



Oxford Cambridge and RSA

## **A Level Chemistry A**

**H432/03** Unified chemistry

### **Question Set 1**

- 1** Within the permafrost in Arctic regions of the Earth, large amounts of methane are trapped within ice as 'methane hydrate',  $\text{CH}_4 \cdot x\text{H}_2\text{O}$ . Methane makes up about 13.4% of the mass of 'methane hydrate'.

Scientists are concerned that global warming will melt the permafrost, releasing large quantities of methane into the atmosphere.

- (a)** The H–O–H bond angle in ice is about  $109^\circ$  but about  $105^\circ$  in gaseous  $\text{H}_2\text{O}$ .

Explain why there is this difference.

**[3]**

- (b)** Why are scientists concerned about the release of methane into the atmosphere?

**[1]**

- (c)** Determine the formula of 'methane hydrate',  $\text{CH}_4 \cdot x\text{H}_2\text{O}$ .

In the formula, show the value of  $x$  to **two** decimal places.

**[2]**

- (d)** Calculate the volume of methane, in  $\text{dm}^3$ , that would be released from the melting of each 1.00 kg of 'methane hydrate' at 101 kPa and  $0^\circ\text{C}$ .

Give your answer to **three** significant figures.

**[4]**

- (e)** Suggest why some industries are interested in the presence of 'methane hydrate' in regions of the Earth.

**[1]**

**Total Marks for Question Set 1: 11**

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