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Assiut University
Faculty of Science
Chemistry Department

Date Monday : 05/01/2015
Time : 03 Hours
Course No.: 210C

Final Exam for Second Level Chemistry Student 210C (2015)

Answer the Following Questions: (50 Marks)

(I) Mark Ten Only (√) or (X) for the following sentences and then correct the wrong one:(10 Marks)

1-The rate of nuclophilic addition reactions of aldehydes increase with increasing the No. of donner groups ( )
2- E2 reactions need high concentration of good nucleophile ( )
3-Crowding at the carbon that bears the leaving group slows the rate of S_N2 reactions ( )
4- Vinyl bromide react with NaOH forming vinyl alcohol ( )
5- Elimination reaction is one where starting material loses the elements of a small molecule ( )
6- Chemical trapping and isolation are used to determine intermediates ( )
7- Electrophilic addition reaction of bromine to alkene is stereospecific syn addition reaction ( )
8- Formation of an oxirane from alkene and peroxycarboxylic acid is stereospecific ( )
9- Aldol reaction with aldehydes more reactive than ketones ( )
10-Benzyne is determine by using anthracene to yield triptycene ( )
11-$CF_2=CCl_2$ can exist as cis and trans isomers ( )
12-Ozonolysis of 2,3-dimethyl-2-butene gave propanone . ( )

(II)Give the product(s) that you would expecte to be formed in Three Only of the following reactions.In each case write the mechanism , its type, and specify the following regioselective ,steroselective,and sterospecific where appropriate. (12 Marks)

1- $(CH_3CH_2)_3CBr$ $\xrightarrow{25^0C/CH_3OH}$?

2-$CH_3CH_2CH=C(CH_3)\ CH_2CH_3$ $\xrightarrow{HBr/R_2O_2}$?

3-$(CH_3)_2CHCH(Br)CH_3$ $\xrightarrow{NaOC_2H_5/\ 50^0C/C_2H_5OH}$?

4-$2CH_3COOC_2H_5$ $+NaOC_2H_5$ $\xrightarrow{C_2H_5OH}$?

(III)Show by equations the reaction mechanism of the following , and then gave the name or type of each reaction: (8 Marks)

1-Ethanal + HCN/H^+ ⟶ ?

2- Acetaldehyde + Formaldehyde / OH^- ⟶ ?

3- 1,3-Butadiene + Cl_2 ⟶ ?

4- 2-Bromopropane + $NaOC_2H_5/C_2H_5OH$ ⟶ ?

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Assiut University
Faculty of Science
Chemistry Department

Date: 03 January, 2014
Time allowed: 02 Hours
Course No.: 211C

Final Examination
Subject: Course No. 211C (Chemistry)
Students: 2nd Year Non Chemistry Students

Answer the following questions:-

(I) a. Mark (√) or (X) for the following sentences and then correct the wrong one: (10 Marks)

1. Thiols are similar to alcohols and phenols, except that the oxygen is replaced by sulfur ( )
2. In the common name, the separate word alcohol is placed after the name of alkyl group ( )
3. All azo compounds are colored, and many are used commercially as dyes for cloth and in color photography ( )
4. The strength of an acid is measured quantitatively by its acidity constant ( )
5. A Lewis acid is a substance that can accept an electron pair, and a Lewis base is a substance that can donate an electron pair ( )
6. Alcohols cannot be oxidize to Aldehydes, Ketones, and Carboxylic Acids ( )
7. Substances that are sensitive to air oxidation, such as foods and lubricating oils cannot be protected by phenolic additives ( )
8. Thiols are less acidic than alcohols because thiols not react with aqueous base ( )
9. Ethers have higher boiling points than alcohols with an equal number of carbon atoms ( )
10. Grignard reagent can be prepared easily from $HOCH_2CH_2CH_2Br$ and magnesium ( )

b. Write the structure of TEN only of the following: (10 Marks)

Ethylphenylether	1,3-Propendiol	Ethylmethylketone
2,4,6-tri-Bromophenol	t-Butyl alcohol	*m*-Hydroxybenzoic acid
Diallyldisulfide	Ethyleneoxide	*p*-Cresol
2-Aminopentane	*o*-Bromoaniline	tri-Ethylamine

