

The logo for S4S Coaching features the text "S4S" in a large, bold, blue font, with the word "coaching" in a smaller, blue, lowercase font below it. Above the "4" is a stylized graphic of three blue figures jumping or running upwards, with a blue arrow pointing diagonally upwards to the right.

Year 12- Chemistry

Production of Materials

Production of Materials exam 3 – Questions

1. (1 mark)

What is the IUPAC name for ethylene?

2. (4 mark)

Outline the steps in the commercial production of polyethylene.

3. (5 marks)

Discuss the need for alternative sources of compounds manufactured by the petrochemical industry.

4. (2 marks)

(a) Write a balanced chemical equation for the complete combustion of ethanol

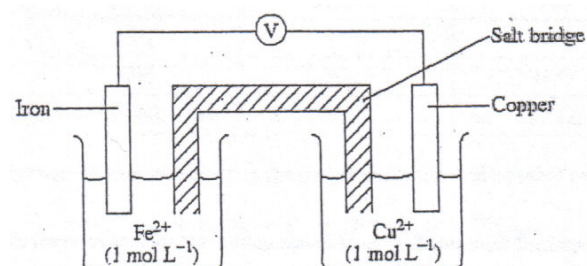
1 mark

(b) A mass of 72.5 g of ethanol was burnt completely in air. Calculate the volume of carbon dioxide that was produced at 25°C and 100 kPa.

1 mark

5. (5 marks)

Consider the galvanic cell drawn below.



(a) Write the two half equations and work out the potential E° for the cell.

2 marks

(b) Compare the terms anode and cathode.

1 mark

(c) Explain why a standard electrode is needed to construct a table of electrode potentials.

2 marks

6. (7 marks)

Describe the experiment you used to distinguish between the reactivity of an alkane and alkene. Also identify and explain two safety precautions you used.

7. (2 marks)

The dry cell and the lead-cell are both one of the most commonly used batteries.

(a) For ONE of these batteries identify a use.

1 mark

(b) Identify the reaction that occurs at the cathode for this battery.

1 mark

8. (4 marks)

Chemists and chemical engineers continue to play a pivotal role in the search for new sources of materials. “Nuclear chemistry provides a range of materials”.

Discuss this statement.

9. (4 marks)

Outline the processes involved in the industrial production of ethanol from sugar cane.

10. (2 marks)

(a) What causes incomplete combustion?

1 mark

(b) Write a balanced equation for the incomplete combustion of methane.

1 mark

11. (4 marks)

Propene (propylene) is an important monomer used in the production of the polymer polypropylene. The structure of propene is drawn below.

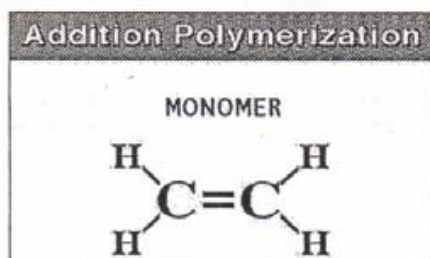
(a) Draw the structure of a small section of the polymer made from the above monomer. **1 mark**

(b) Describe ONE similarity and ONE difference in properties between this polymer and polyethene (polyethylene). **2 marks**

(c) Account for that different property in terms of the molecular structure of the two polymers. **1 mark**

12. (6 marks)

The following is a monomer used in addition polymerization



(a) Explain the meaning of addition polymerisation.

1 mark

(b) Outline the steps in the production of the polymer produced by this monomer.

3 marks

(c) Discuss the importance of this polymer both commercially and industrially

2 marks

13. (4 Marks)

Compare a named biopolymer and polyethylene in terms of uses and environmental effect.

14. (7 Marks)

A student was asked to choose accessible equipment that would be suitable for carrying out an investigation involving the fermentation of glucose. The mass change in the fermentation vessel would be monitored.

The student was given a list of specifications for the investigation, as shown below:

- 50g of glucose powder is allowed to undergo fermentation in the presence of yeast
- Air should be excluded from the vessel in which fermentation occurs.
- The gas produced in the reaction is to be trapped and passed through a suitable reagent to determine if it is carbon dioxide.

- Identify the piece of equipment needed to collect data for this investigation **1 mark**
- Make a neat, labelled diagram of the assembled equipment that would meet the above specifications of the investigation **3 marks**
- After 1 day the mass of the fermentation vessel had decreased by 15.0 g. Calculate the theoretical volume of carbon dioxide produced if the reaction is carried out at 25°C and 100 kPa and state the assumption that you made in carrying out the calculation. **2 marks**

15. (5 Marks)

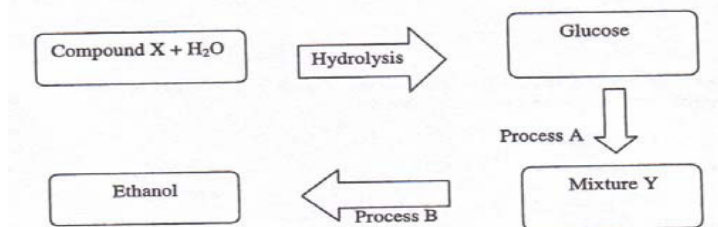
During your course you will have performed an open-ended investigation. Briefly outline how you gathered your information and briefly describe the procedure you followed. Include in your answer the procedure you adopted in order to obtain valid and reliable results.

16. (7 Marks)

Fossil fuels are currently the dominant source of both energy and raw materials needed for the production of polymers. However, the supply of fossil fuels is finite and rapidly diminishing. In the near future, a replacement source of both energy and polymer raw materials will need to be found and one potential source is ethanol. Using appropriate chemical equations, assess the potential of ethanol as a resource to replace fossil fuels for the supply of both polymers and energy.

17. (4 Marks)

The flow chart shows a method for the production of ethanol.



- Identify compound X **1 mark**
- Write a balanced equation for process A **1 mark**
- Describe the conditions necessary for process A **2 marks**

18. (4 marks)

Car manufacturers opposed a proposal for legislation to ensure a percentage of ethanol was added to Australian petrol. Discuss the scientific issues on which the proposal was based and why it was rejected.

19. (6 marks)

The following experiment was performed to investigate the relative activity of metals. The beaker initially contained 250.0 mL of 0.050 mol L⁻¹ copper sulfate solution.

After several hours the dark blue colour of the solution had become lighter and a red-brown deposit had formed on the piece of zinc metal.

(a) Account for the changes observed. Provide a balanced oxidation-reduction equation in your answer.

3 marks

The red-brown deposit was removed from the piece of zinc metal and dried.

It was found to weigh 0.325 g.

(b) Calculate the concentration of copper sulfate solution remaining in the beaker. **3 marks**

20. (2 marks)

Identify a radioisotope which is used in medicine or industry, and describe the method used to produce this isotope.

21. (3 marks)

Assess the benefits and problems associated with the use of this radioisotope.

22. (3 marks)

The following is a flow diagram showing the sequence of products released during the decay of uranium.

Using examples from the flow diagram to describe processes by which an unstable isotope undergoes radioactive decay

