विद्या सर्वार्थि साधिका

ANANDALAYA

PERIODIC TEST -1

Class: XI

Subject: Chemistry (043) MM : 40

Date : 23-07-2024 Time: 1 Hr. 30 min.

General Instructions:

(1) There are 20 questions in all. All questions are compulsory.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.

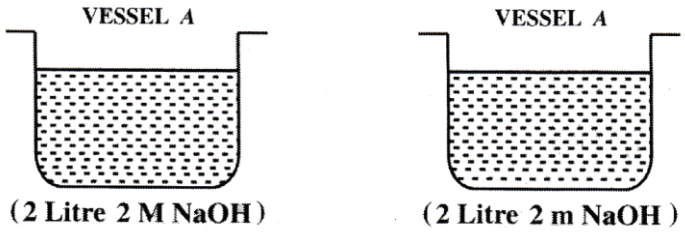
(3) Section A consists of twelve MCQs of 1 mark each, Section B consists of two very short answer questions of 2 marks each, Section C consists of two questions short answer type of 3 marks each, Section D consists of two long answer type questions of 5 marks each and Section E consists two case study-based questions of 4 marks each.

(4) There is no overall choice. However, an internal choice has been provided in section D and E. You have to attempt only one of the choices in such questions.

(5) Use of calculators is not allowed.

SECTION A

1. (1)



Which of the following statements is correct for the solution expressing above concentration?

(A) Concentration of A is less than that of B.

(B) Concentration of A is more than that of B.

(C) Concentration of both the solutions will be the same.

(D) Comparison of concentration is not possible.

2. A solution is prepared by adding 60 g of methyl alcohol to 120 g of water. What will be the mole fraction of methanol in the solution? (H = 1u, C = 12u, O =16u) (1)

(A) 0. 780 (B) 7.80 (C) 0.220 (D) 2.20

3. The number of molecules in 1 lit. of water is _____. (1)

(A) 18 (B) 18 × N (C) 55.5 (D) 55.5 × N

(Here, N = Avogadro's no.)

4. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much? (Mg = 24u, O = 16u) (1)

(A) Mg, 0.44g (B) O_2, 0.16g (C) Mg, 0.16g (D) O_2, 0.28g

5. What is the stoichiometric coefficient of Ca in the reaction $3Ca + 2Al^{+3} \rightarrow 3Ca^{+2} + 2Al$? (1)

(A) 2 (B) 1 (C) 3 (D) 4

6. Which of the following has the largest number of atoms? (Cu =63.5u) (1)

(A) 6.35 gm of Cu (B) 0.635 gm of Cu

(C) 0.25 moles of Cu (D) 63.5 × 10^{-3} kg of Cu

7. If 500 mL of a 5 M solution is diluted to 1500 mL, what will be the molarity of the solution obtained? (1)
(A) 1.5 M (B) 1.66 M (C) 0.017 M (D) 1.59 M

8. In which case is the number of molecules of water maximum? (1)
(A) 0.00224 L of water vapours at 1 atm and 273 K (B) 0.18 g of water
(C) 18 mL of water (D) 10^{-3} mole of water

9. Which of the following statements about the molecular formula is correct? (1)
(A) Molecular formula shows the exact number of different types of atoms present in a molecule.
(B) Molecular formula can be obtained from empirical formula if molar mass is known.
(C) Percentage composition of a compound can be calculated from its molecular formula.
(D) All the above statements are correct.

10. A student performs a neutralization reaction in a laboratory. The below reaction shows the same: (1)

$$H_3PO_{3\,(aq.)} + 2KOH_{\,(aq.)} \rightarrow K_2HPO_{3\,(aq.)} + 2H_2O_{\,(l)}$$

What will be the amount of 0.1 M KOH required to neutralize 20 ml of 0.1 M H_3PO_3 aqueous solution?
(A) 40 ml (B) 20 ml (C) 10 ml (D) 60 ml

For question numbers 11 and 12, select the correct answer from the codes (A), (B), (C) and (D) as given below.
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(C) (A) is true but (R) is false
(D) (A) is false but (R) is true.

11. Assertion (A): The empirical mass of ethene is half of its molecular mass. (1)
Reason (R): The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

12. Assertion (A): Atomicity of oxygen is 2. (1)
Reason (R): 1 mole of an element contains 6.023×10^{23} atoms.

SECTION B

13. (a) What is the mass of sulphuric acid in gram present in 0.25 mole of H_2SO_4? (2)
(b) Find out the total number of atoms present in 1 mole HNO_3.
(Atomic mass H = 1u, S = 32 u, O = 16 u, N = 14 u)

14. (a) Answer the following questions. (2)
(i) Calculate the number of significant figures in the following value.
Avogadro number - 6.23×10^{23}
(ii) Express the results of the following calculations to the appropriate number of significant figures.

$$\frac{(1.36\times10^{-4})(0.5)}{2.6}$$

(b) Express the following up to three significant places.
(i) The height of a man, 5 feet 9 inches in centimeters. (1 inch = 2.54)
(ii) Decimal equivalent of 2/3.

SECTION C

15. (a) Will the molarity of a solution at 50°C be same, less or more than molarity at 25°C? (3)
(b) Sulphuric acid is generally available in market as 18.0 M solution. How would you prepare 250 mL 0.50 M aqueous H_2SO_4?

