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Matric 171145011034

1 A) $M/z = 105$

Given: $C = 12.0107 \text{ g/mol}$, $H = 1.00794 \text{ g/mol}$, $O = 15.999 \text{ g/mol}$,
 $N = 14.0067 \text{ g/mol}$.

i) $C_2H_3NO_4$ (Acetyl nitrate) = $(2 \times 12.0107) + (3 \times 1.00794) +$
 $(14.0067) + (4 \times 15.999) = 105.05 \text{ g/mol}$.

ii) $C_5H_3N_3 = (5 \times 12.0107) + (3 \times 1.00794) + (3 \times 14.0067)$
 $= 105.1 \text{ g/mol}$.

iii) $C_3H_7NO_3$ (2-Nitro-1-propanol) = $(3 \times 12.0107) + (7 \times 1.00794)$
 $+ 14.0067 + (3 \times 15.999) = 105.093$.

iv) C_7H_5O (phenylmethane) = $(7 \times 12.0107) + (5 \times 1.00794) +$
 $15.999 = 105.116$.

B) Importance of organic chemistry.

- They can be used in medicine for the production of drugs, study of diseases and diagnosis of diseases.
- They can be used as sterilizing agents
- They are used as analytical substances.
- They solely make up food substances
- ~~They are used in medicine for the p~~
- They serve as major constituents of certain valuables like diamond and petroleum.

c) Difference between homocyclic and heterocyclic compounds.

Homocyclic	Heterocyclic
i. They are cyclic compounds having atoms of the same element as ring members	They are compounds having atoms of at least two different elements including carbon atoms as ring members
ii. Ring contains some atoms of elements.	Ring contains atoms of different elements including oxygen, sulphur, nitrogen and carbon.

Homocyclic

iii) Examples are: Benzene, toluene, cyclohexane, phenol, naphthalene etc.

Heterocyclic

examples are: azoline, thiocane, pyran, pyridine, etc.

2 A) Retardation factor = $\frac{\text{Distance moved by substance}}{\text{Distance moved by solvent front}}$

Given: solvent front = 12.2 cm

Band A = 2.4 cm, Band B = 5.6 cm, Band C = 8.9 cm

Retardation factor = $\frac{2.4 \text{ cm}}{12.2 \text{ cm}} = 0.196$

for Band A

Retardation factor = $\frac{5.6 \text{ cm}}{12.2 \text{ cm}} = 0.459$

for Band b

Retardation factor = $\frac{8.9 \text{ cm}}{12.2 \text{ cm}} = 0.73$

for Band C

B) Tollen's test gives a positive test for aldehyde, therefore A is an aldehyde.

Bromination test / Bromine water test gives a positive test for unsaturated compounds. Therefore, B is an unsaturated compound (Alkene or Alkyne).

C) 2,4-Dinitrophenylhydrazine is employed for or to qualitatively detect the carbonyl functionality of a ketone or aldehyde functional group.

7) Name	Formula	Examples
i. Alkanol	ROH	$\text{C}_2\text{H}_5\text{OH}$ (Ethanol) $\text{C}_3\text{H}_7\text{OH}$ (Propanol)
ii) Ethers	ROR'	$\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$ (Ethoxyethane) $\text{CH}_3\text{OC}_2\text{H}_5$ (Methoxyethane)

	Name	Formula	Examples
iii)	Alkyl halides	RX	Propyl chloride (C_3H_7Cl) methyl chloride (CH_3Cl)
iv)	Alkanal / Aldehydes	$RCHO$	C_3H_6O (propanal) C_2H_4O (ethanal)
v)	Alkanoate / Esters	$RCOR'$	$CH_3COOC_2H_5$ (methyl propanoate) $C_2H_5COOC_2H_5$ (ethyl propanoate)
vi)	Alkanones (Ketones)	$RCOR'$	CH_3COCH_3 (propanone) $C_2H_5COC_2H_5$ (pentanone)
vii)	Alkanonic / carboxylic acid	$RCOOH$	C_2H_5COOH (propanoic acid) C_3H_7COOH (butanoic acid)