1. Which of the following undergoes nucleophilic addition most readily?

A. Formaldehyde
B. Acetaldehyde
C. Acetone
D. Benzaldehyde

Answer: A. Formaldehyde
Explanation: Less steric hindrance and strong partial positive charge on carbonyl carbon make HCHO most reactive.

2. Which of the following does not give a positive Tollens' test?

A. Formaldehyde
B. Acetaldehyde
C. Benzaldehyde
D. Acetone

Answer: D. Acetone
Explanation: Ketones do not give Tollens' test; only aldehydes do.

3. Which reagent converts ketone to alcohol?

A. $KMnO_4$
B. $NaBH_4$
C. PCC
D. Br_2/H_2O

Answer: B. $NaBH_4$
Explanation: $NaBH_4$ is a mild reducing agent that reduces ketones to secondary alcohols.

4. Which of the following will undergo decarboxylation most easily on heating?

A. CH_3COOH
B. CH_3CH_2COOH
C. HOOC–COOH
D. C_6H_5COOH

Answer: C. HOOC–COOH
Explanation: Oxalic acid (HOOC–COOH) easily loses CO_2 due to adjacent carboxylic groups.

5. Which is the product when benzaldehyde reacts with concentrated NaOH?

A. Benzoic acid
B. Benzyl alcohol
C. Benzal alcohol
D. Benzyl alcohol and benzoate salt

Answer: D. Benzyl alcohol and benzoate salt
Explanation: Cannizzaro reaction gives one oxidized and one reduced product.

6. Which compound gives a yellow precipitate with 2,4-DNP (dinitrophenylhydrazine)?

A. Ethanol
B. Acetic acid
C. Acetone
D. Aniline

Answer: C. Acetone
Explanation: 2,4-DNP test is positive for aldehydes and ketones only.

7. Aldehyde to carboxylic acid conversion is done by:

A. $NaBH_4$
B. $LiAlH_4$
C. $KMnO_4$
D. HCl

Answer: C. $KMnO_4$
Explanation: Strong oxidizing agents like $KMnO_4$ oxidize aldehydes to acids.

8. Which carboxylic acid is most acidic?

A. CH_3COOH
B. $ClCH_2COOH$

C. HCOOH
D. C_2H_5COOH

Answer: B. $ClCH_2COOH$
Explanation: Electron-withdrawing Cl increases acidity by stabilizing conjugate base.

9. Which of the following is used in the synthesis of cinnamic acid?

A. Claisen condensation
B. Aldol condensation
C. Perkin reaction
D. Cannizzaro reaction

Answer: C. Perkin reaction
Explanation: Perkin reaction involves aldehyde and acid anhydride forming cinnamic acid derivatives.

10. What is formed when acetone is heated with iodine and NaOH?

A. Acetic acid
B. Iodoform
C. Acetaldehyde
D. Chloroform

Answer: B. Iodoform
Explanation: Methyl ketones give yellow ppt. of iodoform in I_2/NaOH test.

11. What is the IUPAC name of $CH_3–CH_2–CO–CH_3$?

A. Butan-2-one
B. Butanone
C. Pentanone
D. Butanal

Answer: A. Butan-2-one
Explanation: Longest chain: 4 carbon atoms with ketone at C2.

12. Which of the following will not undergo aldol condensation?

A. Acetone
B. Benzaldehyde
C. Acetaldehyde
D. Propanal

Answer: B. Benzaldehyde
Explanation: Lacks alpha-H; hence, cannot form enolate → no aldol.

13. When formic acid is warmed with conc. H_2SO_4, it gives:

A. CO
B. CO_2
C. CH_4
D. CH_3OH

Answer: A. CO
Explanation: HCOOH + conc. H_2SO_4 → CO + H_2O.

14. Which of the following shows positive iodoform test?

A. Formaldehyde
B. Acetophenone
C. Propanal
D. Benzaldehyde

Answer: B. Acetophenone
Explanation: It has a methyl ketone group → gives iodoform.

15. Which of the following is most reactive towards nucleophilic addition?

A. Benzaldehyde
B. Acetone
C. Acetaldehyde
D. Formaldehyde

Answer: D. Formaldehyde
Explanation: Least steric hindrance and most electrophilic carbonyl carbon.

16. The product formed when benzaldehyde reacts with acetone in presence of dilute NaOH is:

A. Benzyl alcohol
B. α,β-unsaturated ketone
C. Benzoin
D. Benzoic acid

Answer: B. α,β-unsaturated ketone
Explanation: Cross aldol condensation between aromatic aldehyde (benzaldehyde) and acetone gives α,β-unsaturated ketone.

