1. A

   Solution - 1/4 of 16 is 4. So 4 is the base to find the relative atomic masses for carbon. So relative atomic mass for C-12 isotope will be 12/4 = 3.

2. C

   Solution – Let the oxidation state of N be x. Oxidation state of O is –2 as it is in oxide form.

   $2x + 5(-2) = 0$

   $x = 10/2 = +5$

3. C

   Solution - Oxidation number of nitrogen in N_2O is +1. But in real situation, one nitrogen atom is at +2 oxidation state and other nitrogen atom is at 0 oxidation state. Oxidation number of oxygen is -2.

4. A

   Solution - The oxidation no. of S in SF_2, SF_4, SF_6 are +2, +4, +6.

5. A

   Solution – Chlorine (Cl) has an oxidation number of -1 i.e. negative except Fluorine (F).

6. C

   Solution – Elements P and Q react to form a compound P_xQ_y. A and B react to form A_sB_t. When A and P react, the compound formed is A_yP_t and if A and Q react, the compound formed is A_xQt.

7. D

   Solution - None of these because Isotopes have same atomic number but different mass number and none of the statement verifies it.

LEVEL - 2

1. B

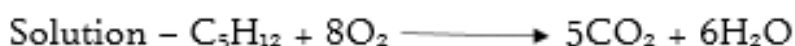   Solution – Bromine is the one that exist in liquid form in room temperature amongst all.

2. C

   Solution – $_1H^3$ is also known as tritinum that is an isotope of hydrogen. It comprises of 2 neutrons and 1 proton in its nucleus.

3. A

   Solution - $_1H^1$, $_1H^2$, $_1H^3$ are collectively called as isotopes of hydrogen.

4. D

   Solution – $C_5H_{12} + 8O_2 \longrightarrow 5CO_2 + 6H_2O$

5. B

   Solution – 1g atomic weight of C is 12g.

6. D

   Solution – The valency of oxygen is 2 as Oxygen is in group six in the periodic table so it has six electrons in its valence shell. This means that it needs to gain two electrons to obey the octet rule and have a full outer shell of electrons.
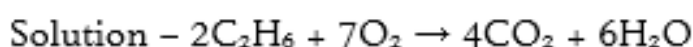
7. A

   Solution – The formula of Calcium Sulphate is $CaSO_4$.

8. D

   Solution – Empirical formula represents the simplest whole number ratio of various atoms in a compound hence for C_6H_6 the empirical formula is CH.

9. C

   Solution – $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

10. C

Solution – The formula of nitride of an element is XN. Since from the above reaction we can figure out that the valency of x is 3 and the valency of nitride is also 3.

11. C

Solution – Curium i.e. Cm and the scientists name Marie Curie Pierre Curie.

12. B

Solution – In a cation carrying two +ve charges there are 20 protons and 21 neutrons. therefore, the number of electrons will be 18.

13. A

Solution – An atom or a group of atoms which forms a part of an inorganic compound is called a radical. Sodium radical and Chloride radical are the two radicals that combine to form sodium chloride a compound radical.

14. B

Solution – In a negatively charged ion X, there are 17 protons and 18 electrons. Then the charge on ion will be X^-.

15. D

Solution – The mass of chlorine atoms and chloride ions are equal then which they contain same number of electrons is false.

16. D

Solution - In N_2O_5 the valency of nitrogen is 5.

17. A

Solution – An isotope of nitrogen has A = 15 and Z = 7 then, the atom has 8 neutrons, 7 protons and 7 electrons.

18. C

Solution – A balanced chemical equation is in accordance with Law of conservation of mass.

–

19. C

Solution – Molecular weight of ozone (O_3) is 48 hence molecular weight of oxygen is 32.

20.   B

Solution – $Pb(NO_3)_2 \longrightarrow 2\ PbO + 4\ NO_2 + O_2$

21. B

Solution – Natrium is an old name of Na i.e. sodium.

22.   C

Solution – In the outermost orbit of helium two electrons are present, hence its valency is zero because the electron is 2 for helium and the outer most shell is fully filled i.e. K shell contain 2 electrons in its shell.

