IB · SL · Chemistry

43 mins 7 questions

Structured Questions

# From Models to Materials

Bonding Models / Bonding & Properties / Properties of Alloys / Polymers / Addition Polymers

| | |
|---|---|
| Easy (2 questions) | /13 |
| Medium (3 questions) | /21 |
| Hard (2 questions) | /9 |
| **Total Marks** | **/43** |

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# Easy Questions

**1 (a)** Suggest why elements are found at the bottom of a triangular bonding diagram.

.....

**(1 mark)**

**(b)** Suggest the position of ionic and covalent materials within a triangular bonding diagram. Explain your answer.

.....

.....

**(2 marks)**

**(c)** Name the x-axis and y-axis on a standard triangular bonding diagram.

x-axis: .....

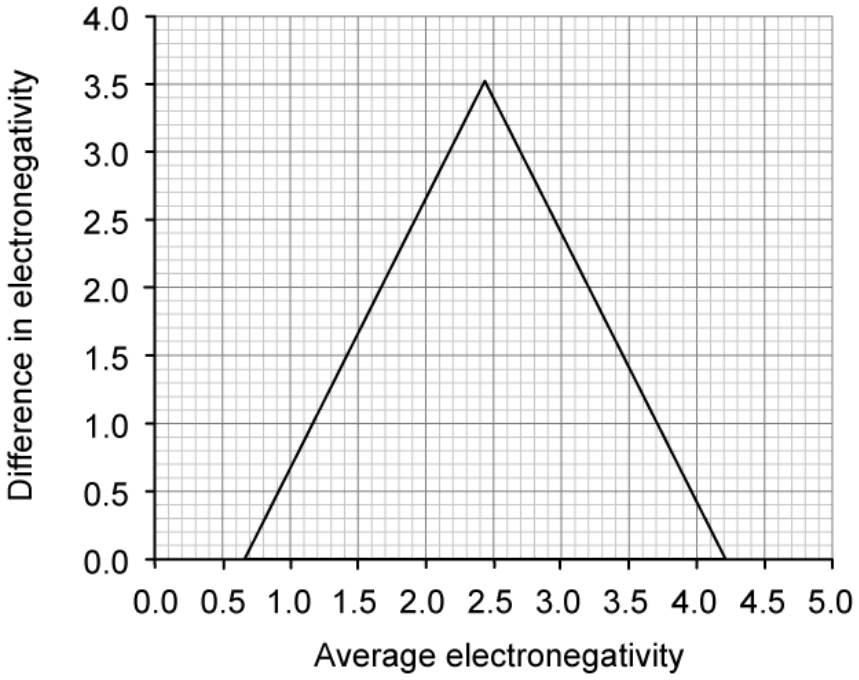
y-axis: .....

.....

.....

**(2 marks)**

**(d)** Using Sections 9 and 17 of the Data Booklet, plot nitrogen trifluoride ($NF_3$) on the triangular bonding diagram.




.....

**(1 mark)**

**2 (a)** Repeating monomer units can be manipulated in various ways to give polymers with different properties.

i) Draw the structural formula of 2-chloropropene.

[1]

ii) Deduce the repeating unit of poly(2-chloropropene).

[1]

.....

.....

**(2 marks)**

**(b)** Poly(2-chloropropene) is formed by the addition polymerisation of 2-chloropene. Deduce the percentage atom economy for this polymerisation reaction.

.....

**(1 mark)**

**(c)** Suggest why poly(2-chloropropene) is:

i) Unreactive.

[2]

ii) Strong.

[1]

iii) Water-resistant.

[1]

.....

.....

.....

.....

**(4 marks)**

# Medium Questions

**1 (a)** The type of bonding and percentage ionic / covalent character of binary compounds can be deduced using triangular bonding diagrams.

Complete the table by calculating Σχ and Δχ for the given compounds.

Use section 9 of the data booklet.

| Compound | Σχ | Δχ |
|---|---|---|
| Ammonia | | |
| Graphite | | |
| Silica | | |

**(3 marks)**

**(b)** Use data from sections 9 and 17 of the data booklet to percentage covalent character and bonding type in the following compounds:

i) $BBr_3$

[1]

ii) $BeH_2$

[1]

iii) SrMg

[1]

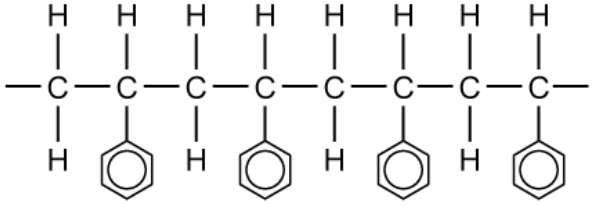
**(3 marks)**

**(c)** Deduce the chemical that is found in the bottom left of a triangular bonding diagram by using sections 9 and 17 of the data booklet.

