

Hydrocarbons — NEET Chemistry PYQ (2005-2021)

Class 11 Chemistry · 34 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. The major product of the following chemical reaction is :



- (A) $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{Br}$
- (B) $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{O}-\text{COC}_6\text{H}_5$
- (C) $(\text{CH}_3)_2\text{CH}-\text{CH}(\text{Br})-\text{CH}_3$
- (D) $(\text{CH}_3)_2\text{CBr}-\text{CH}_2-\text{CH}_3$

NEET 2021

2. Dihedral angle of least stable conformer of ethane is :

- (A) 120°
- (B) 180°
- (C) 60°
- (D) 0°

NEET 2021

3. $\text{CH}_3\text{CH}_2\text{COO}^-\text{Na}^+ \xrightarrow{(\text{NaOH}, + ?; \text{Heat})} \text{CH}_3\text{CH}_3 + \text{Na}_2\text{CO}_3$.

Consider the above reaction and identify the missing reagent/chemical.

- (A) B_2H_6
- (B) Red Phosphorus
- (C) CaO
- (D) DIBAL-H

NEET 2020 · Q133

4. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

- (A) Cyclohexane carrying a $-\text{CH}=\text{CH}-\text{CH}_3$ group (1-cyclohexylprop-1-ene)
- (B) Cyclohexene ring ($\text{C}=\text{C}$ in the ring) carrying a $-\text{CH}_2-\text{CH}_2-\text{CH}_3$ group on the carbon next to the ring double bond (3-propylcyclohexene)
- (C) Cyclohexane carrying a $-\text{CH}_2-\text{CH}=\text{CH}_2$ group (allylcyclohexane)
- (D) Cyclohexene ring ($\text{C}=\text{C}$ in the ring) carrying a $-\text{CH}_2\text{CH}_2\text{CH}_3$ group two carbons away from the ring double bond (4-propylcyclohexene)

NEET 2020 · Q134

5. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

- (A) n-Hexane
- (B) 2,3-Dimethylbutane
- (C) n-Heptane
- (D) n-Butane

NEET 2019 · Q55

6. The most suitable reagent for the following conversion, is: $\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3 \rightarrow \text{cis-2-butene}$

- (A) $\text{Na}/\text{liquid NH}_3$
- (B) H_2 , Pd/C , quinoline
- (C) Zn/HCl
- (D) $\text{Hg}^{2+}/\text{H}^+$, H_2O

NEET 2019 · Q74

7. An alkene "A" on reaction with O_3 and $\text{Zn}-\text{H}_2\text{O}$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is:

- (A) $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{CH}(\text{CH}_3)_2$
- (B) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}(\text{CH}_2\text{Cl})-\text{CH}_3$
- (C) $\text{H}_3\text{C}-\text{CH}_2-\text{C}(\text{CH}_3)(\text{Cl})-\text{CH}_3$
- (D) $\text{H}_3\text{C}-\text{CH}(\text{Cl})-\text{CH}(\text{CH}_3)-\text{CH}_3$

NEET 2018 · Q62

8. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is

- (A) $\text{CH}_3 - \text{CH}_3$
- (B) $\text{CH}_2 = \text{CH}_2$
- (C) $\text{CH} \equiv \text{CH}$
- (D) CH_4

NEET 2017 · Q2

9. Predict the correct intermediate and product in the following reaction: $\text{H}_3\text{C}-\text{C}\equiv\text{CH} \xrightarrow{(\text{H}_2\text{O}, \text{H}_2\text{SO}_4, \text{HgSO}_4)} \text{intermediate (A)} \rightarrow \text{product (B)}$

- (A) A: $\text{H}_3\text{C}-\text{C}(\text{SO}_4)=\text{CH}_2$, B: $\text{H}_3\text{C}-\text{CO}-\text{CH}_3$
- (B) A: $\text{H}_3\text{C}-\text{C}(\text{OH})=\text{CH}_2$, B: $\text{H}_3\text{C}-\text{C}(\text{SO}_4)=\text{CH}_2$
- (C) A: $\text{H}_3\text{C}-\text{CO}-\text{CH}_3$, B: $\text{H}_3\text{C}-\text{C}\equiv\text{CH}$
- (D) A: $\text{H}_3\text{C}-\text{C}(\text{OH})=\text{CH}_2$, B: $\text{H}_3\text{C}-\text{CO}-\text{CH}_3$

