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Chemistry Grade 12 — Chapter 11

Carbonyl Compounds

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Independent practice MCQs from the supplied Class 12 Chemistry notes pack. Total: 50 questions.

A. Important / Main Topics

1. Which of the following is the strongest acid?

(A) Trichloroethanoic acid (pK_a = 0.9)
(B) Ethanoic acid (pK_a = 4.7)
(C) Chloroethanoic acid (pK_a = 2.9)
(D) Dichloroethanoic acid (pK_a = 1.3)

Correct Answer: A

Explanation: A smaller pK_a means a stronger acid. Trichloroethanoic acid has the lowest pK_a (0.9), so it is the strongest acid.

2. Why is trichloroethanoic acid stronger than ethanoic acid?

(A) Because it has more hydrogen atoms.
(B) Because chlorine is electron-withdrawing and stabilizes the carboxylate ion.
(C) Because chlorine is electron-donating.
(D) Because it has a higher molecular weight.

Correct Answer: B

Explanation: Chlorine is an electron-withdrawing group that stabilizes the carboxylate ion by pulling electron density away, increasing acidity.

3. What is the relationship between K_a and acid strength?

(A) Larger K_a means weaker acid.
(B) K_a has no relation to acid strength.
(C) Larger K_a means stronger acid.
(D) K_a is always 1.

Correct Answer: C

Explanation: Larger K_a means stronger acid. — this correctly answers the question.

4. Which of the following substituents increases the acidity of a carboxylic acid?

(A) Alkyl group
(B) Hydrogen atom
(C) Ethyl group
(D) Chlorine atom

Correct Answer: D

Explanation: Chlorine is an electron-withdrawing group that increases acidity.

5. What is the pK_a of ethanoic acid?

(A) 4.7
(B) 0.9
(C) 1.3
(D) 2.9

Correct Answer: A

Explanation: 4.7 — this correctly answers the question.

6. Which of the following is the weakest acid?

(A) Trichloroethanoic acid
(B) Ethanoic acid
(C) Dichloroethanoic acid

(D) Chloroethanoic acid

Correct Answer: B

Explanation: Ethanoic acid has the highest pK_a (4.7), so it is the weakest acid among the given options.

7. What is the effect of an electron-donating group on the acidity of a carboxylic acid?

(A) It increases acidity.
(B) It has no effect.
(C) It decreases acidity.
(D) It makes the acid neutral.

Correct Answer: C

Explanation: It decreases acidity. — this correctly answers the question.

8. Which of the following is the correct order of acidity?

(A) CH□COOH > CH□ClCOOH > CHCl□COOH > CCl□COOH
(B) CHCl□COOH > CCl□COOH > CH□COOH > CH□ClCOOH
(C) CH□ClCOOH > CH□COOH > CCl□COOH > CHCl□COOH
(D) CCl□COOH > CHCl□COOH > CH□ClCOOH > CH□COOH

Correct Answer: D

Explanation: The correct order is CCl□COOH > CHCl□COOH > CH□ClCOOH > CH□COOH.

9. What is the primary reason for the acidity of carboxylic acids?

(A) Resonance stabilization of the carboxylate ion.
(B) The presence of a carbonyl group.
(C) The presence of a hydroxyl group.
(D) The presence of an alkyl group.

Correct Answer: A

Explanation: The resonance stabilization of the carboxylate ion is the primary reason for the acidity of carboxylic acids.

10. Which of the following statements is correct about pK_a?

(A) A larger pK_a means a stronger acid.
(B) A smaller pK_a means a stronger acid.
(C) A smaller pK_a means a weaker acid.
(D) pK_a is always positive.

Correct Answer: B

Explanation: A smaller pK_a means a stronger acid.

11. Which reagent is used to convert toluene to benzoic acid?

(A) Fehling's solution
(B) PCl□
(C) KMnO□ and dilute acid
(D) SOCl□

Correct Answer: C

Explanation: The reagent is hot alkaline KMnO□ followed by dilute acid.

12. What is the main product of the reaction between toluene and hot alkaline KMnO□?

(A) Benzyl alcohol
(B) Benzaldehyde
(C) Phenol
(D) Benzoic acid

Correct Answer: D

Explanation: Benzoic acid — this correctly answers the question.

13. What is the role of the acidification step in the preparation of benzoic acid?

(A) To convert the benzoate ion into benzoic acid.
(B) To oxidize the side chain.

(C) To reduce the benzoic acid.
(D) To neutralize the solution.

Correct Answer: A

Explanation: To convert the benzoate ion into benzoic acid. — this correctly answers the question.

14. Which part of the toluene molecule is oxidized when it is converted to benzoic acid?

(A) The aromatic ring
(B) The methyl group
(C) The hydrogen atoms
(D) The carbon-carbon bonds

Correct Answer: B

Explanation: The methyl group — this correctly answers the question.