16. 3.0 g of H_2 react with 29.0 g of O_2 to yield H_2O. (3)
(i) Which is the limiting reactant?
(ii) Calculate the maximum amount of H_2O that can be formed.
(iii) Calculate the amount left if one of the reactants is in excess.

SECTION D

17. (a) A vessel contains 1.6 g of dioxygen at STP (273.15K, 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes half of the original pressure. Calculate the volume of the new vessel. (5)

(b) The density of 3 molal solution of NaOH is 1.110 g mL^{-1}. Calculate the molarity of the solution.

OR

(a) If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in whole number ratio.
(i) Is this statement true?
(ii) If yes, according to which law?
(iii) Give one example related to this law.

(b) Calculate the mass percent of calcium, phosphorus and oxygen in calcium phosphate $Ca_3(PO_4)_2$. (Ca = 40u, P = 31u, O = 16u)

18. (a) A jug contains 2 L of milk. Calculate the volume of milk in m^3. (5)
(b) How many molecules and atoms of sulphur are present in 0.1 mole of S_8 molecules?
(c) If 11 g of oxalic acid are dissolved in 500 mL of solution (density = 1.1 g mL^{-1}), what is the mass % of oxalic acid in solution?

SECTION E

Questions 19 and 20 are Case Study Based questions and are compulsory. Each question carries 4 marks.

19. A balanced chemical equation gives the identity of the reactants and the products as well as the accurate number of molecules or moles of each that are consumed or produced. **Stoichiometry** is a collective term for the quantitative relationships between the masses, the numbers of moles, and the numbers of particles (atoms, molecules, and ions) of the reactants and the products in a balanced chemical equation. **A stoichiometric quantity** is the amount of product or reactant specified by the coefficients in a balanced chemical equation. This section describes how to use the stoichiometry of a reaction to answer questions like the following: How much oxygen is needed to ensure complete combustion of a given amount of isooctane? (This information is crucial to the design of non-polluting and efficient automobile engines.) How many grams of pure gold can be obtained from a ton of low-grade gold ore? (The answer determines whether the ore deposit is worth mining.) If an industrial plant must produce a certain number of tons of sulfuric acid per week, how much elemental sulphur must arrive by rail each week?
All these questions can be answered using the concepts of the mole, molar and formula masses, and solution concentrations, along with the coefficients in the appropriate balanced chemical equation.
(i) Why is it essential to balance a chemical equation? (1)

(ii) Calculate the volume of oxygen gas at STP that can be produced by 12.25g of $KClO_3$. (1)

$2KClO_3 \rightarrow 2KCl + 3O_2$ (K = 39u, Cl = 35.5u, O = 16u)

(iii) 0.5 mole each of H_2S and SO_2 are mixed together in a reaction flask, react according to equation: (2)

$$2H_2S+SO_2 \rightarrow 2H_2O+3S.$$

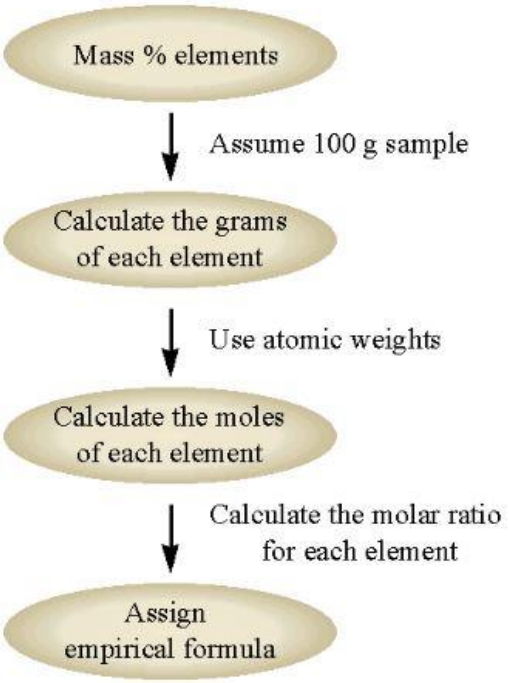
Calculate the number of moles of Sulphur formed. (S = 32u, O = 16u)

OR

(iii) 56 kg of N_2 (g) and 10 kg of H_2 are mixed to produce NH_3 (g). Calculate the amount of NH3(g) formed. (Assume the reaction goes to completion)

$$N_2(g)+3H_2(g) \rightarrow 2NH_3(g)$$ (N = 14u, H = 1u)

20. There are three main types of chemical formulae: empirical, molecular and structural. Empirical formulas show the simplest whole-number ratio of atoms in a compound, molecular formulas show the number of each type of atom in a molecule, and structural formulas show how the atoms in a molecule are bonded to each other.
The chemical formula for a compound obtained by composition analysis is always the empirical formula. We can obtain the chemical formula from the empirical formula if we know the molecular weight of the compound. The chemical formula will always be some *integer multiple* of the empirical formula (i.e. integer multiples of the subscripts of the empirical formula). The general flow for this approach is shown in Figure.



(i) What is the empirical formula of Benzene? (1)

(ii) Can empirical formula and molecular formula be same? If yes, give one example. (1)

(iii) Mercury forms a compound with chlorine that is 73.9% mercury and 26.1% chlorine by mass. What is the empirical formula? (Hg = 200.5 u, Cl = 35.5 u) (2)

OR

(iii) A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What will be its molecular formula is empirical formulas is CH_2Cl?
(H = 1u, Cl = 35.5u, C = 12u)