NEET 2017 · Q17

10. Which one is the correct order of acidity?

- (A) $\text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{CH}=\text{CH}_2 > \text{CH}_3-\text{C}\equiv\text{CH} > \text{CH}\equiv\text{CH}$
- (B) $\text{CH}\equiv\text{CH} > \text{CH}_3-\text{C}\equiv\text{CH} > \text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{CH}_3$
- (C) $\text{CH}\equiv\text{CH} > \text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{C}\equiv\text{CH} > \text{CH}_3-\text{CH}_3$
- (D) $\text{CH}_3-\text{CH}_3 > \text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{C}\equiv\text{CH} > \text{CH}\equiv\text{CH}$

NEET 2017 (Gujarati paper) · Q7

11. Amongst the following compounds the one which is most easily sulphonated is:

- (A) Benzene
- (B) Nitro benzene
- (C) Toluene
- (D) Chlorobenzene

NEET 2017 (Gujarati paper) · Q44

12. The correct statement regarding ethane conformation is:

- (A) Rotation around carbon-carbon bond in ethane molecule is not possible, because ethane molecule contains a pi (π) bond between the carbon and carbon and ethane has very low melting point.
- (B) Rotation around carbon-carbon bond in ethane molecule is not possible, because ethane molecule contains both sigma (σ) bond and pi (π) bond between the carbon and carbon.
- (C) Rotation around carbon-carbon bond in ethane molecule is possible because of cylindrical symmetry of sigma (σ) bond between carbon-carbon atoms.
- (D) Rotation around carbon-carbon bond in ethane molecule is not possible, because ethane molecule contains both sigma (σ) bond and pi (π) bond between the carbon and carbon and ethane has very high boiling point.

NEET 2016 Phase 2 · Q80

13. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

- (A) Cyclopropane
- (B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- (C) $\text{H}_2\text{C}=\text{C}=\text{O}$
- (D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

NEET 2016 Phase 2 · Q84

14. In the given reaction, benzene + cyclohexene $\xrightarrow{(\text{HF}, 0^\circ\text{C})}$ P, the product P is

- (A) (2-Fluorocyclohexyl)benzene
- (B) (1-Fluorocyclohexyl)benzene
- (C) Cyclohexylbenzene
- (D) 1,2-Diphenylcyclohexane

NEET 2016 Phase 1 · Q47

15. In the reaction

$\text{H}-\text{C}\equiv\text{CH} \xrightarrow{(1) \text{NaNH}_2/\text{liq. NH}_3, (2) \text{CH}_3\text{CH}_2\text{Br}} \text{X} \xrightarrow{(1) \text{NaNH}_2/\text{liq. NH}_3, (2) \text{CH}_3\text{CH}_2\text{Br}} \text{Y}$

X and Y are:

- (A) X = 1-Butyne; Y = 3-Hexyne
- (B) X = 2-Butyne; Y = 3-Hexyne
- (C) X = 2-Butyne; Y = 2-Hexyne
- (D) X = 1-Butyne; Y = 2-Hexyne

NEET 2016 Phase 1 · Q69

16. Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3 . If a large amount of KHSO_4 is added to the mixture, the rate of nitration will be:

- (A) faster
- (B) slower
- (C) unchanged
- (D) doubled

NEET 2016 Phase 1 · Q81

17. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is:

- (A) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.
- (B) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.
- (C) The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.
- (D) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

AIPMT 2015

18. A single compound of the structure $\text{OHC}-\text{CH}_2-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CO}-\text{CH}_3$ is obtainable from ozonolysis of which of the following cyclic compounds?

- (A) 1,2-Dimethylcyclopentene
- (B) 1,4-Dimethylcyclopentene
- (C) 3,4-Dimethylcyclopentene
- (D) 3,3-Dimethylcyclopentene

AIPMT 2015

19. The reaction of $\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_3$ with HBr produces:

- (A) $\text{p-Br-C}_6\text{H}_4-\text{CH}=\text{CHCH}_3$
- (B) $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$
- (C) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{Br})\text{CH}_3$
- (D) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$

NEET 2013

20. Nitrobenzene on reaction with conc. $\text{HNO}_3/\text{H}_2\text{SO}_4$ at $80-100^\circ\text{C}$ forms which one of the following products?

