In TEXT Questions Page 27 and 28

1. In a reaction, 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass.
Sodium carbonate + ethanoic acid → sodium ethanoate + carbon dioxide + water
Answer:
In the given reaction, sodium carbonate reacts with ethanoic acid to produce sodium ethanoate, carbon dioxide, and water.
Sodium Carbonate + Ethanoic acid → sodium ethanoate + carbon dioxide + water
Mass of sodium carbonate = 5.3 g (Given)
Mass of ethanoic acid = 6 g (Given)

Mass of sodium ethanoate = 8.2 g (Given)
Mass of carbon dioxide = 2.2 g (Given)
Mass of water = 0.9 g (Given)
Now, total mass before the reaction = (5.3 + 6) g = 11.3 g
And, total mass after the reaction = (8.2 + 2.2 + 0.9) g
= 11.3 g
∴ Total mass before the reaction = Total mass after the reaction
Hence, the given observations are in agreement with the law of conservation of mass.

2. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?
Answer:
It is given that the ratio of hydrogen and oxygen by mass to form water is 1:8.
Then, the mass of oxygen gas required to react completely with 1 g of hydrogen gas is 8 g.
Therefore, the mass of oxygen gas required to react completely with 3 g of hydrogen gas is 8 × 3 g = 24 g.

3. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?
Answer:
The postulate of Dalton :"Atoms are indivisible particles, which can not be created or destroyed in a chemical reaction" is the result of the law of conservation of mass.

4. Which postulate of Dalton's atomic theory can explain the law of definite proportions?
Answer:
The postulate of Dalton, "The relative number and kinds of atoms are constant in a given compound", can explain the law of definite proportions.

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1. Define atomic mass unit.
Answer:
Mass unit equal to exactly one-twelfth the mass of one atom of carbon-12 is called one atomic mass unit. It is written as 'u'.

2. Why is it not possible to see an atom with naked eyes?
Answer:
The size of an atom is so small that it is not possible to see it with naked eyes. Also, the atom of an element does not exist independently.

In TEXT Questions Page 34

1. Write down the formulae of
(i) sodium oxide
Answer: Na_2O
(ii) aluminium chloride
Answer: $AlCl_3$
(iii) sodium sulphide
Answer: Na_2S
(iv) magnesium hydroxide
Answer: $Mg(OH)_2$

2. Write down the names of compounds represented by the following formulae:
(i) $Al_2(SO_4)_3$
Answer: Aluminium sulphate
(ii) $CaCl_2$
Answer: Calcium chloride
(iii) K_2SO_4
Answer: Potassium sulphate

(iv) KNO_3
Answer: Potassium nitrate
(v) $CaCO_3$
Answer: Calcium carbonate

3. What is meant by the term chemical formula?
Answer:
The chemical formula of a compound is a symbolic representation of its composition.

4. How many atoms are present in a
(i) H_2S molecule and
(ii) PO_4^{3-} ion?
Answer:
(i) In an H_2S molecule, three atoms are present; two of hydrogen and one of sulphur.
(ii) In a PO_4^{3-} ion, five atoms are present; one of phosphorus and four of oxygen.

In TEXT Questions Page 35

1. Calculate the molecular masses of H_2, O_2, Cl_2, CO_2, CH_4, C_2H_6, C_2H_4, NH_3, CH_3OH.
Answer:
Molecular mass of H_2= 2 × Atomic mass of H
= 2 × 1
= 2 u
Molecular mass of O_2= 2 × Atomic mass of O
= 2 × 16
= 32 u
Molecular mass of Cl_2= 2 × Atomic mass of Cl
= 2 × 35.5
= 71 u
Molecular mass of CO_2= Atomic mass of C + 2 × Atomic mass of O
= 12 + 2 × 16
= 44 u
Molecular mass of CH_4= Atomic mass of C + 4 × Atomic mass of H
= 12 + 4 × 1
= 16 u
Molecular mass of C_2H_6= 2× Atomic mass of C + 6× Atomic mass of H
= 2 × 12 + 6 × 1
= 30 u
Molecular mass of C_2H_4= 2 x Atomic mass of C + 4 × Atomic mass of H
= 2 × 12 + 4 × 1
= 28 u
Molecular mass of NH_3 = Atomic mass of N + 3 × Atomic mass of H
= 14 + 3×1
= 17 u
Molecular mass of CH_3OH= Atomic mass of C + 3 × Atomic mass of H + Atomic mass of O + Atomic mass of H
= 12 + 3×1 + 8 + 1
= 24 u

2. Calculate the formula unit masses of ZnO, Na_2O, K_2CO_3, given atomic masses of Zn = 65 u, Na = 23 u, K = 39 u, C = 12 u, and O = 16 u.
Answer:
Formula unit mass of ZnO = Atomic mass of Zn + Atomic mass of O
= 65 + 16
= 81 u
Formula unit mass of Na_2O = 2 × Atomic mass of Na + Atomic mass of O
= 2 × 23 + 16
= 62 u
Formula unit mass of K_2CO_3= 2 × Atomic mass of K + Atomic mass of C + 3 × Atomic mass of O
= 2 × 39 + 12 + 2 × 16
= 78 + 12 + 32
= 122 u

1. A 0.24 g sample of compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the compound by weight.
Answer:
Total mass of Compound = 0.24 g (Given)
Mass of boron = 0.096 g (Given)
Mass of oxygen = 0.144 g (Given)
Thus, percentage of boron by weight in the compound = 0.096 / 0.24 × 100%
= 40%
And, percentage of oxygen by weight in the compound = 0.144 / 0.24 × 100% = 60%

2. When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combinations will govern your answer?
Answer:
3.0 g of carbon combines with 8.0 g of oxygen to give 11.0 of carbon dioxide.

