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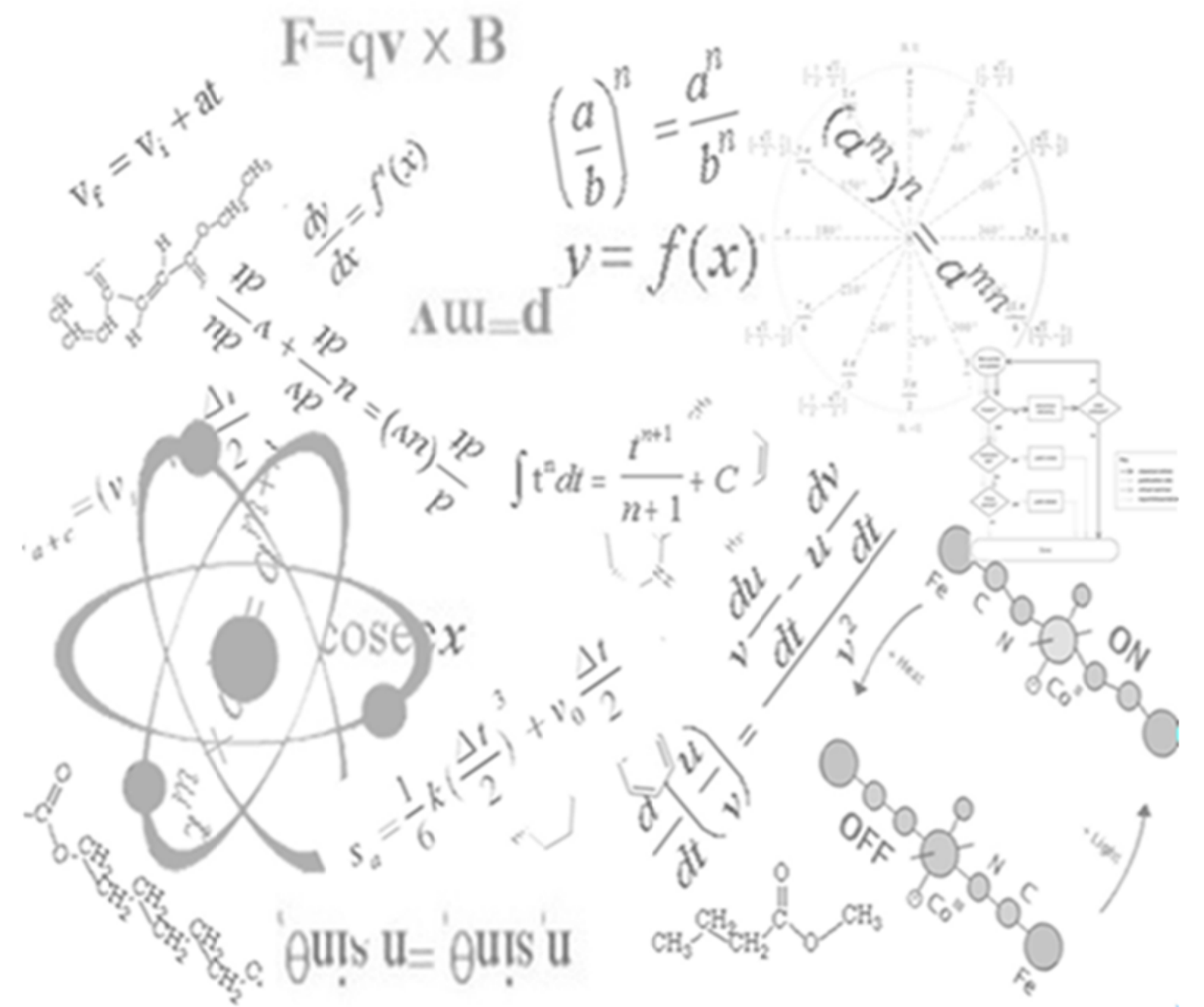
S4S coaching

