

HSC CHEMISTRY PRODUCTION OF MATERIALS TOPIC TEST

Time Allowed: 1 hour 20 minutes

Reading time: 5 minutes

Total Marks: 60

Write answers using blue or black pen

NAME:

Part A – 15 marks

Attempt Questions 1–15

Allow about 20 minutes for this part

Use the given multiple choice answer sheet below.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ~~●~~ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A ~~●~~ B ~~●~~ ^{correct} C ○ D ○

MULTIPLE CHOICE ANSWERS

1. A ○ B ○ C ○ D ○

2. A ○ B ○ C ○ D ○

3. A ○ B ○ C ○ D ○

4. A ○ B ○ C ○ D ○

5. A ○ B ○ C ○ D ○

6. A ○ B ○ C ○ D ○

7. A ○ B ○ C ○ D ○

8. A ○ B ○ C ○ D ○

9. A ○ B ○ C ○ D ○

10. A ○ B ○ C ○ D ○

11. A ○ B ○ C ○ D ○

12. A ○ B ○ C ○ D ○

13. A ○ B ○ C ○ D ○

14. A ○ B ○ C ○ D ○

15. A ○ B ○ C ○ D ○

1 Which of the following represents the chemical formula for ethylene?

- (A) C_2H_2
- (B) C_2H_4
- (C) C_2H_6
- (D) C_2H_8

2 Glucose ($C_6H_{12}O_6$) is a monomer that can form naturally occurring polymers.

The approximate atomic weights for the elements which make up glucose are shown in the table.

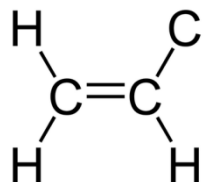
<i>Element</i>	<i>Approximate atomic weight</i>
Carbon	12
Hydrogen	1
Oxygen	16

Using data from the table, what would be the approximate molecular weight of a polymer made from 5 glucose polymers?

- (A) 810
- (B) 828
- (C) 882
- (D) 900

3 Which of the following is the correct name of the structure on the right?

- (A) Polyvinyl chloride
- (B) Polyethylene
- (C) Vinyl chloride
- (D) Ethylene

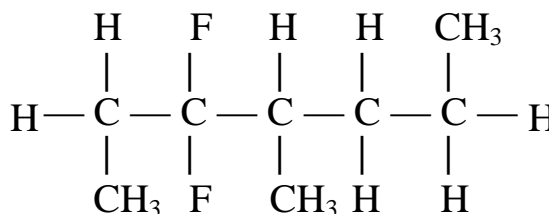


4 Which of the following best describes how Br_2 reacts with alkenes?

- (A) Br_2 is polar and reacts by addition of Br atoms across the double bond
- (B) Br_2 is polar and reacts by substitution of H atoms with Br atoms
- (C) Br_2 is non-polar and reacts by addition of Br atoms across the double bond
- (D) Br_2 is non-polar and reacts by substitution of H atoms with Br atoms

5 What is the IUPAC name of the compound on the right?

- (A) 2,2-difluoro-1,3,5-trimethylpentane
- (B) 3,3-difluoro-4,6-dimethylhexane
- (C) 3,3-difluoro-4-methylheptane
- (D) 3,3-difluorooctane



- 6 Which of the following can form a polymer by addition polymerisation?
- (A) Ethanol
(B) Glucose
(C) Propylene
(D) Octane
- 7 Which of the following is the most ideal condition for fermentation to form ethanol?
- (A) Temperature about 37°C and oxygen free environment
(B) Temperature about 37°C and oxygen rich environment
(C) Temperature about 25°C and oxygen free environment
(D) Temperature about 25°C and oxygen rich environment
- 8 A group of students measured out 100g of water into a container and heated the water by burning a measured mass of ethanol. Their results are shown below.

Fuel used	Ethanol
Amount of water heated (g)	100
Temperature rise (K)	10
Mass of ethanol burnt (g)	?
Heat of combustion of Ethanol (kJ/mol)	1364

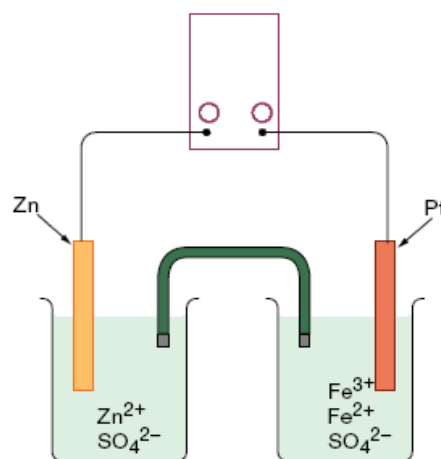
Assuming ideal conditions, what is the approximate mass of ethanol burnt?

