1. Mark the conversion factor which is not correct

(a) $1\text{atm} = 1.01325 \times 10^5\,\text{Pa}$

(b) 1 metre = 39.37 inches

(c) 1 litre $= 10^{-3}\,\text{m}^3$

(d) 1 inch = 3.33 cm

2. The number of oxygen present in 1 mole of oxalic acid dehydrate is.

(a) 6×10^{23} (b) 6.022×10^{34}

(c) 7.22×10^{23} (d) 36.13×10^{23}

3. Match the prefixes present in column I with their multiples in column II and mark the appropriate choice.

Column I (Prefixes)	**Column II (Multiples)**
(A) Pico	(i) 10^9
(B) Femto	(ii) 10^{-3}
(C) Milli	(iii) 10^{-12}
(D) Giga	(iv) 10^{-15}

(a) (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)

(b) (A) → (ii), (B) → (i), (C) → (iv), (D) → (iii)

(c) (A) → (iv), (B) → (iii), (C) → (i), (D) → (ii)

(d) (A) → (iii), (B) → (iv), (C) → (ii), (D) → (i)

4. What should be the volume of the milk $(\text{in}\,\text{m}^3)$ which measures 5 L? (L-2)

(a) $5 \times 10^{-3}\,\text{m}^3$ (b) $5 \times 10^3\,\text{m}^3$

(c) $5 \times 10000\,\text{m}^3$ (d) $5 \times 10^6\,\text{m}^3$

5. 18.72 g of a substance 'X' occupies $1.81\,\text{cm}^3$. What will be its density measured in correct significant figures? (L-2)

(a) $10.3\,\text{g}\,\text{cm}^{-3}$ (b) $10.34\,\text{g}\,\text{cm}^{-3}$

(c) $10.4\,\text{g}\,\text{cm}^{-3}$ (d) $10.3425\,\text{g}\,\text{cm}^{-3}$

6. How many seconds are there in 3 days?

(a) 259200 s (b) 172800 s

(c) 24800 s (d) 72000 s

7. Which of the following pairs illustrates the law of multiple proportions? (L-2)

(a) PH_3, HCl (b) pbO, PbO_2

(c) H_2S, SO_2 (d) $CuCl_2, CuSO_4$

8. Given below are few statements. Mark the statement which in not correct.

(a) Gram atomic mass of an element may be defined as the mass of Avogadro's number of atoms.

(b) The molecular mass of a diatomic elementary gas is twice its atomic mass.

(c) Gay Lussac's law of chemical combination is valid for all substances.

(d) A pure compound has always a fixed proportion of masses of its constituents.

9. Atomic masses of elements are usually fractional because.

(a) These are mixtures of isotopes.

(b) They contain impurities of other atoms.

(c) They are mixtures of isobars.

(d) Atomic masses cannot be weighed accurately.

10. Which of the following gases will have least volume if 10 g of each gas is taken at same temperature and pressure?

(a) CO_2 (b) N_2 (c) CH_4 (d) HCl

11. What will be the mass of 100 atoms of hydrogen?

(a) $100\,g$ (b) 1.66×10^{-22}

(c) $6.023\times10^{23}\,g$ (d) $100\times6.023\times10^{23}\,g$

12. 1.4 moles of phosphorus trichloride are present in a sample. How many atoms are there in the sample?

(a) 5.6 (b) 34

(c) 2.4×10^{23} (d) 3.372×10^{24}

13. Which of the following formulae is not correctly depicted?

(a) Molar mass = $\frac{\text{Mass of substance}}{\text{Moles of substance}}$

Or $M=\frac{W}{n}\,g\,mol^{-1}$

(b) Number of moles of a substance

$=\frac{\text{Mass of substance}}{\text{Molar mass}}$ or

$x=\frac{w}{m}\,mol$

(c) Number of molecules

$=\frac{\text{Mass of the substance}}{\text{Molar mass}}\times\text{Avogadro's no}$

Or no. of molecules $=\frac{w}{M}\times6.023\times10^{23}$ molecules

(d) Mole × Molar mass = Number of molecules or n × m = Number of molecules

14. How many number of aluminium ions are present in $0.051g$ of aluminium oxide?

(a) 6.023×10^{20} (b) 3 ions

(c) 6.023×10^{23} (d) 9 ions

15. I mole of water contains

(a) 6.023×10^{23} atoms (b) 6.023×10^{23} molecules

(c) $3\times6.023\times10^{23}$ molecules (d) None of these

16. A mixture having 2 g of hydrogen and 32 g of oxygen occupies how much volume at NTP?

(a) $44.8L$ (b) $22.4L$

(c) $11.2L$ (d) $67.2L$

17. What will be the molality of the solution made by dissolving 10 g of NaOH in 100 g of water?

(a) $2.5m$ (b) 5m (c) 10 m (d) $1.25m$

18. What is the concentration of copper sulphate $(in\,mol\,L^{-1})$ if 80 g of it is dissolved in enough water to make a final volume of L?

