Exercise-1

Marked Questions may have for Revision Questions.

PART - I : SUBJECTIVE QUESTIONS

- **1.** How much time (in years) would it take to distribute one Avogadro number of wheat grains if 10¹⁰ grains are distributed each second ?
- 2. The weight of one atom of Uranium is 238 amu. Its actual weight is g.
- 3. Calculate the weight of 12.044×10^{23} atoms of carbon.
- 4. How many grams of silicon is present in 35 gram atoms of silicon (Given at. wt. of Si = 28).
- 5. Find the total number of nucleons present in 12 g of ¹²C atoms.
- **6.** Find (i) the total number of neutrons, and (ii) the total mass of neutrons in 7 mg of ¹⁴C. (Assume that the mass of a neutron = mass of a hydrogen atom)
- 7. Calculate the number of electrons, protons and neutrons in 1 mole of ¹⁶O⁻² ions.
- 8. How many atoms are there in 100 amu of He?
- **9.** The density of liquid mercury is 13.6 g/cm³. How many moles of mercury are there in 1 litre of the metal? (Atomic mass of Hg = 200.)
- 10. Calculate the atomic mass (average) of chlorine using the following data :

	% Natural Abundance	Molar Mass
³⁵ Cl	75	35.0 g
³⁷ Cl	25	37.0 g

- **11.** Average atomic mass of Magnesium is 24.31 amu. This magnesium is composed of 79 mole % of ²⁴Mg and remaining 21 mole % of ²⁵Mg and ²⁶Mg. Calculate mole % of ²⁶Mg.
- 12. The number of molecules in 16 g of methane is :
- **13.** Calculate the number of molecules in a drop of water weighing 0.09 g.
- **14.** A sample of ethane has the same mass as 10.0 million molecules of methane. How many C₂H₆ molecules does the sample contain ?
- **15.** The number of neutrons in 5 g of D_2O (D is ${}^{2}H$) are :
- **16.** Calculate the weight of 6.022×10^{23} formula units of CaCO₃.
- 17. From 200 mg of CO₂, 10²¹ molecules are removed. How many moles of CO₂ are left ?
- **18.**Find the total number of H, S and 'O' atoms in the following :
(a) 196 g H_2SO_4 (b) 196 amu H_2SO_4 (c) 5 mole $H_2S_2O_8$ (d) 3 molecules $H_2S_2O_6$.
- **19.** If from 10 moles NH₃ and 5 moles of H₂SO₄, all the H-atoms are removed in order to form H₂ gas, then find the number of H₂ molecules formed.
- **20.** If from 3 moles MgSO₄.7H₂O, all the 'O' atoms are taken out and converted into ozone find the number of O₃ molecules formed.
- **21.** If the components of air are N₂ 78%; O₂ 21%; Ar 0.9% and CO₂ 0.1% by volume (or mole), what would be the molecular weight of air ?

22. Find the expression of Universal Gas Constant R in SI system in terms of the given properties of oxygen gas.

Pressure = p(kPa)Volume = V (mL)Temperature = t (°C) Mass of oxygen = w(g)

- 23. The volume of a gas at 0°C and 700 mm pressure is 760 cc. The number of molecules present in this volume is :
- The weight of 350 mL of a diatomic gas at 0°C and 2 atm pressure is 1 g. The weight of one atom is : 24.
- Oxygen is present in a 1-litre flask at a pressure of 7.6 × 10⁻¹⁰ mm of Hg at 0°C. Calculate the number of 25. oxygen molecules in the flask.

26. Fill in the blanks :

> (i) 1µm = nm (iv) 1dm = mm

(ii) 10 MJ = J (v) 10 pm = cm (iii) 100 Pa = kPa

PART - II : OBJECTIVE QUESTIONS

Single Correct Questions (SCQ)

