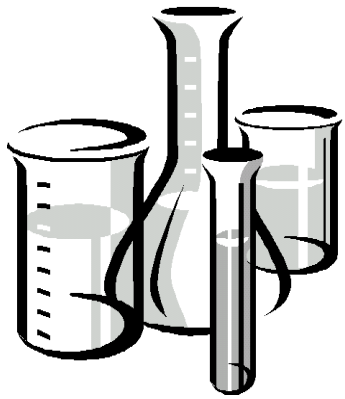

PHYSICAL CHEMISTRY

by: SHAILENDRA KR.

MEQ. APPROACH

Classes at: -

SCIENCE TUTORIALS; Opp. Khuda Baksh Library, Ashok Rajpath, Patna

PIN POINT STUDY CIRCLE; House No. 5A/65, Opp. Mahual Kothi, Alpana Market, Patna

Topic: Mole Concept

01. Find the number of atoms in 48 g of ozone at NTP. (1.8066×10^{24})

02. What is the ratio of the volumes occupied by 1 mole of O_2 and 1 mole of O_3 in identical conditions? (1:1)

03. Calculate the mass of 5 moles of $CaCO_3$ in gram. (500 g)

04. The vapour density of a gas is 11.2. Calculate the volume occupied by 11.2 g of the gas at NTP. (11.2 litres)

05. Calculate the number of oxygen atoms in 0.2 mole of $Na_2CO_3 \cdot 10H_2O$. (1.56×10^{24})

06. Calculate number of moles of $CuSO_4$ contained in 100 mL of 1 M $CuSO_4$ solution. Also find the number of SO_4^{2-} in it.

(0.1 mole, 0.6022×10^{23})

07. Find total number of nucleons present in 12 g of ^{12}C atoms. ($12 \times 6.022 \times 10^{23}$)

08. Find (i) total number of neutrons and (ii) total mass of neutrons in 7 mg of ^{14}C. (Assume that the mass of a neutrons = mass of a hydrogen atom) (24.088×10^{20}, 0.004 g)

09. How many moles are there in 1 metre^3 of any gas at NTP? (44.6 moles)

10. 3 g of a salt of molecular weight 30 is dissolved in 250 g of water. Calculate the molarity of the solution. (0.4 m)

11. Calculate volume occupied by 5.25 g of nitrogen at 26ºC and 74.2 cm. of pressure.

(4.71 litres)

12. Find the ratio of number of molecules contained in 1 g of NH_3 and 1 g of N_2.

(28 : 17)

13. How many molecules of CO_2 are contained in one litre of air if the volume content of CO_2 is 0.03% at NTP ? (8.06×10^{18})

14. Is the number of molecules in 1 kg of H_2 and 1 kg of O_2 at the same? What is the ratio of weights of H_2 and O_2, the mixture of which contains equal number of molecules of each gas? (No, 1 : 16)

15. The measured density at NTP of a gaseous sample of a compound was found to be 1.78 g/l. What is the weight of 1 mole of the gaseous sample? (39.9 g)

16. If the concentration of a solution is 2M, calculate the millimoles present in 2 liters of a solution. (4000)

17. How many moles of oxygen are contained in one litre of air, if its volume content is 21% at NTP? (0.0093)

18. How many atoms do mercury vapour molecules consist of if the density of mercury vapour relative to air is 6.92? The average mass of air is 29 g/mole. (One)

19. Calculate total number of atoms in 0.5 mole of $K_2Cr_2O_7$. (3.31×10^{24})

20. What is the volume of 6 g of hydrogen at 1 atm and 0°C? (67.2 litres)

21. What is the density of oxygen gas at NTP. (1.429 g/l)

22. Calculate the total number of electrons present in 18 ml of water. ($10 \times 6.022 \times 10^{23}$)

23. Calculate the number of electrons, protons and neutrons in 1 mole of $_{16}O^{2-}$ ions.

($10 \times 6.022 \times 10^{23}$, $8 \times 6.022 \times 10^{23}$, $8 \times 6.022 \times 10^{23}$)

24. Find the mass of the nitrogen contained in 1 kg of (i) KNO_3 (ii) NH_4NO_3 and (iii) $(NH_4)_2HPO_4$.

[(i) 138.5 g;, (ii) 350 g and (iii) 212 g]

25. Find the mass of each element in 7.84 g $FeSO_4$, $(NH_4)_2SO_4$, $6H_2O$. What will be the volume of O_2 at NTP in this sample?

(3.136 litres)

26. The density of solid AgCl is 5.56 g/cc. The solid is made up of cubic array of alternate Ag^+ and Cl^- ions at a spacing of 2.773 Å between centres. From these data calculate avogadro constant. (6.04×10^{23})

27. Three atoms of magnesium combine with 2 atoms of nitrogen. What will be the weight of magnesium which combines with 1.86 g of nitrogen? (4.86 g)

28. 600 ml of a mixture of O_3 and O_2 weighs 1 g at NTP. Calculate the volume of ozone in the mixture. (200 ml)

29. The vapour density (hydrogen = 1) of a mixture consisting of NO_2 and N_2O_4 is 38.3 at 26.7°C. Calculate the number of moles of NO_2 in 100 g of the mixture. (0.437 mole)

30. A nugget of gold and quartz weighs 100g. Sp. gr. of gold and quartz and the nugget are 19.3, 2.6 and 6.4 respectively. Calculate the weight of gold in the nugget. (68.6 g)

31. The nucleus of an atoms X is supposed to be a sphere with a radius 5×10^{-13} cm. Find the density of the matter in the atomic nucleus if the atomic weight of X is 19.

(6.02×10^{13} g/ml)

32. Copper forms two oxides. For the same amount of copper, twice as much oxygen was used to form the first oxide than to form the second one. What is the ratio of the valencies of copper in the first and second oxides?

(2:1)

33. 105 ml of pure water (4°C) is starurated with NH_3 gas, producing a solution of density 0.9 g/ml. If this solution contains 30% of NH_3 by weight, calculate its volume. (166.67 ml)

34. How many iron atoms are present in a stainless steel ball-bearing having a radius of 0.1 inch? The stainless steel contains 85.6% Fe, by weight and has a density of 7.75 g/cc. (4.91×10^{21})

35. How many liters of liquid CCl_4 *(d = 1.5 g/cc)* must be measured out to contain 1×10^{25} CCl_4 molecules? (1.61 lit.)

36. A sample of potato starch was ground in a ball mill to give a starch like molecule of lower molecular weight. The product analysed 0.086% phosphorus. If each molecule is assumed to contain one atom of phosphorus, what is the molecular weight of the material?

(3.6 × 104 amu)

37. The dot at the end of this sentence has a mass of about one microgram. Assuming that the black stuff is carbon, calculate the approximate number of atoms of carbon needed to make such a dot. (5×10^6 atoms)

38. To what volume must 50 ml of 3.50 M H_2SO_4 be diluted in order to make 2M H_2SO_4?

(87.5 ml)