Q1. Which of the following compounds gives a positive Baeyer's test?

A. Ethene
B. Ethane
C. Benzene
D. Toluene

Answer: A. Ethene
Explanation: Baeyer's test detects unsaturation. Ethene has a double bond, which reacts with alkaline $KMnO_4$, decolorizing it. Alkanes and aromatic compounds like benzene and toluene do not give this test.

Q2. Which of the following alkenes forms the most stable carbocation during electrophilic addition?

A. Ethene
B. Propene
C. 2-Methylpropene
D. 1-Butene

Answer: C. 2-Methylpropene
Explanation: 2-Methylpropene forms a tertiary carbocation, which is more stable than primary or secondary carbocations, facilitating the reaction.

Q3. Markovnikov's rule is applicable in the addition of HX to:

A. Symmetrical alkenes
B. Unsymmetrical alkenes
C. Aromatic compounds
D. Alkynes only

Answer: B. Unsymmetrical alkenes
Explanation: In unsymmetrical alkenes, the H from HX adds to the carbon with more hydrogen atoms, and X^- goes to the carbon with fewer hydrogens.

Q4. Which compound is formed when 1-butyne reacts with HBr in the presence of peroxide?

A. 1-Bromobutane
B. 2-Bromobutane
C. 1,2-Dibromobutane

D. 2-Bromo-2-butene

Answer: A. 1-Bromobutane
Explanation: In the presence of peroxide, anti-Markovnikov addition occurs through a free radical mechanism.

Q5. Which reagent can distinguish between alkane and alkene?

A. Br_2 in CCl_4
B. H_2O
C. $KMnO_4$ (neutral)
D. NaCl

Answer: A. Br_2 in CCl_4
Explanation: Alkenes decolorize bromine water due to the addition reaction across the double bond. Alkanes do not react.

Q6. What is the correct order of acidity among the following hydrocarbons?

A. Ethyne > Ethene > Ethane
B. Ethene > Ethyne > Ethane
C. Ethane > Ethene > Ethyne
D. Ethyne > Ethane > Ethene

Answer: A. Ethyne > Ethene > Ethane
Explanation: Acidity increases with s-character of the hybrid orbital. Ethyne (sp) is most acidic, followed by ethene (sp^2), and then ethane (sp^3).

Q7. Benzene undergoes electrophilic substitution because:

A. It is highly reactive due to delocalized electrons
B. It has localized π bonds
C. It is an alkene
D. Its π bonds are unstable

Answer: A. It is highly reactive due to delocalized electrons
Explanation: Benzene's resonance structure creates high electron density that attracts electrophiles, favoring substitution over addition.

Q8. Nitration of toluene mainly gives:

A. o-Nitrotoluene
B. m-Nitrotoluene
C. p-Nitrotoluene
D. Both A and C

Answer: D. Both A and C
Explanation: The methyl group is an activating group that directs incoming electrophiles to the ortho and para positions.

Q9. Which compound is used as an antiknock agent in petrol?

A. Methanol
B. Tetraethyl lead
C. Ethanol
D. Benzene

Answer: B. Tetraethyl lead
Explanation: Tetraethyl lead reduces knocking by smoothening the combustion process in engines.

Q10. Which of the following undergoes addition reactions most readily?

A. Ethane
B. Ethene
C. Benzene
D. Cyclohexane

Answer: B. Ethene
Explanation: Ethene has a reactive C=C double bond that undergoes electrophilic addition readily.

Q11. Which of the following reagents is used for the detection of unsaturation in hydrocarbons?

A. Bromine water
B. Dilute HCl
C. Conc. H_2SO_4
D. NaOH

Answer: A. Bromine water
Explanation: Unsaturated hydrocarbons like alkenes and alkynes decolorize bromine water, which is a common test for the presence of double or triple bonds.

Q12. What is the major product formed when benzene is treated with CH_3Cl in the presence of anhydrous $AlCl_3$?

A. Benzyl chloride
B. Toluene
C. Chlorobenzene
D. Benzaldehyde

Answer: B. Toluene
Explanation: This is a Friedel–Crafts alkylation reaction. Benzene reacts with methyl chloride in the presence of $AlCl_3$ to give toluene (methylbenzene).

Q13. Which of the following alkanes has the lowest boiling point?

A. n-Butane
B. Iso-butane
C. Propane
D. Ethane

Answer: D. Ethane
Explanation: Boiling point increases with molecular weight and surface area. Ethane has the smallest molecular mass and surface area.

Q14. Which compound will show geometric (cis-trans) isomerism?

A. Propene
B. 1-Butene
C. 2-Butene
D. Ethyne

Answer: C. 2-Butene
Explanation: Geometrical isomerism requires restricted rotation (like in a double bond) and different groups on each carbon of the double bond. 2-butene satisfies this condition.

