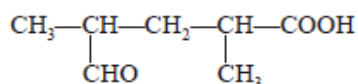


UP-PGT CHEMISTRY
Basic organic

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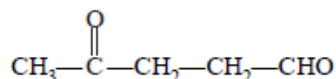
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1. Write the IUPAC name of: 1



Ans : 2, 4-Dimethyl-5-oxopentanoic acid

2. Write IUPAC name of: 1



Ans : 4-Oxopentanal

3. Name the process of separating benzoic acid and naphthalene. 1

Ans : Fractional crystallisation using benzene as a solvent.

4. Which gas is liberated in Kjeldahl's method? 1

Ans : Ammonia gas (NH₃)

5. What is the value of 'x' in an organic compound with molecular formula C_xH₁₂ with vapour density 42? 1

Ans : V.D. is 42, therefore,
Mol. wt. = 2 × V.D. = 2 × 42 = 84,
therefore, molecular formula is C₆H₁₂.

6. What is Lassaigne's extract? 1

Ans : When organic compound is fused with sodium metal and then extracted by water, it is called Lassaigne's extract.

7. Which gas is liberated in Dumas method? 1

Ans : N₂

8. What type of solids are separated by fractional crystallisation? 1

Ans : Those solids which are soluble in same solvent but to different extent, i.e., differ in their solubility.

9. Explain, why Lassaigne's solution is boiled with conc. HNO_3 before testing for halogens? 1

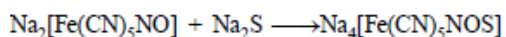
Ans : It is done so as to decompose NaCN to HCN and Na_2S to H_2S which are removed as gases.

10. How are liquids with high boiling point or liquids which decompose at or below their normal boiling points, purified? 1

Ans : They are purified by distillation under reduced pressure.

11. What happens when Lassaigne's extract containing sodium sulphide is treated with sodium nitroprusside? 1

Ans : Violet colour is formed due to formation of complex compound.



12. If we get blood red colouration on adding FeSO_4 and dil. H_2SO_4 to the sodium extract, what do you infer about the elements present in organic compound? 1

Ans : The organic compound contains nitrogen and sulphur.

13. Name two classes of compounds in which Kjeldahl's method cannot be used for estimation of nitrogen. 1

Ans : Nitro compounds, azo compounds and compounds containing nitrogen in ring, e.g., pyridine.

14. What is the formula of magnesium pyrophosphate? 1

Ans : $\text{Mg}_2\text{P}_2\text{O}_7$ (Magnesium pyrophosphate)

15. In Carius method, sulphur is estimated by precipitating it as which compound? 1

Ans : BaSO_4

16. How will you separate a mixture of *o*-nitrophenol and *p*-nitrophenol? 1

Ans : Steam distillation because *o*-nitrophenol is steam volatile while *p*-nitrophenol is not steam volatile.

17. What are the formulae of (i) Sodium nitroprusside (ii) Ferric ferrocyanide? 1

Ans : (i) $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ (ii) $\text{Fe}_4(\text{Fe}(\text{CN})_6)_3$

18. Why does hydrazine not give test for Lassaigne's extract? 1

Ans : It does not contain carbon, therefore, it is not an organic compound.

19. Name a compound which does not contain halogen but responds to Beilstein's test. 1

Ans : Urea

20. Which elements are estimated by Liebig's Method? 1

Ans : Carbon and Hydrogen

21. Name the method used to purify aniline. 1

Ans : Steam distillation

22. Which type of compounds are purified by steam distillation? 1

Ans : Steam volatile and insoluble in water.

23. Why does SO_3 act as an electrophile? 2

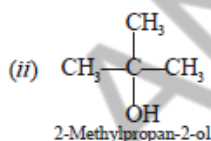
Ans :



Since oxygen is more electronegative than 'S', therefore, 'S' is positively charged and acts as an electrophile.

24. (i) Mention the type of hybridisation of each carbon in the compound $\text{CH}_3\text{—CN}$. 2
(ii) Draw the structure of 2-methylpropan-2-ol.

