(iii) acid NO_2

Copper has valency of 2. Write down the molecular formula of its.

(a) Tetraoxosulphate (VI)
(b) Trioxonitrate (V)
(c) Trioxocarbonate (IV)
(d) Hydroxide
(e) Chloride
(f) Oxide.

Potassium has valency of 1. Write down the molecular formula of its.

(a) Tetraoxosulphate (VI)
(b) Trioxonitrate (V)
(c) Trioxocarbonate (IV)
(d) Hydroxide
(e) Chloride
(f) Oxide.

Iron has valency of 3. Write down the molecular formula of its.

(a) Tetraoxosulphate (VI)
(b) Trioxonitrate (V)
(c) Trioxocarbonate (IV)
(d) Hydroxide
(e) Chloride
(f) Oxide.

Zinc has valency of 2. Write down the molecular formula of its.

(a) Tetraoxosulphate (VI)
(b) Trioxonitrate (V)
(c) Trioxocarbonate (IV)
(d) Hydroxide
(e) Chloride

SO_4

(f) Oxide.

). Write down the valency of the underlined elements/radicals in the compound.

(a) $\underline{Zn}Cl_2$ (b) $Cu(\underline{OH})_2$ (c) $K_2\underline{Cr_2}O_7$

(d) $K\underline{Mn}O_4$ (e) $\underline{Fe_2}O_3$ (f) $\underline{Na}Cl$

(g) $\underline{N_2}O_5$ (h) $\underline{Al}Cl_3$ (i) $\underline{Fe}SO_3$

(j) $Pb(\underline{N}O_3)_2$ (k) $\underline{P_2}O_3$ (l) $\underline{Fe}O$

(m) $H_3\underline{P}O_4$ (n) $\underline{Pb}Cl_2$

1. Write down the molecular formulae of the following compounds.

(a) Calcium hydrogen trioxocarbonate (IV)

(b) Lead trioxonitrate (V)

(c) Zinc tetraoxosulphate (IV)

(d) Ammonium hydroxide

(e) Sodium sulphide

(f) Aluminium chloride

Calculate the relative molecular mass or formula masses of the following elements or compounds.

(a) $Ca(HCO_3)_2$

(b) $Fe(OH)_2$

(c) Cl_2

(d) Al_2O_3

(e) O_3

(f) $Mg(NO_3)_2$

(g) $(NH_4)_2SO_4.Fe_2(SO_4)_3.24H_2O$

(h) $ZnSO_4$

(i) H_2SO_4

(j) H_3PO_4

(k) Pb_3O_4

(l) Sodium dioxoaluminate (III) [$NaAlO_2$]

(m) Potassium heptaoxochromate (VI) [$K_2Cr_2O_7$]

(n) Zinc trioxonitrate (V) hexahydrate $Zn(NO_3)_2.6H_2O$

(o) Potassium hexacyanoferrate (III) [$K_3Fe(CN)_6$]

(p) Potassium hexacyanoferrate (II) [$K_4Fe(CN)_6$]

(q) Oxochlorate (I)acid [HOCl]

(r) Sodium trioxochlorate (V) [$NaClO_3$]

2. Calculate the percentage composition of

(a) Hydrogen in tetraoxosulphate (VI) acid

(b) Sulphur in potassium tetraoxosulphate (VI)

(c) Nitrogen in lead trioxonitrate (VI)

(d) Oxygen in water

(e) Water of crystallization in copper trioxonitrate (V) trihydrate

(f) Water of crystallization in sodium tetraoxosulphate (VI) decahydrate

(g) Chlorine in iron (II) chloride

(h) Oxygen in copper trioxocarbonate (VI)

(i) Carbon in carbon (IV) oxide

(j) Carbon in carbon (II) oxide

1. Calculate the Empirical Formulae of the following compounds whose percentage composition are given:

(a) Fe = 70.0%; O = 30%

(b) C = 75%; H = 25%

(c) C = 92.3%; H = 7.7%

(d) Mg = 25.3%; Cl = 74.7%

(e) H = 5.9%; S = 94.1%

(f) Mg = 28.6%; C = 14.3%; O = 57.1%

(g) Pb = 62.5%; N = 8.5%; O = 29%

(h) Na = 29.1%; S = 40.55%; O = 30.45%

(i) Ca = 40%; C = 12%; O = 48%

(j) Na = 37.1%; C = 9.7%; O = 38.7%; H_2O = 14.5%

(k) Ca = 19.7%; H = 0.99%; S = 31.7%; O = 47.5%

(l) Na = 19.3%; S = 26.8%; O = 53.9%

(m) Fe= 63.6%; S = 36.4%

2. Calculate the molecular formulae of the following compounds whose percentage composition by mass are given and the relative molecular masses are given in bracket.

