



INDIAN SCHOOL MUSCAT
FIRST TERM EXAMINATION
CHEMISTRY

CLASS: XI

Sub. Code: 042

Time Allotted: 3 Hrs

16.09.2018

Max. Marks: 70

General Instructions:

- All questions are compulsory.
- Questions 1 to 5 are very short answer type and carry one mark each.
- Questions 6 to 12 are short answer type and carry two marks each.
- Questions 13 to 24 are also short answer type and carry three marks each.
- Questions 25 to 27 are long answer type and carry five marks each.
- Use log tables if necessary, Use of calculators is not allowed.

1. Why do atomic masses of most of the elements in atomic mass units involve fractions? 1
2. How many electrons in a given atom can have the following quantum numbers?
 $n = 3, l = 1$ 1
3. Write any two applications of dipole moment. 1
4. Lanthanoids and actinoids are placed in separate rows at the bottom of the periodic table. Give reason for this arrangement. 1
5. What do you mean by biological oxygen demand (BOD)? 1
6. What do you understand by formula mass? How does it differ from molecular mass? 2
7. Explain giving reasons, which of the following sets of quantum numbers are not possible. 2
 - i) $n = 0, l = 1, m_l = 0, m_s = +\frac{1}{2}$
 - ii) $n = 2, l = 1, m_l = 0, m_s = -\frac{1}{2}$
 - iii) $n = 3, l = 2, m_l = -2, m_s = +\frac{1}{2}$
 - iv) $n = 1, l = 1, m_l = -1, m_s = +\frac{1}{2}$
8. What is greenhouse effect and what are its consequences? 2
9. Arrange the following elements in the order of the property indicated: 2
 - i) $N^{3-}, O^{2-}, Mg^{2+}, Na^+, F^-, Al^{3+}$ (increasing ionic radii)
 - ii) F, N, Si, C (decreasing non-metallic character)

10. Predict giving reason whether each of the following molecule is polar or non-polar: 2
- H_2O
 - CO_2

11. Give reason for the following: 2
- Anionic radius is always more than that of a neutral atom.
 - Third period of periodic table can accommodate 18 elements but it has only 8 elements.

OR

The first (IE_1) and the second (IE_2) ionization energies and electron gain enthalpies of four elements A, B, C and D are shown below:

Elements	IE_1	IE_2	$\Delta_{\text{eg}}\text{H}$
A	2372	5250	+48
B	520	7298	-273
C	899	1758	-40
D	1680	3374	-328

Which of the element is likely to be :

- A reactive metal
 - A noble gas
 - A metal that forms a stable binary halide of the formula AX_2
 - A reactive non-metal
12. What is Eutrophication? How does it threaten the development of fish? 2
13. Define the following: 3
- Avogadro's law
 - Limiting reagent
 - Mole fraction
14. Electrons are emitted with zero velocity from the surface of a metal when it is exposed to radiation of wavelength 6800\AA . Calculate the threshold frequency and work function of the metal. ($c = 3 \times 10^8 \text{ m/s}$, $h = 6.63 \times 10^{-34}$) 3
15. Explain limitations of octet rule with the help of examples. (any three) 3

OR

Write all the favourable conditions for the formation of ionic bond.

16. An element 'X' with atomic number 110 has been recently predicted. Its electronic configuration is: $[\text{Rn}] 5f^{14}6d^87s^2$. Predict the 3
- Group and
 - Block in which this element would be placed.
 - IUPAC name of this element.

