

Sainik School Chandrapur

Winter Vacation Work

CLASS XI

Subject - Chemistry

Unit 1 SOME BASIC CONCEPTS OF CHEMISTRY

1 mark question

1. What is the number of significant figures in 0.001620?
2. Calculate the percentage of nitrogen in NH_3 .
3. Calculate the molecular mass of $\text{C}_6\text{H}_{12}\text{O}_6$ molecule.
4. State the law of multiple proportions.
5. How many atoms of Calcium are there in 2g of Ca?
6. State the law of multiple proportions.
7. What is the effect of temperature on molarity and molality?
8. What do you understand by the term limiting reagent?
9. 100 ml of 10M HCl is diluted with water to 2L. Find the molarity of the solution.
10. Define the term empirical formula and molecular formula.

2 marks Question:

11. Define Gay Lussac's law of gaseous volumes. Explain with one suitable example.
12. An organo metallic compound on analysis was found to contain C=64.4% , H=5.5 % and Fe=29.9 % . Determine its empirical formula. (At mass of Fe= 56)
13. 200 ml of 0.05M magnesium chloride is mixed with 75 ml of 0.1M silver nitrate solution. Find the number of moles and mass in grams of AgCl formed. What is the limiting reagent?
14. 6.5g of Zn was reacted with excess of dil. HCl. Calculate the amount and volume of hydrogen produced at STP.
15. Calculate the percentage of (i) copper (ii) sulphur (iii) oxygen and (iv) water of hydration in crystalline copper sulphate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.
16. 1.8g of an organic compound on combustion gave 2.64g of CO_2 and 1.08g of water. Find the empirical formula of the compound.

3 or more marks

17. If 20.0 g of CaCO_3 is treated with 20.0 g of HCl, how many grams of CO_2 can be generated according to the following equation:
$$\text{CaCO}_{3(g)} + 2 \text{HCl}_{(aq)} \rightarrow \text{CaCl}_{2(aq)} + \text{H}_2\text{O}_{(l)} + \text{CO}_{2(g)}$$
18. Concentrated H_2SO_4 is 98% weight and has density 1.84 g cm^{-3} . What volume of concentrated acid is required to make 5.0L of 0.50M H_2SO_4 solution?
19. a) Calculate the number of atoms and molecules in 224ml of Nitrogen gas at STP.
b) Find the number of atoms of each type in 3.42g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$).
20. A hydrocarbon on burning gave 3.38g of CO_2 and 0.69g of H_2O . 10 L of the gas at STP weighs 11.6g. Find empirical and molecular formula.
21. Aqueous magnesium chloride solution is marketed as 20% by mass. Its density is 1.18g/ml. Calculate
a) The mole fraction of each component.
b) Molarity and Molality.
22. Commercially available H_2SO_4 contains 98% acid by mass. Find the molarity if density of the sample is 1.84g/cc. What volume of this acid is required to make 2L of 0.1M solution?
23. (i) 24g of NaOH is dissolved in 300ml water. Calculate the molarity of the solution.
(ii) The density of a 3M solution of NaCl is 1.25g/mL. Calculate the molality of the solution.

24. From 0.2g of CO_2 , 10^{21} molecules are removed. How many moles of CO_2 remain?

Unit 2 Structure of

Atom 1 mark question.

1. Why are half filled and completely filled orbitals more stable?
2. Write electronic configuration of Cu^{2+} and Cr^{3+} .
3. What is the shape of s-orbital and p-orbital?
4. An atomic orbital has $n=3$, what are the possible values of l ?
5. State Hund's rule of maximum multiplicity. Illustrate with an example.
6. State Pauli Exclusion Principle.
7. What is meant by "Energy of an electron in a hydrogen atom is quantized"?
8. State $(n+l)$ rule.
9. How many unpaired electrons are present in N? Name the principle which explains the presence of these unpaired electrons.
10. Draw the shapes (boundary surfaces) of the following orbitals.
 $2p_y$ and $3d_{x^2-y^2}$.