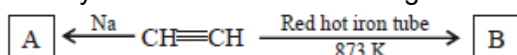
Ans : (i) 1st carbon is ' sp^3 ' and 2nd carbon is ' sp ' hybridised. $\overset{2}{\text{CH}_3}\text{—}\overset{1}{\text{C}}\equiv\text{N}$

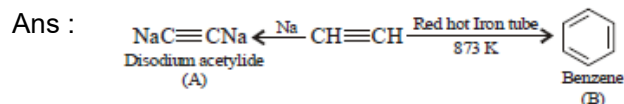


25. In sulphur estimation, 0.157 g of an organic compound gave 0.4813 g of barium sulphate. 2
What is the percentage of sulphur in the compound?
[Given: molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$]

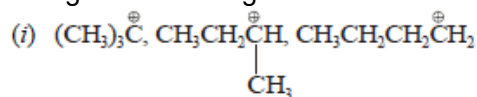
Ans :
$$\% \text{ of S} = \frac{32}{233} \times \frac{\text{Weight of BaSO}_4 \text{ formed}}{\text{Weight of organic compound}} \times 100$$
$$= \frac{32}{233} \times \frac{0.4813}{0.157} \times 100 = \frac{1540.16}{36.581} = 42.10\%$$

26. Identify 'A' and 'B' in the following: 2





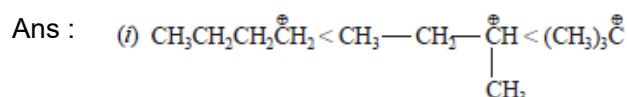
27. Arrange the following: 2



[Increasing order of stability]

(ii) $-\text{I}, -\text{Br}, -\text{Cl}, -\text{F}$

[Decreasing order of $-\text{I}$ effect]




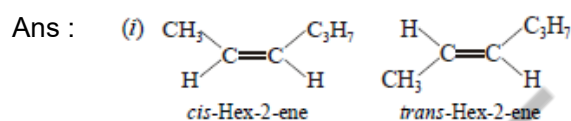
Due to more number of hyperconjugative structure, tertiary carbonium ion is more stable than secondary carbonium ion.

(ii) $\text{F} > \text{Cl} > \text{Br} > \text{I}$


F being maximum electronegative shows highest $-\text{I}$ (negative inductive effect).

28. (i) Draw cis and trans-structures for Hex-2-ene. Which isomer will have higher boiling point and why? 2

(ii) Explain why  is not aromatic.

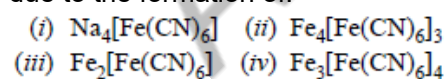


cis-Hex-2-ene has higher dipole moment and therefore this has higher boiling point.

(ii)  Due to the presence of sp^3 carbon

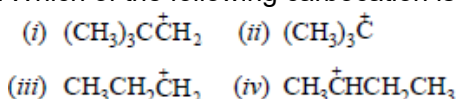
(carbon 3), the system is not planar. Further, it contains only four π electrons. Hence it is not aromatic because it does not contain planar delocalised cloud with $(4n + 2)\pi$ electrons.

29. In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of: 2



Ans : (ii) Ferric ferrocyanide

30. Which of the following carbocation is most stable? 2



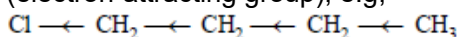
Ans : (ii) is most stable, because 3° carbocation is most stable. (i) will become most stable after methyl shift.