17. $2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{KCl} + 2\text{MnCl}_2 + 8\text{H}_2\text{O} + 5\text{Cl}_2$ 3
 If 1.58g of KMnO_4 is allowed to react with excess of HCl , Calculate
 i) Number of moles of KCl formed
 ii) Volume of Cl_2 produced at STP
 iii) Number of molecules of Chlorine formed.
 (RAM of $\text{K} = 39$, $\text{Mn} = 55$, $\text{O} = 16$, $\text{Cl} = 35.5$)
18. i) Electronic configuration of Cr is $[\text{Ar}]4s^13d^5$ and not $[\text{Ar}]4s^23d^4$. Why? 3
 ii) Differentiate between an orbit and an orbital. (any three points)
19. i) Define bond dissociation energy. 3
 ii) Explain the shapes of the following molecules on the basis of VSEPR theory.
 a) SF_4
 b) PCl_5
20. i) What are isoelectronic species? 3
 ii) Write the general electronic configuration of d block elements and mention any two of its characteristics.
21. What is smog? How is classical smog different from photochemical smog? (Any two points) 3
22. i) What is the difference in the angular momentum of an electron present in 2p and that present in 3p orbital? 3
 ii) Based on Bohr Bury's rule arrange the following orbitals in the increasing order of energy: 5f, 6d, 7s, 7p
 iii) What is the significance of Uncertainty principle?
23. From the elements: Cl , F , O , Al , C , Li and Cs ; choose the following: 3
 i) The element with highest negative electron gain enthalpy.
 ii) The element with lowest ionization energy.
 iii) The element which forms largest number of compounds.
24. i) State Hund's rule of maximum multiplicity. 3
 ii) Account for the following:
 a) In the building of the atom, the filling of 4s orbitals takes place before 3d orbitals.
 b) Bohr's orbits are called stationary orbits.
25. i) A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molecular mass is 98.96. What are its empirical and molecular formulae? 5
 (RAM of $\text{C} = 12$, $\text{H} = 1$, $\text{Cl} = 35.5$)
 ii) Define the following:
 a) Molality
 b) Parts per million

OR

- i) A solution of glucose in water is labelled as 10% (w/w). The density of the solution is 1.20 g mL^{-1} . Calculate
 - a) Molarity
 - b) Mole fraction of glucose in water.
(molar mass of glucose = 180)
- ii) Why is molality preferred over molarity in expressing the concentration of a solution?
- iii) Define molar volume.

26. 5
- i) Define resonance.
 - ii) Arrange the following in increasing order of bond angle around the central atom:
 $\text{BeF}_2, \text{NH}_3, \text{H}_2\text{O}, \text{BF}_3$
 - iii) How does multiplicity of bonds affect the bond strength and bond length?
 - iv) How can you account for the fact that BF_3 is non-polar molecule even though the B –F bonds are polar while NH_3 is not?

OR

- i) Define bond angle.
- ii) Draw the resonance structure for carbon dioxide molecule.
- iii) Calculate the formal charge on nitrogen and hydrogen atoms in NH_3 molecule.
- iv) Bond angle in NH_3 is 107° while that of PH_3 is 93° . Why?

27. 5
- i) What is the energy in joules required to shift the electron of the hydrogen atom from the first Bohr orbit to the fifth Bohr orbit and what is the wavelength of the light emitted when the electron returns to the ground state? The ground state electron energy is $-2.18 \times 10^{-18} \text{ J}$.
($h = 6.626 \times 10^{-34} \text{ J s}$, $c = 3.0 \times 10^8 \text{ m/s}$)
 - ii) Why is the +2 oxidation state of Manganese (25) quite stable while the same is not for iron (26)?
 - iii) State the principle which distinguishes the electron in the same orbital.

OR

- i) If an electron is moving with a velocity of 800 m/s which is accurate upto 0.005%, then calculate the uncertainty in its position.
($h = 6.63 \times 10^{-34} \text{ Js}$ and mass of electron = $9.1 \times 10^{-31} \text{ Kg}$)
- ii) Calculate the mass of a photon of sodium light having wavelength 5000 \AA and a velocity of $3 \times 10^8 \text{ m/s}$.
- iii) Write any two important observations of photoelectric effect.
- iv) What is the significance of the azimuthal quantum number?

End of the Question Paper