

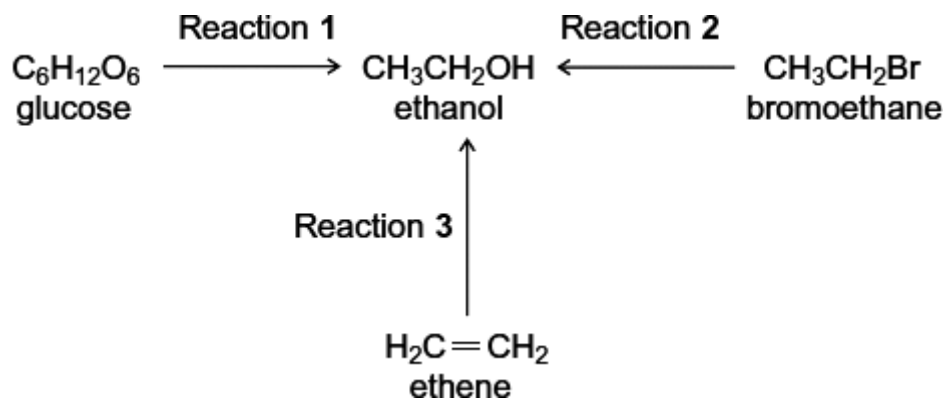
Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Q1.

Three different ways of producing ethanol are shown below.



- (a) Reaction 1 produces a 15% aqueous solution of ethanol.
It is claimed that the ethanol produced in this way is a carbon-neutral biofuel.

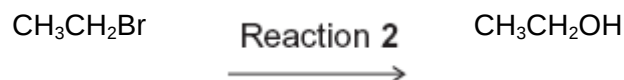
Write an equation for Reaction 1 and name the process.

Write an equation for the complete combustion of ethanol.

Explain why the ethanol produced by this process may **not** be a *carbon-neutral* biofuel.

(5)

- (b) Give a reagent and conditions for Reaction 2.



Name and outline a mechanism for Reaction 2.

Suggest **one** reason, other than safety, why this method is **not** used in industry to make ethanol.

(6)

(c) Reaction 3 is used in industry.



Identify a suitable catalyst for Reaction 3.

Identify the type of reaction.

Give **two** conditions, in addition to the presence of a catalyst, necessary for Reaction 3 to produce a high yield of ethanol.

(4)

(Total 15 marks)

Q2.

- (a) Give the **formula** of a Group 2 metal hydroxide used in agriculture.

(1)

- (b) Identify a sodium halide that does **not** undergo a redox reaction when added as a solid to concentrated sulfuric acid.

(1)

- (c) Chlorine gas reacts with cold dilute sodium hydroxide solution to form sodium chloride and another chlorine-containing compound, **X**.

Give the **formula** of **X**.

(1)

- (d) Give the **formula** of the substance responsible for the orange colour when chlorine gas is bubbled through an aqueous solution of sodium bromide.

(1)

- (e) Solid sodium iodide undergoes a redox reaction with concentrated sulfuric acid.

Give the **formula** for each of the following in this reaction.

Formula of the solid reduction product _____

Formula of the oxidation product _____

(2)

- (f) Draw the structure of each of the following organic compounds.

- (i) The hydrocarbon that is a chain isomer of methylpropene, but does **not** exhibit E–Z stereoisomerism.

(1)

- (ii) The alcohol that is a position isomer of butan-2-ol.

(1)

- (iii) The hydrocarbon that has a peak, due to its molecular ion, at $m/z = 44$ in its mass spectrum.

(1)

- (iv) The bromoalkane that reacts with sodium cyanide to produce propanenitrile.

(1)

(Total 10 marks)