.....

**(1 mark)**

**2 (a)** Poly(phenylethene) is widely used as a polymer for many purposes such as packaging. The structure of poly(phenylethene) is shown below.



i) State the type of polymerisation required to form poly(phenylethene).

[1]

ii) Draw the monomer used to form poly(phenylethene).

[1]

iii) Suggest why the monomer is liquid at room temperature but the polymer poly(phenylethene) is in the solid state at room temperature.

[2]

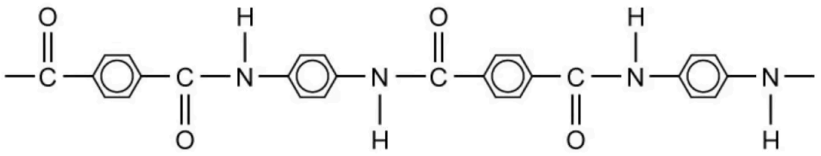
**(4 marks)**

**(b)** Explain why poly(phenylethene) drawn in part (a) is less reactive than Terylene described in part (b).

**(6 marks)**

**3** i) Draw a second strand of Kevlar underneath to show how the strands are attached to one another.

[2]



ii) Use your diagram to explain why Kevlar can be used for making items that require high strength.

[2]

.....

.....

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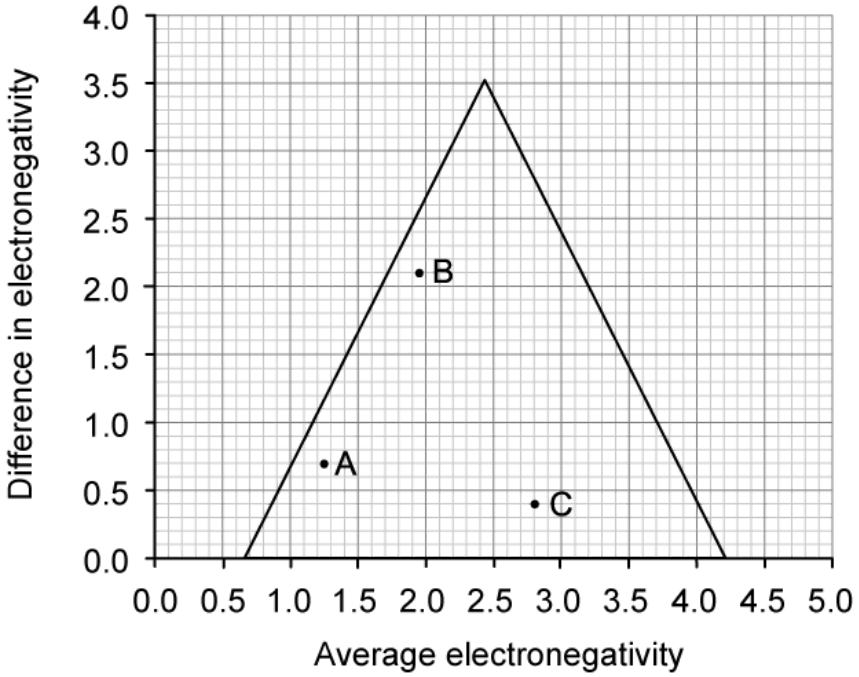
.....

**(4 marks)**

# Hard Questions

**1 (a)** Substances **A**, **B** and **C** are located in the bonding triangle as shown.




Suggest, giving a reason, a physical property that substances **A** and **B** would have in common.

Use the bonding triangle and section 17 of the data booklet.

.....

.....

.....

**(3 marks)**

**(b)** Substance **A** is an alloy containing a Group 1 metal and a Group 2 metal.

Identify the constituent metals in substance **A**, giving a reason.

Use the bonding triangle in (a) and section 9 of the data booklet.

**(2 marks)**

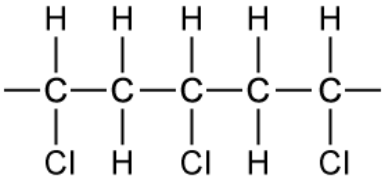
**(c)** Silicon tetrachloride is used to produce high purity silicon and silica for commercial applications.

Explain whether silicon tetrachloride has a higher boiling point than substance **C**.

Use the bonding triangle in (a) and sections 9 and 17 of the data booklet.

**(1 mark)**

**2** The structure shows a section of a polymer found in some plastics.




i) State the type of polymerisation involved in forming this polymer.

[1]

ii) Draw the repeating unit for this polymer.

[1]

iii) Name the monomer used to form this polymer.

[1]

**(3 marks)**