(a) C, 92.3%; H, 7.7% (78)

(b) N, 30.4%; O, 69.6% (92)

(c) N, 82.3%; H, 17.7% (17)

(d) P, 56.4%; O, 43.6% (220)

(e) C, 40%; H, 6.7%; O, 53.3% (60)

(f) C, 64.8%; H, 13.5%; O, 21.7% (74)

3. Calculate the empirical formulae of the following compounds from the results of analysis given:

(a) 3.18g of copper (II) oxide was found to contain 2.54g of copper and 0.64g of oxygen

(b) 3.33g of manganese (IV) oxide was found to contain 2.11g of manganese and 1.22g of oxygen.

(c) 2.10g of Iron (II) chloride was found to contain 0.92g of Iron and 1.18g of chlorine.

4. The analysis of 2.12g of a compound gave 0.33g of carbon, 1.82g of the same compound gave 1.53g of sulphur. Calculate,

(a) The empirical formula of the compound.

(b) The molecular formula of the compound given that its vapour density is 38.

5. The analysis of a compound gave the following: 1.25g of the compound contained 0.62g of potassium, 2.51g of the same compound contained 0.51g of sulphur, 1.87g of the compound contained 0.57g of oxygen.

Determine (a) the empirical formula of the compound.

(b) the molecular formula of the compound given that its relative molecular mass is 158.

6. 2.32g of a hydrocarbon when combusted in excess of oxygen gas gave 7.3g of carbon (IV) oxide and 2.98g of water. If the vapour density of the compound is 28,

Calculate (a) Its empirical formula

(b) Its molecular formula

7. An organic compound G has the following percentage composition: C = 58.8%; H = 9.8%; O = 31.4%. If the relative molecular mass of the compound G is 102, find its molecular formula.

8. A compound containing Carbon, Hydrogen and Oxygen only contains 13.1% Hydrogen, 52.2% Carbon, calculate

(a) Its empirical formula

(b) Its molecular formula

If its relative molecular mass is 46.

9. An organic compound A contains 48.6% carbon, 8.1% Hydrogen and the remaining being oxygen. When A reacts with ethanol in the presence of concentrated tetraoxosulphate (VI) acid, the resulting compound was a fragrant smelling liquid B with a relative molecular mass of A being 102.

Calculate (a) The empirical formula of A

(b) The molecular formula of B

(c) Deduce the structures of A and B.

10. An inorganic compound contains 20.1% Iron, 11.51% Sulphur, 63.3% Oxygen 5.04% Hydrogen. Calculate, its formula on the assumption that all the hydrogen present in the form of water of crystallization.

11. 2.000g of a hydrated salt were found to contain 1.106g of the anhydrous salt. If the vapour density of the anhydrous salt is 67, calculate the number of moles of water of crystallization in one mole of the hydrated salt.

12. An hydrocarbon of molecular mass 70 was found to contain 85.7% carbon. Determine,
    (a) The empirical formular
    (b) The molecular formula
    (c) The structural formula

13. 1.62g of an oxide of a metal X were reduced to 1.30g of the metal. Determine,
    (a) The empirical formula
    (b) The molecular formula of the oxide given that the relative atomic mass of X is 65 and the relative molecular mass of the oxide is 81.

14. Copper forms two oxides containing respectively 11% and 20% of oxygen. Calculate,
    (a) The formulae of the two oxides
    (b) Name the oxides

15. Phosphorus forms two oxides containing respectively 44% and 57% of oxygen. Calculate,
    (a) The formulae of the two oxides.
    (b) Name the oxides

16. 0.308g of an organic compound containing Carbon, Hydrogen and Oxygen, on combustion gave 0.438g of carbon (IV) oxide and 0.269g of water. If the vapour density of the compound is 62
    Calculate (a) Its empirical formula.
    (b) Its molecular formula

17. A hydrocarbon burns completely in oxygen to form 8.8g of carbon (IV) oxide and 4.5g of water.
    Determine (a) The empirical formula
    (b) The molecular formula of the Hydrocarbon, if the relative molecular mass of the hydrocarbon is 58.

analysis of a gas gave the following percentage composition. 85.7% and H = 14.3%. If the vapour density of the gas is 21, determine,

(a) The empirical formula

(b) The molecular formula

19. Calculate the empirical formula of a compound, which has the following percentage composition: Na = 18.2%; S = 12.7%; O = 19.1% and H_2O = 50%.

20. Determine the formulae of the following hydrates, if,

(a) 0.520g of $NiSO_4.xH_2O$ after strong heating gave a residue of 0.304g.

(b) 0.654g of $MgSO_4.xH2O$ after strong heating gave a residue of 0.320g.

21. A sample of a substance containing only Carbon and Hydrogen burns in excess of Oxygen to yield 4.4g of carbon (IV) oxide and 2.7g of water. Given that the vapour density of the substance is 15. Determine the empirical formula and the molecular formula.