(2) Answer the following questions. (7½ Marks)

a. Arrange the following compounds according to their acidity order (Higher acidity first):
CH_3COOH, CH_3OH, CH_3CH_3, C_6H_5OH, C_6H_5COOH

b. Arrange the following compounds according to their basicity order (Higher basicity first):
CH_3NHCH_3, $C_6H_5NH_2$, CH_3NH_2, *p*-$NO_2C_6H_4NH_2$, $(CH_3)_3N$.

c. Which of the following are Lewis acid and which are Lewis base?
$(CH_3)_3C^+$, $AlCl_3$, BBr_3, CH_3OCH_3, Cl^-, HO^-, PhO^-, H^+, HOH, CH_3^-

(3) Write on the following reactions giving the mechanism of each one (12½ Marks)

1. Grignard reaction for synthesis of 2-deuteropropane starting from 1-propene.
2. Williamson reaction for synthesis of ether.
3. Friedel-Crafts reaction for synthesis of acetophenone.
4. Nitration of benzene.

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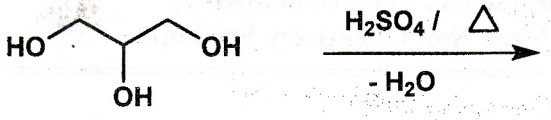
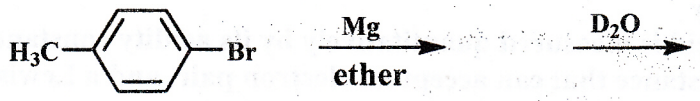
(4) Complete FIVE only of the following equations giving the name of each product (10 Marks)

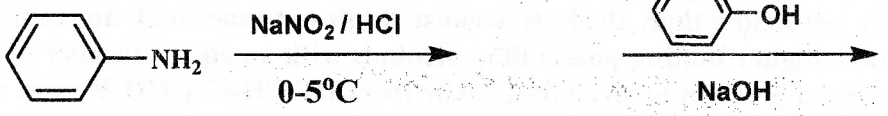
1. $CO + H_2 \xrightarrow[400^\circ C,\ 50\ atm]{ZnO - Cr_2O_3}$

2. 

3. $CH_3CH_2OH \xrightarrow[140^\circ C]{H_2SO_4}$ and $CH_3CH_2OH \xrightarrow[180^\circ C]{H_2SO_4}$

4. 

5. $H_3C-C\equiv N \xrightarrow{LiAlH_4}$

6. 

Good Luck
Prof. Abdelwareth Abdelhaleem

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(IV) a) Complete the following equations: (8 Marks)

1- $CH_3CH_2\ CH_2OH \xrightarrow{PCC} ? \xrightarrow{K_2Cr_2O_7/\ H^+} ?$

2- $CH_3COCH_3 + HOCH_2CH_2OH \xrightarrow{/H^+} ?$

3- $2C_6H_5CHO + NaOH \longrightarrow ? + ?$

4- $CH_3CH_2CH(Br)CH_3 + NaOC_2H_5 / C_2H_5OH \longrightarrow ? \xrightarrow{O_3/Zn/H_2O}$

b) There are four alkyl choloride isomers with the formula C_4H_9Cl ,write their structural formulas, classify each as to whether it is a primary,secondary or tertiary . (2 Marks)

(V) Choose the correct answer from the following sentences (10 Marks)

1-Which of the following is most readily undergoes an E2 reaction with CH_3CH_2ONa ?

a) CH_3I b) CH_3CH_2I c) $(CH_3)_3CI$ d) CH_3OCH_3

2-Which of the following statements does not correct describe S_N2 reaction ?

a)Substituation occurs with inversion of stereochemistry

b)Tertiary halides react faster than secondary halides .

c) The rate law is bimolecular .

3-Which of the following condition favor the S_N1 mechanism over the S_N2 mechanism

a) 3^0 RX /ionizing solvent b)1^0RX/ ionizing solvent

c) 3^0 RX/strong nuclophile d)1^0RX//strong nuclophile

4-What type of solvent is best for S_N2 reaction which employ anionic nucleophiles

a)Polar protic solvent . b) Polar aprotic solvent c)nonpolar solvent .

