# Tutorial 4 - Solids

May/ June 2008

7 Which pair of elements have bonds of the same type between their atoms in the solid state?

A aluminium and phosphorus

B chlorine and argon

C magnesium and silicon

D sulphur and chlorine

October/November 2007

7 What are the lattice structures of solid diamond, iodine and silicon(IV) oxide?

| | giant molecular | simple molecular |
|---|---|---|
| A | diamond, silicon(IV) oxide | iodine |
| B | diamond, iodine | silicon(IV) oxide |
| C | iodine | diamond, silicon(IV) oxide |
| D | silicon(IV) oxide | diamond, iodine |

3 The elements phosphorus, sulphur, and chlorine are regarded as having simple molecular structures.

(a) What are the molecular formulae of **each** of these three elements?

phosphorus .....

sulphur .....

chlorine ..... [3]

(b) (i) Place the three elements in order of their melting points **with the highest first.**

highest ..... lowest

(ii) Suggest an explanation for the order you have given in **(i)**.

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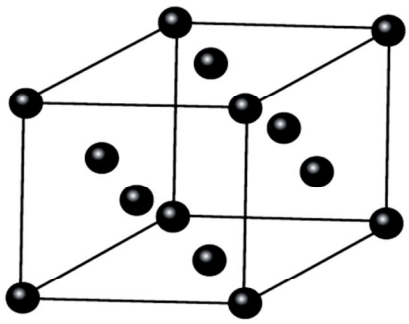
.....[3]

7 Magnesium oxide may be used for the lining of an electric furnace for making crockery.

Which properties of magnesium oxide help to explain this use?

| | strong forces between particles | ionic bonding | electrical conductor |
|---|---|---|---|
| A | yes | yes | no |
| B | yes | no | yes |
| C | no | yes | no |
| D | no | no | yes |

2 Copper and iodine are both solids which have different physical and chemical properties. Each element has the same face-centred crystal structure which is shown below.



The particles present in such a crystal may be atoms, molecules, anions or cations. In the diagram above, the particles present are represented by ● .

**(a)** Which type of particles are present in the iodine crystal? Give their formula.

particle .....

formula ..... [2]

**(b)** When separate samples of copper or iodine are heated to 50 °C, the copper remains as a solid while the iodine turns into a vapour.

**(i)** Explain, in terms of the forces present in the solid structure, why copper remains a solid at 50 °C.

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**(ii)** Explain, in terms of the forces present in the solid structure, why iodine turns into a vapour when heated to 50°C.

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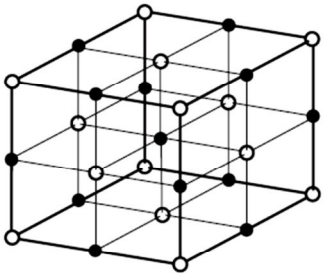
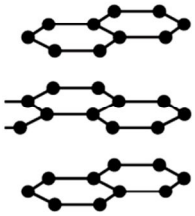
[4]

May/ June 2006

**7** The diagram shows part of the lattice structures of solids **X** and **Y**. [In **X**, ○ and ● represent particles of different elements.]



**X**



**Y**

What are the types of bonding present in **X** and **Y**?

| | X | Y |
|---|---|---|
| A | covalent | metallic |
| B | ionic | covalent |
| C | ionic | metallic |
| D | metallic | ionic |

October/November 2005

**35** What properties enable magnesium oxide to be used as a refractory lining in a furnace?

**1** It has a high melting point.

**2** It has a low thermal conductivity.

**3** It does not react with basic slags.

6 Magnesium oxide is used to line industrial furnaces because it has a very high melting point.

Which type of bond needs to be broken for magnesium oxide to melt?

A co-ordinate

B covalent

C ionic

D metallic

7 Which solid exhibits more than one kind of chemical bonding?

A brass

B copper

C diamond

D ice

October/November 2003

1 **(a)** Salt, sodium chloride, forms transparent colourless crystals. Describe the bonding in sodium chloride crystals, give the formula of each particle and sketch part of the crystal structure.

[3]

**(b)** Explain why crystals of sodium chloride do not conduct electricity, but molten sodium chloride does.

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.....[2]