

## C5.1 Mastery Quiz: Carbon Chemistry

### Section A

1. Choose the correct word to complete the sentence:

Crude oil is formed by the decomposition of \_\_\_\_\_.

Tick (✓) **one** box.

[1]

A. Plankton

☐

B. Fish

☐

C. Rocks

☐

2. Choose the correct word to complete the sentence:

Crude oil is a \_\_\_\_\_ of different substances.

Tick (✓) **one** box.

[1]

A. Compound

☐

B. Mixture

☐

C. Molecule

☐

3. A group of hydrocarbons found in crude oil are the alkanes. What is the name of the alkane that contains 3 carbon atoms?

Tick (✓) **one** box.

[1]

A. Ethane

☐

B. Propane

☐

C. Butane

☐

4. The general formula for the alkanes is  $C_nH_{2n+2}$ . How many hydrogen atoms would there be in a molecule of an alkane with 14 carbon atoms?

Tick (✓) **one** box.

[1]

A. 28

☐

B. 30

☐

C. 32

☐

5. Which type of bonding is found in the alkanes?

Tick (✓) **one** box.

[1]

A. Covalent

☐

B. Ionic

☐

C. Metallic

☐

6. Decane is an alkane that is cracked to produce two products, as shown by the reaction below.



What is the formula of the other product?

Tick (✓) **one** box.

[1]

A.  $C_{12}H_{26}$

☐

B.  $C_8H_{16}$

☐

C.  $C_8H_{18}$

☐

7. Which statement best explains why large hydrocarbons are cracked?

Tick (✓) **one** box.

[1]

- A. There is greater demand for shorter hydrocarbon chains ☐
- B. Large hydrocarbon chains have low boiling points so are easy to break down ☐
- C. To make equal numbers of long and short chain hydrocarbons ☐

8. One of the products of the cracking of decane is  $C_2H_4$ , which is an alkene. What test and result would indicate the presence of an alkene?

Tick (✓) **one** box.

[1]

- A. Limewater would turn cloudy ☐
- B. Limewater would turn colourless ☐
- C. Bromine water would turn cloudy ☐
- D. Bromine water would turn colourless ☐

9. Fractional distillation is used to separate the different substances found in crude oil. There are three stages involved in this process:

Stage X: Hydrocarbons evaporate

Stage Y: Crude oil is heated

Stage Z: Vapours condense

Which option shows the correct order of these stages?

Tick (✓) **one** box.

[1]

- A. X, Y, Z ☐
- B. Z, Y, X ☐
- C. Y, X, Z ☐



10. Choose the correct option to complete the sentence:

Fractional distillation separates substances based on their \_\_\_\_\_.

Tick (✓) **one** box.

[1]

A. Boiling points

☐

B. Melting points

☐

C. Temperature

☐

11. Choose the products of the complete combustion of propane.

Tick (✓) **one** box.

[1]

A. Water and oxygen

☐

B. Water and carbon dioxide

☐

C. Oxygen and carbon dioxide

☐

12. Incomplete combustion of propane also produces another product, carbon monoxide. Which explains why combustion may be incomplete?

Tick (✓) **one** box.

[1]

A. There is not enough propane

☐

B. There is not enough oxygen

☐

C. There is more oxygen than propane

☐

13. What type of reaction is the combustion of propane?

Tick (✓) **one** box.

[1]

A. Exothermic, as it transfers energy to the surroundings

☐

B. Exothermic, as it takes in energy from the surroundings

☐

C. Endothermic, as it transfers energy to the surroundings

☐

D. Endothermic, as it takes in energy from the surroundings

☐

14. Which monomer is used to produce poly(ethene)?

Tick (✓) **one** box.

[1]

A. Ethane

☐

B. Ethene

☐

C. Alkene

☐

15. Petrol used in fuels should be treated to remove sulfur. Which correctly explains why?

Tick (✓) **one** box.

[1]

A. It would cause incomplete combustion

☐

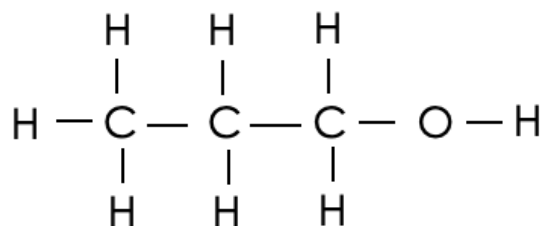
B. It would burn to produce sulfur dioxide, leading to acid rain

☐

C. It would burn to produce carbon dioxide, leading to global warming

☐

## CHEMISTRY ONLY



16. The structural formula above shows an organic compound. What is the name of this compound?

Tick (✓) **one** box.

