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Level 1 Chemistry, 2018

90932 Demonstrate understanding of aspects of carbon chemistry

2.00 p.m. Thursday 15 November 2018
 Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of carbon chemistry.	Demonstrate in-depth understanding of aspects of carbon chemistry.	Demonstrate comprehensive understanding of aspects of carbon chemistry.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

A periodic table and other reference material are provided in the Resource Booklet L1–CHEMR.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–11 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

ASSESSOR'S USE ONLY

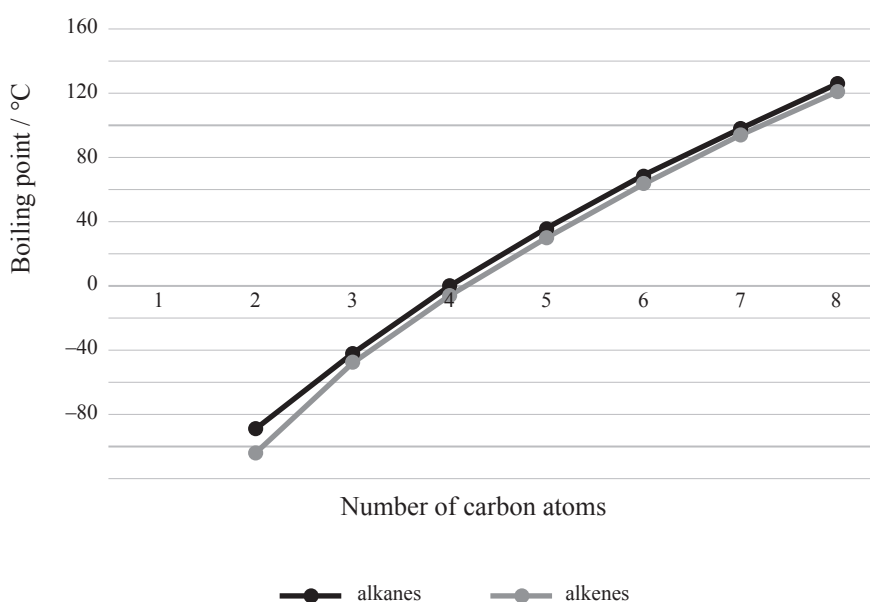
QUESTION ONE

(a) Both ethane and ethene are classified as hydrocarbons.

(i) Draw the structural formulae of ethane and ethene in the boxes below:

Ethane	Ethene

Boiling points of straight chain alkanes and alkenes



(ii) Compare and contrast alkanes and alkenes in relation to:

- the structure and bonding of alkanes and alkenes
- trends in their boiling points.

In your answer, you should refer to the graph above, and your knowledge of the structure of alkanes and alkenes.

- (iii) Ethene can be produced by cracking long-chain hydrocarbons such as hexane in crude oil. The ethene can then be used to produce the alcohol, ethanol.

Ethanol can also be produced by fermentation.

How does the process of producing ethene from hexane (cracking), differ from the process of fermentation to form ethanol?

In your answer, you should include:

- a description of the two processes
- explanations of any conditions required
- balanced symbol equations for any reactions occurring, in the labelled boxes below.

Balanced symbol equation for the cracking of hexane to form ethene:

Balanced symbol equation for preparation of ethanol using fermentation:

QUESTION TWO

- (a) Fuels such as butane react with oxygen to release energy.
- (i) Draw the structural formula of butane in the box below:

Butane

- (ii) When butane reacts with oxygen, water vapour is produced, as well as carbon dioxide, carbon monoxide, and/or carbon particles (soot), depending on the conditions.

Explain under what conditions these various products are produced.

In your answer, you should state the type of reaction(s) occurring and give balanced symbol equations for the reaction(s).

- (b) A variety of fuels can be used in car engines. The table below shows some properties of two of these fuels.

Fuel	Content	Flashpoint* / °C	Energy released/kJ L ⁻¹
Ethanol	C ₂ H ₅ OH	16.6	29 700
Petrol	mixture of hydrocarbons	-43	35 000

* Flashpoint is the lowest temperature at which the vapours of the fuel will ignite.

Evaluate the feasibility of replacing petrol with ethanol as a fuel for use in cars.

In your answer, you should:

- refer to relevant data from the table above
- consider the combustion reactions of each fuel
- include the effects of each fuel on human health and on the environment.

QUESTION THREE

(a) Polymerisation reactions are used to make the commonly used polymer, polyethene.

(i) What is the name of the monomer unit that polyethene is made from?

(ii) Elaborate on the polymerisation reaction involved in producing polyethene.

In your answer you should:

- refer to the structure of the monomer unit
- state any conditions required for the reaction, and explain why they are needed
- give the structural formula of polyethene.

**Question Three continues
on the following page.**

- (b) The following table shows selected data for three compounds, A, B, and C.

Compound	Solubility in water	Number of molecules of CO ₂ produced per molecule of compound during complete combustion
A	Soluble	2
B	Insoluble	3
C	Insoluble	2

It is known that the compounds are: ethane, ethanol, and propane.

Use the information in the table to identify each of the compounds listed above.

Compound A	
Compound B	
Compound C	

Justify your choices by referring to the information given in the table above.

Explain how you used the structure and properties of these compounds to distinguish between them.

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