

DAV PUBLIC SCHOOL, POKHARIPUT
PSVT EXAMINATION, 2021-22

- Check that this question paper contains 05 Printed pages.
- Check that this question paper contains 20 questions.
- Write down the Serial Number of the question in the left side of the margin before attempting it.

CLASS - XI

SUB: CHEMISTRY

Time: 1.5 Hours

Maximum Marks: 35

General instruction:

- All questions are compulsory.
- Question no.1 carries 4 marks.
- Questions 2-13 carry 1 mark each.
- Questions 14-17 carry 2 marks each.
- Questions 18-19 carry 3 marks each.
- Question no.20 carries 5 marks.

SECTION A (OBJECTIVE TYPE)		(1x4=4)
1.	<p>Read the passage given below and answer the following questions:</p> <p>The mole is an amount unit similar to familiar units like pair, dozen, gross, etc. It provides a specific measure of the number of atoms or molecules in a bulk sample of matter. A mole is defined as the amount of substance containing the same number of discrete entities (atoms, molecules, ions, etc.) as the number of atoms in a sample of pure ^{12}C weighing exactly 12 g. One Latin connotation for the word “mole” is “large mass” or “bulk,” which is consistent with its use as the name for this unit. The mole provides a link between an easily measured macroscopic property, bulk mass, and an extremely important fundamental property, number of atoms, molecules, and so forth.</p> <p>The number of entities composing a mole has been experimentally determined to be $6.02214179 \times 10^{23}$, a fundamental constant named Avogadro’s number (N_A) or the Avogadro constant in honor of</p>	

	<p>Italian scientist Amedeo Avogadro. This constant is properly reported with an explicit unit of “per mole,” a conveniently rounded version being $6.022 \times 10^{23}/\text{mol}$. Consistent with its definition as an amount unit, 1 mole of any element contains the same number of atoms as 1 mole of any other element. The masses of 1 mole of different elements, however, are different, since the masses of the individual atoms are drastically different. The molar mass of an element (or compound) is the mass in grams of 1 mole of that substance, a property expressed in units of grams per mole (g/mol).</p> <p>The following questions are multiple choice questions. Choose the most appropriate answer.</p> <p>(i) The number of oxygen atoms in 4.4g of CO_2 is approximately (a) 1.2×10^{23} (b) 6×10^{22} (c) 6×10^{23} (d) 12×10^{23}</p> <p>(ii) Number of atoms of He in 100 u of He (Atomic mass of He is 4 u) (a) 25 (b) 50 (c) 100 (d) 400</p> <p>(iii) Which has the maximum number of molecules among the following ? (a) 44g of CO_2 (b) 44g of O_2 (c) 8g of H_2 (d) 64g of SO_2</p> <p style="text-align: center;">OR</p> <p>Which one of the following will have largest number of atoms?</p> <p>(a) 1g Au (s) (b) 1g Na (s) (c) 1g Li (s) (d) 1g of $\text{Cl}_2(\text{g})$</p> <p>(iii) 7.5 grams of a gas occupy 5.6 litres of volume at STP the gas is (a) NO (b) N_2O (c) CO (d) CO_2</p>	
	<p>Following questions (No.2 – 8) are multiple choice questions carrying 1 mark each.</p>	
2	<p>The empirical formula and molecular mass of a compound are CH_2O and 180 g respectively. What will be the molecular formula of the compound?</p> <p>(a) $\text{C}_9\text{H}_{18}\text{O}_9$ (b) CH_2O (c) $\text{C}_6\text{H}_{12}\text{O}_6$ (d) $\text{C}_2\text{H}_4\text{O}_2$</p>	1

	OR	
	What is the mass percent of carbon in calcium carbonate? (a) 0.12% (b) 27.27% (c) 12.00% (d) 28.7%	
3	Which of the following is dependent of temperature? (a) Molarity (b) Molality (c) Mole fraction (d) Mass percentage	1
4	What will be the molality of the solution containing 18.25 g of HCl gas in 500 g of water? (a) 0.1 m (b) 1 M (c) 0.5 m (d) 1 m	1
5	If 500 mL of a 5M solution is diluted to 1500 mL, what will be the molarity of the solution obtained? (a) 1.5 M (b) 1.66 M (c) 0.017 M (d) 1.59 M	1
6	4 g of NaOH dissolved in 100 ml solution. Molarity of the solution is (a) 1 M (b) 10 M (c) 0.1 M (d) 4 M	1
7	The molarity of a solution obtained by mixing 750 mL of 0.5 M HCl with 250 ml of 2 M HCl will be (a) 0.975 M (b) 0.875 M (c) 1.00 M (d) 1.175 M	1
8	The total number of ions present in 111 g of CaCl ₂ is (a) One Mole (b) Two Moles (c) Three Moles (d) Four Moles	1
	In the following questions (Q.No.9- 13) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices. a) Assertion and reason both are correct statements and reason is the correct explanation for assertion. b) Assertion and reason are correct but reason is not the correct explanation of assertion. c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement	
9	Assertion : A solution of table salt in a glass of water is homogeneous Reason: A solution having same composition throughout is heterogeneous.	1
10	Assertion: The molecular weight of oxygen is 32 amu. Reason: The atomic weight of oxygen is 16 amu.	1