23.   C

Solution – $H2 + O \longrightarrow H_2O$ is incorrect because oxygen atom has no free existence.

Subjective Questions

1. a. H_2 - molecule

   b. CO_2 - molecule

   c. He – atom and molecule

   d. Fe - atom

   e. Fe_2O_3 – molecule

   f. CO_3^{2-} - ion

2. Three elements having Same number of electrons, protons and neutrons are as follows –

   a. Helium – 2 electrons, 2 protons and 2 neutrons.

   b. Carbon – 6 electrons, 6 protons and 6 neutrons.

   c. Oxygen – 8 electrons, 8 protons and 8 neutrons.

3. It is based on the fact that the carbon-12 atom has 6 protons, 6 neutrons and 6 electrons. Of these the 6 electrons have negligible weight compared to the others (1 electron is around 1/1836 times as heavy as a proton). Protons and neutrons weigh almost the same at least at the accuracy levels during the time when the convention was adopted. Hence 1 proton weighs equal to 1 neutron = 1/12 of a carbon-12 atom which has 6 protons and 6 neutrons. And as the weight of all atoms is almost completely from the contained protons and neutrons, it is mentioned in terms of 1/12 carbon-12 atom.

4. An atom of hydrogen is considered here $_1H^1$, the isotope which has two excess of neutrons is tritium which has two neutrons and its mass number is 3.

5. The reason to why chlorine has an atomic weight of 35.5 not 35 is because of its isotopes. Isotopes are atoms with the same number of protons (in the case of chlorine that means 17 protons) but different numbers of neutrons. Chlorine has two common isotopes, Chlorine- 35 and Chlorine- 37. Chlorine- 35 has 17 protons and 18 neutrons and occurs in nature about 75% of the time. Chlorine- 37 has 17 protons and 20 neutrons and occurs in nature about 25% of the time. That means that in any mixture of pure chlorine that can be isolated from all other elements there is 75% Chlorine- 35 and 25% Chlorine- 37. So, when the mass of chlorine is measured the result is 35.5. The atomic weight, or as it is properly called, the relative atomic mass, is a weighted average of the masses of all the isotopes of chlorine. So, Relative Atomic Mass = (75/100 x 35) + (25/100 x 37) = 35.5

6. The valency and name of elements are as follows -

Symbol	Name	Valency
K	Potassium	+1
Cr2O7	Dichromate	+2
Cl	Chlorine	+1
Ni	Nickel	+2
ClO3	Chlorate	+3
CO3	Carbonate	-2
Ba	Barium	+2
MnO4	Permanganate	+7
HSO4	Hydrogen Sulphate	-1
HCO3	Bicarbonate	-1
SO4	Sulphate	2
NO3	Nitrate	-1

7. The formula are as follows –

  a. Potassium nitrate – KNO_3

  b. Sodium bisulphate - $NaHSO_4$

  c. Calcium carbonate - $CaCO_3$

  d. Magnesium hydroxide - $Mg(OH)_2$

  e. Zinc sulphate - $ZnSO_4$

  f. Aluminium oxide - Al_2O_3

  g. Copper [II] nitrate - $Cu(NO_3)_2$

  h. Iron [III] hydroxide - $Fe(OH)_3$

  i. Lead [II] sulphate - $PbSO_4$

8. The names are as follows –

  a. KClO - Potassium hypochlorite

  b. HClO - Hypochlorous acid

  c. $K_2Cr_2O_7$ - Potassium dichromate

  d. NH_4OH - Ammonium hydroxide

  e. $Cr_2(SO_4)_3$ - Chromium(III) sulfate

9. C, H, N

Carbon = $24 \times 1.66 \times 10^{-24}$, where $1.66 \times 10^{-24} = 1$ amu

Carbon = 24 amu

C_1 = 12 amu $\qquad\qquad$ C_2 = 24 amu

Hydrogen = 12 amu

H_1 = 1 amu $\qquad\qquad$ H_{12} = 12 amu

Nitrogen = 28 amu

N_1 = 14 amu $\qquad\qquad$ N_2 = 28 amu

Molecular formula – $C_2H_{12}N_2$

Empirical formula – CH_6N

Molecular weight – 64

10. 1) Names are as follows –

a. Rf – Rutherfordium.

b. Am – Americium.

c. Cm – Curium.

d. U – Uranium.

