Unit 12 · Basic Concepts of Organic Chemistry

WORKSHEET

Full marks 35

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 35

1 Key words [4]

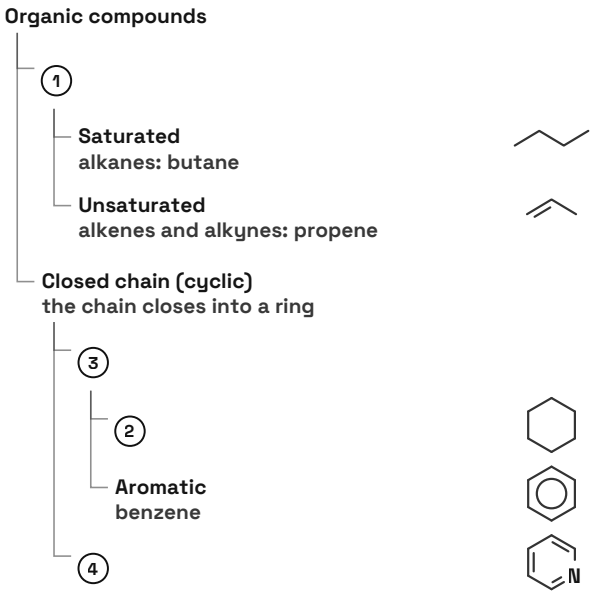
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

aromatization	**catenation**	**cracking**	**functional group**	**heteroatom**	**homologous series**
isomerism	**knocking**	**tetracovalency**	**vital force**		

The idea that organic compounds could be made only inside living things was the _____ theory. Carbon forms four covalent bonds: its _____. Its atoms join one another in long chains and rings, which is called _____. An atom other than carbon in a ring is a _____. The atom or group that largely decides a compound's chemical properties is its _____. Compounds with the same functional group whose members differ by $-CH_2-$ form a _____. Breaking large hydrocarbon molecules into smaller ones by heat is _____. The early, uncontrolled explosion of the fuel–air mixture in a petrol engine is called _____.

2 Label the diagram [2]

The chart classifies organic compounds. Write the class that belongs in place of 1 to 4. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Which of these is studied with inorganic chemistry, though it contains carbon? [1]

a. methanol, CH_3OH
b. chloromethane, CH_3Cl
c. calcium carbide, CaC_2
d. ethanoic acid, CH_3COOH

ii. The alkyl group with the formula C_3H_7- is called: [1]

a. methyl
b. ethyl
c. propyl
d. butyl

iii. The functional group of an aldehyde is: [1]

a. –COH
b. –CHO
c. –CO–
d. –COOH

iv. A diesel ignites on compression just like a mixture of 55% cetane and 45% 1-methylnaphthalene. Its cetane number is: [1]

a. 45
b. 55
c. 100
d. 10

v. Which of these would raise the octane number of a petrol most? [1]

a. adding more heptane
b. turning branched alkanes into straight chains
c. reforming straight-chain alkanes into aromatic hydrocarbons
d. adding long straight-chain alkanes such as cetane

4 Short answers [9]

Write short answers to the following questions.

a. How did Wöhler's experiment of 1828 go against the vital force theory? Write its second step as an equation. [2]

b. Draw the bond-line formula of pentane and write its contracted formula. How many hydrogen atoms does the bond-line drawing leave out? [2]

c. Write two characteristics of a homologous series, using the alcohols as the example. [2]

d. What is reforming? Write the two steps by which hexane becomes benzene, with the catalyst, and name each step. **[3]**

5 Long answer **[4]**

Write a long answer to the following question.

What is knocking in a petrol engine? Define octane number, and explain how the structure of a hydrocarbon affects it.

6 Numerical problems **[8]**

Solve the following problems. Show your working. Take C = 12, H = 1.

a. A hydrocarbon contains 85.7% carbon and 14.3% hydrogen by mass, and its molecular mass is 70. i. Find its empirical formula. ii. Find its molecular formula. iii. It decolorizes bromine water and has a straight chain with the double bond at the end. Name it. **[4]**

Answer:

b. i. A petrol knocks just like a mixture of 72 mL of iso-octane and 18 mL of heptane. Find its octane number. ii. Write a balanced equation for the cracking of decane, $C_{10}H_{22}$, into octane and one other product, and name that product. iii. In reforming, heptane becomes toluene, C_7H_8. Find the mass of hydrogen given off by 1.0 kg of heptane. **[4]**

Answer: _____

7 Think **[3]**

Cracking an alkane always gives at least one alkene. Explain why, using the general formulas, and say why refineries want the alkenes.

8 Activity: Fuels at home and on the road (not marked)

Find the fuels used round you: in the kitchen, in vehicles, in lamps or heaters. For each, use the unit to say which kind of engine or burner uses it and what quality matters.

Fuel	Where it is used	Petrol engine, diesel engine or burner?	Quality that matters (octane, cetane, or none)

Why would putting diesel in a petrol motorbike make it run badly?