

**FIRST B. SC. EXAMINATION, 2019**

( 1st Semester, Old Syllabus )

**PHYSICAL CHEMISTRY ( SUBSIDIARY )****PAPER - IIS**

Time : Two hours

Full Marks : 50

Use a separate answerscript for each group.

**GROUP - A**

- b) Electronegativity of F (4.0) is greater than Cl (3.5) while the electron affinity of F (3.45eV) < Cl (3.61eV). Explain.
- c) Calculate the univalent radii of  $\text{Na}^+$  and  $\text{F}^-$  ions, if the internuclear distance between the ions in the crystal is  $2.31 \text{ \AA}$ . (Shielding effect of  $\text{Na}^+/\text{F}^- = 4.5$ ). 2
- d) Why does radius of C in acetylene ( $0.60 \text{ \AA}$ ) is lower than ethane ( $0.77 \text{ \AA}$ )? 2
- e) The successive Ionization Potential (IP) of B are 8.29, 25.15, 37.92, 259.3eV. Why the fourth IP is so high compared to the first three ?
- f) 1<sup>st</sup> Electron affinity of N is  $-0.10\text{eV}$  whereas neighbouring atoms have +ve electron affinities; C, 1.25 eV; O, 1.4eV. Explain the differences.
2. Attempt **any two** questions : 3×2
- a) Using Slater's rule calculate shielding constant ( $\sigma$ ) of Na and hence determine effective atomic number,  $Z_{\text{eff}}$
- b) Calculate the Allred-Rochow electronegativity of Zn taking its covalent radius  $1.25 \text{ \AA}$  ( $Z_{\text{eff}}(\text{Zn})=4.00$ ).
- c) i) Electronegativity of C in following groups is noted : –  $\text{CH}_3$ , 2.3;  $-\text{CF}_3$ , 3.3;  $-\text{COOH}$ , 2.8;  $-\text{C}_6\text{H}_5$ , 3.0. Explain the difference.
- ii) Why does radius of  $\text{H}^-$  ( $2.08 \text{ \AA}$ ) longer than isoelectronic He ( $1.2 \text{ \AA}$ ) ?

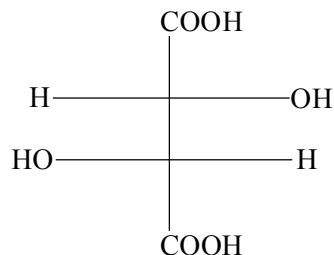
1. a) Briefly discuss about the 'capillary action'. Give its practical example.
- b) What is surface energy? Write down its unit.
- c) The two arms of a U-tube have diameters 10mm. and 1mm. The tube is partially filled with water and is held with the arms vertical. Find the difference in the levels of water in the two limbs if the surface tension of water is 72 dynes/cm. 3+2+3
2. a) State Newton's law of viscous flow. What is the SI Unit of coefficient of viscosity?
- b) Distinguish between streamline flow and turbulent flow of a liquid.
- c) What is Reynold's number ? 2+2+1
3. a) State Steno's law with reference to crystallography. 1
- b) What do you mean by Miller Indices ?
- c) Write down Bragg's law and its equation for crystal analysis. 1+1+2

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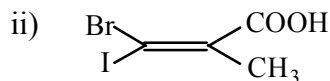
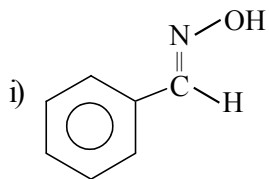
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**GROUP - B**

4. a) Draw the potential energy diagram for n-propane arising from the rotation of C<sub>2</sub>-C<sub>3</sub> σ = bond and label the conformer/s. 2
- b) i) Draw Fischer projection for the following molecules  
(A) (S)-Lactic acid (B) (R)-2-Butanol 2
- ii) Designate the chiral centers of the following compound with R/S configurational notation. 1



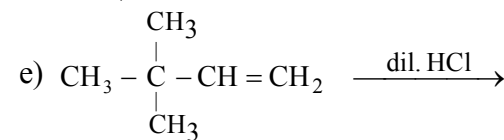
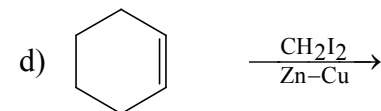
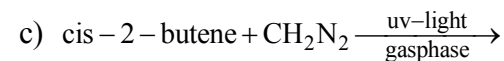
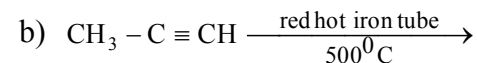
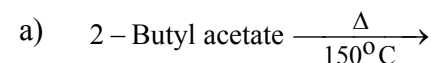
- c) Designate E/Z configurations of the following compounds. 2



- d) Write short note on 1×2
- i) Diastereomer
- ii) Center of symmetry.

[ 3 ]

5. Predict the product(s) of the following reactions with plausible reaction mechanism (**any three**) 1 ½×3



6. a) What is Zeigler-Natta Catalyst? Mention its application. 2
- b) What is Vulcanization of rubber? Indicate the significance of this process. 1 ½

**GROUP - C**

7. Attempt **any five** questions : 2×5
- a) The Pauling electronegativity in the 2<sup>nd</sup> Period is increased by 0.5 unit from left to right of the element-by-element while in the Transition elements in the 3<sup>rd</sup> Period it remains either unchanged or increased by 0.1-0.3 unit. Explain

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