# AECS No.4, Rawatbhata

## Half-Yearly Examination-2015-16 (Model paper)

**Subject: Chemistry Class: XI Time:3 hour Maximum Marks : 70**

**General Instruction:**

1. **This paper contains 26 questions. All the questions are compulsory.**
2. **Question No. 1 to 5 are very short type questions and carry one mark each.**
3. **Question No. 6 to 10 carry two marks each.**
4. **Question No. 11 to 22 carry three marks each.**
5. **Question No. 23 is value based question and carry four marks.**
6. **Question No. 24 to 26 carry five marks each.**
7. **There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such question.**
8. **Use of calculator is not permitted.**

| **Q.No.** | | **Marks** |
|---|---|---|
| Q.1. | What is molar volume? | 1 |
| Q.2. | What is Pauli exclusion principle? | 1 |
| Q.3. | What is absolute zero temperature? | 1 |
| Q.4. | What is a nano-second? | 1 |
| Q.5. | State modern periodic law. | 1 |
| Q.6. | a. The shapes of molecules are very well explained by VESPER theory, then, why is there a need for any other theory?<br>b. The molecule $SO_2$ has a dipole moment. Is the molecule linear or bent? Explain. | 2 |
| Q.7. | Define Octet rule. Give two examples, which can be considered as exceptions to the octet rule. | 2 |
| Q.8. | Write the electronic configurations of the elements with atomic numbers 9, 24 17, 36, 29 and 58 and from this decide to which group of the periodic table each element belongs. | 2 |
| Q.9. | The radius of the cation is invariably smaller and the radius of the anion is invariably larger than the radius of the corresponding atom. Why? | 2 |
| Q.10. | Define ionization energy. How do ionization energies very in a group and across a period in the periodic table. How is it expressed and on what factors does the ionization energy of an atom depend?<br>**(OR)**<br>A, B, C are three elements with atomic number, Z-1, Z, Z + 1 respectively. B is an inter gas. Answer the following questions:<br>(a) Predict the group of A and C.<br>(b) Which out of the three has zero electron gain enthalpy and why? | 2 |
| Q.11. | a) What is diagonal relationship?<br>b) What is the basic difference between the terms: Electron Gain enthalpy and electron affinity? | 3 |
| Q.12. | A. What are inter-and intra-molecular hydrogen bonds? Illustrate with one example each.<br>B. How best you can draw the structure of $O_3$ molecule? | 3 |

Q.13. Arrange the following according to as directed. 3

(a) B, C, Be and N (increasing atomic IE)
(b) F, CL, Br and I (decreasing electron gain enthalpy)
(c) Ba, Mg, Be and Ca (increasing electro positivity)

Q.14. Write short notes on 3

a) Accuracy &Precision
b) Significant figures
c) Mole fraction

Q.15. Define empirical and molecular formulae. What is the relation between them? Calculate the empirical formula of gold chloride, which contains 35.1 % of chlorine. ( Z of Au = 197) 3

Q.16. Calculate the following- 3

a) mass of oxygen produced by 2.5 g of $KClO_3$ on decomposition.
b) mass of one atom of Carbon.
c) mass of 0.02 moles of $CO_2$ g

Q.17. a. What is compressibility factor? 3
b. What do "a" and "b" represent in Vander Waals equation?
c. Why do drops of liquids assume a spherical shape?

Q.18. a. Give the mathematical expression for the Broglie's proposal about the dual nature of electron. 3
b. Show the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Brogile wavelength associated with the electron revolving around the orbit.

Q.19. a) Write Schrodinger equation. What is the significance of $\varphi^2$? 3
b) How many radial nodes in the following orbitals 1s, 2s, 3p, 3d.

Q.20. a. What was the two novel idea of Bohr's atomic theory? 3
b. What is meant by 'quantization'?
c. To what extent Bohr's atomic model was successful?

Q.21. Which one in the following pairs has greater ionic character? 3
(a) LiCl or NaCl (b) $BeCl_2$ or $MgCl_2$ (c) $BCl_3$ or $AlCl_3$

Q.22. How many $\sigma$ and how many $\pi$ bonds are there in: 3
(a) $C_2H_4$ (c) $C_2H_2$ (c) $C_2H_6$

**(OR)**

Draw the structure of $BF_3$, $NH_3$, and $ClF_3$ molecule.

Q.23. Reeta takes an open pan to cook vegetables and pulses at a hill station while Seeta cook pulses and vegetable in pressure cooker at the same place. The gas cylinder of Seeta lasts for 15 days while Reeta uses one cylinder per month. 4

i. Who will cook vegetable and pulses faster and why?
ii. What is the reason for delay in cooking by Reeta.
iii. What value is possessed by Seeta?
iv. Why Seeta does needs only one gas cylinder per month and not two like Reeta.

Q.24. Use the molecular orbital energy level diagram to show $N_2$ would be expected to have a triple bond; $F_2$ is a single bond and $Ne_2$ , no bond 5

**(OR)**

(a) Discuss the formation of sp, $sp^2$, and $sp^3$ hybrid orbitals and indicate the shapes resulting from these hybridisations.

(b) Explain the difference between $\sigma$ bond and $\pi$ bond.

Q.25. a. State and explain Boyle's law? 5

b. What will be the pressure exerted by a mixture of 3.2 g of methane and 4.4g of $CO_2$ contained in a 9 $dm^3$ flask at 27 $^oC$.

c. In terms of Charles's law explain why -273 $^oC$ is the lowest possible temperature.

d. Critical temperatures for $CO_2$and $CH_4$ are 31.1$^oC$ and -81.9$^oC$ respectively. Which of these has stronger intermolecular forces and why

**(OR)**

a. State and explain Charles' law?

b. Calculate the value of the gas constant for 1 mole of a gas at STP.

c. At 0oC; the density of a gaseous oxide at 2 bar is same as that of nitrogen at 5 bar. What is the molecular mass of the oxide?

d. Why the tyre of an automobile is inflated to lesser pressure in summer than in winter?

**e.** What are the reasons for deviation from ideal behavior?

Q.26. (a) Name the quantum numbers by which an orbital is designated. 5

(b) Draw the structures of orbital s, $p_z$, $d_{xy}$, $d_z^2$.

(c) When electromagnetic radiation of wavelength 300nm falls on the surface of sodium, electrons are emitted with a kinetic energy of 1.6 X 105 J $mol^{-1}$. What is the minimum energy needed to remove an electron from sodium? What is the maximum wavelength that will cause a photoelectron to be emitted?

**(OR)**

a. What is the maximum number of emission lines when the excited electron of H atom in n=6 drops to the ground state.

b. Calculate the wave number for the longest wavelength transition in the Balmer series of atomic hydrogen.

c. The energy associated with the first orbit in the hydrogen atom is -2.18 X $10^{-18}$ J $atom^{-1}$. What is the energy associated with the fifth orbit. Calculate the radius of Bohr's fifth orbit for hydrogen atom.

**Best of Luck**

**Tips to solve the Paper:**

- Read the questions carefully.
- Write answers sequentially.
- Write to the point.
- Write neatly.
- For numerical problems, Start with formulae and mention the steps clearly.
- In last, always check the answer sheet so that no question remains *unanswered*.