

Hydrocarbons — Assignment 1

Class 11 Chemistry · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Alkanes — Structure and Preparation

MCQ Questions (choose the correct option)

- The general formula of alkanes is
 - $\text{C}_n\text{H}_{2n+2}$
 - C_nH_{2n}
 - $\text{C}_n\text{H}_{2n-2}$
 - C_nH_n
- The hybridisation of carbon in alkanes is
 - sp^3
 - sp^2
 - sp
 - sp^3d
- Alkanes are also called
 - saturated hydrocarbons
 - unsaturated hydrocarbons
 - aromatic hydrocarbons
 - cyclic hydrocarbons
- Alkanes can be prepared by the reduction of
 - alkyl halides
 - alkenes only
 - alkynes only
 - alcohols only

1 Mark Questions

- Write the general formula of alkanes.
- What is the hybridisation of carbon in alkanes?
- Why are alkanes called saturated hydrocarbons?

2 Mark Questions

- Write any two methods for the preparation of alkanes.
- Explain why alkanes are chemically less reactive.

3 Mark Questions

- Describe two methods for the preparation of alkanes with chemical equations.
- Explain the structure of alkanes (sp^3 hybridisation, tetrahedral carbon) and describe one method of preparation.

Reactions of Alkanes

MCQ Questions (choose the correct option)

- Alkanes undergo mainly
 - substitution reactions
 - addition reactions
 - elimination reactions
 - polymerisation
- The reaction of an alkane with chlorine in the presence of sunlight is an example of
 - free radical substitution
 - electrophilic addition
 - nucleophilic substitution
 - elimination
- Complete combustion of alkanes produces
 - carbon dioxide and water
 - carbon monoxide only
 - alcohol
 - an alkene
- The reactivity of alkanes toward halogens follows the order
 - $F_2 > Cl_2 > Br_2 > I_2$
 - $I_2 > Br_2 > Cl_2 > F_2$
 - $Cl_2 > F_2 > Br_2 > I_2$
 - $Br_2 > Cl_2 > F_2 > I_2$

1 Mark Questions

- Name the type of reaction shown by alkanes with halogens.
- What are the products of the complete combustion of an alkane?
- Write the order of reactivity of halogens with alkanes.

2 Mark Questions

- Explain the free radical mechanism of the chlorination of methane.
- Write the products of the complete and incomplete combustion of methane.

3 Mark Questions

- Explain the free radical mechanism of the halogenation of alkanes, showing the initiation, propagation and termination steps.
- Describe the reactions of alkanes: halogenation, combustion and cracking, with one example of each.

Alkenes — Unsaturation and Preparation**MCQ Questions (choose the correct option)**

- The general formula of alkenes is
 - C_nH_{2n}
 - C_nH_{2n+2}
 - C_nH_{2n-2}
 - C_nH_n
- The hybridisation of the doubly bonded carbon in alkenes is

- (A) sp^2
 - (B) sp^3
 - (C) sp
 - (D) sp^3d
3. The C=C double bond in alkenes consists of
- (A) one sigma and one pi bond
 - (B) two sigma bonds
 - (C) two pi bonds
 - (D) one sigma bond
4. Alkenes can be prepared by the dehydration of
- (A) alcohols
 - (B) alkanes
 - (C) alkynes only
 - (D) alkyl halides

1 Mark Questions

1. Write the general formula of alkenes.
2. What is the hybridisation of the doubly bonded carbon in ethene?
3. Why are alkenes called unsaturated hydrocarbons?

2 Mark Questions

1. Write any two methods for the preparation of alkenes.
2. Explain the structure of the C=C double bond in ethene.

3 Mark Questions

1. Describe two methods for the preparation of alkenes with chemical equations and explain the nature of the double bond.
2. Explain why alkenes are more reactive than alkanes, referring to the pi bond.