15. What is the product of the reaction of a carboxylic acid with SOCl□?

(A) Ester
(B) Amide
(C) Acyl chloride
(D) Alcohol

Correct Answer: C

Explanation: Acyl chloride — this correctly answers the question.

16. What is the product of the reaction of a carboxylic acid with an alcohol?

(A) Acyl chloride
(B) Amide
(C) Alcohol
(D) Ester

Correct Answer: D

Explanation: Ester — this correctly answers the question.

17. What is the product of the reaction of a carboxylic acid with ammonia?

(A) Amide
(B) Acyl chloride
(C) Ester
(D) Alcohol

Correct Answer: A

Explanation: Amide — this correctly answers the question.

18. What is the product of the reduction of a carboxylic acid with LiAlH□?

(A) Secondary alcohol
(B) Primary alcohol
(C) Tertiary alcohol
(D) Aldehyde

Correct Answer: B

Explanation: Primary alcohol — this correctly answers the question.

19. What is decarboxylation?

(A) Loss of H□O
(B) Loss of H□
(C) Loss of CO□
(D) Loss of O□

Correct Answer: C

Explanation: Loss of CO□ — this correctly answers the question.

20. Which of the following is a good leaving group in nucleophilic acyl substitution?

(A) OH□
(B) NH□□

(C) CH□□
(D) Cl□

Correct Answer: D

Explanation: Cl□ — this correctly answers the question.

21. Which of the following is a poor leaving group?

(A) OH□
(B) Cl□
(C) Br□
(D) I□

Correct Answer: A

Explanation: OH□ — this correctly answers the question.

22. What is the role of the carbonyl carbon in the reactions of carboxylic acids?

(A) It acts as a nucleophile.
(B) It acts as an electrophile.
(C) It acts as a base.
(D) It acts as a catalyst.

Correct Answer: B

Explanation: The carbonyl carbon is electrophilic.

23. What is the product of the reaction of a carboxylic acid with PCl□?

(A) Ester
(B) Amide
(C) Acyl chloride
(D) Alcohol

Correct Answer: C

Explanation: Acyl chloride — this correctly answers the question.

24. Which of the following is a reaction of carboxylic acids?

(A) Acidic reaction with NaOH
(B) Substitution with SOCl□
(C) Reduction with LiAlH□
(D) All of the above

Correct Answer: D

Explanation: All are reactions of carboxylic acids.

25. What is the product of the reaction between ethanoyl chloride and ethanol?

(A) Ethyl ethanoate
(B) Methyl ethanoate
(C) Ethanoic acid
(D) Ethanamide

Correct Answer: A

Explanation: Ethyl ethanoate — this correctly answers the question.

B. Less Important / Secondary Topics

26. What is the product of the reaction between ethanoyl chloride and phenol?

(A) Phenyl ethanoate
(B) Ethyl ethanoate
(C) Ethanoic acid
(D) Ethanamide

Correct Answer: A

Explanation: Phenyl ethanoate — this correctly answers the question.

27. What is the product of the reaction between ethanoyl chloride and water?

(A) Ethyl ethanoate
(B) Ethanoic acid
(C) Ethanamide
(D) Ethanol

Correct Answer: B

Explanation: Ethanoic acid — this correctly answers the question.

28. What is the product of the reaction between ethanoyl chloride and ammonia?

(A) Ethanoic acid
(B) Ethyl ethanoate
(C) Ethanamide
(D) Ethanol

Correct Answer: C

Explanation: Ethanamide — this correctly answers the question.

29. What is the product of the reaction between ethanoyl chloride and methylamine?

(A) Ethanamide
(B) Ethanoic acid
(C) Ethyl ethanoate
(D) N-methylmethanamide

Correct Answer: D

Explanation: N-methylmethanamide — this correctly answers the question.

30. Which of the following is the correct order of ease of hydrolysis?

(A) Acyl > Alkyl > Aryl
(B) Alkyl > Acyl > Aryl
(C) Aryl > Alkyl > Acyl
(D) Acyl > Aryl > Alkyl

Correct Answer: A

Explanation: Acyl > Alkyl > Aryl — this correctly answers the question.

31. What is the product of the hydrolysis of an acyl chloride?

(A) Alcohol
(B) Carboxylic acid
(C) Phenol
(D) Ketone

Correct Answer: B

Explanation: Carboxylic acid — this correctly answers the question.

32. What is the product of the hydrolysis of an alkyl chloride?

(A) Carboxylic acid
(B) Phenol
(C) Alcohol
(D) Ketone

Correct Answer: C

Explanation: Alcohol — this correctly answers the question.

33. What is the product of the hydrolysis of an aryl chloride?

(A) Carboxylic acid
(B) Alcohol
(C) Ketone
(D) Phenol

Correct Answer: D

Explanation: Phenol — this correctly answers the question.