17. Which of the following acids is strongest?

A. Acetic acid
B. Formic acid
C. Trichloroacetic acid
D. Propanoic acid

Answer: C. Trichloroacetic acid
Explanation: Strong electron-withdrawing Cl groups stabilize conjugate base, increasing acidity.

18. The reaction of hydrazine with aldehydes forms:

A. Oximes
B. Hydrazones
C. Imines
D. Alcohols

Answer: B. Hydrazones
Explanation: Aldehyde + hydrazine → hydrazone (–CH=N–NH_2), a characteristic reaction.

19. Which of the following compounds can show tautomerism?

A. CH_3COCH_3
B. C_2H_5OH
C. CH_3COOH

D. HCHO

Answer: A. CH_3COCH_3
Explanation: Acetone has α-hydrogen; can exist in keto-enol tautomeric form.

20. Which reagent does not distinguish between aldehydes and ketones?

A. Tollens' reagent
B. Fehling's solution
C. Schiff's reagent
D. 2,4-DNP

Answer: D. 2,4-DNP
Explanation: 2,4-DNP gives positive test for both aldehydes and ketones – orange-yellow ppt.

21. When benzaldehyde is treated with concentrated NaOH, the reaction is known as:

A. Aldol condensation
B. Perkin reaction
C. Cannizzaro reaction
D. Gattermann reaction

Answer: C. Cannizzaro reaction
Explanation: Aldehydes without α-H undergo Cannizzaro reaction in concentrated base.

22. Which among the following is a product of Clemmensen reduction of acetophenone?

A. Acetophenone
B. Ethylbenzene
C. Benzyl alcohol
D. Benzaldehyde

Answer: B. Ethylbenzene
Explanation: Clemmensen reduction (Zn/HCl) reduces CO group to CH_2 group.

23. Which compound gives effervescence with $NaHCO_3$?

A. CH_3CHO
B. CH_3CH_2OH
C. CH_3COOH
D. C_6H_6

Answer: C. CH_3COOH
Explanation: Carboxylic acids react with $NaHCO_3$ to release CO_2 gas (effervescence).

24. Which one is most reactive towards nucleophilic addition reaction?

A. CH_3COCH_3
B. C_6H_5CHO
C. CH_3CHO
D. HCHO

Answer: D. HCHO
Explanation: Formaldehyde is highly electrophilic and has minimal steric hindrance.

25. Which of the following gives positive Fehling's test?

A. Benzaldehyde
B. Acetone
C. Formaldehyde
D. Acetophenone

Answer: C. Formaldehyde
Explanation: Formaldehyde is an aliphatic aldehyde → gives positive Fehling's test (red ppt. of Cu_2O).

26. Which of the following reduces Fehling's solution and Tollens' reagent both?

A. CH_3OH
B. CH_3COOH
C. CH_3CHO
D. CH_3CH_3

Answer: C. CH_3CHO
Explanation: Acetaldehyde is an aliphatic aldehyde and reduces both reagents.

27. What is the major product in the reaction: $CH_3CHO + HCN \rightarrow ?$

A. CH_3CH_2OH
B. $CH_3CH(OH)CN$
C. CH_3COOH
D. $CH_4 + CO_2$

Answer: B. $CH_3CH(OH)CN$
Explanation: Aldehydes react with HCN → cyanohydrin formation.

28. Which reagent selectively reduces carboxylic acids to primary alcohols?

A. $NaBH_4$
B. $LiAlH_4$
C. $KMnO_4$
D. PCC

Answer: B. $LiAlH_4$
Explanation: $LiAlH_4$ is strong enough to reduce –COOH to $–CH_2OH$.

29. Which of the following acids has the highest boiling point?

A. Formic acid
B. Acetic acid
C. Propanoic acid
D. Butanoic acid

Answer: D. Butanoic acid
Explanation: Greater molecular weight and hydrogen bonding → higher boiling point.

30. Which of the following can be reduced by catalytic hydrogenation?

A. CH_3COOH
B. C_6H_6
C. $CH_3CH=CH_2$
D. CH_3COCH_3

Answer: D. CH_3COCH_3
Explanation: Ketones can be reduced by catalytic hydrogenation (H_2/Ni) to alcohols.