- (A) 1,2-Dinitrobenzene
- (B) 1,3-Dinitrobenzene
- (C) 1,4-Dinitrobenzene
- (D) 1,2,4-Trinitrobenzene

NEET 2013

21. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

- (A) $-\text{C}\equiv\text{N}$
- (B) $-\text{SO}_3\text{H}$
- (C) $-\text{COOH}$
- (D) $-\text{NO}_2$

NEET 2013

22. Which of the following compounds will not undergo Friedel-Crafts reaction easily?

- (A) Cumene
- (B) Xylene
- (C) Nitrobenzene
- (D) Toluene

AIPMT 2012 Mains

23. Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne?

- (A) NaNH_2
- (B) HCl
- (C) O_2
- (D) Br_2

AIPMT 2012 Prelims

24. Among the following compounds the one that is most reactive towards electrophilic nitration is:

- (A) Benzene
- (B) Benzoic acid
- (C) Nitrobenzene
- (D) Toluene

AIPMT 2011 Prelims

25. Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear?

- (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) $\text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_3$
- (D) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{C}\equiv\text{CH}$

AIPMT 2011 Prelims

26. In the following reactions,

(a) $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}(\text{OH})-\text{CH}_3 \xrightarrow{\text{H}^+/\text{heat}}$ A (major product) + B (minor product)

(b) A $\xrightarrow{\text{HBr, dark, in absence of peroxide}}$ C (major product) + D (minor product)

The major products (A) and (C) are respectively

- (A) $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$ and $\text{CH}_3-\text{CBr}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$
- (B) $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$ and $\text{BrCH}_2-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$
- (C) $\text{CH}_3-\text{C}(\text{CH}_3)=\text{CH}-\text{CH}_3$ and $\text{CH}_3-\text{CBr}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$
- (D) $\text{CH}_3-\text{C}(\text{CH}_3)=\text{CH}-\text{CH}_3$ and $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CHBr}-\text{CH}_3$

AIPMT 2010 Prelims · Q84

27. The reaction of toluene with Cl_2 in presence of FeCl_3 gives X and reaction in presence of light gives Y. Thus, X and Y are

- (A) X = Benzyl chloride, Y = m-chlorotoluene
- (B) X = Benzal chloride, Y = o-chlorotoluene
- (C) X = m-chlorotoluene, Y = p-chlorotoluene
- (D) X = o- and p-chlorotoluene, Y = Trichloromethyl benzene

28. Liquid hydrocarbons can be converted to a mixture of gaseous hydrocarbons by

- (A) Hydrolysis
- (B) Oxidation
- (C) Cracking
- (D) Distillation under reduced pressure

29. Benzene reacts with CH_3Cl in the presence of anhydrous AlCl_3 to form:

- (A) Chlorobenzene
- (B) Benzyl chloride
- (C) Xylene
- (D) Toluene

30. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4 . In the mixture, nitric acid acts as a/an:

- (A) acid
- (B) base
- (C) catalyst
- (D) reducing agent

31. Predict the product C obtained in the following reaction of butyne-1.



- (A) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH(I)(Cl)}$
- (B) $\text{CH}_3\text{-CH}_2\text{-CH(I)-CH}_2\text{Cl}$
- (C) $\text{CH}_3\text{CH}_2\text{-C(I)(Cl)-CH}_3$
- (D) $\text{CH}_3\text{-CH(Cl)-CH}_2\text{CH}_2\text{I}$

32. Which of the compounds with molecular formula C_5H_{10} yields acetone on ozonolysis?

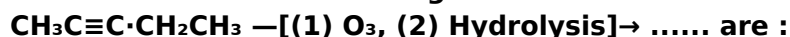
- (A) 3-methyl-1-butene
- (B) cyclopentane
- (C) 2-methyl-1-butene
- (D) 2-methyl-2-butene

33. The order of decreasing reactivity towards an electrophilic reagent, for the following would be

(i) benzene (ii) toluene (iii) chlorobenzene (iv) phenol

- (A) (ii) > (iv) > (i) > (iii)
- (B) (iv) > (iii) > (ii) > (i)
- (C) (iv) > (ii) > (i) > (iii)
- (D) (i) > (ii) > (iii) > (iv)

34. Products of the following reaction :



- (A) $\text{CH}_3\text{CHO} + \text{CH}_3\text{CH}_2\text{CHO}$
- (B) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COCH}_3$
- (C) $\text{CH}_3\text{COOH} + \text{HOOC}\cdot\text{CH}_2\text{CH}_3$
- (D) $\text{CH}_3\text{COOH} + \text{CO}_2$

Answer key and explanations

1. Answer: (A) $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{Br}$

Benzoyl peroxide makes HBr add by a free-radical chain (peroxide or Kharasch effect), giving anti-Markovnikov addition. Br adds to the terminal CH_2 so that the more stable secondary radical forms, giving $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{Br}$. The Markovnikov product $(\text{CH}_3)_2\text{CH}-\text{CH}(\text{Br})-\text{CH}_3$ would form without peroxide.