Year 12- Chemistry

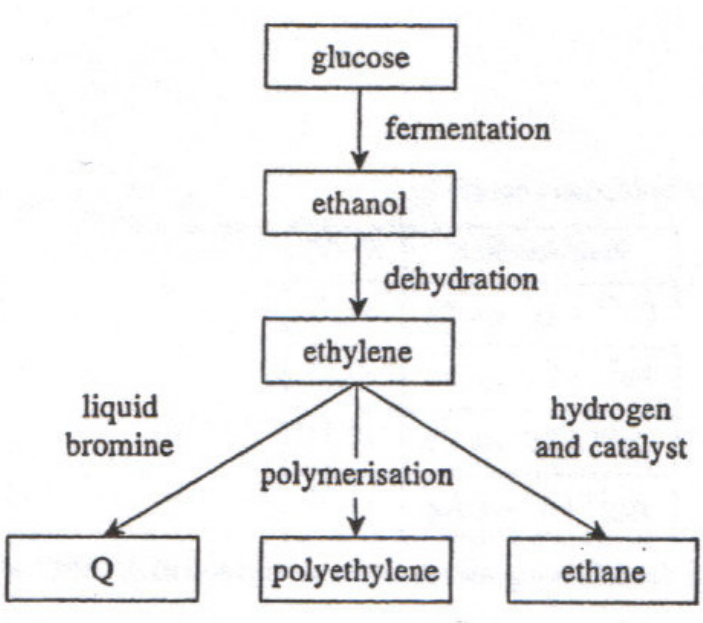
Production of Materials



Production of Materials exam 1 – Questions

1. (4 marks)

The following flow diagram shows a series of reactions.



(a) Draw a structural equation to illustrate the production of Q **1 mark**

(b) Ethylene can be readily converted into ethane. Give a reason for the presence of a catalyst in this reaction.

1 mark

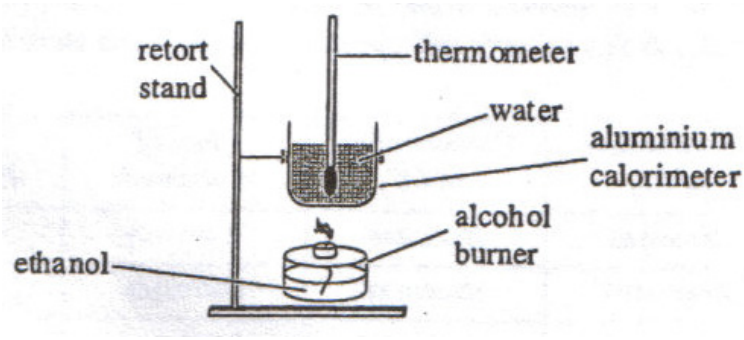
(c) Polyethylene can be used as a cling film. Describe this use in terms of its properties **2 marks**

2. (5 marks)

Assess the suitability of biomass as a future source of energy and chemicals for industry.

3. (6 marks)

A Student assembled the following equipment in order to determine the molar heat of combustion of ethanol.



Experimental results found that the temperature of 100mL of water increased from 18°C to 58°Con burning 0.76 grams of ethanol.

(a) Define the term molar heat of combustion **1 mark**

(b) Write a balanced chemical equation for the complete combustion of ethanol **1 mark**

(c) Calculate the molar heat of combustion of ethanol based on the experimental results **2 marks**

(d) Explain how this calculated value would compare to the theoretical value **2 marks**

4. (2 marks)

What structural feature is responsible for the difference between LDPE and HDPE?

5. (5 marks)

The structures of two commercially significant monomers are shown.

(a) Identify the common name of ONE of the monomers. **1 mark**

(b) The uses of polymers are dependent on their properties. Discuss this statement with reference to a polymer made from one of the above monomers. **3 marks**

(c) Draw the structure of a polymer made from one of the above monomers. **1 mark**

6. (2 marks)

Why does industry need to convert ethylene to vinyl chloride?

7. (3 marks)

Cobalt - 60 forms when cobalt - 59 captures a neutron.