1.	 Which is not a basic postulate of Dalton's atomic theory ? (A) Atoms are neither created nor destroyed in a chemical reaction. (B) Different elements have different types of atoms. (C) Atoms of an element may be different due to presence of isotopes. (D) Each element is composed of extermely small particles called atoms. 							
2.	The modern atomic we (A) ¹² C	ight scale is based on : (B) ¹⁶ O	(C) ¹ H	(D) ¹⁸ O				
3.	1 amu is equal to $\frac{1}{12}$ of C–12	(B) $\frac{1}{14}$ of O-16	(C) 1 g of H ₂	(D) 1.66 × 10 ^{−23} kg				
4.	If the atomic mass of so (A) 1	odium is 23, the number (B) 2	of moles in 46 g of sodiu (C) 2.3	m is : (D) 4.6				
5.	How many grams are contained in 1 gram-atom of Na?							
	(A) 13 g	(B) 23 g	(C) 1 g	(D) ['] 23 g				
6.	1.0 g of hydrogen contains 6 × 10 ²³ atoms. The atomic weight of helium is 4. It follows that the number of atoms in 1 g of He is : $1^{1} + 6 + 10^{23}$							
	(A) $\frac{1}{4}$ \wedge $0 \wedge$ 10	(B) 4 × 6 × 10 ²³	(C) 6 × 10 ²³	(D) 12 × 10 ²³				
7.	The atomic weights of two elements A and B are 40u and 80u respectively. If x g of A contains y atoms, how many atoms are present in 2x g of B?							
	(A) ^y /2	(B) $\frac{y}{4}$	(C) y	(D) 2y				
8.	A sample of aluminiun	n has a mass of 54.0 d.	. What is the mass of th	e same number of magnesium				

ignesium atoms? (At. wt. Al = 27, Mg = 24)

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•	(A) 12 g	(B) 24 g	(C) 48 g	(D) 96 g.			
9.	The number of atoms (A) Twice that in 60 g (C) Half in 8 g He	s in 558.5 g of Fe (at wt. g carbon	= 55.85) is : (B) 6.022 × 10 ²² (D) 558.5 × 6.023 × 10)23			
10.	Which of the followin	g has the Maximum ma	ss ?				
	(A) 1 g-atom of C (C) 10 mL of water		(B) $\frac{1}{2}$ mole of CH ₄ (D) 3.011 × 10 ²³ atoms	s of oxygen			
11.	The total number of p (A) 1.084 × 10 ²⁵	protons, electrons and n (B) 6.022 × 10 ²³	eutrons in 12 g of $_{6}^{12}$ is : (C) 6.022×10 ²²	(D) 18			
12.	1 mole of element X h X has mass, 2 times (A) 80	nas mass, 3/10 times the the mass of one atom o (B) 15.77	e mass of 1 mole of element f ¹² C. What is the atomic w (C) 46.67	Y. One average atom of element reight of Y ? (D) 40.0			
13.	The charge on 1 gra	m ions of AI^{3+} is : ($N_A = A$	Avogadro number, e = cha	rge on one electron)			
	(A) $\frac{1}{27}$ N _A e coulomb	(B) $\frac{1}{3} \times N_{A}e$ couloml	b (C) $\frac{1}{9} \times N_{A}e$ coulomb	(D) 3 × N _A e coulomb			
14.	It is known that an at half of its original valu	om contains protons, ne le whereas that of proto	eutrons and electrons. If the n is assumed to be twice of	e mass of neutron is assumed to its original value, then the atomic			
	mass of ^{6°C} will be : (A) same	(B) 114.28 % less	(C) 14.28 % more	(D) 28.56 % less			
15.	The isotopic abunda number of C–14 isoto	nce of C–12 and C–14 ope in 12 g carbon sam	is 98% and 2% by mass ole ?	respectively. What would be the			
	(A) 1.032×10 ²²	(B) 3.01×10 ²³	(C) 5.88×10 ²³	(D) 6.02×10 ²³			
16.	In chemical scale, th equal to : (X ²⁰ has 99	e relative mass of the i percent abundance)	sotopic mixture of X atoms	s (X ²⁰ , X ²¹ , X ²²) is approximately			
	(A) 20.002	(B) 21.00	(C) 22.00	(D) 20.00			
17.	Indium (atomic weig isotopic weight 115 a for the other isotope	ht = 114.8) has two na and abundance of 95.00 ?	aturally occurring isotopes, %. Which of the following i	the predominant one form has sotopic weights is the most likely			
	(A) 111	(B) 112	(C) 113	(D) 114			
18.	The number of molect (A) 6.0×10^{23}	cules of CO ₂ present in 4 (B) 3×10^{23}	44 g of CO ₂ is : (C) ¹² ×10 ²³	(D) 3×10^{10}			
19.	The number of mole (A) 0.425	of ammonia in 4.25 g of (B) 0.25	ammonia is : (C) 0.236	(D) 0.2125			
20.	Which one of the following pairs of gases contains the same number of molecules :(A) 16 g of O_2 and 14 g of N_2 (B) 8 g of O_2 and 22 g of CO_2 (C) 28 g of N_2 and 22 g of CO_2 (D) 32 g of O_2 and 32 g of N_2						
21.	The weight of a mole (A) 1.09 × 10 ⁻²¹ g	cule of the compound C (B) 1.24 × 10 ⁻²¹ g	C ₆₀ H ₂₂ is : (C) 5.025 × 10 ^{–23} g	(D) 16.023 × 10 ^{−23} g			
22.	Number of electrons	in 1.8 mL of H₂O(ℓ) is a	bout :				
	(A) 6.02 × 10 ²³	(B) 3.011 × 10 ²³	(C) 0.6022 × 10 ²¹	(D) 60.22 × 10 ²⁰			

