1. The reaction between hydrogen, H_2, and iodine, I_2, is reversible.

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

The reaction is exothermic.

What will increase the yield of hydrogen iodide, HI?

A Adding a catalyst
B Adding less hydrogen
C Decreasing the temperature
D Increasing the pressure

Your answer ☐ **[1]**

2(a). Methanol, CH_3OH, is made in industry by reacting carbon monoxide with hydrogen.

This is the equation for the reaction.

$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$

The forward reaction is exothermic.

A catalyst is used to speed up the reaction.

Describe the effect on the position of equilibrium from using a catalyst.

_____

_____ **[1]**

(b). A temperature of 250 °C and a pressure of 100 atmospheres is used for the reaction.

i. Describe and explain the effect on the yield of methanol from using a pressure of 15 atmospheres.

_____

_____

_____

_____ **[3]**

ii. The yield of methanol is greater when a temperature of 150 °C is used instead of 250 °C.

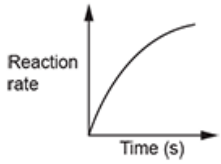
Suggest why a temperature of 150 °C is **not** used in industry.

_____

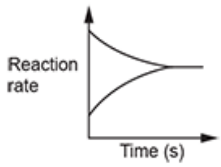
_____ **[1]**

3. Which graph shows a dynamic equilibrium?

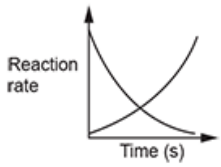
A



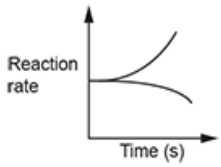
B



C



D



Your answer ☐ **[1]**

END OF QUESTION PAPER