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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 49907 Roll No. [redacted]

B. Tech. Examination 2023-24

(Even Semester)

ENGINEERING CHEMISTRY

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : 8×1=8

(a) Define activation energy.

(b) Explain the magnetic behaviour of C_2 molecule.

(c) What is functional isomerism? Give example.

(d) What are biocomposites?

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(e) Biopolymers are the example of which green chemistry principle?

(f) Write the monomers of Dacron.

(g) How is exhausted zeolite regenerated?

(h) BIS 13428 refers to which type of water?

SECTION – B

2. Attempt any two parts of the following : 2×6=12

(a) Draw the molecular orbit diagram of B_2, CN and NO^-. Find out their bond orders and magnetic behaviour.

(b) Define optical activity. How is it measured? Give the stereo isomers of tartaric acid. What is the reason for the lack of optical activity in the racemic and mesoforms?

(c) Discuss about biodegradable polymers and their significance. Write the preparation and structure of :

(i) Polypyprole

(ii) Kevlar

(iii) Nylon-6, 6

(d) Discuss the principle of High Performance Liquid Chromatography (HPLC). Explain its two main types. How is it operated?

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. 8×5=40

3. (a) Derive the rate equation for a second order reaction when both the reactants are different.

(b) Derive Arrhenius equation. The rate of reaction doubles when the temperature changes from 20 ^{0}C to 50 ^{0}C. Calculate the energy of activation of the reaction.
Given R = 8.314 $Jk^{-1}\ mol^{-1}$.

(c) Explain the following :

(i) Synthesis of nano-materials by sol-gel method.

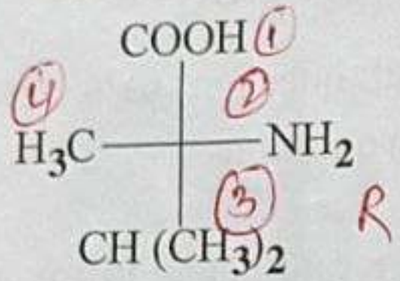
(ii) Structure, properties and uses of graphite.

4. (a) Draw various conformations of n-butane. Discuss their stability with the help of energy profile diagram.

(b) What are non-stoichiometric defects? Explain their types with examples.

(c) Assign R/S and E/Z nomenclature of the following :

2. (i)



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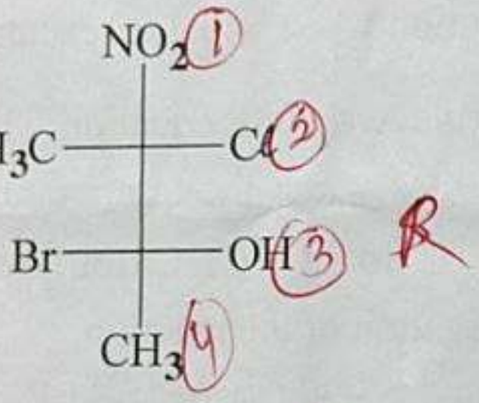

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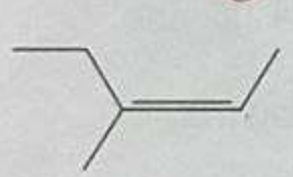

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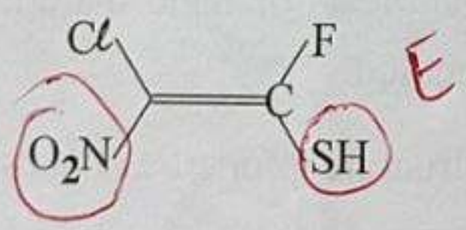

5. (a) What are Persistent Organic Pollutants (POPs)? Discuss about their properties and effects on humans and environment.

(b) Explain the following :

(i) Classification of polymers on the basis of origin and mode of synthesis.

(ii) Endocrine Disrupting Chemicals (EDCs) and their effects on humans.

(c) Discuss about preparation, properties and uses of various types of conducting polymers.

6. (a) Write short notes on the following :

(i) Chromophores and auxochromes

(ii) Softening of water by zeolite process

(b) Explain the principle of ultra-violet spectroscopy Discuss about various tpes of transitions in the UV region with examples.

(c) A sample of water on analysis was found to contain the following impurities in mg/litre.

$Ca(HCO_3)_2$	=	10.0 mg/ℓ
$Mg(HCO_3)_2$	=	8.5 mg/litre
$CaSO_4$	=	22.0 mg/litre
$MgSO_4$	=	24.0 mg/litre

Calculate the temporary, permanent and total hardness of the water sample.

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