CBSE Test Paper 01

Chapter 03 Atoms and Molecules

1. A sample of $CaCO_3$ contains 3.01×10^{23} ions of Ca^{+2} and CO_3^{-2}. The mass of the sample is: **(1)**

   a. 200 g
   b. 50 g
   c. 100 g
   d. 5 g

2. SO_3 is **(1)**

   a. acidic
   b. amphoteric
   c. basic
   d. neutral

3. When dilute sulphuric acid is added to zinc granules, we observe that: **(1)**

   a. the container remains cool
   b. the reaction mixture turns yellow
   c. bubbles start coming from the surface of the zinc granules
   d. a precipitate is formed

4. The number of molecules in $CuSO_4.5H_2O$ bonded by H-bond is **(1)**

   a. 5
   b. 3
   c. 2
   d. 1

5. The maximum number of electrons in L shell is: **(1)**

   a. 38

b. 28
c. 18
d. 8

6. An element X has valency 3 while the element Y has valency 2. Write the formula of the compound formed by X and Y. **(1)**

a. X_2Y_2
b. X_3Y_3
c. XY
d. X_2Y_3

7. Define atomic mass unit **(1)**

8. How many atoms are present in a: **(1)**

a. H_2S molecule and
b. PO_4^{3-} ion?

9. Name the Indian philosopher who proposed the theory of matter. **(1)**

10. Find the ratio by mass of the elements present in the molecule of hydrogen sulphide (H_2S). Given that, atomic mass S = 32, H = 1. **(1)**

11. What is the difference between H_2 and 2H? **(3)**

12. Calculate the number of moles in the following : **(3)**

i. 28g He
ii. 46g of Na.
iii. 60 g of Ca.

Given the gram atomic mass of

i. He = 4 g
ii. Na = 23 g
iii. Ca = 40g.

13. Calculate the molar mass of ethyl alcohol (C_2H_5OH). **(3)**

14. Write the chemical formulae of the following. **(5)**

i. Magnesium chloride
ii. Calcium oxide
iii. Copper(II) nitrate
iv. Aluminium chloride
v. Calcium carbonate.

15. Write an experiment to show that cathode rays travel in straight line? **(5)**

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Answers

1. b. 50 g

   Explanation: The mass of one mole of $CaCO_3$ is equal to 100 g. 6.022×10^{23} ions are equivalent to one mole. Therefore, mass of 3.01×10^{23} ions will be equivalent to (100 / 2) g or 50 g.

2. a. acidic

   Explanation: Molecules whose Lewis structures indicate an atom to have an octet as a result of the formation of one or more multiple bonds will often function as Lewis acids. Examples are CO_2, SO_3, SO_2.

   SO_3 is acidic in nature as it is non-metallic oxide.

3. c. bubbles start coming from the surface of the zinc granules

   Explanation: Zinc reacts with dil. H_2SO_4 to form H_2 gas and we observe bubbles start coming from the surface of the zinc granules.

   $Zn(s) + H_2SO_4 \rightarrow ZnSO_4(aq) + H_2(g)$

   This reaction is exothermic and hence heat is evolved in the reaction.

4. d. 1

   Explanation: One molecule of water is linked by H-bond because only one molecule of water is present outside the coordination sphere.

5. d. 8

   Explanation: L shell can accomodate a maximum of 8 electrons.

6. d. X_2Y_3

   Explanation: The formula of an ionic compound is formed by interchanging the valencies of the constituent atoms. The formula of the compound having atoms of X and Y is X_2Y_3. The valency (2) of Y forms the subscript of X and the valency (3) of X forms the subscript of Y.

7. Atomic mass unit may be defined as:

The mass of one twelfth (1/12) of the mass of one atom of carbon taken as 12u. It is represented as 1u.

8. i. 2 atoms of hydrogen + 1 atom of sulphur = 3 atoms. Hence 3 atoms are present in an H_2S molecule.

   ii. 1 atom of phosphorus + 4 atoms of oxygen = 5 atoms. Hence 5 atoms are present in an ion.PO_4^{3-}

9. Kanad proposed the theory of matter around 600 BC.

10. atomic mass of sulphur S = 32 u
    atomic mass of hydrogen H = 1u
    the ratio by mass of the elements present in the molecule of hydrogen sulphide (H_2S)
    = mass of hydrogen atom present in the compound : the mass of the sulphur atom present compound
    = $2 \times 1 : 32 = 2 : 32 = 1 : 16$

11. H_2 represents one molecule of H_2 (hydrogen gas) whereas 2H represents two separate atoms of hydrogen.

12. i. 28 g of He
    The no. of moles
    $= \frac{\text{Mass of He in grams}}{\text{Gram atomic m ass}} = \frac{m}{M} = \frac{(28\text{g})}{(4\text{g})} = 7$ mol

    ii. 46 g of Na
    The no. of moles
    $= \frac{\text{Mass of Na in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(46g)}{(23g)} = 2$ mol

    iii. 60 g of Ca
    The no. of moles
    $= \frac{\text{Mass of Ca in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(60\text{g})}{(40\text{g})} = 1.5$ mol

13. molar mass of C_2H_5OH
    = (2 × Atomic mass of C) + (6 × Atomic mass of H) + (1 × Atomic mass of O)
    ={(2 × 12)+(6 × 1)+(1× 16)} u
    = {24 + 6 + 16} u

= 46u

14. chemical formulae of

a. **Magnesium chloride**

Symbols; Mg Cl

Valencies: 2 1

cross-over valencies

Mg_1Cl_2 or $MgCl_2$

Thus, the formula of magnesium chloride is $MgCl_2$.

b. **Calcium oxide**

Symbols; Ca O

Valencies: 2 2

cross-over valencies

Ca_2O_2 or CaO

Thus, the formula ofCalcium oxide is CaO.

c. **Copper(II) nitrate**

Symbols; Cu NO_3

Valencies: 2 1

cross-over valencies

$Cu_{1(}NO_{3)2}$ or $Cu(NO_3)_2$

Thus, the formula of copper nitrate is $Cu(NO_3)_2$.

d. **Aluminium chloride**

Symbols; Al Cl

Valencies: 3 1

cross-over valencies

Al_1Cl_2 or $AlCl_2$

Thus, the formula of Aluminium chloride is $AlCl_2$.

e. **Calcium carbonate.**

Symbols; Ca CO_3

Valencies: 2 2

cross-over valencies

$Ca_2(CO_3)_2$ or $CaCO_3$

Thus, the formula of Calcium carbonate is $CaCO_3$.

15. Experiment to show that cathode rays travel in the straight line:-

a. Take a discharge tube coated with a fluorescent substance
b. Place an opaque object in the path of the cathode rays.
c. When cathode rays were made to pass through the discharge tube then discharge the glowed wherever cathode rays fall except in the region of the shadow of the opaque object.
d. The above experiment shows that cathode rays travel in the straight line.