

Worksheet-2**Juniors****Mole Concept**

- Chlorophyll contains 2.68% of magnesium by mass. Calculate the number of magnesium atoms in 3 grams of chlorophyll. (Atomic mass of Mg = 24)
- Each molecule of haemoglobin contains four iron atoms. (Atomic mass of iron = 56). If haemoglobin contains 0.32% of iron by weight, what will be the molecular weight of haemoglobin.
- Find the ratio of number of molecules contained in 1 gram of NH_3 and 1 gram of Nitrogen.
- On an wedding day, bride and bridegroom exchanged diamond rings. The diamond is only made of carbon atoms. The weight of diamond in their rings combinedly is 8g. Weight of diamond in bride's ring is twice that of bridegroom's. Calculate the number of C atoms present in the diamond ring of bridegroom.
- Calculate the number of moles of SO_2Cl_2 in 13.5 grams of it.
- An ore contains 1.34 % of the mineral Argentite, Ag_2S by weight. How many grams of this ore would have to be processed in order to obtain 1g of pure solid silver, Ag?
- (a) If the atomic weight of nitrogen is expressed as 14 amu, how many atoms would it represent?
(b) If the atomic weight of nitrogen is expressed as 14 grams, how many atoms would it represent?
- Chlorine has two naturally occurring isotopes $^{35}\text{Cl}_{17}$ with an abundance of 75.77% and an atomic weight of 34.969 amu, and $^{37}\text{Cl}_{17}$ with an abundance of 24.23% and an atomic weight of 36.966 amu. What is the average atomic weight of chlorine.
- If you won 1 mol of Rupees in a lottery the day you were born and spent a billion rupees every second, how much percentage still you will have the prize money the day when you will die at the age of ninety years.
- i) What is the mass of 3.01×10^{23} molecules of ammonia?
ii) How many molecules and atoms are present in 11.2 litre of chlorine at STP
- 1 mole of Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) consists of
(A) 6 gram molecules of H_2 (B) 6 gram atoms of carbon
(C) 12 gram atoms of Hydrogen (D) All of these
- Weight of a molecule of the compound $\text{C}_{60}\text{H}_{22}$ is
(A) 1.09×10^{-21} g (B) 1.24×10^{-21} (C) 5.025×10^{23} g (D) 16.02×10^{23} g
- The volume of one mole of a gas at standard temperature and pressure is
(A) 11.2 litres (B) 22.4 litres (C) 100 litres (D) 5.6 litres
- How many years it would take to spend Avogadro's number of rupees at the rate of 10 lac rupees per second?
- Calculate the no. of moles of water in 488 g $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$. (Ba = 137, Cl = 35.5, O = 16, H = 1)
- If molecular mass and atomic mass of sulphur are 256 and 32 respectively, its atomicity is
(A) 2 (B) 4 (C) 8 (D) 16
- Number of atoms in 22 g of CO_2 is:-
(A) $3 \times 6.023 \times 10^{23}$ (B) $21.5 \times 6.023 \times 10^{23}$ (C) $1.5 \times 6.023 \times 10^{23}$ (D) $2.5 \times 6.023 \times 10^{23}$

