M.Prakash Academy **Daily Workout**
Science set-I 16 – 22 April

Dear Students,

As announced in the class, we are presenting the first set of the Daily Workout (DW) problems. The problems will generally be based on a theme. For instance, the theme for this week is the **Mole Concept**. The problems are set in such a way that they offer a revision of the topic/concept to a good extent. In addition to the given problems, you are expected to revise corresponding theory.

We are planning to give one problem set every week which means three to four simple problems every day. Since the programme is called DW, do not forget to work daily. With regular practice of solving problems, you will not only **be in touch with what has been taught** so far, but you will also **make more sense of your Science**. Kindly note that you are supposed to get **detailed solutions** of the entire DW i.e. the DW Solution file in **the very first Science** class when we reopen in June 2015.

Along with the problem sets, we are planning to give you links to some of **the films / documentaries** that are available on youtube and related websites. These films would inform you about histories /applications of the subjects we are learning.

So here we go .....

Use the following data while attempting the problems.

Atomic weights of some elements are given below:
$H = 1, C = 12, F = 19, N = 14, O = 16, Na = 23, Mg = 24, Al = 27, P = 31, Cl = 35.5,$
$S = 32,$
$K = 39, Ca = 40, Fe = 56, Cu = 64, Zn = 65, Br = 80, Ag = 108, Ba = 137, Pb = 207,$
$As = 75, I = 127,$
Avogadro's number $= 6.022 \times 1023$, Volume of one mole of gas at STP $= 22.4lit.$

1. Calculate the no. of electrons in 62 gm nitrate ion.

2. Haemoglobin contains 0.25% iron by weight. The molar mass of Heaemoglobin is 89600 gmpermol. Calculate the no of iron atom per molecule of Haemoglobin.

3. Calculate the molar ratio of Fe^{2+} to Fe^{3+} in a mixture of $FeSO_4$ and $Fe_2(SO_4)_3$ having equal number of sulphate ion in both ferrous and ferric sulphate.

4. Calculate the maximum number of mole of $Ba_3(PO_4)_2$ when 0.6 mole of $BaCl_2$ is mixed with 0.6 mole of Na_3PO_4.

5. What is the maximum amount of ammonia formed when 14 gm of N_2 is mixed with 2 gm of H_2.

6. DNA has density 1.1 gm/ml and its molecular weight is 6000 gm/mol. Calculate the average volume occupied by the single molecule of DNA.

7. 2 mol of H_2S and $11.2LSO_2$ at STP reacts to form x mol of sulphur, y mol of water. Find the value of x.

8. One mole of potassium chlorate is thermally decomposed and excess of aluminium is burnt in the gaseous product. How many mol of aluminium oxide are formed?

9. Calculate the number of oxygen atoms required to combine with 7 gm of N_2 to form N_2O_3 when 80% of N_2 is converted to N_2O_3.

10. The element A (at.wt. $= 75$) and B (at. Wt. $= 32$) combine to form a compound X. If 3 mol of B combine with 2 mol of A to give 1 mol of X. Calculate the weight of 5 mol X.

11. Calculate the amount of H_2SO_4 consumed when 112 gm of iron ($_{26}Fe^{56}$) reacts with H_2SO_4 in such a way that $FeSO_4$ and $Fe_2(SO_4)_3$ are produced in $2:3$ molar ratio.

12. 2.4 kg of carbon is made to react with 1.35 kg of aluminium to form Al_4C_3. Calculate the maximun amount (in kg) of aluminium carbide formed.

13. 0.2 gm of gas X occupies a volume of 440 ml. If 0.1 gm of carbon di-oxide gas occupies a volume of 320 ml at the same temperature and pressure, then what should be the molar mass of gas X?

14. The phosphate of a metal has the formula $MHPO_4$. Write the formula of its metal chloride.

15. The formula of a hydrated salt of barium is $BaCl_2\square_x H2O$. If 1.936 g of this compound gives 1.846 g of anhydrous $BaSO_4$ upon treatment with H_2SO_4, calculate x.

16. Ammonia is manufactured by the reaction of N_2 and H_2. An equilibrium mixture contains 5.0 g of each N_2, H_2 and NH_3. Calculate mass of N_2 and H_2 present initially.

17. 4 gm of $NaOH$ are present in $0.1dm^3$ solution have specific gravity $1.038gm/ml$. Calculate the mole fraction of $NaOH$.

18. Calculate the volume occupied by $6.022\square 10^{22}$ molecules of N_2 at NTP.

19. How many grams are contained in one gram-atom of Na?

20. How many moles of $NaOH$ are contained in 27 ml of 0.15 M $NaOH$?

21. Commercially available concentrated hydrochloric acid contains $38\% HCl$ by mass. What is the molarity of this solution? The density is 1.19 gm/ml.

22. What volume of $12.389M$ concenterated solution of HCl is required to make 1.00 litre of $0.010MHCl$?

23. Calculate the amount of axalic acid ($C_2H_2O_4.2H_2O$) required to obtain 250 ml of deci-molar solution.

24. 4 gm of $NaOH$ are present in $0.1dm^3$ solution have specific gravity 1.038 gm/ml. calculate:
a. Molality of $NaOH$ solution;
b. Molarity of $NaOH$ solution.

25. Find the molality of H_2SO_4 solution whose specific gravity is 1.98 gm/ml and 90% by volume H_2SO_4.

Answer Key:

Que	1	2	3	4
Ans	6.023×10^{23}	4	3:2	0.3
Que	5	6	7	8
Ans	11.33	$0.9 \times 10^{-20} ml$	1.5 mol	1
Que	9	10	11	12
Ans	$3.6 \times 10^{23} o - atoms$	1230 gm	269.5 gm	3.2 gm
Que	13	14	15	16
Ans	64	MCl_2	$9.2gmN_2$, $5.88gmH_2$	0.018
Que	17	18	19	20
Ans	14.48	2.24 lit.	1/23 gm	$4.05 \times 10^{-3} mol$
Que	21	22	23	24
Ans	12.389 M	0.807 ml	3.15 gm	1.002 M
Que	25			
Ans	8.50			