HCl solution having density of 1.2 g/ml and containing 28% HCl, by mass, 'x' g of chlorine is produced. The value of '100x' is

11. A fluorine disposal plant was constructed to carry out the reactions:

$2F_2 + 4NaOH \rightarrow 4NaF + 2H_2O + O_2$

$2NaF + CaO + H_2O \rightarrow CaF_2 + 2NaOH$

As the plant operated, excess lime was added to bring about complete precipitation of the fluorides as CaF_2. Over a period of operation, 1900 kg of fluorine was fed into the plant and 10,000 kg of lime was required. What was the percentage utilization of lime? (Ca = 40, F = 19)

12. A sample of chalk contained as impurity a form of clay which losses 14.5% if its weight as water on strong heating. A 5 g of chalk sample, on heating, shows a loss in weight by 1.507 g. The mass percentage of $CaCO_3$ in the chalk sample is (Ca = 40)

13. An impure sample of iron pyrite contains 28% iron, the impurity being silica. If 100 g of the sample is roasted to oxidize all the FeS_2 to Fe_2O_3, what will be the mass of the roasted sample, in g? (Fe = 56)

14. Chlorine samples are prepared for analysis by using NaCl, KCl and NH_4Cl separately or as mixture. What minimum volume (in ml) of 8.5%, by mass, $AgNO_3$ solution (specific gravity = 1.25) must be added to a sample of 10.7 g in order to ensure complete precipitation of chloride in every possible case?

15. A gas mixture contains CH_4 and C_3H_6. When this mixture undergo cracking into C(s) and H_2(g), the total number of moles of H_2(g) obtained is 42. If the total volume of the initial gas mixture at 1.5 atm and 27°C is 246.3 L, what is the mole per cent of CH_4 gas in the initial mixture?

16. A solid mixture (5 g) containing lead nitrate and sodium nitrate was heated below 600°C until weight of residue become constant. If the loss in weight is 28%, the amount of lead nitrate (in mg) in the mixture is (Pb = 208)

17. Octane is a component of gasoline. Complete combustion of octane leads to CO_2 and H_2O while incomplete combustion produces CO and H_2O, which not only reduces the efficiency of the engine using the fuel but is also toxic. In a certain test run, gallon of octane is burned in an engine. The total mass of CO, CO_2 and H_2O produced is 9.768 kg. Calculate the efficiency of the process, i.e., calculate the percentage of octane converted to CO_2. The density of octane is 2.28 kg/gallon.

18. A volume of 100 ml of water gas containing some CO_2 was mixed with 100 ml of oxygen and mixture exploded. The volume after explosion was 100 ml. On introducing NaOH, the volume was reduced to 52.5 ml. If the volume ratio of CO, H_2 and CO_2 in the original sample is ab:cd:2, the value of 'abcd' is

19. When 10 ml of acetic acid (density = 0.8 g/ml) is mixed with 40 ml of water (density = 1 g/ml) at a certain temperature, the final solution is found to have a density of $\frac{96}{98}$ g/ml. The per cent change in total volume on mixing is (Answer as 'abcd' where the value of 'a' is 1 in case of increase in volume and 2, in case of decrease in volume, and 'bcd' is the magnitude of percentage change in volume)

20. The enzyme carbonic anhydrase catalyses the hydration of CO_2. The reaction $CO_2 + H_2O \rightarrow H_2CO_3$ is involved in the transfer of CO_2 from tissues to the lungs via the bloodstream. One enzyme molecule hydrates 10^6 molecules of CO_2 per second. How many grams of CO_2 are hydrated in 1 hour by one ml of 10^{-6} M enzyme?