

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

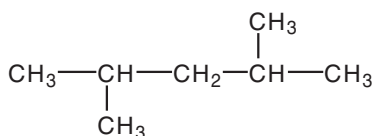
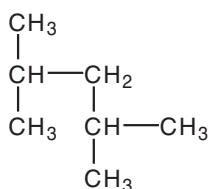
Write your name and your teacher's name in the spaces provided above.
Answer all questions in the spaces provided.

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

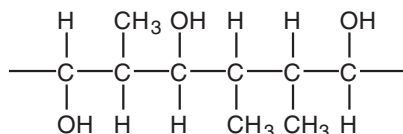


The pair of structures shown above are

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

Question 2

A section of a polymer is shown below.



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

- A. $\text{CH}(\text{OH})\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{CH}(\text{OH})$
- B. $\text{CH}_3\text{CHCHCH}_3$ and H_2O
- C. $\text{CH}(\text{OH})\text{CH}(\text{CH}_3)$
- D. $\text{CH}(\text{OH})$ and CH_3CH

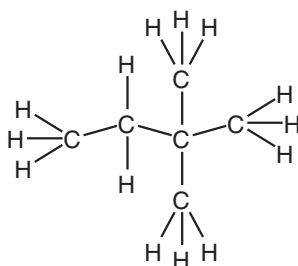
Question 3

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

- A. 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 C_2H_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 ₃	CH ₂ CH ₂	CH ₂ CHCH ₃	(CH ₃) ₄ C

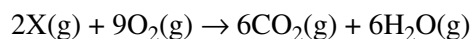
Question 7

Which compound is a member of the homologous series with general formula C_nH_{2n+2}?

- 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 C₅H₁₂?

- A. CH₃(CH₂)₃CH₃
- B. dimethylpropane
- C. 2-methylpentane
- D. CH₃CH₂CH(CH₃)₂

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

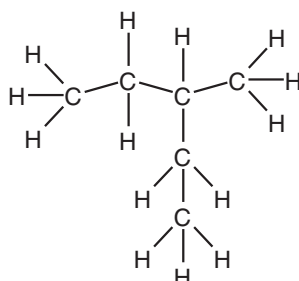
- a. Carbon forms more compounds than any other element. Give **two** reasons why carbon forms so many compounds.

2 marks

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

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

iii.



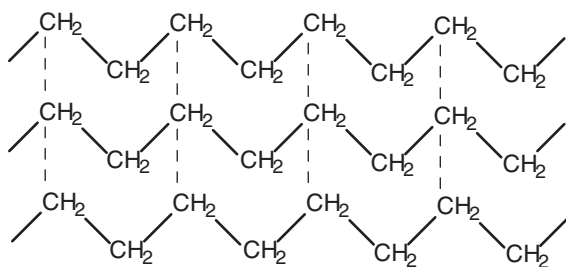
Name the molecule whose structural formula is shown above.

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

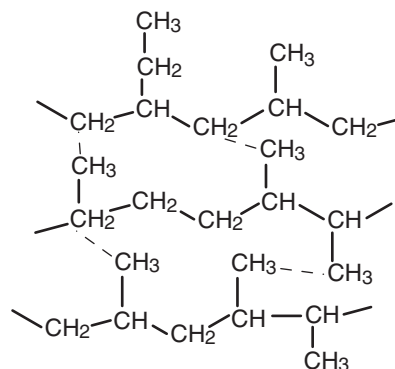
1 + 1 + 1 + 1 = 4 marks
Total 6 marks

Question 2

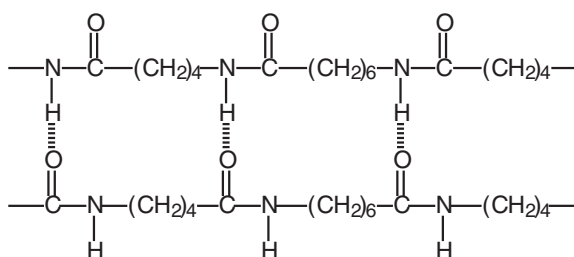
The structures of four different polymers are shown below.



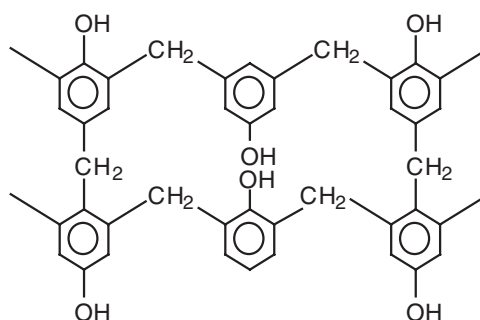
I



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.

2 marks
Total 6 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, CH_3CCH ;

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