(a) Write a balanced nuclear equation for this reaction. **2 marks**

(b) Explain why cobalt - 60 is produced in a nuclear reactor rather than a cyclotron (particle accelerator).

1 mark

8. (6 marks)

Evaluate ethanol's ability and progress as a fuel.

9. (5 marks)

Draw the electrochemical cell:

$$C_{(s)} | Fe^{2+}, Fe^{3+} \| Cu^{2+}, Cu_{(s)}$$

Label the anode and cathode and write the redox half equations and full equation to determine the voltage produced by the cell.

10. (1 mark)

On February 1, 2004, the synthesis of the transuranic elements ununpentium (Z = 115) and ununtrium (Z = 113) was reported by Russian and American scientists. Identify ONE safe practice which must be adopted with radioactive elements such as these.

11. (4 marks)

Ethane can be cracked to form ethene and hydrogen at 850 degrees. The reaction is strongly exothermic.

a) Construct the equation for this reaction **1 mark**

b) Justify the use of high temperature for this reaction **1 mark**

c) Describe what is observed when ethane and ethene gases are bubbled separate through bromine water

2 marks

12. (2 marks)

Ethene is commonly obtained from oil as a byproduct of cracking. Name a commonly used catalyst in this industrial process and state if it is classified as a homogenous or heterogenous compound.

13. (3 marks)

Vinyl chloride is an important monomer for the production of polymer, PVC.

(a) Distinguish between the terms monomer and polymer. **1 mark**

(b) Describe uses of PVC and relate them to the properties of PVC. **2 marks**

14. (2 marks)

Explain what is meant by condensation polymerisation. Include an example of a naturally occurring condensation polymer.

15. (3 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) Using an example to illustrate your answer, explain how the formation of an additional polymer is different from a condensation polymer. **2 marks**

16. (4 marks)

"Synthetically produced biopolymers are believed to have great potential for the future as they will replace those polymers obtained from the petrochemical industry".
Assess the development of a biopolymer with reference to this statement.

17. (5 marks)

The table shows properties of some fuels.

Fuel	*Main sources*	*Heat of combustion* ($kJ\ g^{-1}$)	*Boiling point* (°C)
Methane	• Petrochemical industry	55.6	–161.5
Propane	• Petrochemical industry • Natural gas	50.3	–42.1
Octane	• Refined from crude oil	47.9	125.7
Ethanol	• Hydration of ethene • Fermentation	29.7	78.3

Assess the potential of ethanol as an alternative fuel, making use of data from the table.

18. (2 marks)

(a) Write a balanced equation to show how ethanol can be made from an alkene. **1 mark**

(b) What name is given to this type of reaction? **1 mark**

19. (4 marks)

A galvanic cell was set up using two metals A and B

$$A^{2+}_{(aq)} + 2e^- \rightleftharpoons A_{(s)}$$

$$B^{+}_{(aq)} + e^- \rightleftharpoons B_{(s)}$$

A voltmeter showed that metal B was 1.2V positive with respect to metal A.

(a) Draw a fully labeled diagram for this galvanic cell. **2 marks**

(b) A second cell was set up using metals B and C

$$C^{2+}_{(aq)} + 2e^- \rightleftharpoons C_{(s)}$$

In this cell, metal B was 0.4V positive with respect to metal C.

Arrange these three metals in order of decreasing strength as a reductant. Justify your answer.

2 marks

20. (1 mark)

What is meant by the superscript 0 in E^0?

21. (2 marks)

Describe the conditions under which a nucleus is unstable.

22. (3 marks)

Nuclear chemistry provides a range or materials that can be used in industry and medicine. Discuss the problems associated with the use of these materials.

23. (2 marks)

The transuranic element, curium-242, is made by bombarding plutonium-239 with alpha particles; a small particle is emitted in the process.

(a)What are transuranic elements? **1 mark**
(b)Write a nuclear equation for the process described above. **1 mark**

24. (1 mark)

Identify and describe ONE method of detecting nuclear radiation.