18. The percentage of oxygen in NaOH is
(A) 40 (B) 16 (C) 8 (D) 1
19. Which of the following specimens has highest weight?
(A) One atom of silver (B) One mole of SO₂
(C) One grams atoms of nitrogen (D) Two grams of sodium
20. Calculate the no. of molecules present in 350 CC of NH₃ gas at 273 K and 1 atm pressure is
(A) 1.882×10^{22} (B) 18.82×10^{22} (C) 1.882×10^{21} (D) 18.82×10^{21}
21. Number of neutrons present in 8g of methane gas, are
(A) 1.8066×10^{24} (B) 18.82×10^{22} (C) 1.8066×10^{23} (D) 1.5×10^{23}
22. Number of atoms in 5.6 L of He gas at STP is
(A) 1.51×10^{22} (B) 1.51×10^{23} (C) 15.1×10^{22} (D) 1.51×10^{23}
23. Which of the following expressions is correct (n = no. of moles of the gas, N_A = Avogadro constant, m = mass of one molecule of the gas, N = no. of molecules of the gas) ?
(A) $n = mN_A$ (B) $m = N_A$ (C) $N = nN_A$ (D) $m = mn/N_A$
24. 2 moles of N atoms at NTP occupy a volume of
(A) 11.2 L (B) 44.8 L (C) 22.4 L (D) 5.6 L
25. Which of the following contains the greatest number of atoms,
(A) 1g of butane (C₄H₁₀) (B) 1g of Nitrogen (N₂)
(C) 1g of silver (Ag) (D) 1g of water (H₂O)
26. In which of the following pairs do 1g of each have an equal number of molecules ?
(A) N₂O and CO (B) N₂ and C₃O₂ (C) N₂ & CO (D) N₂O and CO₂
27. The atomic weights of two elements A and B are 40 and 80 respectively. If x g of A contains Y atoms, how many atoms are present in $2x$ g of B.
(A) $\frac{Y}{2}$ (B) $\frac{Y}{4}$ (C) Y (D) $2Y$
28. Which of the following will contain same number of atoms as 20g of calcium.
(A) 24 g magnesium (B) 12 g carbon
(C) 8g of oxygen gas. (D) 16g of oxygen gas.
29. 4.6×10^{22} atoms of an element weight 13.5 gm. The atomic mass of the element is
(A) 290 (B) 180 (C) 344 (D) 104
30. Which of the following contains the least no of molecules
(A) 1 gm CO₂ (B) 1 gm N₂ (C) 1 gm O₂ (D) 1 gm H₂
31. A polystyrene of formula Br₃ C₆ H₂ (C₈ H₈)_n was prepared by heating styrene with tribromobenzoyl peroxide in the absence of air. If it was found to contain 10.46% Bromine by weight. Find the value of n .
(Atomic mass of Br = 80 g)
32. Which of the following contains the same no. of atoms as 20 gm of calcium
(A) 24 gm of Mg (B) 12 gm of Mg (C) 24 gm of C (D) 12 gm of C

33. Avogadro's number is the no. of molecules present in
 (A) One litre of the gas at N.T.P. (B) 22.4 litre of gas at N.T.P.
 (C) 22.4 ml of the gas at N.T.P. (D) 44.8 litre of the gas at N.T.P.
34. One atomic mass unit is equivalent to
 (A) 1.66×10^{-27} g (B) 1.66×10^{-27} kg (C) 1.66×10^{-27} mg (D) 1.66×10^{-27} cg
35. The atomic mass of an element is measured relative to the mass of (Now a days)
 (A) hydrogen atom (B) oxygen atom
 (C) carbon-12 (D) isotopic mixture of ^{12}C , ^{13}C and ^{14}C .
36. Avogadro's Number is the number of molecules present in:
 (A) 22.4 litres of a gas at NTP (B) 1g – molecule of a substance
 (C) 32 g of oxygen (D) 6gm of carbon
37. Which of the following is correct?
 (A) g-mole wt. = mol. Wt. in g = wt. of 6.02×10^{23} molecules
 (B) Mole = N molecule = 6.02×10^{23} molecules
 (C) Mole = g – molecules (D) Mole = 1g. atom.
38. 8g of O_2 has the same number of molecules as :
 (A) 7g of CO (B) 14 g of CO (C) 28 g of CO (D) 11g of CO_2
39. 11.2 litre of a gas at STP weighs 14g. The gas could not be :
 (A) N_2 (B) CO (C) B_2H_6 (D) N_2O
40. The weight of Ca present in $\text{Ca}(\text{NO}_3)_2$ that contains 20g of nitrogen, is
 (A) $\frac{20 \times 28}{40}$ (B) $\frac{28}{40 \times 20}$ (C) $\frac{40 \times 28}{20}$ (D) $\frac{40 \times 20}{28}$
41. 0.44 g of an oxide of nitrogen occupies 224 ml at, STP, molecular formula is
 (A) N_2O (B) NO (C) N_2O_4 (D) N_2O_3
42. The weight of gaseous mixture containing 6.02×10^{23} molecules of nitrogen and 3.01×10^{23} molecules of SO_2
 (A) 46 (B) 92 (C) 60 (D) 30
43. The weight of a piece of copper is 0.635 g. The number of copper atoms present in it are (N = Avogadro's no.)
 (A) 0.05N (B) 0.1 N (C) 0.01 N (D) 1 N
44. Match the following:

