Faculty of Computers & Artificial Intelligence, Benha University

Student Name: ……………………………………

Seat Number: ……………………………………

Academic Year: ………….. / …………..

■ **First Semester** □ **Second Semester** □ **Summer**

Program Name: ………………………………………………

Course Name: …………………………………………………

Exam Date: ……./……./ …………..

Question No	Marks attained	Full Mark	Examiner
Q1		10	
Q2		13	
Q3		17	
Q4		10	
Q5			
Q6			
Q7			
Q8			
Q9			
Q10			
Total For written exam		50	
Class Work			
TOTAL MARKS			

Total Marks

Total Marks (in Letters)	………………………………………………………………………..		
Examination Committee	Examiner No. 1	Examiner No. 2	Examiner No. 3

Faculty of Computers & Artificial Intelligence

1st Term (January 2022) Final Exam
Medical Informatics Program
Course Code: MBS151   Level: 1st level
Subject: Principles of Chemistry

Benha University
Date: 3 / 2 /2022
Time: 3 Hours
Total Marks: 50 Marks
Examiner(s): Prof. Dr. Alaa S. Amin
Dr. Hesham El-Feky

Answer the following questions [4 questions in 4 pages]:

Question No. 1	[10 Marks]

Calculate and draw the Lewis structure for the following ions: (10 marks)

- NH_4^+ [atomic number of (N= 7) and (H= 1), N-atom is the central atom].

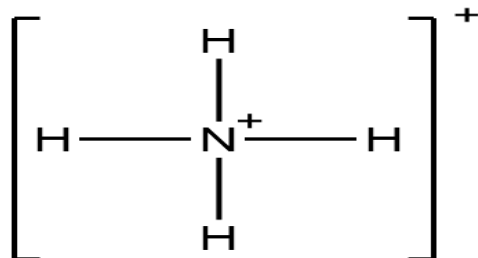- BF_4^- [atomic number of (F= 9) and (B= 5), B-atom is the central atom].

NH_4^+

VE=5+4-1=8 electrons
For saturated state=1*8+4*2=16 electrons
Shared elect.= 16-8= 8 electrons
Number of bonds= 8/2 = 4 bonds
Unshared= 8-8 = 0 electrons

Formal charge of N = 5-4-0= +1
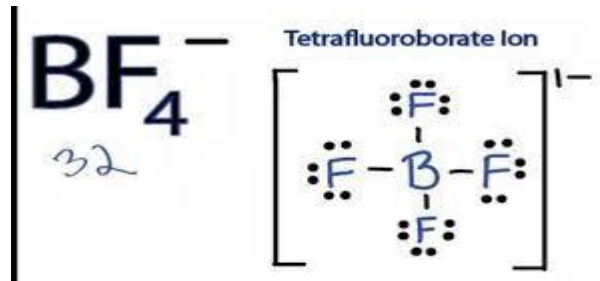Formal charge of each H = 1-1-0 = 0

BF_4^-

VE=3+4*7+1=32 electrons
For saturated state=5*8+0*2=40 electrons
Shared elect. = 40-32= 8 electrons
Number of bonds= 8/2 = 4 bonds
Unshared= 32-8 = 24 electrons

Tetrafluoroborate Ion

Formal charge of B = 3-4-0= -1
Formal charge of each F = 7-1-6 = 0

- ## Choose the correct answer

1- sulphur dioxide has
   a) No resonance structure   b)- Three resonance structure
   c) Four resonance structure   d) Two resonance structure

2- Formal charge equal to
   a- Group number plus number of bond minus number of unshared electron
   b- Group number minus number of bond plus number of unshared electron
   c- Group number minus number of bonds minus number of unshared electron
   d- Number of bond minus group number minus number of unshared electron

3- According to Lewis structure nitric acid has
   a) No resonance structure   b) Three resonance structure
   d) Four resonance structure   d) Two resonance structure

4- The force of the gas that the gas exerts on the walls of the container divided by the surface area of the container is called the …… of gas
   a- pressure   b- volume   c- surface area   d- none of these

5- A gas occupies 180 mL under a pressure of 1.5 atm if the temp. is held const, at 1 atm the gas will occupy…….mL
   a-270   b- 540   c- 200   d- none of these

6- At 45 $°C$, N_2 gas occupies 159 mL. if the temperature of it is decreased to zero $°C$, it will occupy ….. mL at constant pressure.
   a-68.25   b- 136.5   c- 220   d- none of these