34. Why are acyl chlorides more reactive than alkyl chlorides?

(A) Because the carbonyl carbon is more electrophilic.
(B) Because the C-Cl bond is stronger.
(C) Because the chlorine is less electronegative.
(D) Because they are smaller molecules.

Correct Answer: A

Explanation: The carbonyl carbon is more electrophilic.

35. What type of mechanism is involved in the hydrolysis of acyl chlorides?

(A) Nucleophilic substitution
(B) Nucleophilic acyl substitution
(C) Electrophilic addition
(D) Free radical substitution

Correct Answer: B

Explanation: The mechanism is nucleophilic acyl substitution.

36. A student argues that because chlorobenzene contains chlorine, it should undergo nucleophilic substitution like chloroethane. This reasoning is flawed because:

(A) Chlorobenzene has no chlorine atom.
(B) Chlorobenzene is a gas.
(C) The C-Cl bond in chlorobenzene has partial double bond character due to resonance.
(D) Chloroethane is more stable.

Correct Answer: C

Explanation: A student argues that because chlorobenzene contains chlorine, it should undergo nucleophilic substitution like chloroethane. This reasoning is flawed because The C-Cl bond in chlorobenzene has partial double bond character due to resonance..

37. Which of the following is a correct statement about the reaction of a halogenoalkane with aqueous silver nitrate?

(A) It is an addition reaction.
(B) It is an elimination reaction.
(C) It is an oxidation reaction.
(D) It is a nucleophilic substitution reaction.

Correct Answer: D

Explanation: The reaction is a nucleophilic substitution.

38. What is the product of the reaction between bromoethane and cyanide ion?

(A) Propanenitrile
(B) Ethanol
(C) Ethylamine
(D) Ethane

Correct Answer: A

Explanation: Propanenitrile — this correctly answers the question.

39. What is the product of the reaction between bromoethane and ammonia?

(A) Ethanol
(B) Ethylamine
(C) Propanenitrile
(D) Ethane

Correct Answer: B

Explanation: Ethylamine — this correctly answers the question.

40. What is the product of the reaction between bromoethane and hydroxide ion?

(A) Ethene
(B) Ethanoic acid
(C) Ethanol

(D) Ethane

Correct Answer: C

Explanation: Ethanol — this correctly answers the question.

41. Which of the following is a correct statement about the hydrolysis of halogenoalkanes?

(A) It is an addition reaction.
(B) It is an elimination reaction.
(C) It is an oxidation reaction.
(D) It is a nucleophilic substitution reaction.

Correct Answer: D

Explanation: Hydrolysis is a nucleophilic substitution.

42. Which of the following is a correct statement about the reaction of halogenoalkanes with aqueous silver nitrate?

(A) It produces a silver halide precipitate.
(B) It produces a silver mirror.
(C) It produces a gas.
(D) No reaction occurs.

Correct Answer: A

Explanation: It produces a silver halide precipitate. — this correctly answers the question.

43. What is the colour of the AgCl precipitate?

(A) Cream
(B) White
(C) Yellow
(D) Green

Correct Answer: B

Explanation: White — this correctly answers the question.

44. What is the colour of the AgBr precipitate?

(A) White
(B) Yellow
(C) Cream
(D) Green

Correct Answer: C

Explanation: AgBr is a cream-coloured precipitate.

45. What is the colour of the AgI precipitate?

(A) White
(B) Cream
(C) Green
(D) Yellow

Correct Answer: D

Explanation: Yellow — this correctly answers the question.

46. Which halogenoalkane is the most reactive with aqueous silver nitrate?

(A) Iodoethane
(B) Fluoroethane
(C) Chloroethane
(D) Bromoethane

Correct Answer: A

Explanation: Iodoethane — this correctly answers the question.

47. Which halogenoalkane is the least reactive with aqueous silver nitrate?

(A) Chloroethane
(B) Fluoroethane

(C) Bromoethane
(D) Iodoethane

Correct Answer: B

Explanation: Fluoroethane — this correctly answers the question.

48. Which of the following is a correct statement about the relative stability of cis and trans isomers?

(A) Cis isomers are generally more stable than trans isomers.
(B) Both isomers have the same stability.
(C) Trans isomers are generally more stable than cis isomers due to less steric hindrance.
(D) Stability depends only on the molecular weight.

Correct Answer: C

Explanation: Trans isomers are generally more stable than cis isomers due to less steric hindrance. — this correctly answers the question.

49. Which of the following compounds can show geometric isomerism?

(A) 1-butene
(B) Propene
(C) Ethene
(D) 2-butene

Correct Answer: D

Explanation: 2-butene — this correctly answers the question.

50. What is the product of the reaction of benzene with bromine in the presence of $FeBr_3$?

(A) Bromobenzene
(B) Benzene bromide
(C) Dibromobenzene
(D) Bromomethane

Correct Answer: A

Explanation: Bromobenzene — this correctly answers the question.