- (A) 0.00306 grams
(B) 0.141 grams
(C) 3.06 grams
(D) 141 grams
- 9 What catalyst is used for dehydration reaction of ethanol to ethylene and water?
- (A) Dilute acid
(B) Concentrated acid
(C) Dilute base
(D) Concentrated base
- 10 Consider the following reaction: $\text{Cr}^{2+}_{(\text{aq.})} + [\text{CoCl}]^{2+}_{(\text{aq.})} \rightarrow [\text{CrCl}]^{2+}_{(\text{aq.})} + \text{Co}^{2+}_{(\text{aq.})}$
What can be said about the change in the chromium (Cr) and cobalt (Co) cations?
- (A) Chromium has oxidised and cobalt has reduced
(B) Chromium has oxidised and cobalt has oxidised
(C) Chromium has reduced and cobalt has oxidised
(D) Chromium has reduced and cobalt has reduced

- 11 In a galvanic cell, what is the purpose of the salt bridge?
- (A) To allow the flow of charge between the separated vessels
 - (B) To provide a mechanism for oxidation to occur
 - (C) To allow salt crystals to form on the electrode
 - (D) To provide an increase in electrical conductivity of the cell

- 12 Consider the diagram of a galvanic cell on the right. Which is the correct classification of the Pt metal electrode?

- (A) Anode
- (B) Cathode
- (C) Electrolyte
- (D) Salt bridge



- 13 Which elements in the Periodic Table have radioisotopes?
- (A) Elements with an atomic number greater than that of uranium
 - (B) Elements in the Actinide series
 - (C) Elements with an unstable proton to neutron ratio
 - (D) Elements that have metallic properties
- 14 Which of the following contains an unstable nucleus?
- (A) Carbon
 - (B) Sodium
 - (C) Lead
 - (D) Uranium
- 15 Which one of the following instruments is NOT used primarily to detect radiation?
- (A) Synchrotron
 - (B) Photographic film
 - (C) Cloud chambers
 - (D) Geiger counter

Part B – 45 marks
Attempt Questions 16–23
Allow about 1 hour for this part

Write the answers in the spaces provided in blue or black pen.

Question 16 (4 marks)

Marks

- (a) In the space below draw a structural representation of polystyrene.

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- (b) Describe the uses of polystyrene in terms of its properties.

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Question 17 (4 marks)

Biopolymers have a long history of use, but much chemical research is proceeding on a new generation of biopolymers with exciting potential applications.

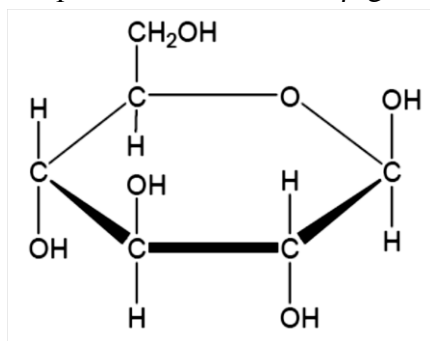
Complete the table providing information about a recently developed biopolymer that you have studied in your Chemistry course.

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Name of biopolymer	
Specific enzyme or organism used to synthesise the biopolymer	
Possible use of biopolymer	
Property of biopolymer which relates to its use	

Question 18 (2 marks)**Marks**

The structure of cellulose is made up of the monomers of β -glucose as shown below.



Draw the dimer formed by linking two β -glucose molecules in the space below.

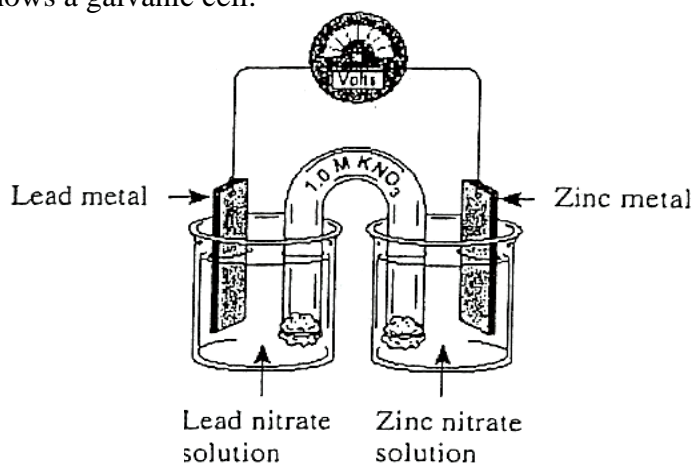
2**Question 19** (3 marks)

Assess the effectiveness of ethanol being commonly used as a solvent.