23.	One mole of P ₄ molecu (A) 1 molecule 1	les contain :	(B) 4 molecules				
	(C) $\overline{4} \times 6.022 \times 10^{23}$ a	toms	(D) 24.088 × 10 ²³ atoms				
24.	A sample of ammonium	n phosphate (NH₄)₃PO₄ c	ontains 3.18 mole of H a	toms. The number of mole of O			
	(A) 0.265	(B) 0.795	(C) 1.06	(D) 3.18			
25.	Torr is unit of : (A) Temperature	(B) Pressure	(C) Volume	(D) Density			
26.	The atmospheric press (A) 0.63	ure on Mars is 0.61 kPa. (B) 4.6	What is the pressure in mm Hg ? (C) 6.3 (D) 3.2				
27.	Centigrade and Fahren $\frac{C}{5} = \frac{F - 32}{9}$	heit scales are related as $\frac{C}{Q} = \frac{F - 32}{5}$	$\frac{C}{R} = \frac{F - 32}{5}$				
	(A) 5 9	(B) 9 5	(C) 8 5	(D) None of these			
28.	At what temperature, bo (A) 100°	oth Celsius and Fahrenh (B) 130º	eit scale read the same v (C) 60º	/alue : (D) –40º			
29.	The value of universal ((A) temperature of gas (C) number of moles of	gas constant R depends gas	on : (B) volume of gas (D) units of volume and pressure				
30.	The value of gas consta (A) 1 cal	ant in calorie per degree (B) 2 cal	temperature per mol is a (C) 3 cal	pproximately : (D) 4 cal			
31.	The value of R in SI uni (A) 8.314 × 10 ⁻⁷ erg K ⁻⁷ (C) 0.082 litre atm K ⁻¹ r	it is : ¹ mol ⁻¹ nol ⁻¹	(B) 8.314 JK ⁻¹ mol ⁻¹ (D) 2 cal K ⁻¹ mol ⁻¹				
32.	The pressure of sodiur	n vapour in a 1.0 L cont	tainer is 9.5 torr at 927%	C. How many atoms are in the			
	container ? (A) 9.7 × 10 ⁷	(B) 7.5 × 10 ¹⁹	(C) 4.2 × 10 ¹⁷	(D) 9.7 × 10 ¹⁹			
33.	The pressure of a gas h (A) 1 atm	naving 2 mole in 44.8 litre (B) 2 atm	e vessel at 546 K is : (C) 3 atm	(D) 4 atm			
34.	According to the ideal g (A) 22.4 litre	jas laws, the molar volun (B) RT / P	ne of a gas is given by : (C) 8RT / PV	(D) RT / PV			
35.	Equal volumes of oxygen gas and a second gas weigh 1.00 and 19/8 grams respectively under the same experimental conditions. Which of the following is the unknown gas? (A) NO (B) SO ₂ (C) CS ₂ (D) CO						
36.	A high altitude balloon contains 6.0 g of helium in 10^4 L at 240 K. Assuming ideal gas behaviour, how many grams of helium would have to be added to increase the pressure to 4.0×10^{-3} atm? (A) 1 (B) 1.2 (C) 1.5 (D) 2.0						
37.	Four 1-1 litre flasks are pressure. The ratio of to	separately filled with the otal number of atoms of t	e gases H ₂ , He, O ₂ and C hese gases present in di	D_3 at the same temperature and fferent flask would be :			
38	(A) 1 : 1 : 1 : 1 Under the same conditi	(B) $1:2:2:3$	(C) 2 : 1 : 2 : 3	(D) 3 : 2 : 2 : 1			
50.	(A) be noble gases(C) have a volume of 22	2.4 dm ³ each	(B) have equal volumes(D) have an equal number of atoms				

