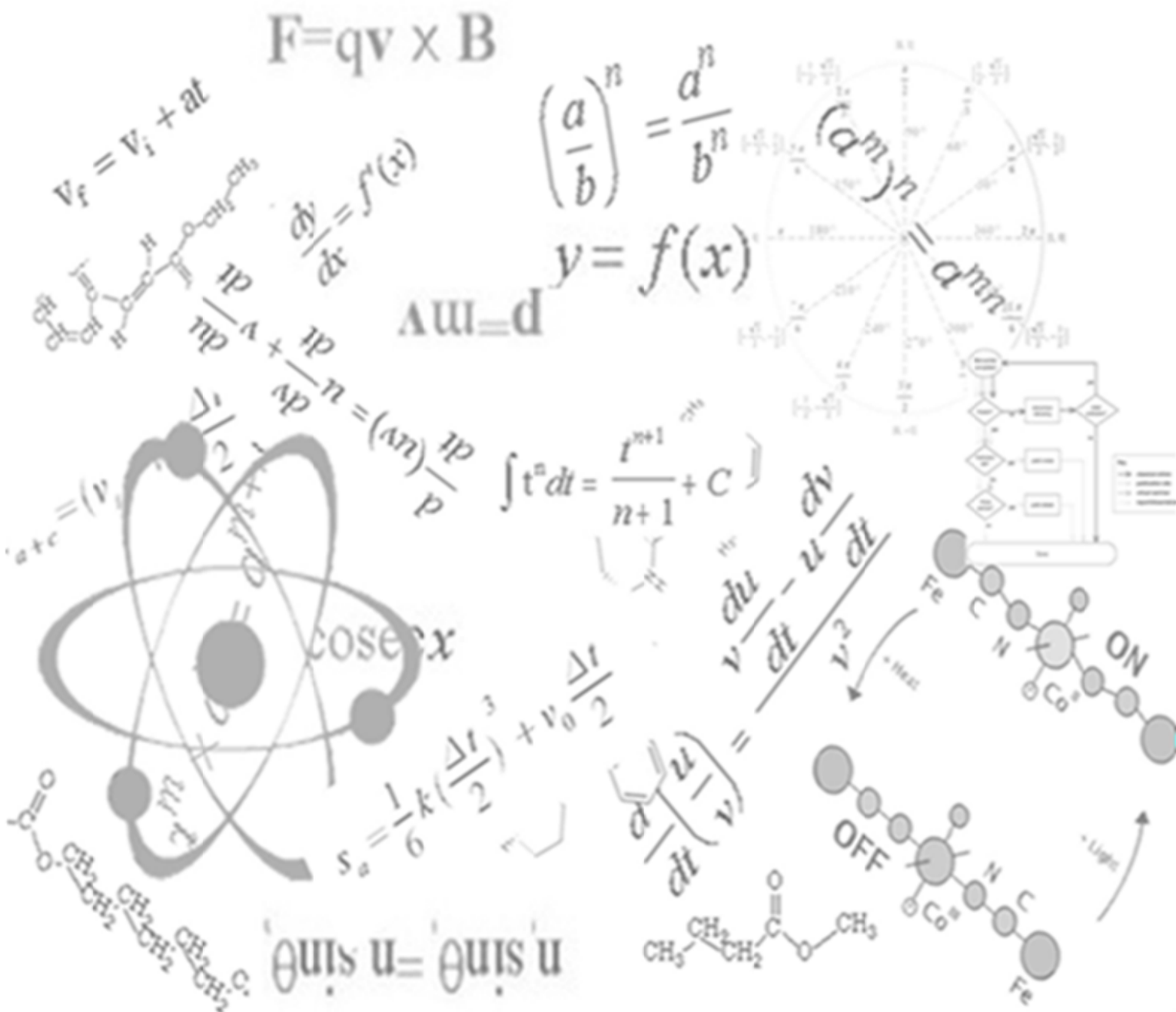


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Year 12- Chemistry

Production of Materials



## Production of Materials exam 2 – Questions

### 1. (5 marks)

During your practical work you performed a first-hand investigation to distinguish between an alkene and the corresponding alkane.

- (a) Name the alkene used in your investigation. **1 mark**
- (b) Identify a potential hazard in your investigation, and outline how you addressed this hazard. **2 marks**
- (c) Outline the procedure you used for your first-hand investigation. **2 marks**

### 2. (4 marks)

Cellulose is a naturally occurring condensation polymer that makes up a major proportion of biomass.

- a) Identify the monomer from which cellulose is made. **1 mark**
- b) Explain what is meant by the term condensation. **1 mark**
- c) Using an example to illustrate your answer, explain how the formation of an additional polymer is different from a condensation polymer. **2 marks**

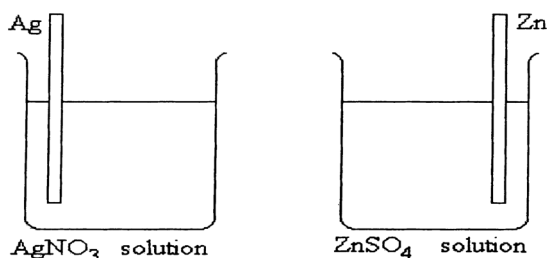
### 3. (5 marks)

A chemistry student set up the following experiment to measure the heat of combustion of ethanol. Pure ethanol was used as 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 0.30g of ethanol produced an energy change of 5.2kJ. Calculate the experimental molar heat of combustion of ethanol. **2 marks**
- (c) The accepted value for the heat of combustion of ethanol, 1364kJ/mol, is higher than the value obtained experimentally. Account for the difference between the two values. **2 marks**

#### 4. (5 marks)

Two beakers are set up as follows.



