نموذج
كيمياء
د. مصطفى الخطيب

Al-Azhar University

Faculty of Pharmacy

Department of Pharmacognosy and Pharmaceutical chemistry

General chemistry

Final exam.

Student name:.....

Time: 120 minutes.

Q1	/18
Q2	/7
Q3	/15
Q4	/10
Q5	/10
Final Mark /60	

First semester

2019-2020

Question 1:

A- For each of the following molecules, draw lewis structures that have no formal charges, and then use VSEPR model to predict the geometric shape of the molecule and type of hybridization of the central atom.

The molecule	Lewis structure	Geometric shape (name + drawing)	Type of hybridization of the central atom
AsF_5 As is the central atom			
HCN C is the central atom			
OSbCl Sb is the central atom			
$OPCl_3$ P is the central atom			
H_2CO C is the central atom			

C- Which of the following two compounds has a higher solubility in water: CH_3OH or LiCl? Justify your answer.

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Question 3:

A- You have a bottle containing concentrated HCl solution that is 37% HCl by mass. The density of the solution is 1.18 g/ml.

1- What volume of this bottle should be used to prepare 250 ml of 2 M HCl solution?

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2- Calculate the molality of the concentrated solution?

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B- When $H_3PO_4(aq)$ is added to 125 ml of a solution of $BaCl_2$, 3.26g of $Ba_3(PO_4)_2(s)$ precipitates. What is the molarity of the $BaCl_2$ solution. The equation for the reaction is:

$$3\ BaCl_2(aq) + 2\ H_3PO_4(aq) \longrightarrow Ba_3(PO_4)_2(s) + 6\ HCl(aq)$$

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B- Which of the following two molecules has a higher polarity: PF_3 or BF_3? Justify your answer using lewis structures.

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C- Write Lewis structures for these ions: (a) C_2^{-2}, (b) NO^+. Show formal charges.

(a) C_2^{-2}	
(b) NO^+	

D- Draw the most acceptable resonance structures for: (a) ClO_3^- ion, (b) FNNN molecule. Show formal charges.

(a) ClO_3^- ion	
(b) FNNN molecule	

Question 2:

A- List the types of intermolecular forces that exist in each of these species:

(a) Benzene (C_6H_6).....

(b) CH_3Cl.....

(c) NH_3.....

B- Which of the following two compounds has a higher boiling point: CH_3OH or CH_3Br? Justify your answer.

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Question 4:

A- Consider the following equilibrium at 395 K:

$$NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$$

Write the equation of Kc and Kp (if found) for the reaction.

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B- Consider the equilibrium between molecular oxygen and ozone:

$$3O_2(g) \rightleftharpoons 2O_3(g) \qquad \Delta H^\circ = 284 \text{ kJ/mol}$$

What would be the effect of the following changes on the position of equilibrium:

(a) increasing the pressure on the system .....

(b) adding O2 to the system.....

(c) decreasing the temperature.....

(d) adding a catalyst.....

C- A sample of 20 mL of 0.10 M $Ba(NO_3)_2$ is added to 50 mL of 0.10 M Na_2CO_3. Given that: K_{sp} for Barium carbonate ($BaCO_3$) is 8.1×10^{-9}.Will BaCO3 precipitate? Justify your answer by calculations.

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C- **Balance the following equations:**

1- $MnO_4^- + I^- \longrightarrow MnO_2 + I_2$ **in basic media**

Final equation	

2- $Fe^{2+} + MnO_4^- \longrightarrow Fe^{3+} + Mn^{2+}$ **in acidic media**

Final equation	

3- $HNO_3 + H_2S \dashrightarrow NO + S + H_2O$

Final equation	

A- Identify the acid-base conjugate pairs in each of these reactions:

1- $HClO + CH_3NH_2 \rightleftharpoons CH_3NH_3^+ + ClO^-$

2- $CO_3^{2-} + H_2O \rightleftharpoons HCO_3^- + OH^-$

B- Compare the strengths of the following pairs of acids:

1- H_2SO_4 and H_2SeO_4.

2- HNO_3 and HNO_2.

3- H2O and H2S.

C- Complete the following sentences:

1. In 2s subshell, 2 denotes the value of .....number, and s denote the symbol of .....number.
2. The ground state electron configuration of Cs represented by noble gas core is.....
3. The elements in which the differentiating electron is filled in the f subshells are called.....
4. Group ..... have the highest electron affinity values, while groups .....and.....have the lowest electron affinity.
5. .....is defined as the energy required to completely separate one mole of a solid ionic compound into gaseous ions.
6. The name of P_4O_6 is....., while the molecular formula of boron trichloride is.....
7. When the overall enthalpy change in the formation of the solution (ΔH_{soln}) is negative, this means that overall process of solution formation is.....

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