(a) 0.0167 (b) 0.167

(c) 1.067 (d) 10.67

19. What volume of 5M Na_2SO_4 must be added to 25 mL of 1 M $BaCl_2$ to produce 10 g of $BaSO_4$?

(a) $8.58mL$ (b) $7.2mL$ (c) 10 mL (d) 12 Ml

20. How much mass of silver nitrate will react with 5.85 g of sodium chloride to produce 14.35 g of silver chloride and 8.5 g of sodium nitrate if law of conservation of mass is followed?

(a) $22.85\,g$ (b) 108 g (c) 17.0 g (d) $28.70\,g$

21. Calcium carbonate decomposes on heating to give calcium oxide and carbon dioxide. How much volume of CO_2 will be obtained by thermal decomposition of 50 g of $CaCO_3$?
(a) 1 L (b) $11.2\,L$ (c) $44\,L$ (d) $22.4\,L$

22. Chlorine gas is prepared by reaction of H_2SO_4 with MnO_2 and NaCl. What volume of Cl_2 will be produced at STP if 50 g NaCl is taken in the reaction?
(a) $1.915\,L$ (b) $22.4\,L$ (c) $11.2\,L$ (d) $9.57\,L$

23. Oxygen occurs in nature as a mixture of isotopes ^{16}O, ^{17}O and ^{18}O having atomic masses of 15.995 u 16.999 u and 17.999 U and relative abundance of $99.763\%, 0.037\%$ and 0.200% respectively.
What is the average atomic mass of oxygen?
(a) $15.999\,u$ (b) $16.999\,u$
(c) $17.999\,u$ (d) $18.999u$

24. Match the mass of elements given in column I with the no. of moles given in column II and mark the appropriate choice.

Column -I	Column -II
(A) 28 g of He	(i) 2 moles
(B) 46 g of Na	(ii) 7 moles
(C) 60 g of Ca	(iii) 1 mole
(D) 27 g of Al	(iv) 1.5 moles

(a) (A) $\rightarrow$ (iv), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (ii), (D) $\rightarrow$ (i)
(b) (A) $\rightarrow$ (i), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (ii), (D) $\rightarrow$ (iv)
© (A) $\rightarrow$ (iii), (B) $\rightarrow$ (ii), (C) $\rightarrow$ (i), (D) $\rightarrow$ (iv)
(d) (A) $\rightarrow$ (ii), (B) $\rightarrow$ (i), (C) $\rightarrow$ (iv), (D) $\rightarrow$ (iii)

25. Which of the following correctly represents 180 g of water?
(i) 5 moles of water
(ii) 10 moles of water
(iii) 6.023×10^{23} molecules of water
(iv) 6.023×10^{24} molecules of water
(a) (i) and (ii) (b) (i) and (iv)
(b) (ii) and (iv) (d) (ii) and (iii)

26. 0.48 g of a sample of a compound containing boron and oxygen contains 0.192 g of boron and 0.288 g of oxygen. What will be the percentage composition of the compound?
(a) 60% and 40% B and O respectively
(b) 40% and 60% B and O respectively
(c) 30% and 70% B and O respectively
(d) 70% and 30% B and O respectively

27. Molarity equation of a mixture of solutions of same substance is given by
(a) $M_1 + V_1 \times M_2 + V_2 \times M_3 + V_3 + ... = M_1 + M_2 + M_3$
(b) $M_1V_1 + M_2V_2 + M_3V_3 + ... = M(V_1 + V_2 + V_3)$
(c) $\frac{M_1}{V_1} + \frac{M_2}{V_2} + \frac{M_3}{V_3} + ...M\left(\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3}\right)$
(d) $\frac{M_1}{V_1} \times \frac{M_2}{V_2} \times \frac{M_3}{V_3} + ... = M_1\left(\frac{1}{V_1} \times \frac{1}{V_2} \times \frac{1}{V_3}\right)$

28. The final molarity of a solution made by mixing 50 mL of $0.5M$ HCl, 150 mL of $0.25M$ HCl and water to make the volume 250 mL is

(a) $0.5\,M$ (b) 1 M (c) $0.75\,M$ (d) $0.25\,M$

29. A solution is prepared by adding 5 g of a solute 'X' to 45 g solvent 'Y' what is the mass per cent of the solute 'X'?
(a) 10% (b) 11.1% (c) 90% (d) 75%

30. $4.28\,g$ of NaOH is dissolved in water and the solution is made to 250 cc. what will be the molarity of the solution?