31. Which of the following gives iodoform test?

A. CH_3CHO
B. CH_3COOH
C. HCHO
D. CH_3CH_2CHO

Answer: A. CH_3CHO
Explanation: Compounds with $CH_3CO–$ or $CH_3CH(OH)–$ group give iodoform test. Acetaldehyde has $CH_3–CO$ group.

32. Which of the following is least acidic?

A. Formic acid
B. Acetic acid
C. Propanoic acid
D. Phenol

Answer: D. Phenol
Explanation: Carboxylic acids are more acidic than phenol due to greater resonance stabilization of the conjugate base.

33. Acetic acid on treatment with PCl_5 gives:

A. Acetyl chloride
B. Acetone
C. Acetic anhydride
D. Ethyl chloride

Answer: A. Acetyl chloride
Explanation: –COOH group is replaced by –COCl on reaction with PCl_5.

34. In Tollens' test, the silver ion is reduced to metallic silver by:

A. Ketones
B. Aldehydes
C. Alcohols
D. Carboxylic acids

Answer: B. Aldehydes
Explanation: Aldehydes are oxidized to acids and reduce Ag^+ to metallic Ag (silver mirror test).

35. Which of the following will not give a positive test with Fehling's solution?

A. CH_3CHO
B. HCHO
C. C_6H_5CHO
D. $CH_3CH(OH)CH_3$

Answer: C. C_6H_5CHO
Explanation: Aromatic aldehydes do not give a positive Fehling's test.

36. Which of the following reacts with 2,4-DNP but not with Fehling's solution?

A. CH_3CHO
B. CH_3COCH_3
C. HCHO
D. CH_3CH_2CHO

Answer: B. CH_3COCH_3
Explanation: Ketones give 2,4-DNP test but not Fehling's test.

37. The correct order of reactivity of carbonyl compounds towards nucleophilic addition is:

A. Ketone > Aldehyde > HCHO
B. HCHO > Aldehyde > Ketone
C. Aldehyde > HCHO > Ketone
D. HCHO > Ketone > Aldehyde

Answer: B. HCHO > Aldehyde > Ketone
Explanation: Less steric hindrance and greater electrophilicity in HCHO makes it most reactive.

38. Which reaction can be used to distinguish between formic acid and acetic acid?

A. Esterification
B. Neutralization
C. Reaction with $AgNO_3/NH_3$
D. Reaction with Na metal

Answer: C. Reaction with $AgNO_3/NH_3$
Explanation: Formic acid reduces Tollens' reagent while acetic acid does not.

39. In the Cannizzaro reaction, the species which undergoes oxidation is:

A. Alcohol
B. Aldehyde
C. Carboxylic acid
D. Ketone

Answer: B. Aldehyde
Explanation: One molecule of aldehyde is oxidized to acid while another is reduced to alcohol.

40. Which compound cannot undergo aldol condensation?

A. CH_3CHO
B. CH_3COCH_3
C. HCHO
D. C_6H_5CHO

Answer: D. C_6H_5CHO
Explanation: It lacks α-hydrogen needed for aldol condensation.

41. Which of the following is the product of oxidation of ethanol using acidified $K_2Cr_2O_7$?

A. Ethene
B. Ethanal
C. Acetic acid
D. Methanol

Answer: C. Acetic acid
Explanation: Ethanol is first oxidized to ethanal, then to acetic acid.

42. Which of the following is used in the synthesis of aspirin?

A. Acetyl chloride
B. Acetic acid
C. Acetic anhydride
D. Ethyl acetate

Answer: C. Acetic anhydride
Explanation: Acetylation of salicylic acid with acetic anhydride gives aspirin.

43. Which compound gives red precipitate with Fehling's solution?

A. Acetophenone
B. Benzaldehyde
C. Formaldehyde
D. Ethanol

Answer: C. Formaldehyde
Explanation: Aliphatic aldehydes give red precipitate of Cu_2O with Fehling's reagent.

44. When acetaldehyde is treated with dilute NaOH and heated, the product is:

A. Acetone
B. Crotonaldehyde
C. Ethanol
D. 3-Hydroxybutanal

Answer: B. Crotonaldehyde
Explanation: Aldol condensation product dehydrates to form α,β-unsaturated aldehyde.

45. Which is most reactive towards nucleophilic addition among the following?

A. CH_3COCH_3
B. $C_6H_5COCH_3$

C. HCHO
D. CH_3CH_2CHO

Answer: C. HCHO
Explanation: Formaldehyde is the simplest carbonyl with highest electrophilicity and least steric hindrance.