

## CHEMISTRY VCE UNITS 1&2 DIAGNOSTIC TOPIC TESTS 2007

### TEST 4: HYDROCARBONS AND POLYMERS

TOTAL 35 MARKS (45 MINUTES)

Student's Name: \_\_\_\_\_ Teacher's Name: \_\_\_\_\_

#### Directions to students

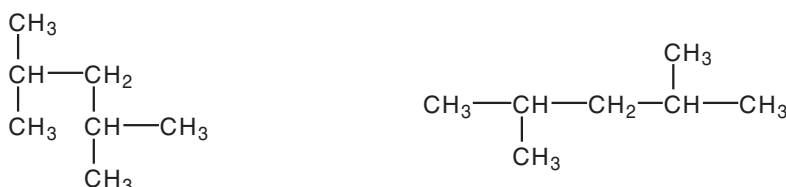
Write your name and your teacher's name in the spaces provided above.  
Answer all questions in the spaces provided.

#### SECTION A: MULTIPLE-CHOICE QUESTIONS

##### Instructions for Section A

For each question in Section A, choose the response that is correct and circle your choice.  
Choose the response that is **correct** or **best answers** the question.  
A correct answer scores 1, an incorrect answer scores 0.  
Marks will **not** be deducted for incorrect answers.  
No marks will be given if more than one answer is completed for any question.

#### Question 1

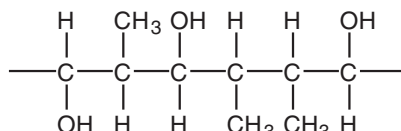


The pair of structures shown above are

- different representations of the same organic compound.
- isomers.
- different organic compounds that are not isomers of one another.
- both alkenes.

#### Question 2

A section of a polymer is shown below.



This polymer was produced by reaction of large numbers of molecules of

- $\text{CH}(\text{OH})\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{CH}(\text{OH})$
- $\text{CH}_3\text{CHCHCH}_3$  and  $\text{H}_2\text{O}$
- $\text{CH}(\text{OH})\text{CH}(\text{CH}_3)$
- $\text{CH}(\text{OH})$  and  $\text{CH}_3\text{CH}$

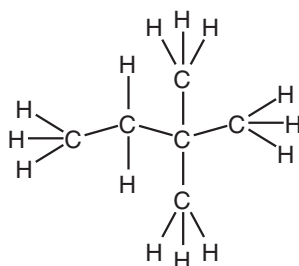
### Question 3

Ethene undergoes addition reactions with a wide range of reactants. The product of the addition reaction between ethene and hydrogen chloride is

- A.  $\text{CHClCH}_2$
- B.  $\text{CH}_3\text{CH}_2\text{Cl}$
- C.  $\text{CH}_2\text{ClCH}_2\text{Cl}$
- D.  $\text{CH}_2\text{CH}_2\text{Cl}$

### Question 4

The structural formula of a hydrocarbon is shown below.



Which of the following statements concerning this hydrocarbon is **incorrect**?

This hydrocarbon

- A. belongs to the homologous series that includes  $\text{C}_2\text{H}_6$ .
- B. would have the same physical properties as hexane.
- C. is saturated.
- D. has a boiling point higher than that of propane.

### Question 5

The table below shows relationships between some properties of several hydrocarbons, high-density polyethene (HDPE) and low-density polyethene (LDPE), indicating whether the quantity in the first column is greater than (>) or less than (<) the quantity in the second column. Which statement is correct?

A.	chemical reactivity of alkanes	>	chemical reactivity of alkenes
B.	the H-C-C bond angle in ethane	>	the H-C-C bond angle in ethene
C.	melting point of LDPE	>	melting point of HDPE
D.	degree of branching in LDPE	>	degree of branching in HDPE

### Question 6

In which of the following materials would you expect to find a small amount of cross linking between polymer chains?

- A. vulcanised rubber used in tyre tubing
- B. bakelite used in bowling balls
- C. perspex used as a glass substitute
- D. polystyrene used in disposable coffee cups

*Questions 7–9 refer to the following information.*

The semi-structural formulas of four hydrocarbons (I–IV) are shown below.

Compound	I	II	III	IV
Formula	HCCCH <sub>3</sub>	CH <sub>2</sub> CH <sub>2</sub>	CH <sub>2</sub> CHCH <sub>3</sub>	(CH <sub>3</sub> ) <sub>4</sub> C

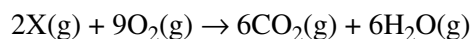
**Question 7**

Which compound is a member of the homologous series with general formula C<sub>n</sub>H<sub>2n+2</sub>?

- A. I
- B. II
- C. III
- D. IV

**Question 8**

The complete combustion of one of the hydrocarbons can be represented by the balanced equation below.



Which of the four compounds could X be?

- A. I
- B. II
- C. III
- D. IV

**Question 9**

Which compound has molecules containing at least one C–C–H bond with a bond angle of approximately 180°?

- A. I
- B. II
- C. III
- D. IV

**Question 10**

Which of the following is **not** a structural isomer of C<sub>5</sub>H<sub>12</sub>?

- A. CH<sub>3</sub>(CH<sub>2</sub>)<sub>3</sub>CH<sub>3</sub>
- B. dimethylpropane
- C. 2-methylpentane
- D. CH<sub>3</sub>CH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

**SECTION B: SHORT-ANSWER QUESTIONS**

**Instructions for Section B**

Answer **all** questions in the spaces provided.

