

**F.Y.B.SC. SEM – II (CBCS - 2016 Course) : SUMMER - 2019**  
**SUBJECT: CHEMISTRY: PHYSICAL AND INORGANIC CHEMISTRY-II**

Day : Monday  
Date : 08/04/2019

Time : 03.00 P.M. To 06.00 P.M  
Max. Marks: 60.

**S-2019-0811**

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate full marks.
- 3) Answers to both the sections should be written in the **SAME** answer book.
- 4) Use of log table/ non-programmable calculator is allowed.

**SECTION-I**

**Q.1 A)** Select the most correct alternative from among those given below: **(06)**

- a) A sigma bond is ----- the Pi bond  
(i) Stronger than (ii) Weaker than  
(iii) Equal in strength to (iv) Same in direction to
- b)  $\text{BF}_3$  molecule involves ----- hybridization of 'B' atom.  
(i)  $sp$  (ii)  $sp^2$  (iii)  $sp^3$  (iv)  $dsp^2$
- c) The bonding in HF molecule takes place due to  
(i) p-p overlap (ii) s-p overlap (iii) s-s overlap (iv) s-d overlap
- d)  $\eta$  is expressed in unit -----  
(i)  $\text{Kg m}^{-1}\text{s}^{-1}$  (ii)  $\text{gm m}^{-1}\text{s}^{-1}$  (iii)  $\text{Kg cm}^{-1}\text{s}^{-1}$  (iv)  $\text{mg m}^{-1}\text{s}^{-1}$
- e)  $I_t = I_0 10^{-\epsilon ct}$  is mathematical expression for -----  
(i) Beer's law (ii) Lambert's law (iii) Boyle's law (iv) Avogadro's
- f) The range of wavelength, 4000–7500 Å is called ----- range.  
(i) IR (ii) UV (iii) visible (iv) None of these

**B)** Answer the following in one sentence: **(06)**

- a) What is opacity?
- b) Define critical temperature.
- c) In equation  $I_0 = I_a + I_t + I_r$ , what is  $I_r$ ?
- d) The graph of PV against 'p' at constant temperature for a perfect gas is straight line parallel to ----- axis.
- e) Give definition of the critical volume.
- f) Optical density  $D =$  -----

**Q.2** Attempt any **THREE** of the following: **(12)**

- a) State and explain Einstein's law of photochemical equivalence.
- b) Obtain the values of  $P_c$ ,  $V_c$  and  $T_c$  in terms of van der waal's constants.
- c) Explain Joule-Thomson effect.
- d) Draw Andrew's isotherms for carbon dioxide.

**Q.3** Solve any **FOUR** of the following: **(12)**

- a) Critical temperature and critical pressure for oxygen are, 154.4 K and  $5.131 \times 10^6 \text{ Nm}^{-2}$ . Find the van der waal's constants 'a' and 'b' for oxygen if  $R = 8.31 \text{ J K}^{-1}\text{mol}^{-1}$ .
- b) The van der waal's constants of HCl are  $a = 0.3707 \text{ Nm}^4\text{mol}^{-2}$ ,  $b = 4.08 \times 10^{-5} \text{ m}^3$ . Find the critical constants. ( $R=8.314 \text{ J K}^{-1}\text{mol}^{-1}$ ).
- c) Calculate the energy in calories per mole for ultraviolet light having wavelength of 850 Å.
- d) A certain system absorbs  $3 \times 10^{17}$  quanta of light per second. On irradiation for 30 min; 0.025 moles of the reactant were found to have reacted. Calculate quantum yield of the process ( $N=6.02 \times 10^{23}$ ).
- e) A solution of vitamin  $\text{D}_2$  shows 80% transmittance at wavelength 264 nm. Express the measurement in terms of absorbance unit.

**P.T.O.**

- Q.4 A)** Attempt any **ONE** of the following: **(06)**
- a)** Explain the phenomenon of phosphorescence.
  - b)** Discuss the measurement of viscosity using Ostwald's viscometer.

**SECTION-II**

- Q.4 B)** Attempt any **ONE** of the following: **(06)**
- a)** Define hybridization. Write any five characteristics of hybrid orbitals and hybridization.
  - b)** Explain the formation of  $N_2$  molecule on the basis of V.B. Theory.

- Q.5** Attempt any **TWO** of the following: **(12)**
- a)** Write the postulates of Valence Bond Theory.
  - b)** Explain the bonding in  $BF_3$  molecule using the concept of hybridization.
  - c)** Draw the structures and write the type of hybridization and also mention the number of bonded and lone pairs on the basis of VSEPR theory.  
(i)  $Cl_2O$                       (ii)  $TeCl_4$       (iii)  $BrF_5$

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