Unit 14 · Hydrocarbons

WORKSHEET

Full marks 33

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 33

1 True or false [3]

Write True or False in the box beside each sentence. Correct each false sentence. Each carries 0.5 mark.

i. Cyclohexane and hex-1-ene have the same molecular formula, C_6H_{12}. ☐

ii. Wurtz's reaction is a good way to make propane. ☐

iii. A triple bond is made of one σ bond and two π bonds. ☐

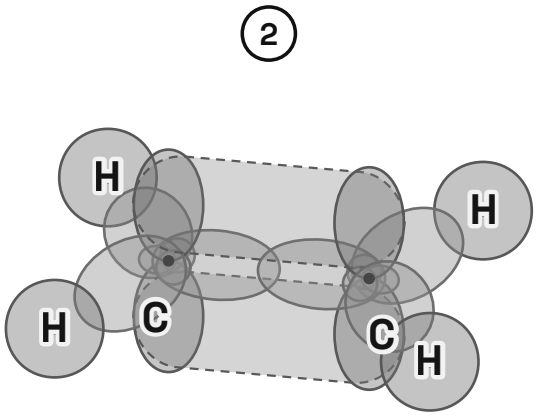
iv. Alcoholic KOH turns bromoethane into ethanol. ☐

v. With peroxide present, HCl adds to propene against Markovnikov's rule. ☐

vi. Branching lowers the boiling point of an alkane. ☐

2 Label the diagram [1]

The diagram shows the bonds in ethene. Write what belongs in place of 1 and 2. Each carries 0.5 mark.



1. _____ **2.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. The carbon atoms of ethyne are: [1]

a. sp^3 hybridized, with bond angles of 109.5° **b.** sp^2 hybridized, with bond angles of 120°

c. sp hybridized, with bond angles of 180° **d.** not hybridized

ii. Which compound gives a red precipitate with ammoniacal copper(I) chloride? [1]

a. ethene **b.** but-2-yne
c. propyne **d.** propane

iii. Sodium butanoate, $CH_3CH_2CH_2COONa$, is heated with soda lime. The hydrocarbon formed is: [1]

a. butane **b.** propane
c. hexane **d.** propene

iv. Which is the major product when 2-methylpropene reacts with HBr in the presence of a peroxide? [1]

a. 2-bromo-2-methylpropane **b.** 1-bromo-2-methylpropane
c. 2-bromobutane **d.** 2-methylpropane

v. The number of σ bonds in a molecule of ethyne, HC≡CH, is: [1]

a. 2 **b.** 3
c. 4 **d.** 5

4 Short answers [9]

Write short answers to the following questions.

a. State Markovnikov's rule. Write the major product when HCl adds to propene. [2]

b. Write balanced equations for i. the complete combustion of propane, and ii. the reaction of ethyne with sodium in liquid ammonia. [2]

c. Why does ethyne take up twice as much bromine as ethene does? Name the final product with ethyne. [2]

d. Name the reagent and conditions for converting i. ethanol to ethene, ii. propyne to propanone, iii. ethyne to ethene only (not ethane). [3]

5 Long answer [4]

Write a long answer to the following question.

Explain the free-radical mechanism of the chlorination of methane in ultraviolet light, writing the initiation, propagation and termination steps. Why is chloromethane the main product when methane is in large excess?

6 Numerical problems [8]

Solve the following problems. Show your working. Take C = 12, H = 1, Br = 80, O = 16, and the molar volume of a gas at STP as 22.4 L.

a. A gas cylinder holds 12 kg of butane, C_4H_{10}. Write the balanced equation for its complete combustion and find i. the mass of carbon dioxide formed when all of it burns, and ii. the volume of oxygen used, measured at STP. [4]

Answer:

b. 1.12 L of a gaseous hydrocarbon, measured at STP, has a mass of 2.80 g. It decolorizes bromine water, and on ozonolysis gives ethanal only. i. Find its molar mass and molecular formula. ii. Name it and write its structure. iii. Find the mass of bromine it adds. [4]

Answer:

7 Think [3]

Ethyne is called acidic, yet it does not turn blue litmus red and is a weaker acid than water. In what sense is it acidic, and why is it more acidic than ethene and ethane?

8 Activity: Testing for unsaturation (a teacher's demonstration) (not marked)

In the laboratory, by the teacher: bromine is toxic and burns the skin, so it is used only in a fume cupboard with gloves. The teacher shakes a little of each sample with bromine water and, separately, with cold dilute alkaline potassium permanganate. Record what you see.

Sample	Bromine water	Baeyer's reagent	Saturated or unsaturated?
hexane			
hex-1-ene			
cyclohexane			

Which bond in the unsaturated sample reacted, and what kind of reaction was it?