

Practice exam questions for Chapter 6: Molecules and intermolecular forces (Write-on version)

Question 1 (Bursary 2000 Question 6)

Hydrogen fluoride, HF, is liquid at 0 °C whereas all the other hydrogen halides are gases at this temperature.

- a Name the intermolecular attraction responsible for the unusually high boiling point of HF. **A**

- b HF is called a binary compound because it contains only two elements.
Name TWO binary compounds (other than HF) where the same type of intermolecular attraction present in HF is also important. **A**

i _____

ii _____

Question 2 (Bursary 2001 Question 1: modified)

Element	Atomic Number	Melting Point / °C
Aluminium	13	660
Silicon	14	1410 °C
Chlorine	17	-101

The table above shows the melting points of three elements from row 3 of the periodic table. Discuss why the melting points of aluminium and silicon are much higher than that of chlorine. **A M E**

$$\begin{array}{c} \text{O} \\ \parallel \\ \text{HO}-\text{C}-\text{C}-\text{CH}_2-\text{CH}_2-\text{C}=\text{O} \\ \mid \quad \mid \quad \quad \quad \mid \\ \text{H} \quad \text{N} \quad \quad \quad \text{O} \\ \mid \quad \mid \quad \quad \quad \mid \\ \text{H} \quad \text{H} \quad \quad \quad \text{OH} \end{array}$$

90°	109^0	120°	180°	210°
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Angle α	Angle β
Justify your answer.	Justify your answer.

Question 4 (Bursary 2001 Question 5: modified)

a The table below contains data on some compounds that can be used as fuels.

Name	Formula	$M/\text{g mol}^{-1}$	Melting point/ $^{\circ}\text{C}$	Boiling point/ $^{\circ}\text{C}$	$\Delta_{\text{c}}H/\text{kJ mol}^{-1}$
ethane	C_2H_6	30	-183	-88	-1557
methanol	CH_3OH	32	-97	64	-725
hydrazine	H_2NNH_2	32	1	114	-534

What is the physical state of the following substances at room temperature (25 $^{\circ}\text{C}$)? Circle your chosen answer. **A**

i Ethane: solid liquid gas

ii Hydrazine: solid liquid gas

iii Use the data in the table above to explain how you made your choice. **A M**

b Oxygen, O_2 , has a similar molar mass to methanol, but melts at -219°C .

Explain why there is a difference between the melting points of oxygen and methanol. **A M**

c Draw the Lewis structure for hydrazine, H_2NNH_2 . **A**

d Hydrazine has been widely used as a fuel. However, it melts at 1°C so it is not an ideal fuel if the temperature drops below this point. Methylhydrazine, CH_3HNNH_2 , or dimethylhydrazine, $(\text{CH}_3)_2\text{NNH}_2$, are often used in rocket fuel as they melt at lower temperatures.

Explain why methylhydrazine and dimethylhydrazine have lower melting points than hydrazine. **A M**
