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Solution 35

(a) O - one atom of oxygen

(b) 2O - two separate atoms of oxygen

(c) O_2 - one molecule of oxygen

(d) $3O_2$ - three molecules of oxygen

Solution 36

H_2 represents two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.

Solution 37

(a) Oxygen gas occurs as a diatomic molecule in nature.

(b) Noble gases occur as monoatomic gases in nature.

Solution 38

2H represents two separate atoms of hydrogen and H_2 represents one molecule of hydrogen.

Solution 39

(a) N - one atom of nitrogen

(b) 2N - two separate atoms of nitrogen

(c) N_2 - one molecule of nitrogen

(d) $2N_2$ - two molecules of nitrogen

Solution 40

Significance of formula of a substance-

1. Formula represents the name of the substance.
2. Formula represents one molecule of a substance.
3. Formula gives the number of atoms of each element present in one molecule.
4. Formula also represents one mole of molecules of the substance.

Solution 41

Significance of the formula H_2O:

1. H_2O represents water.
2. It represents one molecule of water.
3. H_2O also represents 6.022×10^{23} molecules of water.
4. It represents 18gm of water.

Solution 42

Molecular formula of glucose = $C_6H_{12}O_6$

Molecular mass of glucose = (6xC) + (12xH) + (6xO) = 72 + 12 + 96 = 180u.

Solution 43

(a) Molecular mass of Hydrogen (H_2) = 2 x H = 2 x 1 u = 2 u

(b) Molecular mass of oxygen (O_2) = 2 x O = 2 x 16 u = 32 u

(c) Molecular mass of chlorine (Cl_2) = 2 x Cl = 2 x 35.5 = 71 u

(d) Molecular mass of Ammonia (NH_3) = 1 x N + 3 x H = 14 + 3 = 17 u

(e) Molecular mass of carbon dioxide (CO_2) = 1 x C + 2 x O = 12 + 32 = 44 u

Solution 44

(a) Molecular mass of methane (CH_4) = 12 + 4 = 16 u

(b) Molecular mass of ethane (C_2H_6) = 2 x 12 + 6 x 1 = 30 u

(c) Molecular mass of ethane (C_2H_4) = 2 x 12 + 4 x 1 = 28 u

(d) Molecular mass of ethyne (C_2H_2) = 2 x 12 + 2 x 1 = 26 u

Solution 45

(a) Molecular mass of Methanol(CH_3OH) =

1xC + 3xH + 1xO +1xH = (12+3+16+1)u = 32u

(b) Molecular mass of Ethanol (C_2H_5OH) = 2xC + 5xH + 1xO +1xH
= (24 + 5 + 16 + 1) = 46u
Solution 46
Molecular mass of ethanoic acid (CH_3COOH)
= 1xC + 3xH + 1xC + 2xO +1xH = 12+3+12+32+1 = 60u
Solution 47
Molecular mass of Nitric acid (HNO_3) = 1xH + 1xN + 3xO
= (1 + 14 +48) u = 63 u
Solution 48
Molecular mass of chloroform ($CHCl_3$) = 1 x C + 1 x H + 3 x Cl
= (12 + 1 + 106.5)u = 119.5 u
Solution 49
Molecular mass of hydrogen bromide (HBr) = 1 x H + 1 x Br
= (1 + 80) u = 81u
Solution 50
(a) Molecular mass of hydrogen sulphide (H_2S) = 2xH + 1xS
= (2+32) u = 34u
(b) Molecular mass of Carbon disulphide (CS_2) = 1xC + 2xS = (12+2 x 32) u = 76 u
Solution 51
Law of conservation of mass by LAVOISIER states that: "Mass can neither be created nor be destroyed in a chemical reaction". So, in a chemical reaction, the total mass of reactants must be equal to the total mass of products.
For example: When calcium carbonate is heated, a chemical reaction takes place to form calcium oxide and calcium carbonate. If 100 gms of calcium carbonate is decomposed completely, then 56 gms of calcium oxide and 44 gms of carbon dioxide are formed.
In the above example: the total mass of products = 56 gms (CaO) + 44gms (CO_2) = 100 gms.
As total mass of products is equal to the total mass of reactant so, the law of conservation of mass is satisfied.
Solution 52
Law of constant proportion given by PROUST states that "A chemical compound always consists of the same elements combined together in the same proportion by mass."
For example: If we decompose 100 gms of pure water by passing electricity through it, then 11 gms of hydrogen and 89 gms of oxygen are obtained. Now, if we repeat this experiment by taking pure water from different sources (like river, sea, well, etc.), the same masses of hydrogen and oxygen elements are obtained in each case. They are always combined together in the same constant proportion of 11:89 or 1:8 by mass. And this is the law of constant proportions.
Solution 53
(a) Postulates of Dalton's atomic theory:

1. All the matter is made up of very small particles called 'atoms'.
2. Atoms cannot be divided.
3. Atoms can neither be created nor be destroyed.
4. Atoms are of various kinds. There are as many kinds of atoms as are elements.
5. All the atoms of a given element are identical in every respect, having the same mass, size and chemical properties.
6. Atoms of different elements differ in mass, size and chemical properties.
7. The 'number' and 'kind' of atoms in a given compound is fixed.
8. During chemical combination, atoms of different elements combine in small whole numbers to form compounds.
9. Atoms of the same elements can combine in more than one ratio to form more than one compound.

(b) The postulate "The elements consists of atoms and that atoms can neither be created nor destroyed" can be used to explain the

law of conservation of mass.
(c) The postulate "The elements consist of atoms having fixed mass, and that the number and kind of atoms of each element in a given compound is fixed" can be used to explain the law of constant proportions.
Solution 54
(a) Significance of symbol of element:
i. It represents name of the element.
ii. It represents one atom of the element.
iii. It represents a definite mass of the element.
iv. It represents one mole of atoms of the element.
For example - C represents one atom of the element Carbon. It also represents 12 gms of Carbon.
(b) Significance of symbol H:
i. It represents Hydrogen element.
ii. It represents one atom of Hydrogen element.
iii. It represents one mole of Hydrogen atoms.
iv. It represents 2 gms of Hydrogen.
Solution 55
a) An atom is the smallest particle of an element that can take part in a chemical reaction. They usually exist in combination with the atoms of same element or another element.
b) A molecule is an electrically neutral group of two or more atoms chemically bonded together.
For example - Ozone gas has three oxygen atoms combined together, so ozone exists in the form of O_3 molecule.
c) The molecule of an element contains two or more similar atoms chemically bonded together.
For example - A molecule of hydrogen element consists of 2 hydrogen atoms combined together.
Whereas the molecule of compound contains two or more different type of atoms chemically bonded together.
For example - The molecule of hydrogen chloride(HCl) contains two different type of atoms, i.e. H and Cl.
Solution 56
(a) One atomic mass unit is defined as exactly one-twelfth the mass of an atom of carbon-12. Its symbol is 'u'.
(b) The atomic mass of an element is the relative mass of its atom as compared with the mass of a carbon-12 atom taken as 12 units.
(c) It means that one atom of oxygen is 16 times heavier than 1/12 of a C-12 atom.

********** END **********