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

a)S_N1 only b)S_N2 only c)E1 only d)E2 only e)Both E1&E2

6-Based on Saytzeffs rule, select the most stable alkene

a)1-methylcyclohexene b)3-methylcyclohexene

c)4-methylcyclohexene d)They are all of equall stability

7- Hydration of carbonyl compounds procced via :

a) acidic condition only b) basic condition only c) Both a&b

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8-Which of the following compounds undergoes E2 reactions with the fastest rate ?

a)2-Chloropropane
b) 2-Bromoropropane
c) 2- Iodopropan

9-Which of the following compounds contain chiral carbon atom ?

a) $Cl_2C=CHCH_3$ b) $CH_3(CH)BrCH_2CH_3$

c) $CH_3CH=CHCH_3$ d) $(CH_3)_2C=CH_2$

10- Which of the following series contains only nucleophiles :
a) NH_3, H_2O, CN^-, I^-
b) $AlCl_3$, NH_3, H_2O, I^-
c) $AlCl_3$, BF_3, H_2O, NH_3
d) $AlCl_3$, BF_3, NO_2^+, NH_3

Good Luck

الممتحنون: ا.د.زينب عبد الحميد حزين د.اميمه سعد محمد

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Assiut University
Faculty of Science
Chemistry Department

Jan. 2015
Time allowed: 2 hrs.

Final Examination of Physical and Inorganic Chemistry
(250CH)

Section (I)

Answer the following:

1- a- Explain the reason for **Five only** from the following: (5 Marks)

I) Concentrated solution of HF acid is not kept in glass bottle.

II) PF_5 is known but NF_5 is not. III) CO_2 is an acidic oxide.

IV) Cesium ions conduct electricity more than lithium ions.

V) KCl is soluble in water but $CaCO_3$ is not. VI) CO is a poisonous gas.

b- How you can prepare **(Three only)** from the following: (4.5 Marks)

H_2 , NH_3 , HI , $CaCO_3$

c- What products are formed when each of group (I) metals burnt in dioxygen? How do these products react with water? (3 Marks)

2- a- Choose the correct answer and comment **(Three only)** (6 Marks)

I) Which solution of the following reagents gives a precipitate when CO_2 is bubbled into it [KOH, NaOH , $Ba(OH)_2$]

II) Which one of the following species contains an odd number of electrons (CO, NH_4^+ , NO)

III) The element which has the maximum number of oxidation state (C, N, Cl)

IV) The compound which contains hydrogen bond (CH_4 , H_2S , H_2O)

b- In each pairs of acids, state which is stranger and why? HF and HI, H_2SO_4 and H_2SO_3, HClO and HIO. (3 Marks)

c- Give three examples of freons and how do they damage the environment .(3.5Marks)

See next page ⟶

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Section II (Marks:25)

I) Choose the correct answer: (Marks: 10)

1) pressure change at constant volumeof an ideal gas; the work done of this process is equal to:

a) $\Delta W \geq \infty$ b) $\Delta W \leq \infty$ c) $\Delta W = nRTln\ V_2/V_1$ d) $\Delta W = 0$

2) Isothermal expansion of an ideal gas: system should be remain at constant: a) heat b) volume c) pressure d) temperature

3) For irreversible isothermal expansion of an ideal gas: ΔH, and ΔE, are equal to: a) amount of heat b) volume c) zero d) pressure

4) Adiabatic expansion of an ideal gas, the heat is:
a) Absorbed b) evolved c) decrease d) no transfer

5) ΔS of n moles of an ideal gas depending on temperature difference is equal to: a) ΔH b) $nRTlnV_2/V_1$ c) d) ΔW d) $nC_p ln\ T_2/T_1$

II) Calculate the entropy change of n moles of an ideal gas when it's expanded isothermally. (Marks: 5)

III) Show that under adiabatic conditions for the expansions of an ideal gas: $PV^{\gamma} = Constant$ (Marks: 5)

IV) Deduce the relationship between the standard free energy change (ΔG^0) and equilibrium constant (K) for the reaction: (Marks: 5)

$$aA + bB \overset{K}{\longleftrightarrow} cC + dD$$

Good Luck

Examiners: Prof. Dr. Amina SA Zidan, Prof. Dr. Seddique M Ahmed

Assiut University **Jan. 2015**
Faculty of Science **Time: 3 hrs.**
Chemistry Department

Physical Chemistry Examination (230-C) for Second level Students.