[1]

A. Propane

☐

B. Propene

☐

C. Propanol

☐

17. What is the functional group for the homologous series that the compound above belongs to?

Tick (✓) **one** box.

[1]

A. C-H

☐

B. C-O

☐

C. O-H

☐

18. Ethanol reacts with ethanoic acid to form ethyl ethanoate. What type of compound is ethyl ethanoate?

Tick (✓) **one** box.

[1]

A. A carboxylic acid

☐

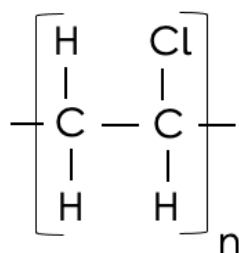
B. An ester

☐

C. A polymer

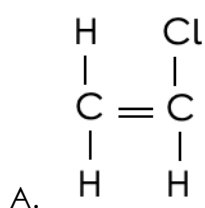
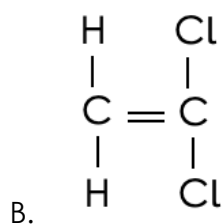
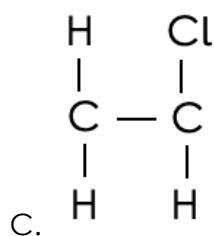
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19. The figure below shows the displayed structural formula of poly(chloroethene). Which monomer would have been used to make poly(chloroethene)?



Tick (✓) **one** box.

[1]


☐

☐

☐

20. What type of polymerisation would poly(chloroethene) have formed from?

Tick (✓) **one** box.

[1]

A. Addition

☐

B. Condensation

☐

C. Esterification

☐




## Section B

1. Butane is an alkane.
  - a. Complete the structural formula for butane. [2]



- b. Give the chemical formula for butane. [1]

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2. The table below shows the melting points and boiling points of methane (CH<sub>4</sub>) and hexane (C<sub>6</sub>H<sub>14</sub>).

	Melting Point (°C)	Boiling Point (°C)
<b>Methane</b>	-183	-162
<b>Hexane</b>	-95	69

- a. Identify the state of matter that each would be at room temperature (20 °C). [2]

Methane: \_\_\_\_\_

Hexane: \_\_\_\_\_

- b. Compare the structure and properties of methane and hexane. [4]

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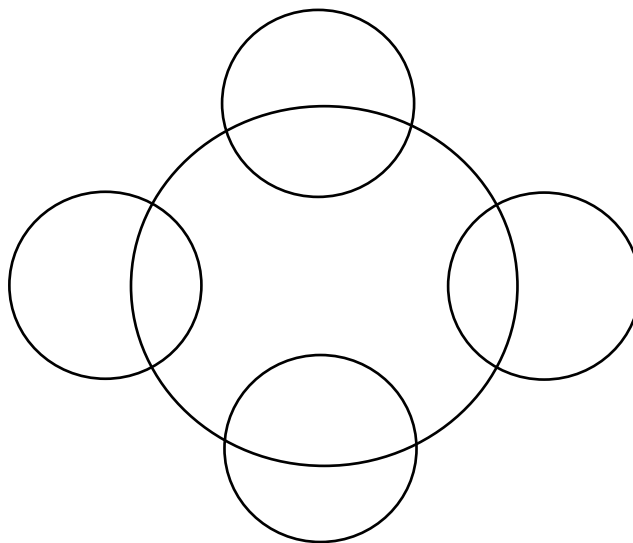
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- c. Explain the trend in the boiling points of the alkanes. [2]



- d. Complete the dot and cross diagram to show the bonding in methane ( $\text{CH}_4$ ). [2]



3. Carboxylic acids and alcohols are homologous series which contain different functional groups.

- a. State the formula of the functional group found in carboxylic acids. [1]

- b. Ethanol is an alcohol. Give one use of ethanol. [1]

- c. Carboxylic acids can react with alcohols. Complete the general equation for these reactions: [2]

Alcohol + carboxylic acid  $\rightarrow$  \_\_\_\_\_ + \_\_\_\_\_

- d. Ethanol can be made in two different ways:

- fermentation



- The table below gives some information about each process.

Feature	Process	
	Fermentation	Hydration
Raw material	Sugar	Crude oil
Relative energy usage	Low	High
Relative rate of reaction	Low	High
Purity of ethanol product	18%	95%

Evaluate which method of producing ethanol should be used. [6]

[illegible]