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Question 20 (7 marks)**Marks**

The diagram below shows a galvanic cell.



- (a) Write down the overall ionic equation to occurring in this galvanic cell. 2

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- (b) Calculate the expected standard potential generated by the galvanic cell. 2

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- (c) When this galvanic cell was set up experimentally, the voltmeter read 0.51 V. Account for the difference of this result to your calculated potential in part (d). 1

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- (d) Suppose that the concentration of lead nitrate was increased significantly. What observed effect would this have on the lead metal electrode? Justify your answer. 2

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Question 21 (14 marks)**Marks**

In recent years, petrol prices have inflated and there has been consideration of investing in alternative sources of fuel taking into account other factors as well as cost.

- (a) Discuss the need for alternative sources of the compounds presently obtained from the petrochemical industry.

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- (b) There has been a significant investigation into whether ethanol can provide a possible alternative for petrol in the future.

Describe TWO chemical processes that can be used to obtain ethanol as a product. Include relevant equations.

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- (c) One advantage of ethanol over petrochemical compounds is that it is considered renewable. Outline why ethanol can be called a renewable resource.

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Question 21 continues on the next page

Question 21 (continued)

Marks

- (d) By considering the advantages and disadvantages, assess the potential of ethanol as an alternative fuel as petrol becomes less affordable for many families in society.

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Question 22 (5 marks)

- (a) Describe how commercial radioisotopes are produced.

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- (b) Discuss the usefulness of the properties of one named radioisotope used in medicine.

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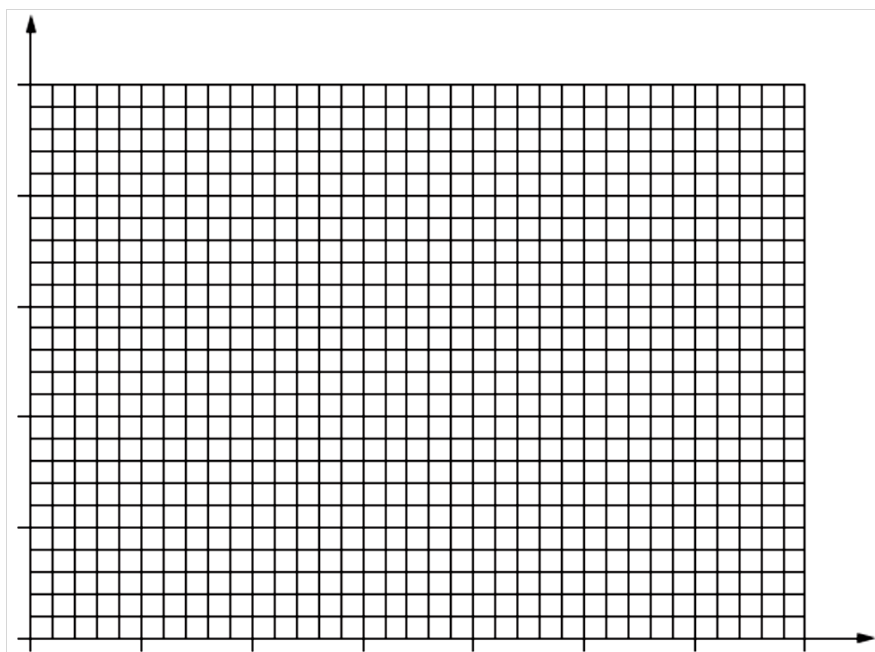
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Question 23 (6 marks)**Marks**

A student conducted a first hand investigation to determine the molar heat of combustion of some alkanols by heating 10 grams of water with each of the alkanols through a burner. His results are presented in the table below.

Alkanol	Molar heat of combustion (kJ mol^{-1})
Methanol	721
Ethanol	1135
1-Propanol	1821
1-Butanol	2432

- (a) Plot the molar heat of combustions for each alkanol below with appropriately labelled axes.

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- (b) Suppose the mass of the water being heated was doubled to 20 grams. What effect would this have on the molar heat of combustion of the alkanols? Justify your answer.

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End of test