2 or more marks Question:

11. Write a short note on Planck's Quantum theory.
12. Calculate the wavelength of an electron that has been accelerated in a particle accelerator through a potential difference of 100 million volts.
13. How does Heisenberg's uncertainty principle support the concept of orbital?
14. Calculate the uncertainty in position of a dust particle with mass equal to 1 mg if the uncertainty in velocity is $5.5 \times 10^{-20} \text{ms}^{-1}$ ($h = 6.626 \times 10^{-34} \text{JS}$)
15. Establish a relation between wavelength of a moving particle and its kinetic energy. The wavelength of a moving particle of mass $1.0 \times 10^{-6} \text{Kg}$ is $3.312 \times 10^{-29} \text{m}$. Calculate its kinetic energy. ($h = 6.625 \times 10^{-34} \text{JS}$)
16. Define quantum numbers. Explain in brief how are different quantum numbers related to each other?
17. Differentiate
 - Absorption and Emission spectrum
 - Orbital and orbital
18. The speed of an electron moving at 600 m/s is measured to an accuracy of 0.005%. What would be the minimum error in determining its position?
19. Calculate the energy and radius of the first orbit of He^+ ion.
20. What are the possible values of l and m for $n=3$ and $n=2$.
21. a) When will the wavelength of a neutron equal to the wavelength of a proton?
b) Two particles A and B are in motion. If the momentum of A is half of that of B and if the wavelength of A is $4.5 \times 10^2 \text{nm}$, what is the wavelength of B?

Unit 3 Classification of elements and periodicity in properties. 1 mark question

1. State the modern periodic law.
2. What is the IUPAC name and symbol of the element with atomic number 117?
3. Name the groups of elements classified as s-, p- and d- blocks.
4. Which is the smallest among Na^+ , Mg^{2+} , Al^{3+} and why?

5. How does electronegativity vary (i) down the group (ii) across the period from left to right?
6. What do you mean by screening effect?
7. To which group and period will the element with atomic number 111 belong?
8. Arrange the following elements S, P, O, N in the increasing order of non-metallic character.
9. Predict the position in the periodic table
 - a) $(n-1)d^1 ns^2$ when $n=4$
 - b) $(n-1)d^2 ns^2$ when $n=5$

3 or more marks Question:

10. The first & second ionization enthalpies & electron gain enthalpies of elements A, B, C & D are as follows

Element	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg} H$
A	419	3051	-48
B	1681	3374	-328
C	738	1451	-40
D	2372	5251	+49

Identify the element which is likely to be

- i) Most reactive non-metal
 - ii) Most reactive metal
 - iii) A noble gas
 - iv) Metal forming binary halide (MX_2)
11. a) Write general configuration of transition and inner transition elements.
 - a) Explain the following
 - i. Electron affinity of chlorine is more than of fluorine.
 - ii. I.E. of nitrogen is greater than that of oxygen.
 12. a) Why is ionization enthalpy of Be higher than Boron?
 - a) Why is second ionization energy of group-1 elements very high?
 13. State the group to which elements having following electronic configuration belong:
 - i. $[Ar]4s^2 3d^1$
 - ii. $[Kr]5s^1$
 - iii. $[Ar]4s^2 3d^{10} 4p^5$
 - iv. $[Ar]4s^1 3d^{10}$
 14. What is the difference between electron gain enthalpy and electronegativity?
 15. Give reason.
 - a) Cl^- is larger than Cl .
 - b) IE_2 of Na is greater than IE_2 of Mg.
 - c) IE_1 of Bi is 800 kJ/mole while IE_1 of Be is 900 kJ/mole.
 - d) Lanthanides and actinides are placed separately in the periodic table
 - e) IE of Na^+ is almost double that of Ne.
 - f) Third period contains only 8 elements.
 - g) Lanthanides and actinides are placed separately in the periodic table
 - h) IE of Na^+ is almost double that of Ne.
 - i) Third period contains only 8 elements.

PROJECTS:

1. Prepare a chart of following (in A4 sheet).
 - a) Mole concept.
 - b) Concentration terms.
 - c) Bohr's model for hydrogen atom.
 - d) Developments leading quantum model of atom.
 - e) Trends of various physical properties in periodic table.
2. Giving importance quantum mechanics, list out the substances which exhibit dual nature of matter.
3. Submit a detailed report on qualitative and quantitative analysis.