

2018 Chemistry ATAR

Unit 4 Part I

Organic chemistry

Empirical formula

Isomerism

IMF

Revision package

Which of the following has been filled in correctly?

		Representation of functional group	Main intermolecular forces between molecules of the substance	Solubility
a)	Carboxylic acid	RCOOH	dipole - dipole	soluble in water
b)	Amine	RNH ₂	hydrogen bonding	soluble in water
c)	Aldehyde	RCHO	hydrogen bonding	soluble in water
d)	Alkene	R = R	dispersion forces	soluble in water

The hydrocarbon but-1-ene (C₄H₈) is a member of the homologous series of alkenes.

a) Provide the general formula of the alkenes: (1)

b) But-1-ene has structural isomers.

(i) State the meaning of the term *structural isomers*.

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..... (2)

Which of the following substances has the LOWEST solubility in water?

- a) HCOOH
- b) $\text{CH}_3\text{CH}_2\text{OH}$
- c) CH_3COONa
- d) $\text{CH}_3\text{CH}_2\text{CH}_3$

A student has been asked to prepare a sample of propyl ethanoate.

- a) Name three substances necessary for the laboratory preparation of the above compound.

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(3)

- b) Draw the structure of propylethanoate:

(1)

- c) Name two isomers of the above substance.

(2)

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- d) Write an equation for the formation of propylethanoate:

(1)

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.....

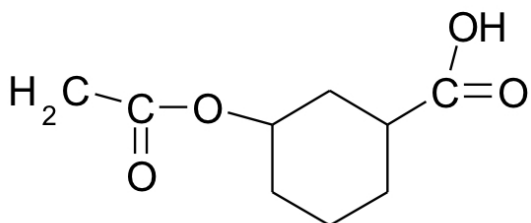
An organic compound known to contain only C, H, N and O was analysed by initially burning a 5.2246g sample which produced 10.5632g of CO₂ and 4.8677 g of H₂O. A second sample (1.367g) was oxidized separately to NO₂ and it was determined that 0.01576 mol of NO₂ was produced.

- (a) Find the empirical formula. (9 marks)
- (b) A 2.090g sample is vapourised and occupied 200mL at 150 kPa and 25°C. Determine the molecular formula. (2 marks)
- (c) Had the organic compound turned blue litmus pink, draw a possible molecular structure and name it. (2 marks)

Write IUPAC names for the following compounds.

<i>Compounds</i>	<i>Names</i>
$\text{CH}_3\text{CH}_2\text{COOCH}_3$	
$(\text{CH}_3)_3\text{CH}$	
$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{COCH}_3$	

The figure below shows the structure of aspirin. The structure contains:



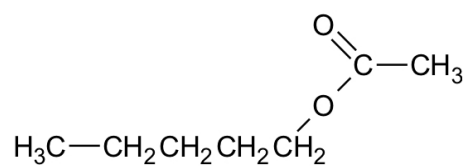
- a) an acid and an ester
- b) an acid and a ketone
- c) an ester and a ketone
- d) a ketone and an alcohol

For each of the situations described below, write a balanced redox reaction showing the changes that take place (there is no need to show the phase of the chemicals);

Give a brief observation of any major colour change that would be observed in any of the coloured reagents used to bring about the reaction.

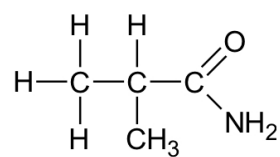
(a) Excess acidified potassium dichromate solution is added to pentan-1-ol.

(e)

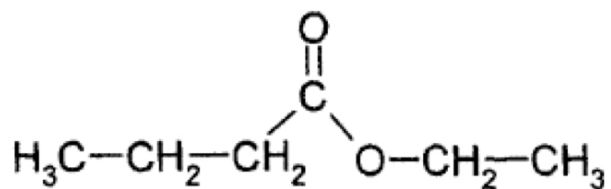


Name:

(f)



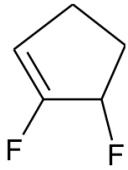
Name:



The two compounds which were used to make the ester were

- Butanol and ethanoic acid.
- Ethanol and butanoic acid.
- Hexanol and acidified potassium dichromate.
- Hexanoic acid, hexanol and a suitable catalyst.

1. Give the IUPAC name of the following structures:

<p>(a)</p> $\begin{array}{ccccccc} & \text{H} & \text{H} & \text{H} & \text{H} & & \text{Cl} \\ & & & & & & \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & =\text{C} & -\text{H} \\ & & & & & & \\ & \text{H} & \text{H} & \text{CH}_3 & \text{H} & & \text{CH}_3 \end{array}$ <p>Name:</p>	<p>(b)</p> $\begin{array}{ccccccc} & \text{H} & \text{H} & \text{H} & \text{H} & \text{Br} & \\ & & & & & & \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{Br} \\ & & & & & & \\ & \text{H} & \text{OH} & \text{H} & \text{H} & \text{H} & \end{array}$ <p>Name:</p>
<p>(c)</p> $\begin{array}{cccccccc} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & & \text{O} \\ & & & & & & & & \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & \\ & & & & & & & & \backslash \\ & \text{H} & \text{OH} & \text{H} & \text{H} & \text{H} & \text{H} & & \text{OH} \end{array}$ <p>Name:</p>	<p>(d)</p>  <p>Name:</p>

Which of the following molecules contains at least a single bond, a double bond and a triple bond?

- a) CH_2CHCCH
- b) $\text{CH}_2\text{Cl}(\text{CH}_2)_3\text{CH}_3$
- c) $\text{CH}_2\text{CCICCCICH}_2$
- d) $\text{CH}_3\text{CHBrCH}_3$

Which one of the following names is incorrect?

- a) 1,2,3-trimethylcyclohexane.
- b) 2,3,3-trichlorohexane.
- c) 2,3,4-trichlorocyclohexene.
- d) 4,4,5-trimethylhexane.

6. Hexane, hexanal and hexanoic acid all contain the same number of carbon atoms but display different physical properties. Their boiling points are given in the table below.

Organic compound	Boiling point (°C)
hexane	68
hexanal	130
hexanoic acid	205

Account for the difference in boiling points of the three compounds.

(5 marks)