms and knocks the electrons out is called:

a ) Ionization b) Ionisation

b) Decay d) None of above

2)The sound that emanates from a piezoelectric transducer originates:

a) From a point on the active surface

b) From most of the active surface

c) From a small area in the center of the active surface

d) From the edges of the active surface

3) Period is determined by:

a) Sound source b) Medium

c) Both

4) The time it takes a wave to vibrate a single cycle, or time from the start of a cycle to the start of the next cycle :

a) Period

b) Frequency

c) Wavelength

d) Speed

e) Power

5) Which of the following ions are involved in neuronal action potentials؟

a) $Na^+$

b) $K^+$

c ) $Cl^-$

d) A and B only

e) A, B, and C

6) At what membrane voltage do neuronal voltage-gated $Na^+$ channels become activated`

a) −70 mV

b) −55 mV

c) 0 mV

d) +55 mV

7) At what membrane voltage do neuronal voltage-gated K+ channels become activated?

a) −70 mV

b) −55 mV

c) 0 mV

d) −90 mV

8) The hyperpolarization phase of the action potential:

a) Is due to the opening of voltage-gated Cl− channels

b) Is due to the prolonged opening of voltage-gated K+ channels

c) Is due to the closure of resting Na+ channels

d) None of the above

9) What is a major health concern wth MRI?

a) Reaction to applied drug

b) extrerme cold؟

c) Radiation dose

d) localized burns due to metallic implants?

10) Uses high doses of radiation to kill cancer cells and shrink tumors, delivered precisely to avoid damaging healthy brain tissue.

a) Radiation therapy

b) Ionizing radiation

c) X-ray

d) Radiosurgery

11) Which of the following is NOT true about the neuronal action potential؟

a) Action potentials are all-or-nothing .

b) Action potentials travel along axons in a non-decremental fashion .

c) Repolarization and hyperpolarization are due to the activity of K+ channels .

d) All of the above are true about action potentials.

12) Which of the following is NOT a source of background radiation?

a) Radiation from Naturally occurring unstable isotopes.

b) Radiation from a Source being measured.

c) Radiation from Space.

d) Radiation from Human Activity.

13) Which of the following types of radiation can enter living cells and cause ionization, thus damaging or destroying the cell?

a) Gamma. b) Alpha and Beta.

c) Beta and Gamma. d) Alpha, Beta and Gamma.

14) Where does radiation come from?

a) An electron b) An atom.

c) A stable nucleus d) An unstable nucleus which decays.

15) Which type of radiation would be stopped by a few millimetres of aluminium, but not by paper?

a) Gamma. b) Infra-red.

c) Alpha d) Beta.

## III-Write the scientific expression:

a) The component of the ultrasound imaging equipment that is placed in direct contact with the patient's body( ).

b) Conversion of electrical energy to mechanical energy and vice versa ( ).

c) Nerves that communicate messages between the central nervous system and the rest of the body nerves that communicate messages between the central nervous system and the rest of the body( ).

d) Places radioactive material into tumor or surrounding tissue( ).

e) The action potential goes past -70 mV because the potassium channels stay open a bit too long( ).

f) A pair of reflecting surface of which one is a perfect reflector and the other is a partial reflector( ).

مع تمنياتي بالتوفيق

د/أمل الشهاوي