- On the diagram include additional components needed to obtain an electric current from this arrangement. **1 mark**
- Label on the diagram
  - the cathode and anode
  - the direction of electron movement**2 marks**
- Construct the equation for the cell reaction **1 mark**
- Determine the cell voltage under standard conditions. **1 mark**

#### 5. (5 marks)

Account for the many uses of ethanol as a solvent for both polar and non-polar substances.

#### 6. (4 marks)

Describe how commercial radioisotopes are produced, and how transuranic elements are produced.

#### 7. (2 marks)

Compare the dry cell or the lead-acid's impact on the environment and on society with that of another battery you have studied in your course.

#### 8. (3 marks)

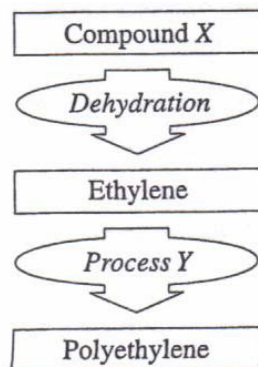
- Using a labelled diagram, demonstrate how polystyrene can be produced from its monomer. **2 marks**
- Explain ONE use of this polymer in terms of ONE of its physical properties. **1 mark**

**9. (4 marks)**

The flowchart shows the production of polyethylene.

(a) Identify Compound X. 1 mark

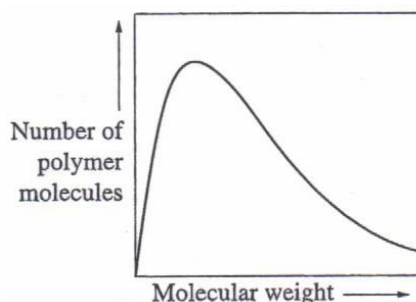
(b) Describe Process Y. 3 marks



**10. (1 marks)**

A sample of polyethylene was produced by Process Y. The following graph shows the distribution of molecular weights of polymer molecules in the sample.

Why is a range of molecular weights observed?



**11. (5 marks)**

During your practical work you performed a first-hand investigation to distinguish between an alkene and the corresponding alkane.

(a) Name the alkene used in your investigation. 1 mark

(b) Identify a potential hazard in your investigation, and outline how you addressed this hazard. 2 marks

(c) Outline the procedure you used for your first-hand investigation. 2 marks

**12. (5 marks)**

Assess the viability of the use of cellulose from biomass as a substitute for carbon chain structures obtained from petroleum.

**13. (2 marks)**

Explain why recycling of plastics is an important means of conserving our fossil fuel resources.

**14. (4 marks)**

Explain why ethanol will dissolve in both water and in pentane.

**15. (6 marks)**

During the course you performed a first hand investigation to determine the molar heat of combustion of an alkanol. Outline a procedure for determining the heat of combustion of an alkanol and justify the procedure you used.

**16. (4 marks)**

- (a) Draw the structural formula for ethanol. **1 mark**
- b) Identify and explain the implications of using ethanol as a fuel extender. **3 marks**

**17. (2 marks)**

The iron supporting posts in jetties are fitted with magnesium or zinc bars below the water line to protect them from corrosion by sea water. Use  $E^0$  to explain:

- (a) How magnesium protects the iron against corrosion. **1 mark**
- (b) Whether sodium metal would be a suitable alternative for protecting iron. **1 mark**

**18. (3 marks)**

For this exam, you have been supplied with a data sheet containing a table showing some standard potentials. You have used this information in your course to calculate the  $E$  requirement of different electrochemical processes.

Describe the standard conditions under which these values were obtained and explain why they are necessary.

**19. (4 marks)**

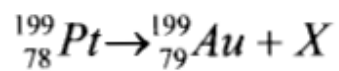
In 1794, Volta constructed the first electrochemical cell. He used a zinc plate and a copper plate separated by a sheet of paper moistened with sodium chloride solution.

He observed that the zinc plate was gradually eaten away as the cell operated but the copper was not. Small bubbles of gas (hydrogen) formed continuously at the surface of the copper nearer the paper.

- a) The cell did not operate when the paper was moistened with pure water. Why **1 mark**
- b) Explain why this cell is classed as a galvanic cell and not an electrolytic cell **1 mark**
- c) Discuss how this cell has impacted (benefited) on modern society **2 marks**

**20. (3 marks)**

The following equation shows the nuclear decay of commercially produced radioactive platinum-199.



a) Identify X.

**1 mark**

b) Describe a process that can be used to process this radiation.

**2 marks**

**21. (3 marks)**

Describe how beta emitters (such as sodium-24, used to detect leaks) are manufactured