Answer the following questions:

1) Answer Only Three from the following: (16.5 Marks)

a) Derive kinetic equation for determination of the specific rate constant and the half-life for the following reaction: $3A \xrightarrow{K_3}$ products

b) Discuss the effect of temperature on the reaction velocity.

c) Discuss the half-life method for determination the order of reaction.

d) In decomposition of a gas which is first order reaction the specific rate constant was found to be 2.2×10^{-5} min^{-1} at 457.6°C and 3.07×10^{-3} min^{-1} at 510.1°C, from these data estimate the energy of activation and the specific rate constant at 480°C.($R=1.987$ cal.$K^{-1}mol^{-1}$)

2) Answer Only Eight from the following: (33.5 Marks)

a) Calculate ΔS when 0.1gm nitrogen gas at 100°C and 380mm/Hg pressure is expanded isothermally to 1000 ml and simultaneously heated to 473°K. [C_v nitrogen=4.15cal $K^{-1}mol^{-1}$. At. wt. nitrogen=14, R=0.082 L.atm. $mol^{-1}K^{-1}$ = 1.98 cal $mol^{-1}K^{-1}$].

b) Find the cell potential for the cell whose reaction equations of the two halfs are:

$Ni^{2+} + 2e \longrightarrow Ni$ $\quad E° = -0.25$

$Sn \longrightarrow Sn^{2+} + 2e$ $\quad E° = +0.14$

and the concentrations are $Ni^{2+} = 1.3x10^{-1}$ and $Sn^{2+} = 1.0x10\text{-}5$ mol/L.

Is the reaction spontaneous as written?

c) At 760 mm/Hg, 100gm of benzene is vaporized at its boiling point of 80°C.

Calculate: a) W_{rev}, b) q , c) ΔH , d)ΔE

The heat of vaporization is 7.6 Kcal/mol , M. wt of benzene = 78gm/mol.

d) At a constant pressure and a temperature of -10°C, water freezes. Calculate the heat evolved in the process $H_2O_{(l)} \longleftrightarrow H_2O_{(s)}$. Given the following: $\Delta H_{273} = -79.7$cal g^{-1}, C_p of $H_2O_{(l)} = 1.0$ cal $K^{-1}g^{-1}$ and C_p of $H_2O_{(s)} = 0.49$ cal $K^{-1}g^{-1}$.

e) Draw the paths corresponding to the four steps for a Carnot's cycle operating reversibly between temperatures T_1 and T_2. Prove that efficiency = $T_2\text{-}T_1 / T_2$.

f) What weigh of ice could be melted at 0°C by the heat liberated by condensing 100g of stem at 100°C to liquid. Heat of vaporization = 9.72K cal/mole, heat of fusion =80 cal/g.

g) Calculate the equilibrium constant at 25°C for the reaction:

$2S + 3O_2 \longleftrightarrow 2SO_3$

The heat of formation of SO_3 at 25°C is -94.45 Kcal/mol and the standard molar entropy changes for S,O_2 and SO_3 at 25°C are 7.62,49.0 and 61.24 cal/mol°K, respectively.

h) You have 10 liter of an ideal gas at 0°C and 10 atm. pressure. You allow the gas to expand against a constant external pressure of 1 atm, while the temperature remains constant. Find w, q, ΔE and ΔH in calories : a) Under the above conditions. b) If the expansion took place in a vacuum.

i) Calculate the enthalpy change for the reaction : $N_{2(g)} + O_{2(g)} \longleftrightarrow 2NO_{(g)}$. given the equilibrium constant $4.08x10^{-4}$ at 1727°C and $3.6x10^{-3}$ at temperature of 2500°K.

Good Luck,,, ***Examiners***: Prof. Dr. Y. Temerk ; Prof. Dr. A. El-Awad.

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Assiut University
Faculty of Science
Chemistry Department

Date: 14/1/2015
Time: 3 hours

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

Answer the following questions:

I- Colloids:

1- Explain what is meant by **Only Three** from the following terms (Give an **example** for each one):

i) **Peptization by ions.** (1.5 Marks) ii) **Tyndall effect.** (1.5 Marks)

iii) **Thixotropy of gels.** (1.5 Marks) iv) **Salting out** of an emulsified substance. (1.5 Marks).