Column – I		Column – II	
(A)	52g of He	(P)	13 atoms
(B)	52 moles of He	(Q)	44.8 L
(C)	34 g of NH_3	(R)	313.196×10^{23} atoms
(D)	52 u of He	(S)	78.299×10^{23} atoms

45. Match the following :

Column – I		Column – II	
(A)	Volume in litre of 0.1 mole of CO ₂ at N.T.P	(P)	12.046 x 10 ²³
(B)	No. of oxygen atoms in 44g of CO ₂	(Q)	110
(C)	Total number of molecules in 100 g of limestone	(R)	2.24
(D)	Total number of electrons in five azide (N ₃ ⁻) ions	(S)	6.023 x 10 ²³

46. Molarity of 4% (w/v) NaOH solution is
(A) 1 M (B) 4 M (C) 0.1 M (D) 0.4 M
47. Molarity of 10.6% (w/v) Na₂CO₃ solution is
(A) 1 M (B) 10.6 M (C) 2 M (D) 0.1 M
48. Molarity of a solution containing 4.9 gm of H₂SO₄ in 100 cm³ of its solution is
(A) 1 M (B) 0.5 M (C) 5 M (D) 0.1 M
49. The amount of Na₂CO₃ present in 500 cm³ of decimolar of its solution is
(A) 5.3 gm (B) 0.005 mol (C) 5.3 mol (D) 0.05 gm
50. The weight of NaOH present in 100 cm³ of semimolar its solution is
(A) 2 gm (B) 4 gm (C) 40 gm (D) 8 gm
51. The number of millimoles present in 200 cm³ of 0.2 M of a solution is
(A) 4 (B) 0.4 (C) 40 (D) 400
52. The total particle concentration in 100 cm³ of 0.2 M Al₂(SO₄)₃ solution is
(A) 1 Mole (B) 10 Mole (C) 0.1 Mole (D) 0.4 Mole
53. The number of molecules of NaOH present in 100 cm³ of decimolar its solution is
(A) N (B) N/10 (C) N/100 (D) N/1000
54. The molarity of a solution containing 0.4 gm mole of NaOH in 100 cm³ of its solution is
(A) 4 M (B) 0.4 M (C) 0.2 M (D) 1 M
55. A solution of glucose is 18% (w/v). What volume of this solution contains 1 gm mole of glucose
(A) 1 m³ (B) 1 dm³ (C) 1 cm³ (D) 10 dm³
56. What volume of water must be added to prepare 75 cm³ of decimolar NaCl solution from 30 cm³ of 0.25 M of NaCl solution
(A) 30 cm³ (B) 45 cm³ (C) 75 cm³ (D) 150 cm³
57. A person adds 1.71 gram sugar (C₁₂H₂₂O₁₁) in order to sweeten his tea. The number of carbon atoms added are (mol. mass of sugar = 342)
(A) 3.6 x 10²² (B) 7.2 x 10²¹ (C) 0.05 (D) 6.6 x 10²²
58. The total number of electrons present in 18 ml of water (density of water is 1 g ml⁻¹) is
(A) 6.02 x 10²² (B) 6.02 x 10²³ (C) 6.02 x 10²⁴ (D) 6.02 x 10²⁵

