

# 4.3 Intermolecular Forces & Metallic Bonding

## Question Paper

Course	DPIB Chemistry
Section	4. Chemical Bonding & Structure
Topic	4.3 Intermolecular Forces & Metallic Bonding
Difficulty	Hard

**Time allowed:** 70  
**Score:** /53  
**Percentage:** /100

**Question 1a**

a)

Explain why methanol is soluble in water.

[3]

**[3 marks]****Question 1b**

b)

Methanol, ethanol and propan-1-ol are all primary alcohols. Describe and explain the trend in their melting points shown below.

<b>Alcohol</b>	Methanol CH <sub>3</sub> OH	Ethanol C <sub>2</sub> H <sub>5</sub> OH	Propan-1-ol C <sub>3</sub> H <sub>7</sub> OH
<b>Melting point / °C</b>	-97	-114	-126

[4]

**[4 marks]**

### Question 1c

c)

These longer primary alcohols have the following melting points:

Alcohol	C <sub>4</sub> H <sub>9</sub> OH	C <sub>5</sub> H <sub>11</sub> OH	C <sub>6</sub> H <sub>13</sub> OH	C <sub>7</sub> H <sub>15</sub> OH	C <sub>8</sub> H <sub>17</sub> OH	C <sub>9</sub> H <sub>19</sub> OH	C <sub>10</sub> H <sub>21</sub> OH
Melting point / °C	-90	-79	-52	-34	-16	-6	6

Describe and explain this trend.

[4]

**[4 marks]**

### Question 1d

d)

Predict, with a reason, whether ethanol or ethane-1,2-diol will have the higher melting point?

[2]

**[2 marks]**

### Question 2a

a)

$C_2H_6$ ,  $C_4H_{10}$  and  $C_3H_8$  are alkanes.

i)

Put them in order of increasing boiling point and explain your answer.

[3]

ii)

Put them in order of increasing volatility and explain your answer.

[3]

**[6 marks]**

### Question 2b

b)

Predict, with a reason, whether the alkanes are soluble in water and propanone.

[5]

**[5 marks]**

**Question 2c**

c)

Pentane can exist as isomers, including pentane,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  and 2,2-dimethylpropane,  $\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_3$ .

i)

Draw skeletal formula for each isomer shown above.

[2]

ii)

Predict and explain which isomer of pentane would have the greater volatility.

[3]

**[5 marks]**

**Question 2d**

d)

There are two isomers possible with the molecular formula  $C_2H_6O$ .

i)

Draw the skeletal formulae of both isomers

[2]

ii)

Identify the strongest type of intermolecular force present in each isomer

[2]

iii)

Predict which isomer would have the higher melting point

[1]

**[5 marks]****Question 3a**

a)

Explain why transition metals, such as iron, alloy best with other transition metals, such as nickel.

[2]

**[2 marks]**

### Question 3b

b)

State the name of the most common type of iron alloy and the element it is alloyed with.

[2]

[2 marks]

### Question 3c

c)

Describe and explain the trend in the melting points of all the Group 1 metals as you descend the group. Use page 7 of the Data book.

[3]

[3 marks]

### Question 3d

d)

Describe and explain the trend in melting points across the Period 3 metals of sodium, magnesium and aluminium. Use page 7 of the Data book.

[3]

[3 marks]

### Question 4a

a)

Explain why pure gold is not often used to make jewellery.

[2]

[2 marks]

### Question 4b

b)

Gold is often alloyed with other metals.

i)

Suggest why alloying gold is useful.

[2]

ii)

Give some examples of metals that are commonly alloyed with gold.

[2]

[4 marks]



**Question 4c**

c)  
Silver is the best metal electrical conductor.

i)  
Explain how silver conducts electricity so well.

[2]

ii)  
Explain why copper is often used instead of silver in wiring.

[1]

**[3 marks]**