2. Answer: (D) 0°

The least stable conformer of ethane is the eclipsed form, where the C-H bonds on adjacent carbons line up and torsional strain is maximum; its dihedral angle is 0° . 60° corresponds to the most stable staggered form.

3. Answer: (C) CaO

Heating a sodium carboxylate with soda lime ($\text{NaOH} + \text{CaO}$) removes CO_2 as Na_2CO_3 and gives an alkane with one carbon fewer: sodium propanoate $\rightarrow$ ethane. The missing reagent is CaO; red phosphorus is used with HI or in HVZ halogenation.

4. Answer: (C) Cyclohexane carrying a $-\text{CH}_2-\text{CH}=\text{CH}_2$ group (allylcyclohexane)

Methanal (HCHO) forms only from a terminal $=\text{CH}_2$ group. Allylcyclohexane, $\text{C}_6\text{H}_{11}-\text{CH}_2-\text{CH}=\text{CH}_2$, has a terminal double bond and gives HCHO plus cyclohexylethanal. The prop-1-enyl compound gives ethanal, and the ring alkenes open to dialdehydes with no methanal.

5. Answer: (C) n-Heptane

Wurtz coupling works well for symmetrical alkanes made from one alkyl halide: n-butane (2 ethyl), n-hexane (2 n-propyl) and 2,3-dimethylbutane (2 isopropyl). n-Heptane has an odd number of carbons and needs two different halides ($\text{C}_3 + \text{C}_4$), which gives a mixture of hexane, heptane and octane, so the yield is poor.

6. Answer: (B) H_2 , Pd/C, quinoline

Lindlar's catalyst (H_2 over partially poisoned Pd with quinoline) adds hydrogen syn to the alkyne, giving the cis-alkene. Na in liquid NH_3 gives anti addition and hence trans-2-butene.

7. Answer: (C) $\text{H}_3\text{C}-\text{CH}_2-\text{C}(\text{CH}_3)(\text{Cl})-\text{CH}_3$

Joining propanone and ethanal at their carbonyl carbons gives A = $(\text{CH}_3)_2\text{C}=\text{CH}-\text{CH}_3$ (2-methylbut-2-ene). Markovnikov addition of HCl puts Cl on the more substituted carbon via the tertiary carbocation, giving 2-chloro-2-methylbutane. The secondary chloride would come from anti-Markovnikov orientation.

8. Answer: (D) CH_4

$\text{CH}_4 + \text{Br}_2 \rightarrow \text{CH}_3\text{Br}$; Wurtz coupling $2\text{CH}_3\text{Br} + 2\text{Na} \rightarrow \text{C}_2\text{H}_6$, a gas with fewer than four carbons. Ethane would give butane (four carbons), and ethene/ethyne add bromine rather than substitute.

9. Answer: (D) A: $\text{H}_3\text{C}-\text{C}(\text{OH})=\text{CH}_2$, B: $\text{H}_3\text{C}-\text{CO}-\text{CH}_3$

Mercuric-ion catalysed hydration of propyne adds water by Markovnikov's rule, giving the enol $\text{CH}_3-\text{C}(\text{OH})=\text{CH}_2$. The enol is unstable and tautomerises to the ketone, acetone (CH_3COCH_3). No sulphate-containing product is formed.

10. Answer: (B) $\text{CH}\equiv\text{CH} > \text{CH}_3-\text{C}\equiv\text{CH} > \text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{CH}_3$

Acidity of C-H rises with s-character of the carbon: sp (50%) $>$ sp^2 (33%) $>$ sp^3 (25%), so alkynes $>$ alkenes $>$ alkanes. Between the alkynes, the electron-donating methyl group makes propyne less acidic than ethyne, which is why ethene cannot be placed above propyne.

11. Answer: (C) Toluene

Sulphonation is electrophilic substitution, so the ring with the most electron-donating group reacts fastest. The methyl group of toluene activates the ring, while $-\text{NO}_2$ and $-\text{Cl}$ deactivate it compared with benzene.