(a) $0.615\,mol\,L^{-1}$ (b) $0.428\,mol\,L^{-1}$

(c) $0.99\,mol\,L^{-1}$ (d) $0.301\,mol\,L^{-1}$

1. (d) : 1 inch = $2.54\,\text{cm}$

2. (d) : One molecule of oxalic acid dehydrate $(COOH)_2 2H_2O$ contains 6 oxygen atoms.
Number of oxygen atoms in 1 mole
$= 6 \times 6.023 \times 10^{23} = 36.13 \times 10^{23}$ atoms

3. (d): Pico = 10^{-12}, femto = 10^{-15}, milli = 10^{-3}, giga= 10^{-}

4. (a) : Since 1 L = 1000 cm^3
and 1 m = 100 cm

$$\frac{1\text{m}}{100\,\text{cm}} = 1 = \frac{100\,\text{cm}}{1\text{m}}, \text{ or}$$

$$\left(\frac{1\text{m}}{100\,\text{m}}\right)^3 = \frac{1\text{m}^3}{10^6\,\text{cm}^3} = 1^3 = 1$$

Hence , 5 L = $5\times1000\,\text{cm}^3 \times \frac{1\text{m}^3}{10^6\,\text{cm}^3} = \frac{5\text{m}^3}{10^3} = 5\times10^{-3}\text{m}^3$

5. (a) : Density

$$= \frac{\text{Mass}}{\text{Volume}} = \frac{18.72}{1.81} = 10.34\,\text{g cm}^{-3}$$

Since volume contains 3 significant figures hence answer will be $10.3\,\text{g cm}^{-3}$

6. (a) : Seconds in 3 days can be calculated as
3 days

$$\times\frac{24\text{h}}{1\text{day}} \times \frac{60\,\text{min}}{1\text{h}} \times \frac{60\,\text{s}}{1\,\text{min}} = 3\times24\times60\times60$$

= 259200 s

7. (b) : PbO, PbO_2

8. (c) : Gay Lussac's law is true only for gaseous substances.

9. (a) : Atomic masses are the average atomic masses of the mixture of isotopes and calculated on the basis of relative abundance.

10. (a) : Number of moles

$$\propto \frac{1}{\text{Molecular mass}}$$

Molecular mass of CO_2 =44, $N_2 = 28$, $CH_4 = 16$, HCl=36.5
CO_2 will have least volume.

11. (b) : Number of gram atoms of $\text{H} = \frac{\text{N}}{\text{N}_\text{A}} = \frac{100}{6.022\times10^{23}}$

$= 1.66 \times 10^{-22}$

Mass of hydrogen atoms = $1\times1.66\times10^{-22}$
$= 1.66 \times 10^{-22}$

12. (d) : No. of atoms in 1 mole of $PCl_3 = 4$
No. of aotms in 1.4 moles of PCl_3
$= 4\times1.4\times6.022\times10^{23} = 3.372\times10^{24}$

13. (d) : Mole × Molar mass = Mass of substance

$n \times M = w$

14. (a) : mass of $Al_2O_3 = 2 \times 27 + 3 \times 16 = 102$

$0.051\,g$ of $Al_2O_3 = \dfrac{0.051}{102} = 0.0005$ mol

1 mol of Al_2O3 contains $2 \times 6.023 \times 10^{23}\ Al^{3+}$ ions

0.0005 mol of Al_2O_3 contains $2 \times 0.0005 \times 6.023 \times 10^{23}\ Al^{3+}$ ions

$= 6.023 \times 10^{20}\ Al^{3+}$ ions

15. (a) : 1 mole of CH_4 =16 g

$16\,g$ of CH_4 contain 10 electorns

1.6 g of CH_4 contain $\dfrac{10}{16} \times 1.6 \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{23}$ electrons