Q15. In the ozonolysis of 2-butene, the final products are:

A. Acetone and formaldehyde
B. Two molecules of acetic acid
C. Two molecules of ethanal
D. Two molecules of ethanoic acid

Answer: C. Two molecules of ethanal
Explanation: Ozonolysis cleaves the double bond and gives aldehydes or ketones. Symmetrical 2-butene forms 2 ethanal molecules.

Q16. The reaction of acetylene with water in the presence of $HgSO_4$ and H_2SO_4 gives:

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

Answer: D. Acetaldehyde
Explanation: Hydration of acetylene in presence of Hg^{2+} and H^+ gives an unstable enol which rearranges to acetaldehyde.

Q17. Which among the following has aromatic character?

A. Cyclopentadiene
B. Cyclohexane
C. Benzene
D. Cyclobutadiene

Answer: C. Benzene
Explanation: Benzene is planar, cyclic, fully conjugated with 6 π electrons (Hückel's rule), fulfilling aromaticity conditions.

Q18. Which of the following will give a white precipitate with ammoniacal $AgNO_3$ solution?

A. Ethene

B. Propyne
C. Acetylene
D. 2-Butyne

Answer: C. Acetylene
Explanation: Terminal alkynes like acetylene give white precipitate with ammoniacal silver nitrate due to the formation of silver acetylide.

Q19. Which product is formed when benzene is treated with concentrated nitric acid and sulfuric acid?

A. Nitrobenzene
B. Benzonitrile
C. Toluene
D. Aniline

Answer: A. Nitrobenzene
Explanation: Nitration of benzene in presence of conc. HNO_3 and conc. H_2SO_4 gives nitrobenzene via electrophilic substitution.

Q20. Which of the following hydrocarbons undergoes polymerization?

A. Ethene
B. Methane
C. Benzene
D. Ethyne

Answer: A. Ethene
Explanation: Ethene undergoes addition polymerization to form polyethene, a common plastic.

Q21. Which of the following undergoes substitution reaction most readily?

A. Ethene
B. Benzene
C. Propane
D. Ethyne

Answer: B. Benzene

Explanation: Benzene undergoes electrophilic substitution reactions due to its stable aromatic π-electron system, which resists addition reactions.

Q22. The number of structural isomers possible for C_4H_{10} is:

A. 1
B. 2
C. 3
D. 4

Answer: B. 2
Explanation: The two isomers are n-butane and isobutane (methylpropane), both having different carbon chain arrangements.

Q23. Which of the following reactions is used to convert alkyl halides to alkanes?

A. Wurtz reaction
B. Kolbe's reaction
C. Friedel–Crafts reaction
D. Clemmensen reduction

Answer: A. Wurtz reaction
Explanation: In Wurtz reaction, two alkyl halides react with sodium in dry ether to form an alkane.

Q24. Which hydrocarbon decolorizes alkaline $KMnO_4$ solution?

A. Ethane
B. Propane
C. Ethene
D. Benzene

Answer: C. Ethene
Explanation: Unsaturated compounds like ethene react with $KMnO_4$, leading to decolorization (Baeyer's test).

Q25. Which alkyne gives a single product on reaction with excess HCl?

A. But-1-yne

B. But-2-yne
C. Pent-1-yne
D. Ethyne

Answer: B. But-2-yne
Explanation: Symmetrical alkynes like but-2-yne give a single dihalo product on addition of HCl.

Q26. Which of the following will not respond to the Baeyer's test?

A. Ethene
B. Benzene
C. Butyne
D. Propyne

Answer: B. Benzene
Explanation: Benzene does not react with cold dilute $KMnO_4$ due to its aromatic stability; alkenes and alkynes do.

Q27. What is the major product formed when 2-methylpropene reacts with HBr in presence of peroxide?

A. 2-Bromo-2-methylpropane
B. 1-Bromo-2-methylpropane
C. 2-Bromo-1-methylpropane
D. 1-Bromo-2-methylpropane

Answer: B. 1-Bromo-2-methylpropane
Explanation: Peroxide effect leads to anti-Markovnikov addition of HBr to alkenes.

Q28. What is the IUPAC name of $CH{\equiv}C{-}CH_2CH_3$?

A. Butyne
B. But-1-yne
C. But-2-yne
D. Butene

Answer: B. But-1-yne
Explanation: The triple bond starts from the first carbon, so the correct name is but-1-yne.

Q29. What is the product when benzene reacts with Cl_2 in presence of $AlCl_3$?

A. Chlorobenzene
B. Benzyl chloride
C. Dichlorobenzene
D. Benzoyl chloride

Answer: A. Chlorobenzene
Explanation: This is a typical electrophilic aromatic substitution forming chlorobenzene.

Q30. Which alkane will give only one monochlorinated product on chlorination?