2- Describe a method for the preparation of **Only Three** from the following:

i) Silver sol. (1.5 Marks) ii) Cream from milk. (1.5 Marks)

iii) Sols of mineral dyes. (1.5 Marks) iv) Silicic acid gels. (1.5 Marks).

3-a) Give the **structure** of thecolloidal ion of **hydrous ferric oxide** sol. (2/3 Mark)

b) Write **a short note** on **Only Two** from the followings: (3 Marks)

i) The **physical properties** of sols. ii) Purification of sols by **electro- dialysis** methods.

iii) **Demulsification** of **emulsions.**

4-a) **Give reasons** for **Only One** from the following: (2 Marks)

i) The amount of electrolyte required to precipitate a given sol depends on the nature of the electrolyte added. Give an example.

ii) **Sols** exhibit colligative properties, but the effects observed are very much smaller than for ordinary solutions.

5- Write on **Only One** from he followings: (2 Marks)

i) The behavior of aluminum oxide [$Al_2O_3.xH_2O$] sol under an applied electric potential.

ii) The size of the pinpoint of light seen in the ultra microscope is not an indication of the actual diameter of the partices. How you can deduce the actual dimensions of the particles.

II- Phase Rule

a) Predict the number of phases and components then the degree of freedom for each of the following : (5 2/3 Maks)

i- Saturated solution of sugar.

ii- Transition point (at 95.6°C) in sulphur system.

iii- Transition point (at 0.15°C) in sodium chloride- water system.

(2)

b) In light of phase rule explain briefly **Only Two** from the following: (5.5 Marks for each)

i- Sodium sulphate-water system.

ii- The main differences of phase diagram of Pb-Ag system with that of KI-water system..

iii- The ternary system $MgCl_2$-$CaCl_2$-water system at 0^oC where the hydrates $MgCl_2.6\,H_2O$ and $CaCl_2.6\,H_2O$ are formed.

III- Electrochemistry

Answer **four only** from the following : (16 2/3 Marks)

1- Compare between the Galvanic cell and the electrolytic cell; use an example for each item from its applications in our life.

2- Complete and balance the following redox equation.

$$MnO_4^- + SO_3^{2-} \rightarrow Mn^{2+} + SO_4^{2-} \text{ (acidic solution)}$$

3- Explain chemical composition, charging and discharging processes of the lead storage battery.

4- Consider the following standard reduction potentials in acid solution:

	E^o(V)
$Al^{3+}(aq) + 3e^- \rightarrow Al(s)$	−1.66
$Sn^{4+}(aq) + 2e^- \rightarrow Sn^{2+}(aq)$	+0.14
$I_2(s) + 2e^- \rightarrow 2I^-(aq)$	+0.53

Which is the weakest oxidizing agent in this list?

Calculate the highest galvanic cell potential.

5- A metal object is to be gold-plated by an electrolytic procedure using aqueous $AuCl_3$ electrolyte. Calculate the milligram of gold deposited in 10 min by a constant current of 10 A. ($F = 96485\ C\ mol^{-1}$, $Au = 197\ g\ mol^{-1}$)

---------- **Good Luck** ----------

Prof. Dr. Maher M. Girgis .
Prof. Dr. Maher M. A. Hamed .
Prof. Dr. Abo El Hagag A. Mohamed .

Assiut University
Faculty of Science
Chemistry Department

Jan., 2015

Time allowed : 2 hours

Final Examination of Introductory Quantitative Analysis (C-240)
Subject : Introductory Quantitative Analysis (C-240)
Students : Second Level " Credit Hours System "

Answer the following questions : (50 Marks)

First Question : (13 Marks)

a) Orthophosphate is determined by weighing as ammonium phosphomolybdate, $(NH_4)_3P$ $12MoO_3$ .If 1.1682 g precipitate(ppt.) was obtained from a 0.2711g sample. Calculate the percent of P and the percent of P_2O_5 in the sample ?
Atomic weights of N=14,H=1,P=30.97,Mo=95.94 and O=16 (7 Marks)

b) Define each of the following terms: (6 Marks)
Post-precipitation; Limit of detection; Accuracy.