12. Answer: (C) Rotation around carbon-carbon bond in ethane molecule is possible because of cylindrical symmetry of sigma (σ) bond between carbon-carbon atoms.

Ethane has only a C-C σ bond, and a σ bond is cylindrically symmetric about the bond axis, so its overlap does not change as the groups rotate; this free rotation produces the staggered and eclipsed conformations. Ethane has no π bond, so the statements saying rotation is blocked by a π bond are false.

13. Answer: (C) $\text{H}_2\text{C}=\text{C}=\text{O}$

Cyclopropane adds HBr to give 1-bromopropane, which eliminates HBr to give propene; propan-1-ol dehydrates and 1-bromopropane dehydrohalogenates directly to propene. Ketene ($\text{H}_2\text{C}=\text{C}=\text{O}$) has only two carbons, so it cannot give a three-carbon alkene.

14. Answer: (C) Cyclohexylbenzene

HF protonates cyclohexene to give the cyclohexyl carbocation, which alkylates benzene (Friedel-Crafts type): the product is cyclohexylbenzene. Fluoride is not retained in the product, and the low temperature and 1:1 reactants do not give a diphenyl product.

15. Answer: (A) X = 1-Butyne; Y = 3-Hexyne

NaNH_2 removes the acidic terminal H of ethyne, and the acetylide is ethylated: $\text{HC}\equiv\text{C}-\text{CH}_2\text{CH}_3$ (1-butyne). Repeating on the remaining terminal H puts a second ethyl group on the other carbon: $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_3$, 3-hexyne. 2-Butyne cannot form because the new group always attaches to the former terminal carbon.

16. Answer: (B) slower

The electrophile NO_2^+ forms when H_2SO_4 protonates HNO_3 : $\text{HNO}_3 + 2\text{H}_2\text{SO}_4 \rightleftharpoons \text{NO}_2^+ + \text{H}_3\text{O}^+ + 2\text{HSO}_4^-$. Adding a lot of HSO_4^- (from KHSO_4) suppresses the ionisation of H_2SO_4 by the common ion effect, so less NO_2^+ forms and nitration slows down.

17. Answer: (D) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

In the staggered form the C-H bonds on adjacent carbons are as far apart as possible, so there is minimum repulsion and no torsional strain, making it the more stable conformation. The eclipsed form has the bonds aligned, which creates torsional strain and makes it less stable.

18. Answer: (B) 1,4-Dimethylcyclopentene

In 1,4-dimethylcyclopentene the ring $\text{C1}(\text{CH}_3)=\text{C2}$ bond is cleaved: C1 becomes a methyl ketone and C2 an aldehyde, still joined through $\text{C5}-\text{C4}(\text{CH}_3)-\text{C3}$. This gives the single product $\text{CH}_3\text{CO}-\text{CH}_2-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CHO}$. 1,2-Dimethylcyclopentene would give a diketone.

19. Answer: (B) $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$

H^+ adds to the carbon away from the ring so that the positive charge sits on the benzylic carbon, where it is stabilised by resonance with the ring. Br^- then attacks there, giving $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$. Ring bromination does not occur with HBr .

20. Answer: (B) 1,3-Dinitrobenzene

$-\text{NO}_2$ is a strong deactivating, meta-directing group, so the second nitro group enters the meta position, giving 1,3-dinitrobenzene. Ortho/para dinitro products would need an ortho/para-directing group.

21. Answer: (D) $-\text{NO}_2$

All four groups withdraw electrons and are meta directing, but $-\text{NO}_2$ deactivates the ring most strongly through its large $-I$ and $-R$ effects. $-\text{C}\equiv\text{N}$, $-\text{SO}_3\text{H}$ and $-\text{COOH}$ are deactivating but less so.

22. Answer: (C) Nitrobenzene

The $-\text{NO}_2$ group strongly deactivates the ring and also complexes with AlCl_3 , so nitrobenzene does not undergo Friedel-Crafts reactions easily. Cumene, xylene and toluene have activating alkyl groups and react readily.

23. Answer: (A) NaNH_2

1-Butyne is a terminal alkyne with an acidic $\equiv\text{C}-\text{H}$ and reacts with NaNH_2 to form a sodium acetylide; 2-butyne has no such hydrogen. Br_2 and HCl add to both alkynes, so they cannot tell them apart.

