15-12-2017

DOON UNIVERSITY, DEHRADUN
End Semester Examination, December 2017
School of Physical Sciences
Generic Elective, Integrated M.Sc.; First Semester

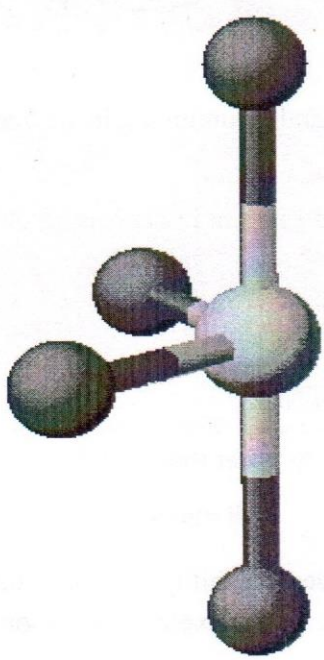
Course Code: CYG–101 **Course Title:** *Generic Chem.: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons*

Time Allowed: 2 Hours. ***Maximum Marks: 30***

Note: Attempt All Questions

Section: A ***(Marks: 6Q × 1= 6)***

[1] Look at the image carefully. It belongs to molecular geometry of some molecule. Comment on it, related molecules with examples and hybridization. [¼ + ¼ + ¼ + ¼]



[2] Comment on the following image. [1]

[7] (a) Describe the Fajans Rule in detail with suitable examples. [2]

(b) $E(H–H) = 436\ kJ\ mol^{-1}$, $E(F–F) = 158\ kJ\ mol^{-1}$,

$E(H–F) = 565\ kJ\ mol^{-1}$, $E(Cl–Cl) = 242\ kJ\ mol^{-1}$, $E(H–Cl) = 431\ kJ\ mol^{-1}$

Calculate the electronegativity values of H and Cl. Electronegativity of Fluorine is 4.0. [1]

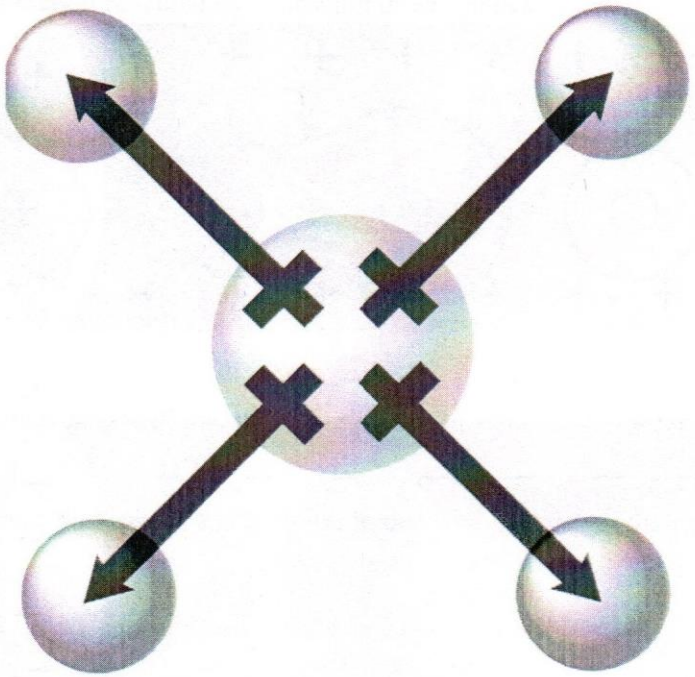
[8] (i) Write short notes on the following: [2]

(a) Additivity Rule of Covalent Radii with example

(b) Breakdown of Additivity Rule of Bond Enthalpy

(c) Pauling Scale of Electronegativity

(d) Polarity of following molecule



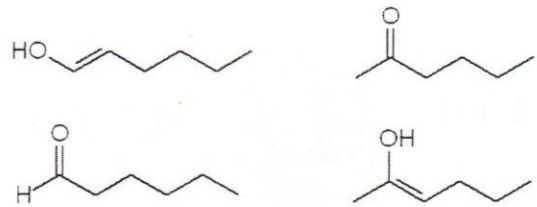
(ii) Explain the following phenomena: [1]

(a) PCl_3 is polar but BCl_3 is non-polar.

(b) Both NBr_3 and NF_3 are polar but their molecules align differently in a non-uniform electrostatic field.

[9] (a) Write detailed mechanism of Electrophilic Addition Reaction of HBr on Propyne. [2]

(b) Which of the following is the product of the acid catalyzed hydration of 1-hexyne? [1]



[10] Explain following with suitable examples and chemical reactions: [3]

(a) Acidity of Terminal Alkynes

(b) Nucleophilic Addition of Acetylide Ion to Carbonyl Compounds

(c) Acid Catalyzed Hydration of Alkynes

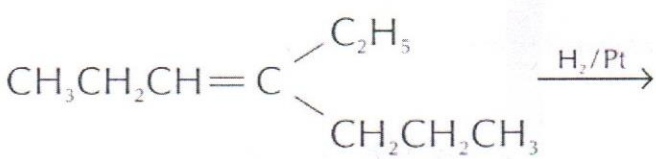
Section: C ***(Marks: 2Q × 6= 12)***

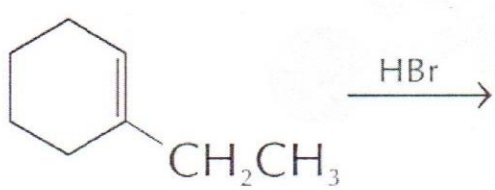
[11] Answer the following:

(a) Both alkanes and alkenes undergo halogenation. The halogenation of alkanes is a free radical substitution reaction while the reaction of alkenes with halogens is an electrophilic addition reaction. Can you tell two differences between the products formed by the two different types of halogenation? [1]

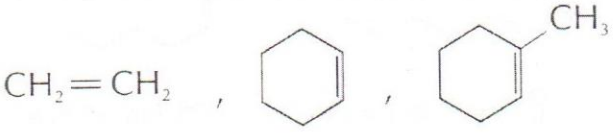
(b) What chemical tests would you use to distinguish between two unlabelled bottles containing hexane and hex-1-ene respectively? [1]

(c) What is the major product of each of the following reactions? [1]

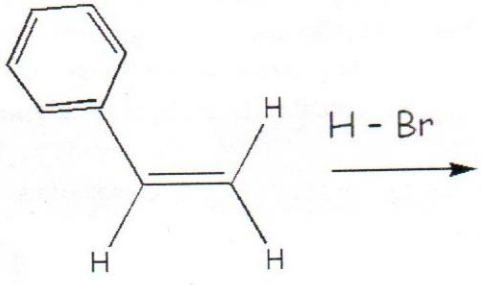




(c) Arrange the following molecules in the order of increasing rates of reaction with hydrogen chloride. Also explain the reason. [1]



(d) Write major and minor products in the following reaction with appropriate explanation in support of your answer. [1]



(e) Explain Anti-Markovnikove addition of HBr molecule on Propene molecule. [1]

[12] Discuss the following in detail with examples and chemical reactions. [6]

(a) Addition of H_2O to Alkenes: Hydration
(b) Oxymercuration-Demercuration
(c) Hydroboration
(d) Intramolecular Dehydration of Alcohols