31. Explain the terms inductive and electromeric effects. Which electron displacement effect explains the following correct orders of acidity of the carboxylic acids? 2

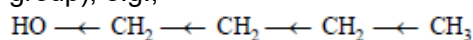
(i) $\text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH}$

(ii) $\text{CH}_3\text{CH}_2\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{CCOOH}$

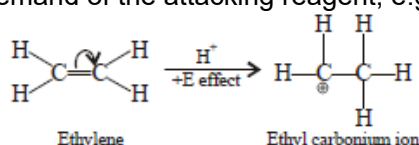
Ans : Inductive Effect. The permanent electron displacement along a chain due to the presence of a polar covalent bond, i.e. bond polarity is known as inductive effect. If an atom or group attracts electron more strongly than hydrogen, it is said to have $-I$ effect (electron-attracting group), e.g.,



If an atom or group attracts electron less strongly than hydrogen, it is said to have $+I$ effect (electron-releasing group), e.g.,

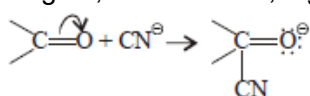


Electromeric Effect. This is a temporary effect which involves the complete transference of the shared pair of electrons to either of the two atoms linked by multiple (double or triple) bonds on the demand of the attacking reagent, e.g.,



(a) $+E$ effect. When the electron transference takes place towards the attacking reagent, it is $+E$ effect.

(b) $-E$ effect. When the electron transference takes place away from the attacking reagent, it is $-E$ effect, e.g.,

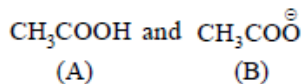


Inductive effect explains the acidity of following carboxylic acids:

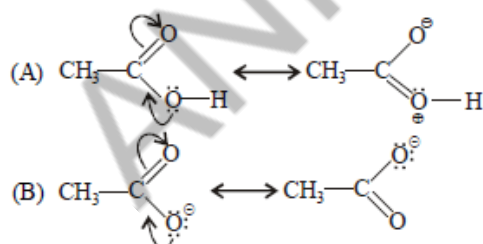
(i) Cl is electron withdrawing group, therefore, stabilizes intermediate carboxylate ion, thus, acidic character increases with increase in number of Cl atoms, because stability of carboxylate ion increases.

(ii) Electron releasing group will destabilize carboxylate ion due to which acidic character decreases with increase in number of alkyl groups.

32. Which of the two structures (A) and (B) given below is more stabilised by resonance? Explain. 2

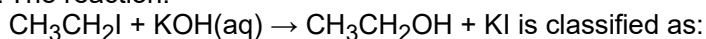


Ans :



'B' is more stable as it does not involve charge separation.

33. The reaction:

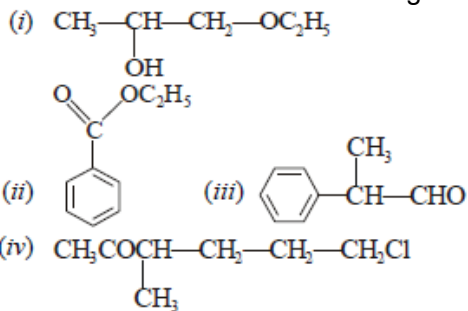


- (i) electrophilic substitution
- (ii) nucleophilic substitution
- (iii) elimination
- (iv) addition

Ans : (ii) Nucleophilic substitution reaction as OH^- ion is replacing I^- ion.

34. Write IUPAC name of the following compounds:

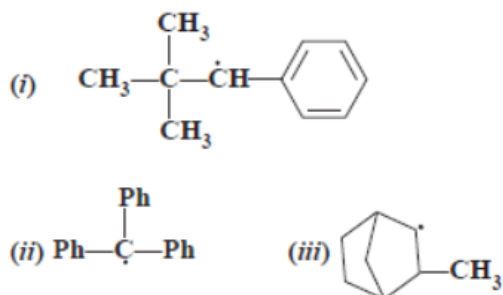
3



Ans : (i) 1-Ethoxypropan-2-ol (ii) Ethylbenzoate
(iii) 2-Phenylpropanal (iv) 6-Chloro-3-methylhexan-2-one

35. Consider the following compounds.

1



Hyper conjugation occurs in

- (a) III
- (b) I and III
- (c) I
- (d) II

Ans : (a) I

Because it has 'H' in conjugation with free radical.