7- The pressure of 0.5 mole Cl_2 gas that occupies 10 L container at 100 $°C$, equals….
   a- 0.766 atm   b- 50 atm   c- 1.532 atm   d- none of these

8- The weight of one liter NH_3 gas at 100 $°C$ and 2.5 atm equals …..
   a- 0.766 gm   b- 150 gm   c- 1.276 gm   d- none of these

9- the density of bromine gas (Cl_2) at STP equals…..   (Atomic weight of Cl =35.5)
   a- 0.003 gm/ml   b- 1.5 gm/ml   c- 1.207 gm/ml   d- none of these

10- what volume of O_2 is required to react with 30 L C_2H_6 if all gases are measured at same temperature and pressure according to the following reaction:

$$2C_2H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$$
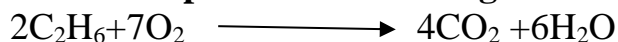
a- 105 L   b- 225 L   c- 50 L   d- none of these

11- a mixture of 32 gm of O_2+28 gm of N_2 has a total pressure 1.2 atm. The partial pressure of O_2 equals ……   (Atomic weight of O =16 g & N=14 g)

a- 1 atm   b- 0.6 atm   c- 2.4 atm   d- none of these

12- 10 L container is filled with a gas under a pressure of 1 atm at 0°C, at what temperature will the pressure inside the container to be 5 atm

a- 1365 K   b- 50 K   c- 200K   d- none of these

13- How many grams of Fe are needed to produce 200 L of H_2 at STP according to the following equation: $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$ (Atomic weight of Fe =56 g)

a- 750.5 g   b- 375.2 g   c- 240.3 g   d- none of these

Question No. 3 (True or false)   **[17 marks]**

1- Any two or more gases can be mixed in any propotions to prepare uniform mixture. (√)

2- gas can be easily compressesd as it consists of widely separated molecules (√)

3- Boyle stated that the pressure of the gas is directly proportional to its volume at constant temperature (X)

4- The volume of gas is inversely proportional to its temperature at constant pressure (X)

5- the pressure of the gas is directly proportional to its temperature at constant volume (√)

6- 1 mole of a gas occupies half volume that 2 moles of this gas at fixed pressure and temperature (√)

7- the number of moles of the gas varies directly with its volume at constant temperature and pressure (√)

8- The actual volume of the individual molecules of the gas is negligible compared to the whole volume of the gas (√)

9- Equal volumes of all gases at the same temperature and pressure contain the same number of molecules (√)

10- A mole of N_2 occupies the same volume as a mole of O_2 will occupy at the same Temp and pressure (√)

11- the molecular weight of the gas equals the weight of 242 L of it at STP (X)

12- the total pressure of a mix of two gases equals the sum of the partial pressures of the two gases if they can react with each other (X)

13- mixing of two gases or more than two doesn't change the average kinetic energy of any of these mixed gases at the same temperature (√)

14- the number of moles of any gas is the ratio between its weight and its volume (X)

15- the unit of pressure is called Pascal which equals $Kg/m.S^2$ (√)

16- the gas molecules expand to fill its container (√)

17- the molecules of any gas can easily fit between the molecules of another gas (√)

Question No. 4   [10 marks]

a) **Glucose compound contains 40% C, 6.73% H and the rest is O. If its molecular weight is 180, what is its molecular formula? (atomic weight of (C=12), (H=1) and (O=16)**

$$C \quad : \quad H \quad : \quad O$$
$$40 \quad : \quad 6.73 \quad : \quad 53.27$$
$$3.33 \text{ mole} : \quad 6.73 \text{ mole} : \quad 3.3 \text{ mole}$$
$$1 \quad : \quad 2 \quad : \quad 1$$

Empirical formula = CH_2O empirical weight= 12+2+16= 30

Molecular formula = n * empirical formula.

180   =   n * 30

N= 6

Molecular formula = 6* CH_2O = $C_6H_{12}O_6$

b) **How many moles of H_2 can be theoretically prepared from the reaction between 12 moles of Fe and 16 moles of H_2O according to the following equation:**

$$3Fe + 4 H_2O \longrightarrow Fe_3O_4 + 4H_2$$

LF of Fe = 12/3= 4

LF of H_2O = 16/ 4 = 4

Thus any of them can be take in calculations

3Fe…………………………4 H_2

12 Fe…………………….X   x = 16 moles

4H_2O…………………………4 H_2

16 H_2O…………………….x   x= 16 moles

GOOD LUCK,

Prof . Dr. Alaa S. Amin
Dr. Hesham H. El-Feky