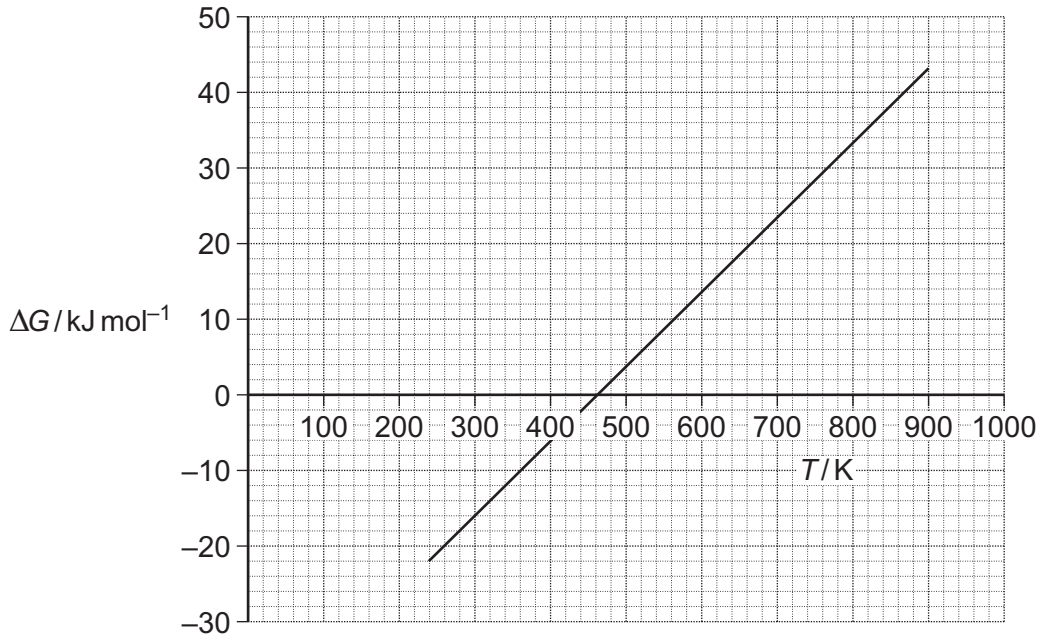
Do not write outside the box

2 The following equation shows the formation of ammonia.

$$\tfrac{1}{2}N_2(g) + \tfrac{3}{2}H_2(g) \longrightarrow NH_3(g)$$

The graph shows how the free-energy change for this reaction varies with temperature above 240 K.



2 (a) Write an equation to show the relationship between ΔG, ΔH and ΔS.

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(1 mark)

2 (b) Use the graph to calculate a value for the slope (gradient) of the line. Give the units of this slope and the symbol for the thermodynamic quantity that this slope represents.

Value of the slope .....

.....

Units .....

Symbol .....

(3 marks)

Do not write outside the box

2 (c) Explain the significance, for this reaction, of temperatures below the temperature value where the line crosses the temperature axis.

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(2 marks)

2 (d) The line is not drawn below a temperature of 240 K because its slope (gradient) changes at this point.

Suggest what happens to the ammonia at 240 K that causes the slope of the line to change.

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(1 mark)

7

Turn over for the next question