Unit 13 · Aldehydes and Ketones

WORKSHEET

Full marks 36

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 36

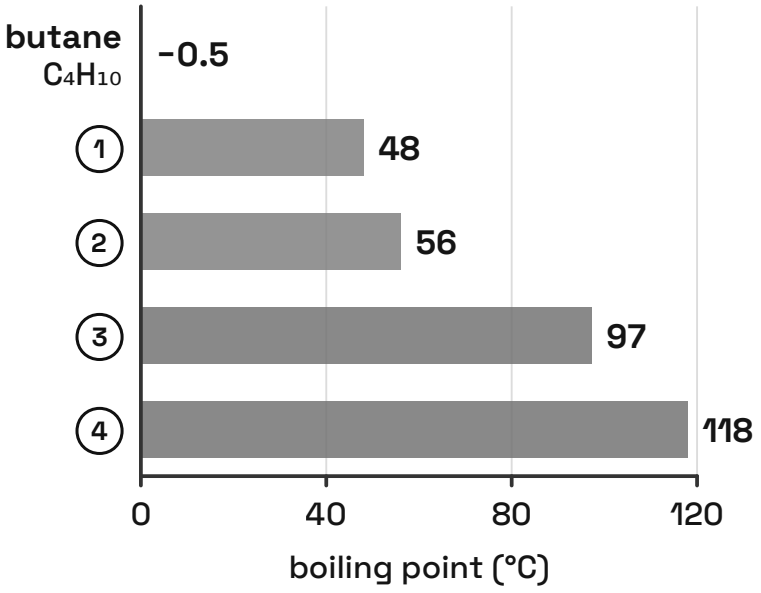
1 Key words [3]

Match each test or reaction in Column A with what it gives in Column B. One item in Column B is not needed. Each carries 0.5 mark.

Column A		Column B
1. 2,4-DNP	☐	**a.** an alcohol and the salt of an acid, from an aldehyde with no α-hydrogen
2. Tollens' reagent	☐	**b.** a pale yellow precipitate with a CH_3CO- group
3. Fehling's solution	☐	**c.** a violet color with phenols
4. iodine and NaOH	☐	**d.** an orange precipitate with any aldehyde or ketone
5. Clemmensen reduction	☐	**e.** a silver mirror with aldehydes
6. Cannizzaro reaction	☐	**f.** a brick-red precipitate with aliphatic aldehydes
		g. the C=O turned into CH_2

2 Label the diagram [2]

The chart shows the boiling points of five compounds of about the same molar mass. Butane is labelled. Use the boiling points and what you know of the forces between molecules to write the compound in place of 1 to 4: propanal, propanone, propan-1-ol or ethanoic acid. 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 carbonyl compound does the catalytic hydration of propyne give? [1]

a. propanal
b. propanone
c. ethanal
d. propan-2-ol

ii. The Rosenmund reduction can make: [1]

a. aldehydes only
b. ketones only
c. both aldehydes and ketones
d. primary alcohols

iii. Aldehydes are more reactive than ketones in nucleophilic addition because: [1]

a. an aldehyde's C=O is not polar
b. an aldehyde has only one carbon group, which pushes fewer electrons onto the carbonyl carbon and crowds it less
c. ketones have no π bond
d. aldehydes are gases

iv. Which compound gives the iodoform test but no silver mirror with Tollens' reagent? [1]

a. ethanal
b. propanal
c. butan-2-one
d. methanal

v. Methanal heated with ammonia gives: [1]

a. Bakelite
b. urotropine, $(CH_2)_6N_4$
c. formalin
d. methanol

4 Short answers [11]

Write short answers to the following questions.

a. Pent-2-ene, $CH_3CH{=}CHCH_2CH_3$, is treated with ozone and then zinc and water. Name the two products. [2]

b. Why is the carbonyl group polar, and why does a nucleophile attack its carbon? [2]

c. Why does ethanal give the aldol condensation but methanal does not? What does methanal give with concentrated NaOH? [2]

d. Write the products of propanone with i. PCl_5 and ii. HCN. **[2]**

e. Describe the aldol condensation of ethanal: the conditions, the product, and what happens to the product on heating. **[3]**

5 Long answer **[4]**

Write a long answer to the following question.

You are given three unlabeled bottles: ethanal, propanone and benzaldehyde. Using 2,4-DNP, Tollens' reagent, Fehling's solution and the iodoform test, say how you would identify each, and what you would see.

6 Numerical problems **[8]**

Solve the following problems. Show your working. Take H = 1, C = 12, O = 16, I = 127.

a. 3.50 g of pent-2-ene is ozonolyzed completely. i. Find the moles of pent-2-ene. ii. Find the masses of the two carbonyl compounds formed. iii. Which of them gives the iodoform test? Write the equation and find the mass of iodoform it can give. **[4]**

Answer:

b. A carbonyl compound contains 66.7% carbon, 11.1% hydrogen and 22.2% oxygen by mass, and its molar mass is 72 g/mol. i. Find its molecular formula. ii. It gives the iodoform test but no silver mirror with Tollens' reagent. Name it and write its structure. iii. Name the product of its Clemmensen reduction. iv. Name an aldehyde with the same formula. **[4]**

Answer: _____

7 Think [3]

An alkene, C_6H_{12}, gives only one product on ozonolysis, and that product gives the iodoform test but no silver mirror. Work out the alkene, and explain each step.

8 Activity: Smell and solubility (not marked)

With your teacher, take a few drops of propanone from the school laboratory, a drop of vanilla essence and a little cinnamon. Shake a few drops of each with water in a test tube. Do not taste any of them; smell by wafting the air towards you.

Sample	Carbonyl compound in it	Smell	Mixes with water?
propanone			
vanilla essence			
cinnamon			

Why does propanone mix with water although it can't hydrogen-bond with itself?