Second Question : (12 Marks)

a) Describe and sketch only three of the following curves: (6 Marks)
1) The titration curve of CH_3COOH with NaOH.
2) The titration curve of NH_4OH with HCl.
3) The titration curve of HCl with NaOH.
4) The titration curve of NaCl with $AgNO_3$.

b) Calculate the pH at zero, 10, 25, 50 and 60 mL titrant in the titration of 50 mL of 0.1 M CH_3COOH with 0.1 M NaOH. ($K_w = 1.0 \times 10^{-14}$) , (K_a of $CH_3COOH = 1.75 \times 10^{-5}$).
(6 Marks)

Third Question : (13 Marks)

a) For the titration of 100 mL of 0.1 M solution of Ca^{+2} with 0.1 M EDTA solution .Calculate the pCa at pH=10 in the following cases : Addition of Zero, 50 and 100 mL of 0.1M EDTA. (K_f of Ca-EDTA complex = 1.8×10^{10}).
(7 Marks)

b) Give reason for each of the following : (6 Marks)
1) The use of sulphuric acid not hydrochloric acid during the titration of ferrous ions with potassium permanganate.
2) Starch indicator is used during iodimetric titrations.
3) The use of dextrin during the titration of chloride ions with silver nitrate by Fajan's method.

Fourth Question : (12 Marks)

a) Write the relations to express two only of the following: (4 Marks)
Relative standard deviation- Beer's law- The Nernst equation.

b) Describe briefly how does Eriochrome Black T indicator work for the titration of Mg^{+2} with EDTA. (4 Marks)

c) Calculate the pCl of the solution during the titration of 100 mL of 0.1 M NaCl with 0.1M $AgNO_3$ in the following cases : Addition of Zero, 50 and 100 mL of 0.1M $AgNO_3$.
(K_{sp} of AgCl = 1.6×10^{-10}). (4 Marks)

" Good Luck "

Examiner : Dr. Ahmed Mohamed Kamal

Assiut University
Faculty of science
Department of chemistry

Jan. 2015

Time : 2 hours

Inorganic chemistry (1) (220 Chem.) For 2nd year students

Answer the following questions: (50marks)

1- Answer the following: (20marks)

a- Mark with (x) for the wrong statement or (√) for the correct statements of the following and *explain why*: (answer five only) (10marks)

i. Melting point of NaCl is higher than $CaCl_2$.
ii. H_2O_2 can act as both reducing and oxidizing agent.
iii. Fluorides and hydroxides increase in solubility on descending the group.
iv. Xenon reacts with fluorine depending on the F_2/Xe ratio
v. CO is toxic for human beings.
vi. HF is kept in glass containers.

b-Compare between the following and *explain why* (answer five only) (10 marks)

i- The acidic strength of HCl and HI.
ii- Differences in acidity between HOCl and $HClO_3$.
iii- Portland and aluminia cement.
iv- Oxidation states of oxygen and group VI elements.
v- Li, B , F (ionization energy , electro negativity)
vi- Permanent and temporary hardness.

2- Answer the following: (10marks)

a- Complete the following equations : (answer five only) (5marks)

i- $CaC_2 + 2H_2O$ ii- BCl_3+3H_2O iii- $XeF_2+ 2HCl$
iv- CCl_4+2HF v- PCl_5+4H_2O vi- $HCOOH+H_2SO_4$

b- Show by equations how can you prepare the following (answer five only) (5marks)

i- Urea ii- Diborane iii-NH_3 iv- HNO_2 v- H_2O_2 vi- HF

3- Answer the following: (10marks)

a- Give reasons for the following statements: (answer three only) (6marks)

i- Boric acid behaves as strong monobasic acid in presence of glycerol.
ii- Great reactivity of fluorine.
iii- Pb(+II) is more stable than Pb(+IV).
iv- Graphite conducts electricity.

b- Write the structure of the following (answer seven only) (4marks)

i- Hydroxylamine ii- Nitrogen sesquioxide iii- Halic acids iv- Ozone
v- Dithionic acid vi- Hydrogen azide vii- Nitric acid viii- XeF_4 molecule

4- Answer the following: (10marks)

a- Complete the following statements: (6marks)

i- Differences between alkanes and silanes are due to 1….2….
ii- Factors influencing complex formation are 1…..2…..3…..
iii- The balanced equation for the reaction between MnO_4^- and N_2H_4 in alkaline solution to produce MnO_2 and N_2 is ……..

b- Show by equations how can O_3 act as a strong oxidizing agent. (4marks)

Good luck

Examiner: Dr. Dina Mamdouh