36. Which of the following compounds will not give Lassaigne's test for nitrogen?

1

- (a) NH_2-NH_2
- (b) $\text{C}_6\text{H}_5\text{NHNH}_2$
- (c) $\text{C}_6\text{H}_5-\text{N}=\text{N}-\text{C}_6\text{H}_5$
- (d) NH_2CONH_2

Ans : (a) NH_2-NH_2

Because it does not have carbon.

37. Which of the following ion is most resonance stabilized?

1

- (a) $\text{C}_2\text{H}_5\text{O}^\oplus$
- (b) $\text{C}_6\text{H}_5\text{O}^\oplus$
- (c) $(\text{CH}_3)_3\text{CO}^\oplus$
- (d) $(\text{CH}_3)_2\text{CHO}^\oplus$

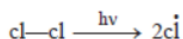
(b) $\text{C}_6\text{H}_5\text{O}^\oplus$
Ans : Phenoxide is stabilized by resonance.

38. Homolyte fission leads to formation of

1

- (a) Nucleophile
- (b) Carbanion
- (c) Free radical
- (d) Carbocation

Ans : (c) Free radical



39. Glycerol is purified by

1

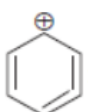
- (a) Vacuum distillation
- (b) Simple distillation
- (c) Steam distillation
- (d) Fractional distillation

Ans : (a) Vacuum distillation

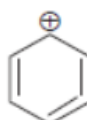
Because glycerol decomposes at its normal boiling point.

40. Pick out the wrong statement.

1

- (a)  is non-aromatic
- (b) >C=O is sp^2 hybridised
- (c) Hyperconjugation is no bond resonance
- (d) dipole moment of $\text{CH}_2=\text{CH}-\text{Cl} < \text{CH}_3\text{Cl}$

Ans :

- (a)  is non-aromatic

It is aromatic \because it has $(4n + 2) \pi$, i.e. 6π electrons which are delocalised.

41. Which one of the following is least stable?

1

- (a) CH_3^\ominus
- (b) $\text{HC}\equiv\text{C}^\ominus$
- (c) $(\text{C}_6\text{H}_5)_3\text{C}^\ominus$
- (d) $(\text{CH}_3)_3\text{C}^\ominus$

Ans :

- (d) $(\text{CH}_3)_3\text{C}^\ominus$

It is least stable because C^\oplus is attached to three electron releasing CH_3 groups.

42. The order of priority in IUPAC system

1

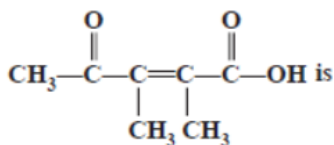
- (a) $-\text{CONH}_2, -\text{CHO}, -\text{SO}_3\text{H}, -\text{COOH}$
- (b) $-\text{COOH}, -\text{SO}_3\text{H}, -\text{CONH}_2, -\text{CHO}$
- (c) $-\text{SO}_3\text{H}, -\text{COON}, -\text{CONH}_2, -\text{CHO}$

(d) —CHO, —COOH, —SO₃H, —CONH₂

Ans : (c) —SO₃H, —COON, —CONH₂, —CHO

43. The IUPAC name of the molecule

1



(a) 4-oxo-2,3-dimethyl pent-2-en-1-oic acid

(b) 2-carboxy-3-methyl pent-2-en -3-one

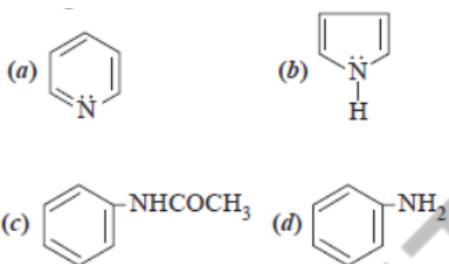
(c) 4-carboxy-3-methyl pent-3-en-2-one

(d) 2,3-Dimethyl-4-oxo-pent-2-en-1-oic acid

Ans : (d) 2,3-Dimethyl-4-oxo-pent-2-en-1-oic acid —COOH is given more preference over keto, prefix for ketone group is oxo.