Addition Reactions of Alkenes

MCQ Questions (choose the correct option)

1. The addition of hydrogen to an alkene in the presence of a catalyst is called
 - (A) hydrogenation
 - (B) halogenation
 - (C) hydration
 - (D) oxidation
2. According to Markovnikov's rule, the negative part of the reagent adds to the carbon
 - (A) with fewer hydrogen atoms
 - (B) with more hydrogen atoms
 - (C) at the end of the chain
 - (D) with a positive charge
3. The addition of HBr to propene follows
 - (A) Markovnikov's rule
 - (B) anti-Markovnikov's rule

- (C) Hund's rule
 - (D) Le Chatelier's principle
4. The addition of water to an alkene in the presence of an acid gives
- (A) an alcohol
 - (B) an aldehyde
 - (C) a ketone
 - (D) an acid

1 Mark Questions

1. State Markovnikov's rule.
2. What product is formed by the addition of water to an alkene?
3. Name the reaction of an alkene with hydrogen in the presence of Ni.

2 Mark Questions

1. State Markovnikov's rule and apply it to the addition of HBr to propene.
2. Write the reactions of an alkene with H_2 , Br_2 and H_2O .

3 Mark Questions

1. Describe the addition reactions of alkenes (hydrogenation, halogenation, hydrohalogenation and hydration) with equations, and state Markovnikov's rule.
2. Explain Markovnikov's rule with a mechanism-based justification using the stability of carbocation intermediates.

Alkynes

MCQ Questions (choose the correct option)

1. The general formula of alkynes is
 - (A) C_nH_{2n-2}
 - (B) C_nH_{2n}
 - (C) C_nH_{2n+2}
 - (D) C_nH_n
2. The hybridisation of the triply bonded carbon in alkynes is
 - (A) sp
 - (B) sp^2
 - (C) sp^3
 - (D) sp^3d
3. The $C \equiv C$ triple bond consists of
 - (A) one sigma and two pi bonds
 - (B) three sigma bonds
 - (C) two sigma and one pi bond
 - (D) three pi bonds
4. Ethynes with a terminal $C \equiv C-H$ bond are
 - (A) acidic
 - (B) basic
 - (C) neutral
 - (D) amphoteric

1 Mark Questions

1. Write the general formula of alkynes.
2. What is the hybridisation of carbon in ethyne?
3. Why are terminal alkynes acidic in nature?

2 Mark Questions

1. Describe the structure of the $C\equiv C$ triple bond in ethyne.
2. Write any two methods for the preparation of alkynes.

3 Mark Questions

1. Describe the structure, preparation and addition reactions of alkynes with equations.
2. Explain why terminal alkynes are acidic and describe the reactions that demonstrate this acidity.

Aromatic Hydrocarbons — Benzene**MCQ Questions (choose the correct option)**

1. The molecular formula of benzene is
 - (A) C_6H_6
 - (B) C_6H_{12}
 - (C) C_6H_{10}
 - (D) C_6H_4
2. Benzene undergoes mainly
 - (A) electrophilic substitution
 - (B) nucleophilic addition
 - (C) free radical addition
 - (D) elimination
3. The delocalisation of pi electrons in benzene is responsible for its
 - (A) aromatic stability
 - (B) reactivity toward addition
 - (C) acidity
 - (D) basicity
4. According to Hückel's rule, a compound is aromatic if it is cyclic, planar and has
 - (A) $(4n + 2)$ pi electrons
 - (B) $(4n)$ pi electrons
 - (C) no pi electrons
 - (D) an odd number of sigma electrons

1 Mark Questions

1. Write the molecular formula of benzene.
2. State Hückel's rule for aromaticity.
3. Name the type of substitution reaction shown by benzene.

2 Mark Questions

1. Explain the aromaticity of benzene using Hückel's rule.
2. Write the reactions of benzene for nitration and halogenation.

3 Mark Questions

1. Explain the structure and aromaticity of benzene, and describe two electrophilic substitution reactions with equations.
2. Describe the mechanism of the electrophilic nitration of benzene.