

Question Paper

Exam Date & Time: 24-Feb-2024 (10:00 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.Sc. HEALTH SCIENCE DEGREE EXAMINATION-FEBRUARY 2024

SUBJECT: BHS - 1102- CHEMISTRY I

(NEW SCHEME - MAKEUP)

Marks: 40

Duration: 120 mins.

Answer all the questions.

2) Answer the following in TWO or THREE sentences

- 2A) For the reaction, $\text{CH}_4 + 3\text{Cl}_2 \longrightarrow \text{CHCl}_3 + 3\text{HCl}$, calculate $\Delta H^\circ_{\text{rxn}}$, given C-H (413 KJ/mol), C1-C1 (243 KJ/mol), C-C1 (339 KJ/mol), H-C1 (427 KJ/mol) and H-C (413 KJ/mol) (2)
- 2B) Calculate the mass percent of oxygen atom present in Sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$). (2)
- 2C) A hydrogen emission line in the ultraviolet region of the spectrum at 95.2 nm corresponds to a transition from a higher energy level n to the $n = 1$ level. What is the value of n for the higher energy level? (2)
- 2D) Explain the type of bonding formed in (2)
- a) BeF_2
- b) SiCl_4
- 2E) Name the ionic compounds formed from the following pairs of elements (2)
- i) Magnesium and nitrogen
- ii) Iodine and cadmium
- iii) Strontium and fluorine
- iv) Sulfur and cesium
- 2F) Arrange the following elements in the increasing order of their ionization energies. (2)
- (a) Kr, He, Ar (b) Sb, Te, Tn (c) K, Ca, Rb (d) I, Xe, Cs

3) Write a short note on the following questions

- 3A) i) The paramagnetic properties of the Fe^{+3} compounds higher than that of Fe compounds. Give reason (3)
- ii) Among Na, Mg, Al, which element would you expect to have the highest IE_2 ? Give reason for your answer.
- 3B) Given ClO_2^- , ClO_4^- , Cl_2O , and ClO_3^- . (3)
- i) Draw Lewis structures for all species.
- ii) Predict the bond angle and geometry for all the species.
- 3C) Describe the calculation of lattice energy for the formation of LiF by following Born Haber Cycle. (3)

- 3D) Explain the effect of electron repulsions on orbital energy of Helium and Lithium system. (3)
- 3E) Find the de Broglie wavelength of an electron with a speed of 1.00×10^6 m/s (electron mass= 9.11×10^{-31} kg, $h=6.626 \times 10^{-34}$ kg.m²/s). Explain the Rutherford's α -scattering experiment which led to the discovery of atomic nucleus. (3)
- 3F) Calculate the formal charge on the nitrogen atom in the nitrate ion and ammonia. Give reason: He₂ molecule does not exist. (3)

4) Answer the following questions

- 4A) Write a note on molecular orbital (MO) theory. Use MO diagrams to place C₂⁻, C₂, and C₂⁺ in order of (5)
a) increasing bond energy;
b) increasing bond length.
- 4B) State Boyle's and Avagadro's law pertaining to gases. Mention any two postulates of Kinetic Molecular Theory of gases and give the van der Waals equation for n moles of a real gas. (5)

-----End-----