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B.Sc.(Biotech.)-I Year

Roll No. .....

NS-3462

B. Sc. (Biotech.) Examination, May 2016

CHEMISTRY

(B-108)

(New)

Time : Three Hours] *[Maximum Marks : 50*

Note : Attempt any *Five* questions. All questions carry equal marks.

1. (a) Write the electronic configuration of the following ions/atom : 3

   Cr^{3+} (Z=24), Ni^{2+} (Z=28)

   Cl^{-} (Z=17) and Pd (Z = 46).

   (b) Write Schrödinger wave equation for hydrogen. What are the various parameters used in equation? 4

   (c) Define effective nuclear charge. Calculate effective nuclear charge for one of the electron (3*p*) of chlorine atom. 3

2. (a) Define electronegativity. How does electronegativity vary in periodic table ? 3

   (b) What do you understand from atomic and ionic radii ? How do they vary in a group and in a period of periodic table ? 4

   (c) Why the first ionisation energy of nitrogen is greater than that of oxygen but second ionisation energy of oxygen is more than nitrogen? Explain. 3

3. (a) Explain on the basis of molecular-orbital theory : 3

   (i) N_2 molecule is diamagnetic while O_2 molecule is paramagnetic.

   (ii) Bond order of N_2^+ is lower than that of N_2.

   (b) How will you determined the percentage ionic character in a covalent molecule with the help of dipole moment and difference of electro-negativity ? Explain with examples. 4

   (c) Discuss the geometry of CO_3^{2-}, CH_4 and CO_2 on the basis of hybridization. 3

4. (a) What do you mean by lattice defect in ionic crystals? Explain Schottky defect in ionic solid. 4

(b) What are necessary conditions for the formation of hydrogen bond ? Describe the effect of hydrogen bond on physical properties of molecules. Arrange the following elements in order of hydrogen bond forming capacity–N, F, O and Cl. 6

5. Describe the group trend in alkaline earth metals on the basis of electronic configuration, nature of hydroxides, complex forming tendency and role in biosystem. 10

6. (a) What are vander Waal's forces ? Discuss their origin and nature. 4

(b) Give the name of the group of 17th elements. Justify the inclusion of the elements in the same group on the basis of : 6

(i) Electronic configuration
(ii) Hydrides
(iii) Electronegativity
(iv) Electron affinity
(v) Reducing character.

7. Given reasons : 10

(i) Xenon forms compounds with fluorine but helium and neon fail to do so

(ii) Noble gases have comparatively larger atomic radii

(iii) Noble gases have very low boiling points

(iv) Noble gases are monoatomic

(v) Zero group has been placed at the extreme right of the periodic table and not before the first group.

8. (a) What are interhalogen compounds ? Give methods of their preparation. Discuss their structures and geometry. 6

(b) What are polyhalides ? Give methods of preparation and properties of polyhalides. 4

9. (a) What are the limitations of the equation PV=RT and what improvements have been suggested by vander Waal ? Show in what aspects vander Waal's equation is an improvement over the simple gas equation. 6

(b) Calculate the RMS velocity and average velocity of oxygen molecule at 27°C. 2

(c) Write short note on liquifaction of gases. 2

10. (a) What is energy of activation ? How is it determined from Arrhenius equation ? 4

(b) What is meant by molecularity and order of reaction ? How are they related to each other ? 4

(c) Write short note on Catalyst. 2