59. If 10^{21} molecules are removed from 200 mg of CO_2 , then the number of moles of CO_2 left are
(A) 2.88×10^{-3} (B) 28.8×10^{-3} (C) 0.288×10^{-3} (D) 1.66×10^{-2}
60. The weight of 1×10^{22} molecules of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is
(A) 41.59g (B) 415.9 g (C) 4.159g (D) none of three
61. How many g of KCl would have to be dissolved in 60g of H_2O to give 20% by weight solution
(A) 15g (B) 1.5g (C) 11.5g (D) 31.5g
62. The volume occupied by one molecule of water (density = 1g /cc) is
(A) 18 cm^3 (B) 22400 cm^2 (C) $6.023 \times 10^{-23} \text{ cm}^3$ (D) $3 \times 10^{-23} \text{ cm}^3$
63. Equal weights of SO_2 and SO_3 are present in a flask. Mole fraction of SO_2 in the mixture is
(A) greater than that of SO_3 (B) smaller than that of SO_3
(C) equal to that of SO_3 (D) None of these
64. 2g mixture of H_2 and He gases have mole fraction of H_2 as 0.5. Hence mole fraction of He is
(A) 0.25 (B) 0.5 (C) 1.0 (D) 1.5
65. The atomic mass of copper is 63.546. There are only two naturally occurring isotopes of copper, ^{63}Cu and ^{65}Cu . The natural abundance of the ^{63}Cu isotope must be approximate.
(A) 10% (B) 30% (C) 50% (D) 73%
66. Molality of 40% (by mass) urea solution is
(A) 0.40 (B) 0.60 (C) 11.11 (D) 0.167
67. 224 ml of a triatomic gas weighs 1g at 273K and 1 atm. The mass of one atom of this gas is
(A) $8.30 \times 10^{-23} \text{ g}$ (B) $2.08 \times 10^{-23} \text{ g}$ (C) $5.53 \times 10^{-23} \text{ g}$ (D) $6.24 \times 10^{-23} \text{ g}$
68. A compound possesses 8% sulphur by mass. The least molecular mass is
(A) 200 (B) 400 (C) 155 (D) 355
69. Which of the following has the smallest number of molecules?
(A) 0.1 mol of CO_2 gas (B) 11.2 L of CO_2 gas (C) 22 gm of CO_2 gas (D) 22.4×10^3 ml of CO_2 gas
70. The volume of 1.0 g of hydrogen in litres at NTP is
(A) 2.24 (B) 22.4 (C) 1.12 (D) 11.2
71. The specific gravity of 36.5% by weight of HCl solution is 1.18, its molarity is
(A) 1.18 M (B) 11.8 M (C) 2 M (D) 9.2 M
72. The molarity of 500 cm^3 of a solution containing 2 gm of 98% pure phosphoric acid is
(A) 4 M (B) 0.4 M (C) 0.04 M (D) 40 M
73. The molarity of 500 cm^3 of a solution containing 5 gm of 80% pure NaOH is
(A) 0.1 M (B) 0.2 M (C) 0.4 M (D) 0.02 M

74. The amount of 98% pure Na_2CO_3 required to prepare 500 cm^3 of 0.5 M of its solution is
(A) 27 gm (B) 26.5 gm (C) 0.25 mol (D) 2.5 mol
75. The weight of 80% pure NaOH required to prepare 100 cm^3 of decimolar its solution is
(A) 0.4 gm (B) 4 gm (C) 8 gm (D) 0.5 gm
76. A solution of glucose is 18% (w/v). What volume of this solution contains 1 gm mole of glucose
(A) 1 m^3 (B) 1 dm^3 (C) 1 cm^3 (D) 10 dm^3
77. The molarity of a solution containing 0.01 weights of NaCl in 500 cm^3 of its solution is
(A) 0.01 M (B) 0.02 M (C) 0.03 M (D) 0.1 M
78. Molarity of HCl solution is 12 M. What volume of water must be added to 200 cm^3 of the acid to get 0.5 M HCl solution
(A) 4.8 dm^3 (B) 4.6 dm^3 (C) 2.6 dm^3 (D) 1 dm^3
79. The molarity of a solution is 2 M. It is diluted by four times. What is the final molarity
(A) 0.1 M (B) 0.5 M (C) 2 M (D) 1.5 M
80. 20 cm^3 of 0.1 M H_2SO_4 is neutralized by 40 cm^3 of NaOH solution. The molarity of NaOH solution is
(A) 0.1 M (B) 0.01 M (C) 0.2 M (D) 0.6 M
81. The volume of decimolar NaOH solution required to neutralize completely 20 cm^3 of 0.05 M oxalic acid solution is
(A) 200 cm^3 (B) 10 cm^3 (C) 40 cm^3 (D) 20 cm^3
82. The volume of 0.025 M phosphoric acid required to neutralize 25 cm^3 of 0.05 M $\text{Ca}(\text{OH})_2$ solution is
(A) 75 cm^3 (B) 25 cm^3 (C) 33.34 cm^3 (D) 150 cm^3
83. The volume of 2 M H_2SO_4 required to neutralize 100 cm^3 of a solution containing 4 gm of NaOH is
(A) 250 cm^3 (B) 25 cm^3 (C) 500 cm^3 (D) 50 cm^3
84. The volume of 1 M NaOH solution required to convert 100 cm^3 containing 12 gm of NaH_2PO_4 completely to Na_3PO_4 is
(A) 200 cm^3 (B) 20 cm^3 (C) 2 dm^3 (D) 500 cm^3
85. 100 cm^3 of 0.1 M KMnO_4 solution oxidizes 200 cm^3 of 'x' M FeSO_4 solution. The value of 'x' is
(A) 2.5 M (B) 0.25 M (C) 0.5 M (D) 1 M
86. 100 cm^3 of 0.2 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution oxidizes x cm^3 of 0.1 M FeSO_4 solution. The value of 'x' is
(A) 1.2 dm^3 (B) 12 dm^3 (C) 1 dm^3 (D) 4 dm^3
87. To prepare 3 M solution from 2 M and 6 M solutions, in what volume ratio they must be mixed
(A) 3 : 1 (B) 6 : 1 (C) 4 : 1 (D) 1 : 2
88. The molarity of chloride ions in the resultant solution obtained by mixing 100 cm^3 of 0.2 M NaCl solution and 200 cm^3 of 0.1 M BaCl_2 solution
(A) 1.2 M (B) 0.2 M (C) 2.0 M (D) 4 M