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39.	16 g of an ideal gas SC (A) x = 3	x occupies 5.6 L. at STP (B) x = 2	. The value of x is (C) x = 4	(D) none of these					
40.	The ratio of the weight of 2.22. The molecular we	of one litre of a gas to the ight of the gas would be	e weight of 1.0 L oxygen :	gas both measured at S.T.P. is					
	(A) 14.002	(B) 35.52	(C) 71.04	(D) 55.56					
41.	Avogadro number is : (A) Number of atoms in one gram of the element (B) Number of mililitre which one mole of a gaseous substance occupies at NTP (1 atm & 0°C) (C) Number of molecules present in one gram molecular mass of a substance. (D) All are correct								
42.	The weight of 1×10^{22} r (A) 41.59 g	nolecules of CuSO4.5H2((B) 415.9 g	D is : (C) 4.159 g	(D) None of these					
43.	How many moles of ele	ctron weigh one kilogran	ו:						
		$\frac{1}{0.100}$	6.023	1					
	(A) 6.023 × 10 ²³	(B) 9.108 × 10 ³¹	(C) 9.108×10^{54} (I	D) $9.108 \times 6.023 \times 10^8$					
44.	Number of atoms in 560 (A) Twice that in 70 g N	D g of Fe (atomic mass 5 I (B) Half that in 20 g H	6 gmol ^{₋1}) is : (C) Both (A) and (B)	(D) None of these					
45.	Which has maximum nu (A) 24 g of C (12)	umber of atoms : (B) 56 g of Fe (56)	(C) 27 g of Al (27)	(D) 108 g Ag (108)					
46.	If we consider that 1/6, in place of 1/12 mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will : (A) decrease twice (B) increase two fold (C) remain unchanged (D) be a function of the molecular mass of the substance								
47.	How many moles of ma (A) 0.02	ignesium phosphate, Mg (B) 3.125 × 10 ⁻²	3(PO₄)₂ will contain 0.25 (C) 1.25 × 10 ^{−2}	mole of oxygen atoms ? (D) 2.5 × 10 ⁻²					
48.	Given that the abundan mass of Fe is :	ces of isotopes ⁵⁴ Fe, ⁵⁶ Fe	e and ⁵⁷ Fe are 5%, 90%	and 5% respectively, the atomic					
	(A) 55.85	(B) 55.95	(C) 55.75	(D) 56.05					
Multip 49.	Which property of an el (A) Atomic weight	ns (MCQ) ement may have non-into (B) Atomic number	egral value. (C) Atomic volume	(D) None of these					
50.	Which of the following v (A) 0.5 mole of H ₂	vould contain 1 mole of p (B) 1 g of H-atoms	oarticles : (C) 16 g of O-18	(D) 16 g of methane					
51.	Which of the following v (A) 1 g Hydrogen	vill have the same numbe (B) 2 g Oxygen	er of electrons : (C) 2 g Carbon	(D) 2 g Nitrogen					
52.	Which the following is e (A) 0.76 cm of Hg	equal to 10 ⁻² atm : (B) 7.6 torr	(C) 0.076 dm of Hg	(D) 0.0076 torr					
53.	Pressure exerted by a s (A) 2 L, 27°C	sample of oxygen is sam (B) 1 L, 150 K	e for the following condit (C) 4 L, 54ºC	ions : (D) 10 L, 1227⁰C					

Assertion / Reasoning (A/R)