	OR	
	Assertion: Number of atoms of He in 60 u of He is 15. Reason: Atomic weight of He is 4 u.	
11	Assertion: Atomic mass of Na is 23. Reason: An atom of sodium is 23 times heavier than 1/12th mass of C-12 isotope.	1
12	Assertion: No of moles of H ₂ in 0.224 L of hydrogen is 0.01 mole. Reason: 22.4 L of H ₂ at STP contain 6.023×10^{23} moles.	1
13	Assertion: The empirical mass of ethene is half of its molecular mass. Reason: The empirical formula represents the simplest whole-number ratio of various atoms present in a compound.	1
	SECTION B	(2*4)
	The following questions, Q. No 14 -17 are Short Answer Type I and carry 2 marks each.	
14	How are 0.50 mol Na ₂ CO ₃ and 0.50 M Na ₂ CO ₃ different?	2
15	State law of multiple proportions with an example.	2
	OR	
	Which postulates of Dalton's Atomic Theory illustrate the Law of conservation of mass and Law of definite proportion?	
16	Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% dioxygen by mass.	2
	OR	
	A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulas?	
17	Calculate the number of moles in the following masses – (i) 7.85g of Fe (ii) 7.9mg of Ca	1+1
	SECTION C	
	Q. No 18-19 are Short Answer Type II and carry 3 marks each.	
18	A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g. Calculate (i) empirical formula, (ii) molar mass of the gas, and (iii) molecular formula .	1+1+1

	OR													
	In three moles of ethane (C ₂ H ₆), calculate the following: (i) Number of moles of carbon atoms. (ii) Number of moles of hydrogen atoms. (iii) Number of molecules of ethane.													
19	(a) Use the data given in the following table to calculate the molar mass of naturally occurring argon isotopes: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Isotope</th> <th style="text-align: left;">Isotopic molar mass</th> <th style="text-align: left;">Abundance</th> </tr> </thead> <tbody> <tr> <td>³⁶Ar</td> <td>35.96755 g mol⁻¹</td> <td>0.337%</td> </tr> <tr> <td>³⁸Ar</td> <td>37.96272 g mol⁻¹</td> <td>0.063%</td> </tr> <tr> <td>⁴⁰Ar</td> <td>39.9624 g mol⁻¹</td> <td>99.600%</td> </tr> </tbody> </table> (b) Calculate the mass per cent of sulphur present in sodium sulphate.	Isotope	Isotopic molar mass	Abundance	³⁶ Ar	35.96755 g mol ⁻¹	0.337%	³⁸ Ar	37.96272 g mol ⁻¹	0.063%	⁴⁰ Ar	39.9624 g mol ⁻¹	99.600%	2+1
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	SECTION D													
	Q. No- 20 is Long Answer Type carrying 5 marks.													
20	Answer the following questions: (a) Chlorine is prepared in the laboratory by treating manganese dioxide (MnO ₂) with aqueous hydrochloric acid according to the reaction: 4 HCl (aq) + MnO ₂ (s) → 2H ₂ O (l) + MnCl ₂ (aq) + Cl ₂ (g) How many grams of HCl react with 5.0 g of manganese dioxide? (b) 3.0 g of H ₂ react with 30.0 g of O ₂ yield H ₂ O. (i) Which is the limiting reagent? (ii) Calculate the maximum amount of H ₂ O that can be formed. (iii) Calculate the amount of reactant left unreacted. OR Answer the following questions:	2+3												
	(i) Determine the mole fraction of CH ₃ OH and H ₂ O in a solution prepared by dissolving 5.5 g of alcohol in 40 g of H ₂ O. Molecular Mass of H ₂ O is 18 and CH ₃ OH is 32. (ii) The molarity of a solution of sulphuric acid is 1.35 M. Calculate its molality. (The density of acid solution is 1.02 g cm ⁻³).	2+3												

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