89. 100 cm³ of 0.1 M NaCl solution is mixed with 100 cm³ of 0.2 M AgNO₃ solution. The concentration of NO₃⁻ ion in the resultant solution is
(A) 50 M (B) 5 M (C) 0.1 M (D) 0.05 M
90. There are four solutions A, B, C and D obtained by mixing acids in various proportions as mentioned below. The correct order of their molarities
[A] : 100 cm³ of 0.1 M HCl + 200 cm³ of 0.2 M HNO₃
[B] : 200 cm³ of 0.2 M H₂SO₄ + 100 cm³ of 0.4 M HNO₃
[C] : 300 cm³ of 0.1 M HCl + 300 cm³ of 0.1 M H₂SO₄
[D] : 500 cm³ of 0.2 M HCl + 500 cm³ of 0.1 M H₂SO₄
(A) A > B > C > D (B) A < B < C < D (C) B > A > D > C (D) B > D > C > A

Answers

- | | | | |
|--|-----------------------------------|--|--------------------------------------|
| 1. 2 × 10 ²¹ atoms | 2. 70,000 | 3. 28 : 17 | 4. 1 × 10 ²³ atoms |
| 5. 0.1 | 6. 85.68 | 7. (a) one atom (b) 6.023 × 10 ²³ atoms | |
| 8. 35.45 amu | 9. 99.99% | | |
| 10. (i) 8.5 g (ii) 3.01 × 10 ²³ molecules and 6.022 × 10 ⁻²³ atom. | | | |
| 11. D | 12. B | 13. B | 14. 1.9099 × 10 ¹⁰ years. |
| 15. 4 | 16. C | 17. C | 18. A 19. B |
| 20. A | 21. C | 22. A | 23. B 24. B |
| 25. B | 26. B | 27. C | 28. C 29. B |
| 30. A | 31. 19 | 32. B | 33. B 34. B |
| 35. C | 36. A, B, C | 37. A, B, C, D | 38. A, D 39. D |
| 40. D | 41. A | 42. C | 43. C |
| 44. A → s ; B → r ; C → q ; D → p | 45. A → r ; B → p ; C → s ; D → q | | |
| 46. A | 47. A | 48. B | 49. A 50. A |
| 51. C | 52. C | 53. C | 54. A 55. B |
| 56. B | 57. A | 58. C | 59. A 60. C |
| 61. A | 62. D | 63. A | 64. B 65. D |
| 66. C | 67. C | 68. C | 69. B 70. A |
| 71. B | 72. C | 73. B | 74. C 75. D |
| 76. B | 77. B | 78. B | 79. B 80. A |
| 81. D | 82. C | 83. B | 84. A 85. B |
| 86. A | 87. A | 88. B | 89. C 90. C |