11. The solution must be

a) Homogenous b) Transparent c) Both of a and b d) None of these

12. Number of moles of solute dissolved in 1 kilogram of solvent is

a) Molality b) Molarity c) mass/mass percentage d) mass/volume percentage

13. The Free energy change (ΔG) in equilibrium has

a) –ve value b) +ve value c) zero value d) Δn value

14. The solubility of gas in liquid increase by

a) Increase temperature b) increase pressure c) gas density d) all of them

15. The system, which **does not allow** the transfer of either mass or energy is

a) Closed system b) open system c) Isolated system d) a and c

Answer

1. A
2. A
3. C
4. C
5. B
6. A
7. A
8. B
9. B
10. C
11. C
12. A
13. C
14. B
15. C

Question 2 (5 marks)

A sample of solid potassium chlorate ($KClO_3$) was heated in a test tube and decomposed by the following reaction

$$2KClO_{3(S)} \rightarrow 2KCl_{(S)} + 3O_{2(g)}$$

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The oxygen produced was collected at 22 °C and a pressure of 733 torr. The volume of the gas collected was 650 mL, ***Calculate***

a. Partial pressure of O_2
b. The mass of $KClO_3$ (*Mol. Wt.* = 122.6 g/mol) in the sample that was decomposed.

Answer

Since $P_{Total} = P_{O2} + P_{H2O}$

So 754 torr = P_{O2} + 21 torr

P_{O2} = 733 torr = 733/760 = 0.964 atm

Calculation of mass of $KClO_3$

Since $P_{O2}V = n_{O2}RT$

So $n_{O2} = P_{O2}V/RT = 0.964(0.65)/0.08206(295) = 0.02259$ mol

Since

$$2KClO_3 \longrightarrow 3O_2$$
$$\textbf{2 mol} \longrightarrow \textbf{3 mol}$$
$$\textbf{x mol} \longrightarrow \textbf{0.02259 mol}$$

So number of moles of $KClO_3$ = 0.02259 (2)/3 = 0.0173 mole

Since mass of $KClO_3 = n_{KClO3} \times Mol.\ Wt_{KClO3}$

Mass of $KClO_3$ = 0.0173 x 122.6 = 2.12 g

Question 3 (3 marks)

An aqueous solution is 2 molar urea (Molecular weight of urea = 60 g/mol). The density of the solution is 1.029 g/mL. What is the molal concentration of urea in the solution?

Answer

Since molality = $\frac{1000 \times Molarity}{(1000 \times denisty) - (Molarity \times Molecular\ weight)} = \frac{1000 \times 2}{(1000 \times 1.029) - (2 \times 60)} = 2.2$ molar

Question 4 (2 marks)

The work done when a gas is compressed in a cylinder is 462 J. During this process, there is a heat transfer of 128 J from the gas to the surroundings. Calculate the energy change for this process.

Answer

$$\Delta E = Q + W = -128\ J + 462\ J = 334\ J$$

With my best wishes

Associate Professor Dr: Khaled Samir Mohammed

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Choose the correct answer **[15 marks, one mark for each point]**

1. The mixing of different gases by random molecular motion with frequent collisions

a) Diffusion b) Fission c) Effusion d) a and c

2. The work done in the system equal zero

a) Isochoric process b) Isoenthalpic process c) Isobaric process d) Isothermal process

3. The gas which has highest rate of diffusion is

a) N_2 b) O_2 c) H_2 d) CH_4

4. All of these are state functions except

a) Enthalpy b) Entropy c) Heat d) Temperature

5. The intensive property is depending on

a) Mass of matter b) Type of matter c) Both a and b d) None of them

6. The internal energy equal the work done in

a) Adiabatic process b) Isobaric Process c) Isothermal process d) Isochoric process

7. The deviation of gases from ideal behavior may occur due to

a) High pressure b) higher temperature c) both a and b d) None of them

8. The following reaction is spontaneous at

$$2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_2 \qquad \Delta H^o = -566\ kJ/mol$$

a) Higher temperature b) lower temperature c) All temperatures d) a and b

9. The internal energy for the reaction in question 8 equal

a) +563.5 kJ/mol b) -563.5 KJ/mol c) -563..5 J/mol d) +563..5 J/mol

10. The relation between partial pressure of individual gas in a gas mixture and total pressure is given by

a) Graham law b) Van-Der Waaal equation c) Dalton law d) Amagat's law