

Section I

4 marks

PRODUCTION of MATERIALS THEORY TEST - 2001

Attempt Questions 1–4

Allow about 7 minutes for this section.

Select the alternative A, B, C or D that best answers the question.

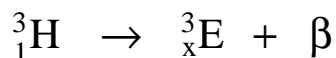
Indicate your answers by filling in the response circles shown below.

Question 1	(A)	(B)	(C)	(D)
Question 2	(A)	(B)	(C)	(D)
Question 3	(A)	(B)	(C)	(D)
Question 4	(A)	(B)	(C)	(D)

1 Which of the following is a catalyst necessary for the production of ethanol from ethene?

- (A) Water
- (B) Ultraviolet light
- (C) Dilute sulfuric acid
- (D) Yeast

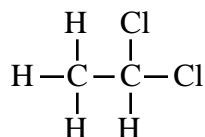
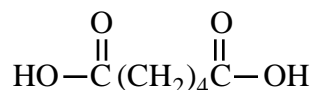
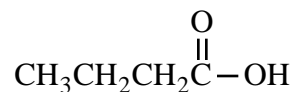
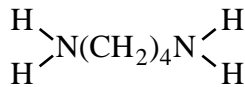
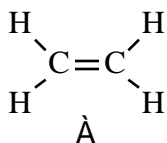
2 The equation below shows tritium emitting a β -particle.



Which of the correctly following identify E and x?

- (A) He and 2
- (B) H and 2
- (C) He and 1
- (D) H and 1

3 Which pair of compounds can be reacted together to produce a condensation polymer?



- (A) 1 and 5
- (B) 2 and 4
- (C) 3 and 4
- (D) 2 and 3

4 What is the change in the oxidation state of vanadium in this half equation?



- (A) +1 to +2
- (B) +2 to +1
- (C) +5 to +4
- (D) +4 to +3

Section II

20 marks

Attempt Questions 5–8

Allow about 33 minutes for this section.

Answer the questions in the spaces provided.

Show all relevant working in questions involving calculations.

Question 5 (3 marks)

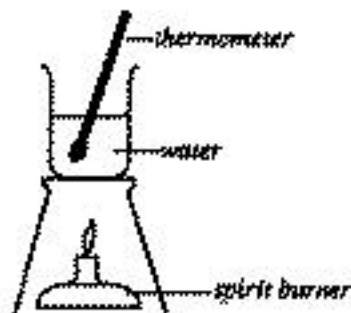
Ethanol has the potential to be used as an alternative to fossil fuels.

- (a) Ethanol can be produced from glucose by fermentation.
Write a balanced equation for this reaction. (1 mark)

- (b) Discuss **one** advantage and **one** disadvantage of ethanol as an alternative to fossil fuels.
(2 marks)

Question 6 (4 marks)

A chemistry student set up the following equipment to measure the heat of combustion of ethanol. Pure ethanol was used as the fuel in the spirit burner.



- (a) In order to calculate the heat of combustion of ethanol, what measurements must the student make? (1 mark)

- (b) In the experiment the student found that the combustion of 0.30 g of ethanol produced an energy change of 5.2 kJ. Calculate the experimental molar heat of combustion for ethanol. (2 marks)

- (c) The accepted value for the heat of combustion of ethanol (1364 kJ mol^{-1}) is higher than the value obtained experimentally. Account for the difference between the two values. (1 mark)

Question 7 (8 marks)

A galvanic cell was constructed using two half cells. One half cell consisted of silver metal and a silver nitrate solution and the other half cell consisted of nickel metal and a nickel nitrate solution.

- (a) Draw a neat labelled diagram of the galvanic cell. (3 marks)
Indicate electron flow in the diagram.

- (b) Which electrode is the anode? (1 mark)

- (c) Write two half equations for the reactions which occur in the cells. (2 marks)

- (d) Write the net ionic reaction occurring in the galvanic cell and calculate the voltage of the cell under standard conditions. (1 mark)

- (e) Which species is the oxidant? (1 mark)

Question 8 (5 marks)

A chemistry student observed that pieces of paper lying on soil soon developed holes that became larger with time. The student knew that paper is almost pure cellulose and she hypothesised that the holes could be due to the action of decay bacteria on cellulose. To test her hypothesis, she sets up the following experiment...

- A weighed amount of shredded paper was mixed with a weighed amount of soil (obtained from the same site where the original observation was made) in a beaker. The mixture was allowed to stand for a few days.
- A known quantity of water was added to the mixture in the beaker, stirred for a given time interval and then filtered through glass wool into a conical flask. (Glass wool is a material similar in appearance to cotton wool, but is made of glass. Like cotton wool, the fibres are fine but, unlike cotton wool, are fragile.)
- The filtrate was tested for the presence of glucose.

(a) Suggest two more tests/set-ups for this experiment to ensure that the investigation is valid. (2 marks)

(b) What assumption did the student use as a basis for the test? (1 mark)

(c) Will a negative result refute her original hypothesis? Explain your answer. (1 mark)

(d) Identify one safe work practice for this investigation. (1 mark)