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(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1. (B) Statement-1 is true, statement-2 is true and statement-2 is not correct explanation for statement-1. (C) Statement-1 is true, statement-2 is false. (D) Statement-1 is false, statement-2 is true. (E) Both statements are false. 54. Statement-1: Gram molecular weight of O₂ is 32 g. **Statement-2**: Relative atomic weight of oxygen is 32. 55. Statement-1 : 1 mole of all ideal gases exert same pressure in same volume at same temperature. Statement-2: Behaviour of ideal gases is independent of their nature. 56. Statement-1: Value of the universal gas constant depends upon the choice of sytem of units. Statement-2: Values of universal gas constant are 8.314 J/molK, 0.0821 L.atm/molK, 2 cal/molK. Comprehension # A vessel of 25 L contains 20 g of ideal gas X at 300K. The pressure exerted by the gas is 1 atm. 20 g of ideal gas Y is added to the vessel keeping the same temperature. Total pressure became 3 atm. Upon further addition of 20 g ideal gas Z the pressure became 7 atm. Answer the following questions. (Hint: Ideal gas equation is applicable on mixture of ideal gases) [Take, R = 1/12 L.atm / mol K] 57. Find the molar mass of gas X. (A) 20 g (C) 30 g (D) 5 g (B) 10 g 58. Identify the correct statement(s) : I. Gas Y is lighter than gas X. II. Gas Z is lighter than gas Y (C) Both I and II (A) I only (B) II only (D) None of the statements 59. Find the average molar mass of the mixture of gases X, Y and Z.

Each question has 5 choices (A), (B), (C), (D) and (E) out of which ONLY ONE is correct.

(A) 40/7 (B) 50/7 (C) 20 (D) 60/7

60. Match the column:

		Column-I			Column-II		
	(Atomic mass (M))				(% composition of beavier isotope)		
	Isotope-I	Isotope-II	Average				
(A)	(z – 1)	(z + 3) z		(p)	25% by moles		
(B)	(z + 1) (z + 3) (z + 2)		(q)	50% by moles			
(C)	Z	3z	2z	(r)	% by mass dependent on z		
(D)	(z – 1) (z + 1) z		(s)	75% by mass			

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	Answers									
1.	1.9 × 10 ⁶ years	(approx.)	2.	3.95 × ²	10 ⁻²²	3.	24 g		
4.	980 g of Si			5.	12 × 6.0	022 × 10 ²³	6.	24.088 × 10 ²⁰ , 0.004 g.		
7.	10 × 6.022 × 10) ²³ , 8 × 6	.022 × 1	0 ²³ , 8 ×	6.022 × 10 ²³ .		8.	25		
9.	68 mole			10.	35.5		11.	10		
12.	6.02 × 10 ²³			13.	3.01 × ²	10 ²¹ molecules o	f H₂O			
14.	5.33 × 10 ⁶			15.	2.5 NA		16.	100 g		
17.	0.00288									
18.	(a) H = 4N _A , S = 2N _A , O = 8N _A (c) H = 10N _A , S = 10N _A , O = 40			itoms N _A atom	(b) H = 4 atoms (d) H = 6 atoms		, S = 2 atoms, O = 8 atoms. , S = 6 atoms, O = 18 atoms.			
19.	20 NA			20.	11 NA		21.	28.964 u		
22.	$R = \frac{32pV}{1000 \times w \times (t+273)}$		23.	1.88 × 10 ²²		24.	16 amu			
25.	2.647 × 10 ¹⁰									
26.	(i) 1000	(ii) 10 ⁷		(iii) 0.1		(iv) 100	(v) 10 ⁻⁹			
					PAR	T – II				
1.	(C)	2.	(A)		3.	(A)	4.	(B)	5.	(B)
6.	(A)	7.	(C)		8.	(C)	9.	(A)	10.	(A)
11.	(A)	12.	(A)		13.	(D)	14.	(C)	15.	(A)
16.	(A)	17.	(A)		18.	(A)	19.	(B)	20.	(A)
21.	(B)	22.	(A)		23.	(D)	24.	(C)	25.	(B)
26.	(B)	27.	(A)		28.	(D)	29.	(D)	30.	(B)
31.	(B)	32.	(B)		33.	(B)	34.	(B)	35.	(C)
36.	(D)	37.	(C)		38.	(B)	39.	(B)	40.	(C)
41.	(C)	42.	(C)		43.	(D)	44.	(C)	45.	(A)
46.	(C)	47.	(B)		48.	(B)	49.	(AC)	50.	(BD)
51.	(ABCD)	52.	(ABC)		53.	(ABD)	54.	(C)	55.	(A)
56.	(B)	57.	(A)		58.	(C)	59.	(D)		

60. (A) - (p,r) ; (B) - (q,r) ; (C) - (q,s) ; (D) - (q,r)