



BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – B.Sc.(BT)-Hons-2024

Course Name – Chemistry

Course Code - BBT27102 (T)

(Semester II)

Full Marks : 40

Time : 2:0 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 10=10

1. Choose the correct alternative from the following :

- (i) Which of the following salts is the main cause of permanent hardness of water?
 - a) Magnesium sulphate
 - b) Magnesium carbonate
 - c) Magnesium bicarbonate
 - d) Calcium carbonate
- (ii) Predict when a molecule is called optically active.
 - a) If it has plane of symmetry
 - b) If it exhibits enantiomerism
 - c) If it exhibits diastereoisomerism
 - d) If it has center of symmetry
- (iii) The commercially developed membrane-separation processes does not include.....
 - a) microfiltration
 - b) macrofiltration
 - c) ultrafiltration
 - d) Nanofiltration
- (iv) Which of the following is not an effect of scale formation in boilers?
 - a) wastage of fuel
 - b) overheating of boiler
 - c) lowering safety of boiler
 - d) eutrophication
- (v) The rate constant for a first order reaction is $1.54 \times 10^{-3} \text{ sec}^{-1}$. It's half-life period will be:
 - a) 450 Sec
 - b) 500 Sec
 - c) 400 Sec
 - d) 240 Sec
- (vi) Organize the following molecules in a decreasing acidity order.

FCH_2COOH , ClCH_2COOH , BrCH_2COOH , ICH_2COOH

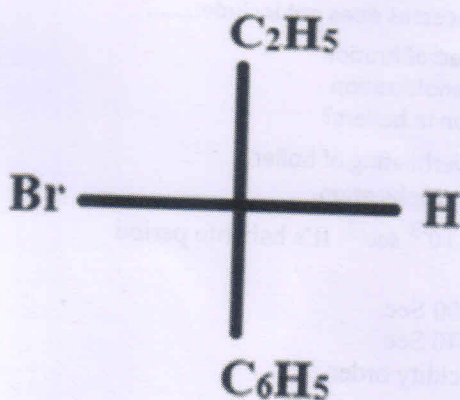
- a) $\text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{FCH}_2\text{COOH}$
 b) $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ICH}_2\text{COOH}$
 c) $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH}$
 d) $\text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
- (vii) Identify the stability order of carbocation.
- a) Primary carbocation > Secondary carbocation > Tertiary carbocation
 b) Secondary carbocation > Primary carbocation > Tertiary carbocation
 c) Tertiary carbocation > Primary carbocation > Secondary carbocation
 d) Tertiary carbocation > Secondary carbocation > Primary carbocation
- (viii) Select the ligand from the following that does not form a chelate.
- a) Thiocyanato
 b) Oxalato
 c) Glycinato
 d) Ethylene-1,2-diamine
- (ix) 1-butene on ozonolysis produces
- a) Formaldehyde only
 b) Propanal only
 c) Both formaldehyde and propanal
 d) Acetone only
- (x) What type of reaction occurs when a ketone is treated with HCN to yield a cyanohydrin?
- a) Nucleophilic addition
 b) Electrophilic substitution
 c) Nucleophilic substitution
 d) Electrophilic addition

Group-B

(Short Answer Type Questions)

3 x 5=15

2. How is temporary hardness removed by OHehner's method? (3)
3. Examine the general mechanism of addition of HBr to $\text{CH}_3\text{-CH=CH}_2$ in presence of peroxide. (3)
4. Assign R/S and D/L nomenclature to the given compound. (3)

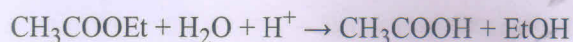


5. Predict the product with a suitable mechanism when acetone is treated with dilute NaOH, (3)
followed by heating.

6. Represent the R and S configurations of lactic acid $[\text{CH}_3\text{CH}(\text{OH})\text{COOH}]$ in Fischer (3)
projection formulae and convert to Flying Wedge projection formulae.

OR

Analyze the order of the following chemical reaction (3)



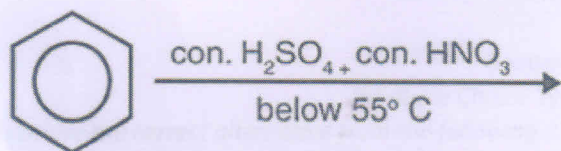
Group-C

(Long Answer Type Questions)

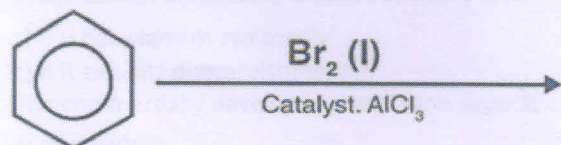
5 x 3=15

7. Predict the products of the following reaction with a suitable mechanism. (5)

i)



ii)



8. Explain the differences between strong and weak acids using ionization concepts. (5)

Classify the conjugate acid-base pairs in the following reaction: $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$

Classify the following species as Lewis acids or Lewis bases: BF_3 , NH_3 .

9. i) Prove that the integrated rate equation for a first-order reaction is $[\text{R}]_t = [\text{R}]_0 e^{-kt}$ Where $[\text{R}]_0$ (5)
and $[\text{R}]_t$ are initial concentration of reactant and concentration after t second.

ii) Rate constant of a first-order reaction is given by 0.02 sec^{-1} and the initial concentration of the reactant (C_0) is 0.1 (M) . Determine the concentration of the reactant left after 30 seconds.

OR

Consider a radioactive substance with a half-life of 10 years. Determine the fraction of the (5) substance remaining after 20 years.

Prove that in a first order reaction, time required for completion of 99.9% reaction is 10 times of half-life of the reaction.

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