44. Which one of the following has the most nucleophilic nitrogen?

1



Ans : (a)

∴ lone pair of electrons are easily available.

In (b) lone pair is delocalised, in (c) —COCH₃ is electron

withdrawing, in (d) C₆H₅⁻ is electron withdrawing.

45. Sodium nitroprusside reacts with sodium sulphide formed in lassaigne's test to detect presence of sulphur gives violet colour due to

1

(a) Na₂[Fe(CN)₅NO]

(b) Na₄[Fe(CN)₅NOS]

(c) Na₂[Fe(CN)₅COS]

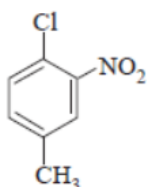
(d) None of these

Ans : (b) Na₄[Fe(CN)₅NOS]



46. The IUPAC name for

1



- (a) 1-Chloro-2-nitro-4-methylbenzene
- (b) 1-Chloro-4-methyl-2-nitrobenzene
- (c) 2-Chloro-1-nitro-5-methylbenzene
- (d) m-Nitro-p-chlorotoluene

Ans : (b) 1-Chloro-4-methyl-2-nitrobenzene.

Groups having prefix are preferred alphabetically.

47. Electronegativity of carbon atoms depends upon their state of hybridisation. In which of the following compounds, the carbon marked with asterisk is most electronegative? 1

- (a) $\text{CH}_3 - \text{CH}_2 - \text{*CH}_2 - \text{CH}_3$
- (b) $\text{CH}_3 - \text{*CH} = \text{CH} - \text{CH}_3$
- (c) $\text{CH}_3 - \text{CH}_2 - \text{C} \text{*CH}$
- (d) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{*CH}_2$

Ans : (c) $\text{CH}_3 - \text{CH}_2 - \text{C} \text{*CH}$

∴ 'C' is *sp* hybridised (50% s-character)
∴ it is most electronegative.

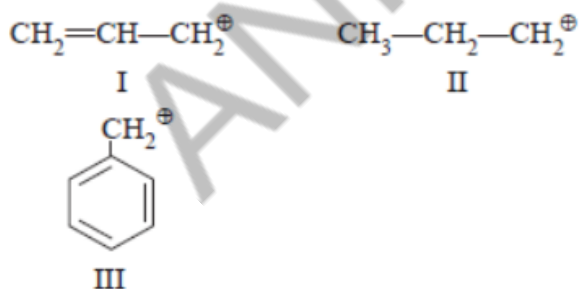
48. The fragrance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is: 1

- (a) Distillation
- (b) Crystallisation
- (c) Distillation under reduced pressure
- (d) Steam distillation

Ans : (d) Steam distillation

Because these are steam volatile and immiscible with water.

49. The order of stability of carbocations is 1



- (a) III > I > II
- (b) III > II > I
- (c) II > III > I
- (d) I > II > III

Ans : (a) III > I > II

Benzyl Carbocation is most stable due to five resonating structures, I (Allyl carbocation is more stable than II (n-propyl carbocation) due to resonance.

50. In which of the following, functional group isomerism is not possible? 1

- (a) Alcohols
- (b) Aldehydes

- (c) Alkyl halides
- (d) Cyanides

Ans : (c) Alkyl halides

Alkyl halide do not show functional isomerism. They can show position and chain isomerism.

51. In which of the following compounds the carbon marked with asterisk is expected to have greatest positive charge? 1

- (a) $^*\text{CH}_3\text{—CH}_2\text{—Cl}$
- (b) $^*\text{CH}_3\text{—CH}_2\text{—Mg}^+\text{Cl}^-$
- (c) $^*\text{CH}_3\text{—CH}_2\text{—Br}$
- (d) $^*\text{CH}_3\text{—CH}_2\text{—CH}_3$

Ans : (a) $^*\text{CH}_3\text{—CH}_2\text{—Cl}$

\therefore 'Cl' is most electron withdrawing.

ANKIT TYAGI