2) Uranium.

3) Argentum i.e. Silver.

4) Americium.

5) Einsteinium.

6) Fermium is the element name and the name of the scientist name is Enrico Fermi.

7) Uranium.

8) Hassium is the name and symbol is Hs.

9) The names and valences are as follows -

Symbol	Name	Valency
Cu	Copper	+1, +2
Ag	Silver	+1
Hg	Mercury	+1, +2
Fe	Iron	+2, +3
Pb	Lead	+2, +4

Mn	Manganese	+2, +4, +7
Pt	Platinum	+2, +4
Au	Gold	+1, +3

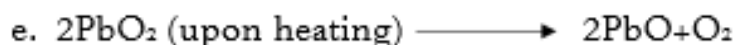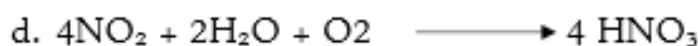10) $CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$

From the above equation, it can be conveyed that a metal carbonate when reacted with an acid, produces a salt, carbon dioxide and water.

And also, the physical states of the substances are not written in the equation, which is a must.

$CaCO_{3\,(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2\,(s)} + H_2O_{(l)} + CO_{2\,(g)}$

11. The balance equation are as follows –

   a. $2KNO_3 \longrightarrow 2KNO_2 + O_2$

   b. $Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$

   c. $Fe + 2HCl \longrightarrow FeCl_2 + H_2$

   d. $4NO_2 + 2H_2O + O2 \longrightarrow 4\,HNO_3$

   e. $2PbO_2$ (upon heating) $\longrightarrow 2PbO + O_2$

   f. $4Al + 3O_2 \longrightarrow Al_2O_3$

   g. $2\,Fe + 3\,Cl_2 \longrightarrow 2\,FeCl_3$

   h. $2KBr + Cl_2 \longrightarrow 2KCl + Br_2$

   i. $2\,KHCO_3 \longrightarrow K_2CO_3 + H_2O + CO_2$

   j. $Ca(OH)_2 + 2NH_4Cl \longrightarrow CaCl_2 + 2H_2O + 2NH_3$

12. N_2O_5 is the chemical formula of the compound di nitrogen Pent oxide. It is also commonly known as nitrogen pent oxide. It contains 2 nitrogen atom combined with 5 oxygen atom. Here in N_2O_5, nitrogen atom shares its electrons with 5 oxygen atom and the valency of nitrogen in N_2O_5 will be 5+.

13. Nitrous oxide is also known as laughing gas with chemical formula N2O

a. Valency of N in N_2O:

As it is a molecule total valency = 0

Let X be N valency

Oxygen valency is - 2

$2X - 2 = 0$

$2X = 2$

$X = 1$

Hence valency of N in $N_2O=1$

b. Valency of N in NO_2:

Let X be the valency of N

$X +2(-2) = 0$

$X = 4$

So, valency of N in $N_2O = 4$

14. a. Valency of S in SF_2

As it is a molecule total valency = 0

Let X be S valency

Fluorine valency is 1

$X + 2(1) = 0$

$X - 2 = 0$

$X = 2$

Hence valency of S in $SF_2 = 2$

b. Valency of S in SF_4

As it is a molecule total valency = 0

Let X be S valency

Fluorine valency is -1

$X + 4(-1) = 0$

$X - 4 = 0$

$X = 4$

Hence valency of S in $SF_4 = 4$

c. Valency of S in SF_6

As it is a molecule total valency = 0

Let X be S valency

Fluorine valency is -1

$X + 6(-1) = 0$

$X - 6 = 0$

$X = 6$

Hence valency of S in $SF_6 = 6$