16. (a) : 2g of H_2 = 1 mole, 32 g of O_2 =1 mole

Total volume of 2 moles of gases at NTP= $2 \times 22.4L = 44.8L$

17. (a) : Molality

$$= \frac{\dfrac{\text{Wt. of solute}}{\text{Mol. wt. of solute}} \times}{\dfrac{1000}{\text{Wt. of solvent}}}$$

$$m = \frac{10}{40} \times \frac{1000}{100} = 2.5\ m$$

18. (b) : Molar mass of $CuSO_4$ =

$63.5 + 32 + 64 = 159.5$

Moles of $CuSO_4$ $\dfrac{80.}{159.5} = 0.50$

Volume of solution = 3 L

Molarity

$$= \frac{\text{Moles of solute}}{\text{Volume of solution in L}}$$

$$= \frac{0.50}{3} = 0.167\ \text{mol}\ L^{-1}$$

19. (a) : $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

No. of moles of

$$BaSO_4 = \frac{w}{M} = \frac{10}{233} = 0.0429$$

$\therefore$ No. of moles of Na_2SO_4 needed

$$= 0.0429 = \frac{M \times V}{1000}$$

$v = 8.58$ Ml

20. (c) : $\underset{x}{AgNO_3} + \underset{5.85g}{NaCl} \rightarrow \underset{8.5g}{NaNO_3} + \underset{14.32g}{AgCl}$

$x + 5.85 = 8.5 + 14.35$

x = 17 g

21. (b) : $\underset{100\,g}{CaCO_3} \rightarrow CaO + \underset{1\,mole=22.4L}{Co_2}$

100 g of $CaCO_3$ at STP gives $22.4\,L$ of CO_2

50 g of $CaCO_3$ will produce $\frac{22.4}{100} \times 50 = 11.2\,L$ of CO_2

22. (d) : $\underset{2\,moles\ (2\times 58.5=117g)}{2NaCl} + MnO_2 + 3H_2SO_4 \rightarrow 2NaHSO_4 + MnSO_4 + \underset{1mle\ 22.4\,L\,(STP)}{Cl_2} + 2H_2O$

117 g of NaCl $\equiv 22.4\,L$ of Cl_2

50 g of NaCl $\equiv \frac{22.4}{117} \times 50 = 9.57\,L$ of Cl_2 at STP

23. (a) : Atomic mass of oxygen

$$= \frac{(99.763 \times 15.995) + (0.037 \times 16.999) + (0.200 \times 17.999)}{100} = 15.999\ u$$

24. (d) : (A) $28\,g\,He = \frac{28}{4} = 7$ mol

(B) : $46\,g$ of $Na = \frac{46}{23} = 2$ mol

(C) : $60\,g$ of $Ca = \frac{60}{40} = 1.5$ mol

(D) : $27\,g$ of $Al = \frac{27}{27} = 1$ mol

25. (c) : 18 g of H_2O = 1 mol

$180\,g$ of H_2O =10 mol

6.023×10^{23} molecules of H_2O =18 g of H_2O

$180\,g$ of H_2O $\frac{6.023 \times 1023}{18} \times 180$

$= 6.023 \times 24^{24}$ molecules of H_2O

26. (b) : Mass of compound taken= $0.48\,g$

Mass of boron in sample = $0.192\,g$

Mas of oxygen in sample = $0.288\,g$

Percentage of B= $\frac{0.192}{0.48} \times 100 = 40\%$

Perceentage of O = $\frac{0.288}{0.48} \times 100 = 60\%$

27. (b) : Molarity of a mixture of solution of same substance is given by

$\underset{(1^{st}\,soln)}{M_1V_1} + \underset{(2^{nd}\,soim)}{M_2V_2} + \underset{(3rd\,soin)}{M_3V_3} + ... = M(V_1 + \underset{(mixture)}{V_2} + V_3)$

28. (d) : $M_1V_1 + M_2V_2 = MV$

$0.5 \times 50 + 0.25 \times 150 = M \times 250$

$$M=\frac{25+37.5}{250}=0.25M$$

29. (a) : Mass per cent of X

$$=\frac{\text{Mass of x}}{\text{Mass of solution}}\times 100$$

$$=\frac{5}{5+45}\times 100=10\%$$

30. (b) : No. of moles of NaOH $=\frac{4.28}{40}=0.107$

Volume of solution = 250 cm^3

$$M=\frac{n}{V\text{ in L}}=\frac{0.107}{250}\times 1000=0.428\,\text{mol L}^{-1}$$