

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 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ 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 ($\text{C}_2\text{H}_5\text{OH}$). **(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.

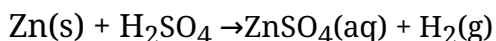
2. a. acidic

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.



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 accommodate 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

$$= \frac{\text{Mass of He in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(28\text{g})}{(4\text{g})} = 7 \text{ mol}$$

ii. 46 g of Na

The no. of moles

$$= \frac{\text{Mass of Na in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(46\text{g})}{(23\text{g})} = 2 \text{ mol}$$

iii. 60 g of Ca

The no. of moles

$$= \frac{\text{Mass of Ca in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(60\text{g})}{(40\text{g})} = 1.5 \text{ mol}$$

13. molar mass of $\text{C}_2\text{H}_5\text{OH}$

$$= (2 \times \text{Atomic mass of C}) + (6 \times \text{Atomic mass of H}) + (1 \times \text{Atomic mass of O})$$

$$= \{(2 \times 12) + (6 \times 1) + (1 \times 16)\} \text{ u}$$

$$= \{24 + 6 + 16\} \text{ u}$$

= 46u

14. **chemical formulae of**

a. **Magnesium chloride**

Symbols; Mg Cl

Valencies: 2 1

cross-over valencies

Mg₁Cl₂ or MgCl₂

Thus, the formula of magnesium chloride is MgCl₂.

b. **Calcium oxide**

Symbols; Ca O

Valencies: 2 2

cross-over valencies

Ca₂O₂ or CaO

Thus, the formula of Calcium oxide is CaO.

c. **Copper(II) nitrate**

Symbols; Cu NO₃

Valencies: 2 1

cross-over valencies

Cu₁(NO₃)₂ or Cu(NO₃)₂

Thus, the formula of copper nitrate is Cu(NO₃)₂.

d. **Aluminium chloride**

Symbols; Al Cl

Valencies: 3 1

cross-over valencies

Al₁Cl₃ or AlCl₃

Thus, the formula of Aluminium chloride is AlCl₃.

e. **Calcium carbonate.**

Symbols; Ca CO₃

Valencies: 2 2

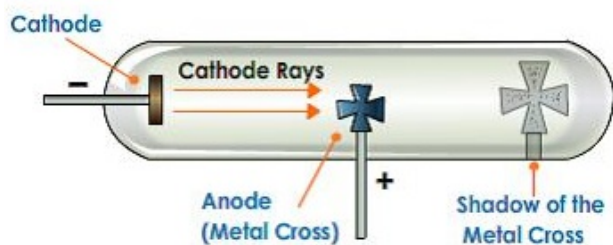
cross-over valencies

$\text{Ca}_2(\text{CO}_3)_2$ or CaCO_3

Thus, the formula of Calcium carbonate is CaCO_3 .

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

- Take a discharge tube coated with a fluorescent substance
- Place an opaque object in the path of the cathode rays.
- 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.
- The above experiment shows that cathode rays travel in the straight line.



Cathode Rays Cast Shadows of the Objects Placed in their Path