To obtain full marks you should

- give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks.
- show all working in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.
- make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example  $\text{H}_2(\text{g})$ ;  $\text{NaCl}(\text{s})$ .

**Question 1**

- a. Carbon forms more compounds than any other element. Give **two** reasons why carbon forms so many compounds.

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2 marks

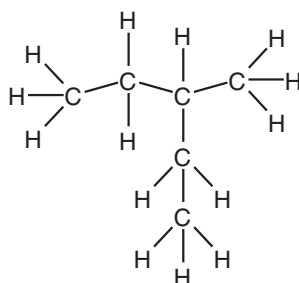
- b. i. How many hydrogen atoms are present in the alkane molecule containing 15 carbon atoms?

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- ii. How many carbon atoms does a molecule of hexanol contain?

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iii.



Name the molecule whose structural formula is shown above.

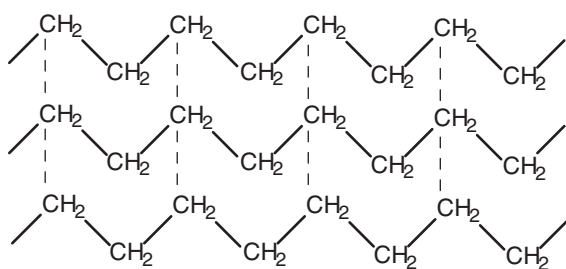
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- iv. Draw a structural formula for a saturated hydrocarbon containing ten hydrogen atoms.

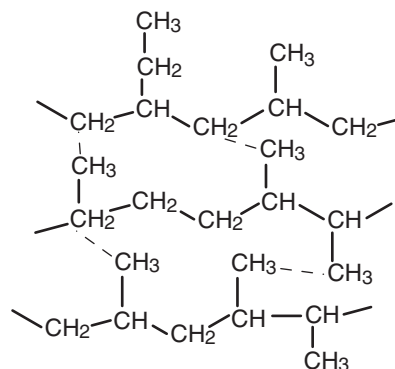
1 + 1 + 1 + 1 = 4 marks  
Total 6 marks

**Question 2**

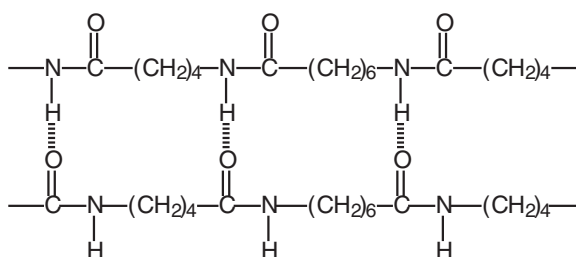
The structures of four different polymers are shown below.



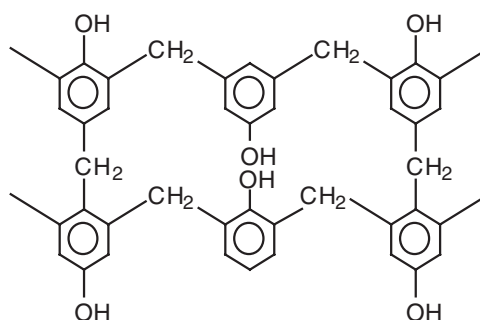
**I**



**II**



**III**



**IV**

- a. Select from polymers I–IV  
i. a cross-linked polymer;

\_\_\_\_\_

- ii. a low-density polymer;

\_\_\_\_\_

1 + 1 = 2 marks

- b. Which of the polymers shown would be expected to have the highest melting or decomposition point (assuming all polymer chains are of equal length)? Explain your choice.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 marks

- c. Polymer I can be produced with very long polymer chains to form ultra-high molecular weight polyethylene (UHMWPE). What effect would this lengthening of the polymer chain have on the strength of the polymer? Explain your answer.

\_\_\_\_\_

\_\_\_\_\_

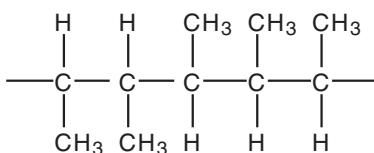
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2 marks

Total 6 marks

**Question 3**

a. A section of an addition polymer is shown below.



i. Sketch the monomer used to produce this polymer.

ii. Give the systematic name of the molecule shown in i.

iii. Draw **two** structural isomers of the molecule shown in i.

iv. Would you expect the polymer to be thermosetting or thermosoftening (thermoplastic)? Explain your choice.

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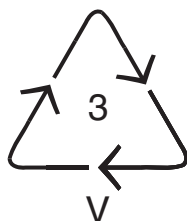
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1 + 1 + 2 + 2 = 6 marks

b. A child's toy carries on it the recycling symbol shown below.



Is the toy made from a thermosetting or thermosoftening polymer? Explain your choice.

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2 marks  
Total 8 marks

**Question 4**

Consider the following list of organic compounds.



Select from the list above a compound which is

- a. a hydrocarbon which could be a cyclic alkane;

\_\_\_\_\_

1 mark

- b. a compound belonging to the same homologous series as propyne,  $\text{CH}_3\text{CCH}$ ;

\_\_\_\_\_

1 mark

- c. an incorrectly written chemical formula;

\_\_\_\_\_

1 mark

- d. the fifth member of the homologous series of alkenes;

\_\_\_\_\_

1 mark

- e. a monomer used to produce an addition polymer.

\_\_\_\_\_

1 mark  
Total 5 marks