A. n-Butane
B. Propane
C. Methane
D. 2-Methylpropane

Answer: C. Methane
Explanation: Methane has all hydrogen atoms equivalent, so only one monochlorinated product is formed.

Q31. Which of the following reactions is not suitable for preparation of alkanes?

A. Kolbe's electrolysis
B. Wurtz reaction
C. Hydrogenation of alkenes
D. Friedel–Crafts alkylation

Answer: D. Friedel–Crafts alkylation
Explanation: Friedel–Crafts alkylation is used to prepare alkylbenzenes, not alkanes.

Q32. On ozonolysis, one mole of an alkene gives two moles of formaldehyde. The alkene is:

A. Propene
B. But-1-ene
C. Ethene
D. But-2-ene

Answer: C. Ethene
Explanation: Ethene on ozonolysis yields two moles of HCHO, indicating both carbon atoms are terminal.

Q33. The product formed when acetylene is passed through dil H_2SO_4 in presence of $HgSO_4$ is:

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

Answer: B. Ethanal
Explanation: Acid-catalyzed hydration of ethyne gives vinyl alcohol, which tautomerizes to ethanal.

Q34. The reaction of ethene with cold dilute alkaline $KMnO_4$ gives:

A. Glycol
B. Acetylene
C. Oxalic acid
D. CO_2 and H_2O

Answer: A. Glycol
Explanation: Alkenes react with cold dilute $KMnO_4$ to give vicinal diols (glycols).

Q35. Which of the following compounds will not give a positive test with bromine water?

A. Ethene
B. Benzene
C. Cyclohexene
D. Propyne

Answer: B. Benzene
Explanation: Benzene is aromatic and does not undergo addition with bromine water; no color change occurs.

Q36. What is the major product in the reaction of 2-butene with HBr in the absence of peroxides?

A. 1-Bromobutane
B. 2-Bromobutane

C. 3-Bromobutane
D. 1,2-Dibromobutane

Answer: B. 2-Bromobutane
Explanation: Follows Markovnikov's rule; Br adds to the more substituted carbon.

Q37. Which hydrocarbon can show both geometrical and optical isomerism?

A. But-1-ene
B. 2-Butene
C. 2-Butene-1-ol
D. 3-Methylpent-2-ene

Answer: D. 3-Methylpent-2-ene
Explanation: It has restricted rotation around the double bond (geometrical) and a chiral center (optical).

Q38. The combustion of one mole of propane releases how much energy (approx)?

A. -890 kJ
B. -2220 kJ
C. -1560 kJ
D. -1970 kJ

Answer: B. -2220 kJ
Explanation: Standard enthalpy of combustion for propane is approximately –2220 kJ/mol.

Q39. Which compound will give a white precipitate with ammoniacal $AgNO_3$?

A. Ethene
B. Acetylene
C. Benzene
D. Ethane

Answer: B. Acetylene
Explanation: Terminal alkynes react with Tollen's reagent (ammoniacal $AgNO_3$) to form white precipitate of silver acetylide.

Q40. What is the IUPAC name of $CH_3–C≡C–CH_3$?

A. But-2-yne
B. But-1-yne
C. 1-Butyne
D. Dimethylacetylene

Answer: A. But-2-yne
Explanation: Triple bond starts from second carbon; hence, it is but-2-yne.

Q41. Which of the following statements is correct regarding aromatic compounds?

A. They follow Markovnikov's rule
B. They undergo nucleophilic substitution
C. They are highly reactive toward addition
D. They undergo electrophilic substitution

Answer: D. They undergo electrophilic substitution
Explanation: Benzene and its derivatives prefer substitution due to stability of aromatic ring.

Q42. Which of the following is the most stable carbocation?

A. CH_3^+
B. $CH_3CH_2^+$
C. $(CH_3)_2CH^+$
D. $(CH_3)_3C^+$

Answer: D. $(CH_3)_3C^+$
Explanation: Tertiary carbocation is most stable due to +I effect and hyperconjugation.

Q43. The major product of bromination of toluene is:

A. o-Bromotoluene
B. m-Bromotoluene
C. p-Bromotoluene
D. Both A and C

Answer: D. Both A and C

Explanation: Methyl group is an ortho–para directing group in electrophilic substitution.

Q44. The number of sigma and pi bonds in benzene is:

A. 12 sigma, 3 pi
B. 6 sigma, 3 pi
C. 6 sigma, 6 pi
D. 12 sigma, 6 pi

Answer: A. 12 sigma, 3 pi
Explanation: Benzene has 6 C–C sigma bonds, 6 C–H sigma bonds, and 3 delocalized pi bonds.

Q45. Which of the following will not give alkane on hydrogenation?

A. Ethene
B. Propyne
C. Benzene
D. Ethane

Answer: D. Ethane
Explanation: Ethane is already a saturated hydrocarbon (alkane), so it doesn't undergo hydrogenation.