JEE Mains 2019 Chapter wise Question Bank

Purification and Characterization of Organic Compounds - Questions

Q1

The correct match between Item I and Item II is:

	Item I		Item II
(A)	Benzaldehyde	(P)	Mobile phase
(B)	Alumina	(Q)	Adsorbent
(C)	Acetonitrile	(R)	Adsorbate

(1) (A) → (Q) ; (B) → (P) ; (C) → (R)
(2) (A) → (R) ; (B) → (Q) ; (C) → (P)
(3) (A) → (Q) ; (B) → (R) ; (C) → (P)
(4) (A) → (P) ; (B) → (R) ; (C) → (Q)

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Q2

If dichloromethane (DCM) and water (H_2O) are used for differential extraction, which one of the following statements is correct?

(1) DCM and H_2O would stay as lower and upper layer respectively in the S.F.
(2) DCM and H_2O will make turbid/colloidal mixture
(3) DCM and H_2O would stay as upper and lower layer respectively in the separating funnel (S.F.)
(4) DCM and H_2O will be miscible clearly

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Q3

The correct match between item 'I' and item 'II' is:

	Item 'I' (compound)		Item 'II' (reagent)
(A)	Lysine	(P)	1-Naphthol
(B)	Furfural	(Q)	Ninhydrin
(C)	Benzyl alcohol	(R)	$KMnO_4$
(D)	Styrene	(S)	Ceric ammonium nitrate

(1) (A) → (Q); (B) → (P); (C) → (S); (D) → (R)
(2) (A) → (Q); (B) → (P); (C) → (R); (D) → (S)
(3) (A) → (R); (B) → (P); (C) → (Q) : (D) → (S)
(4) (A) → (Q); (B) → (R); (C) → (S); (D) → (P)

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Q4

The correct match between items I and II is :

	Item - I (Mixture)		Item - II (Separation method)
(A)	H_2O : Sugar	(P)	Sublimation
(B)	H_2O : Aniline	(Q)	Recrystallization
(C)	H_2O : Toluene	(R)	Steam distillation
		(S)	Differential extraction

(1) (A) → (S); (B) → (R); (C) → (P)
(2) (A) → (Q); (B) → (R); (C) → (S)
(3) (A) → (R); (B) → (P); (C) → (S)
(4) (A) → (Q); (B) → (R); (C) → (P)

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Q5

An organic compound is estimated through Dumas method and was found to evolve 6 moles of CO_2, 4 moles of H_2O and 1 mole of nitrogen gas. The formula of the compound is:

(1) $C_{12}H_8N$ (2) $C_{12}H_8N_2$
(3) $C_6H_8N_2$ (4) C_6H_8N

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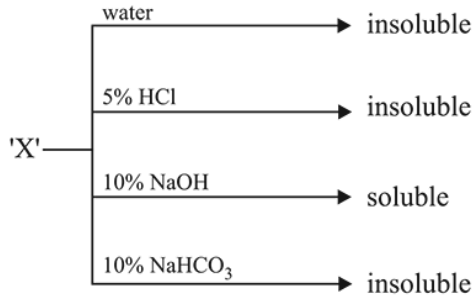
Q6

An organic compound 'X' showing the following solubility profile is:



(1) *o*-Toluidine (2) Oleic acid
(3) *m*-Cresol (4) Benzamide

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Q7

The principle of column chromatography is :
(1) Gravitational force.
(2) Capillary action.
(3) Differential absorption of the substances on the solid phase.
(4) Differential adsorption of the substances on the solid phase.

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Q8

In chromatography, which of the following statement is INCORRECT for R_f?
(1) R_f value depends on the type of chromatography.
(2) The value of R_f can not be more than one.
(3) Higher R_f value means higher adsorption.
(4) R_f value is dependent on the mobile phase.

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Q9

An organic compound 'A' is oxidized with Na_2O_2 followed by boiling with HNO_3. The resultant solution is then treated with ammonium molybdate to yield a yellow precipitate.

Based on above observation, the element present in the given compound is:
(1) Nitrogen (2) Phosphorus
(3) Fluorine (4) Sulphur

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Q10

25 g of an unknown hydrocarbon upon burning produces 88 g of CO_2 and 9 g of H_2O. This unknown hydrocarbon contains:
(1) 20 g of carbon and 5 g of hydrogen
(2) 22 g of carbon and 3 g of hydrogen
(3) 24 g of carbon and 1 g of hydrogen
(4) 18 g of carbon and 7 g of hydrogen

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Purification and Characterization of Organic Compounds - Answers

Q1

(2) Benzaldehyde is an absorbate, alumina is an adsorbent (stationary phase) and acetonitrile is in mobile phase.

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Q2

(1) Due to higher density of dichloromethane than water DCM would be the lower layer and water will form the upper layer in the separating funnel.

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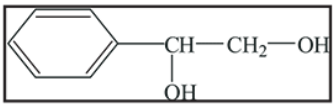
Q3

(1) Lysine being an amino acid reacts with ninhydrin to give a coloured product (blue purple).

Furfural test is used to distinguish between glucose and fructose. In this test, dilute sugar solution is added to 1 naphthol (in alcohol) and conc. HCl.

Alcohols are oxidised to aldehydes using ceric ammonium nitrate.

Styrene is converted to  using $KMnO_4$.

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Q4

(2) H_2O : Sugar – Recrystallisation

H_2O : Aniline – Separation by steam distillation

H_2O : Toluene – Differential extraction

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Q5

(3) $[C_xH_yN_z] \xrightarrow[\text{method}]{\text{Dumas}} 6CO_2 + 4H_2O + N_2$

Mol of $CO_2 = 6$, so mol of C is = 6

Mol of $H_2O = 4$, so mol of H is = 8

Mol of $N_2 = 1$, so mol of N is = 2

$\therefore$ Formula is $C_6H_8N_2$.

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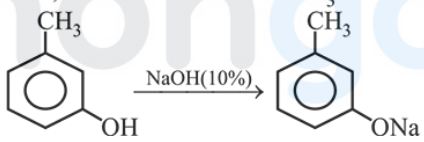
Q6

(3) Phenols (e.g. *m*-cresol), being weak acid, are soluble in dil NaOH, but insoluble in $NaHCO_3$.



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Q7

(4) In column chromatograph; a solid adsorbent is packed on a column and a solution containing number of solute particles is allowed to flow down the column. The solute molecules get adsorbed on the surface of adsorbent and move through column at different rates based on differential adsorption of the substances on the solid phase.

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Q8

(3) In chromatography, R_f represents retardation factor.

$$R_f = \frac{\text{Distance moved by the substance from baseline}}{\text{Distance moved by the solvent from baseline}}$$

$\therefore$ Higher R_f value means lower adsorption.

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Q9

(2) Phosphorus is detected in the form of yellow ppt of ammonium phosphate molybdate on reaction with ammonium molybdate.

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Q10

(3) Let the hydrocarbon be C_xH_y.

$$\underset{25\,g}{C_xH_y}+\underset{(excess)}{\left(x+\frac{y}{4}\right)O_2}\longrightarrow \underset{88\,g}{xCO_2}+\underset{9\,g}{\frac{y}{2}H_2O}$$

$$2\ mol \qquad \frac{1}{2}mol$$

$$x=2 \qquad y=1$$

$\because$ x = 2 and y = 1 the hydrocarbon will be $(C_2H)_n$
2 mol carbon contains 24 g and 1 mol hydrogen contains 1g.

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