24. Answer: (D) Toluene

The $-\text{CH}_3$ group of toluene donates electron density to the ring ($+I$ and hyperconjugation), activating it for electrophilic nitration, so toluene reacts faster than benzene. $-\text{COOH}$ and $-\text{NO}_2$ withdraw electrons and deactivate the ring.

25. Answer: (C) $\text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_3$

In $\text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_3$ both triple-bonded carbons are sp hybridised (180°), so all four carbons lie on a straight line. Butane and but-2-ene contain sp^3 or sp^2 carbons that bend the chain, and pent-1-en-4-yne has sp^3 and sp^2 centres.

26. Answer: (C) $\text{CH}_3-\text{C}(\text{CH}_3)=\text{CH}-\text{CH}_3$ and $\text{CH}_3-\text{CBr}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$

Protonation and loss of water from 3-methylbutan-2-ol gives a secondary carbocation, which undergoes a 1,2-hydride shift to the tertiary cation; loss of H^+ gives the more substituted alkene 2-methylbut-2-ene (Saytzeff). HBr adds by Markovnikov's rule without peroxide, giving 2-bromo-2-methylbutane. The 2-methylbut-1-ene or anti-Markovnikov products are the minor/trap options.

27. Answer: (D) X = o- and p-chlorotoluene, Y = Trichloromethyl benzene

With FeCl_3 (Lewis acid) chlorine substitutes the ring at the o- and p-positions activated by CH_3 , giving o- and p-chlorotoluene (X). In light, free-radical substitution occurs on the side chain; with excess Cl_2 this goes to $\text{C}_6\text{H}_5\text{CCl}_3$, trichloromethylbenzene (Y). Benzyl chloride is a side-chain product, so it cannot be X.

28. Answer: (C) Cracking

Cracking (pyrolysis) breaks large hydrocarbon molecules into smaller ones at high temperature, turning liquid hydrocarbons into gaseous ones. Distillation under reduced pressure only separates components without changing them.

29. Answer: (D) Toluene

This is Friedel-Crafts alkylation: AlCl_3 generates CH_3^+ which substitutes on the ring, giving $\text{C}_6\text{H}_5\text{CH}_3$ (toluene). Chlorobenzene would need Cl_2 , benzyl chloride needs side-chain chlorination of toluene, and xylene needs a second methylation.

30. Answer: (B) base

H_2SO_4 is the stronger acid and protonates HNO_3 : $\text{HNO}_3 + 2\text{H}_2\text{SO}_4 \rightarrow \text{NO}_2^+ + \text{H}_3\text{O}^+ + 2\text{HSO}_4^-$. Accepting a proton means nitric acid acts as a base here, producing the nitronium electrophile.

31. Answer: (C) $\text{CH}_3\text{CH}_2\text{-C(I)(Cl)-CH}_3$

HCl adds by Markovnikov's rule to give $\text{CH}_3\text{CH}_2\text{C(Cl)=CH}_2$ as product B. HI then also adds Markovnikov, with I going to the carbon already carrying Cl (stabilised carbocation), giving $\text{CH}_3\text{CH}_2\text{C(I)(Cl)CH}_3$. Putting I and Cl on the terminal carbon would be anti-Markovnikov.

32. Answer: (D) 2-methyl-2-butene

Acetone needs a $(\text{CH}_3)_2\text{C=}$ unit. 2-Methyl-2-butene $(\text{CH}_3)_2\text{C=CHCH}_3$ gives acetone + acetaldehyde on ozonolysis. 2-Methyl-1-butene gives butanone + formaldehyde, and cyclopentane has no double bond.

33. Answer: (C) (iv) > (ii) > (i) > (iii)

$-\text{OH}$ strongly activates the ring by resonance, $-\text{CH}_3$ activates weakly by hyperconjugation, and $-\text{Cl}$ deactivates ($-\text{I}$ effect dominates). So phenol > toluene > benzene > chlorobenzene.

34. Answer: (C) $\text{CH}_3\text{COOH} + \text{HOOC} \cdot \text{CH}_2\text{CH}_3$

Ozonolysis of an alkyne followed by hydrolysis cleaves the $\text{C}\equiv\text{C}$ and gives carboxylic acids. Pent-2-yne $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_3$ gives $\text{CH}_3\text{COOH} + \text{CH}_3\text{CH}_2\text{COOH}$. Aldehydes would form from an alkene, not an alkyne.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.