If 3 g of carbon is burnt in 50 g of oxygen, then 3 g of carbon will react with 8 g of oxygen. The remaining 42 g of oxygen will be left un-reactive. In this case also, only 11 g of carbon dioxide will be formed.
The above answer is governed by the law of constant proportions.

3. What are polyatomic ions? Give examples?
Answer:
A polyatomic ion is a group of atoms carrying a charge (positive or negative). For example, Nitrate (NO3-) , hydroxide ion (OH –).

4. Write the chemical formulae of the following:
(a) Magnesium chloride
Answer: MgCl2
(b) Calcium oxide
Answer: CaO
(c) Copper nitrate
Answer: Cu (NO3)2
(d) Aluminium chloride
Answer: AlCl3
(e) Calcium carbonate
Answer: CaCO3

5. Give the names of the elements present in the following compounds:
(a) Quick lime
Answer: Calcium and oxygen
(b) Hydrogen bromide
Answer: Hydrogen and bromine
(c) Baking powder
Answer: Sodium, hydrogen, carbon, and oxygen
(d) Potassium sulphate
Answer: Potassium, sulphur, and oxygen

6. Calculate the molar mass of the following substances:
(a) Ethyne, C2H2
Answer: Molar mass of ethyne, C2H2 = 2 × 12 + 2 × 1 = 26 g
(b) Sulphur molecule, S8
Answer: Molar mass of sulphur molecule, S8 = 8 × 32 = 256 g
(c) Phosphorus molecule, P4 (atomic mass of phosphorus = 31)
Answer: Molar mass of phosphorus molecule, P4 = 4 × 31 = 124 g
(d) Hydrochloric acid, HCl
Answer: Molar mass of hydrochloric acid, HCl = 1 + 35.5 = 36.5 g
(e) Nitric acid, HNO3
Molar mass of nitric acid, HNO3 = 1 + 14 + 3 × 16 = 63 g

7. What is the mass of-
(a) 1 mole of nitrogen atoms?
(b) 4 moles of aluminium atoms (Atomic mass of aluminium = 27)?
(c) 10 moles of sodium sulphite (Na2SO3)?Answer:
(a) The mass of 1 mole of nitrogen atoms is 14 g.
(b) The mass of 4 moles of aluminium atoms is (4 × 27) g = 108 g
(c) The mass of 10 moles of sodium sulphite (Na2SO3) is
10 × [2 × 23 + 32 + 3 × 16] g = 10 × 126 g = 1260 g

8. Convert into mole.
(a) 12 g of oxygen gas
(b) 20 g of water
(c) 22 g of carbon dioxide
Answer:
(a) 32 g of oxygen gas = 1 mole

Then, 12 g of oxygen gas = 12 / 32 mole = 0.375 mole
(b) 18 g of water = 1 mole
Then, 20 g of water = 20 / 18 mole = 1.111 mole
(c) 44 g of carbon dioxide = 1 mole
Then, 22 g of carbon dioxide = 22 / 44 mole = 0.5 mole

9. What is the mass of:
(a) 0.2 mole of oxygen atoms?
(b) 0.5 mole of water molecules?
Answer:
(a) Mass of one mole of oxygen atoms = 16 g
Then, mass of 0.2 mole of oxygen atoms = 0.2 × 16g = 3.2 g
(b) Mass of one mole of water molecule = 18 g
Then, mass of 0.5 mole of water molecules = 0.5 × 18 g = 9 g

10. Calculate the number of molecules of sulphur (S8) present in 16 g of solid sulphur.
Answer:
1 mole of solid sulphur (S8) = 8 × 32 g = 256 g
i.e., 256 g of solid sulphur contains = 6.022 × 1023 molecules
Then, 16 g of solid sulphur contains = 6.022 × 1023 / 256 = 16 molecules
= 3.76375 × 1022 molecules

11. Calculate the number of aluminium ions present in 0.051 g of aluminium oxide.
(Hint: The mass of an ion is the same as that of an atom of the same element. Atomic mass of Al = 27 u)
Answer:
mole of aluminium oxide (Al_2O_3) = 2 × 27 + 3 × 16
= 102 g
i.e., 102 g of Al_2O_3= 6.022 × 1023molecules of Al_2O_3
Then, 0.051 g of Al_2O_3contains = 6.022 × 1023 / 102 × 0.051 molecules
= 3.011 × 1020 molecules of Al_2O_3
The number of aluminium ions (Al^{3+}) present in one molecule of aluminium oxide is 2.

Therefore, the number of aluminium ions (Al^{3+}) present in 3.011 × 1020molecules (0.051 g) of aluminium oxide (Al_2O_3) = 2 × 3.011 × 1020
= 6.022 × 1020