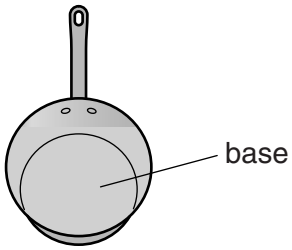
1 Kylie is choosing a metal to make a base for a saucepan.



Look at the information about some metals.

Metal	Melting point in °C	Relative electrical conductivity (1= low, 10= high)	Relative conductivity of heat (1= low, 25= high)	Density in g/cm^3
A	1535	1	4.2	7.9
B	98	2	7.8	1.0
C	1083	6	22.3	8.9
D	660	4	11.8	2.7

(a) Which metal should Kylie choose to make a base for a saucepan?

.....

Explain your answer.

.....

.....

..... **[2]**

(b) Describe **metallic bonding** and explain why metals are good conductors of electricity.

You may wish to draw a labelled diagram.

.....

.....

..... **[3]**

[Total: 5]

2 **(a)** An element **X** has the electronic structure 2.8.8.2.

Explain how you can tell that element **X** is calcium.

.....

..... **[1]**

(b) Chlorine has the electronic structure 2.8.7.

Chlorine, Cl_2, is a covalent molecule.

Use the 'dot and cross' model to describe the bonding in a molecule of chlorine, Cl_2.

You only need to draw the outer shell electrons.

[2]

(c) Sodium chloride, NaCl, contains sodium ions, Na^+, and chloride ions, Cl^-.

Explain why sodium ions are positively charged and chloride ions are negatively charged.

.....

.....

.....

..... **[2]**

(d) Chlorine reacts with sodium bromide solution.

Look at the **ionic** equation for this reaction.

$$Cl_2 + 2Br^- \longrightarrow Br_2 + 2Cl^-$$

Explain why chlorine is **reduced** in this reaction.

.....

..... **[1]**

(e) Chlorine also reacts with potassium iodide solution, KI.

Iodine and potassium chloride are made.

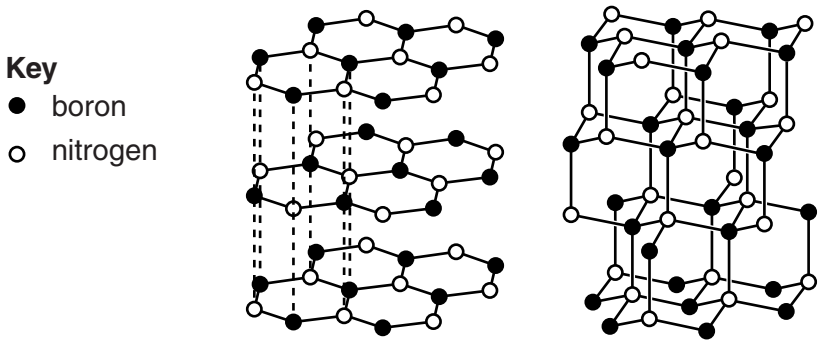
Construct a **balanced symbol** equation for this reaction.

..... **[2]**

[Total: 8]

3 Boron nitride, BN, exists in two physical forms.

The structures of these forms are shown below.



structure **A** structure **B**

These two forms of boron nitride resemble graphite and diamond, the two allotropes of carbon.

(a) Boron nitride, with structure **A**, is slippery.

Explain why, in terms of structure and bonding.

.....

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..... **[2]**

(b) Boron nitride, with structure **B**, has a very high melting point.

Explain why, in terms of structure and bonding.

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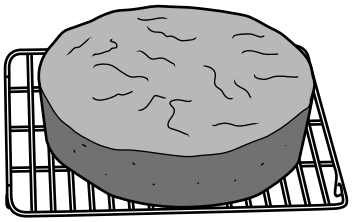
..... **[2]**

[Total: 4]

This question is about chemical changes.

4

(a) Amir is making a cake.



He adds baking powder to the cake mixture.

Baking powder contains sodium hydrogencarbonate.

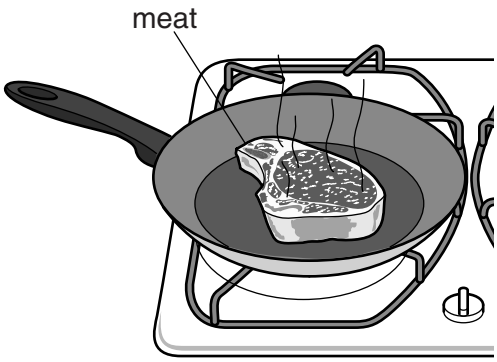
Sodium hydrogencarbonate breaks down when heated in an oven.

Sodium carbonate, water and a gas are the products made.

What gas is made?

..... **[1]**

(b) Amir cooks some meat.



Meat contains protein.

What happens to the **protein molecules** when the meat is cooked?

.....

..... **[1]**

[Total: 2]

5 Some foods contain additives.

An emulsifier stops oil and water in a food from separating.

(a) Phil finds some information about four substances.

Look at this information.

Substance	Is it poisonous?	Does it have a smell?	Cost of making 1g of substance in pence	Does it stop oil and water from separating?
A	yes	no	3	yes
B	no	no	6	yes
C	no	no	1	no
D	no	yes	5	yes

Which substance is the most suitable to be used as an emulsifier in food?

Explain your answer.

.....

.....

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..... **[3]**

(b) A processed food contains an emulsifier.

(i) Draw a diagram of an emulsifier molecule.

Label the **two** important parts of the molecule.

[2]

(ii) The processed food also contains cooked potato.

Potato is easier to digest when it is cooked rather than raw.

Explain why.

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..... **[2]**

6 Look at the electronic structures of some atoms.

Atom	Electronic structure
W	2.8.1
X	2.8.4
Y	2.8.7
Z	2.8.8

(a) (i) One of the atoms is a metal which makes a positive ion.

Which one? Choose from the table.

answer ..... **[1]**

(ii) One of the atoms has a stable electronic structure and is unreactive.

Which one? Choose from the table.

answer ..... **[1]**

(iii) Two of the atoms can combine together by **transferring** electrons to form an **ionic** bond.

Which two? Choose from the table.

..... and ..... **[1]**

(b) Ammonia has the formula, NH_3.

The electronic structure of nitrogen is 2.5.

The electronic structure of hydrogen is 1.

Draw a 'dot and cross' diagram to show the **covalent** bonding in ammonia.

Show all the electrons.

[2]

(c) Sodium chloride is an **ionic** compound.

Sodium chloride

- will not conduct electricity when it is a solid
- will conduct electricity when it is dissolved in water.

Explain these two observations in terms of structure and bonding.

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.....

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..... **[2]**

7 Look at the table. It shows information about the Group 1 metals.

Element	Symbol	Electronic structure	Melting point in °C	Boiling point in °C	Atomic radius in nm
lithium	Li	2.1	181	1342	0.152
sodium	Na	2.8.1	.....	883	0.185
potassium	K	2.8.8.1	64	760	0.227
rubidium	Rb	2.8.18.8.1	39	688	.....

(a) Predict the melting point of sodium and the atomic radius of rubidium.

Write your answers in the table. **[2]**

(b) Sodium reacts with water.

Sodium hydroxide, NaOH, and hydrogen, H_2, are made.

Write a **balanced symbol** equation for this reaction.

..... **[2]**

(c) The Group 1 elements all react in a similar way.

Explain why.

.....

..... **[1]**

(d) Sodium reacts with fluorine. Sodium ions and fluoride ions are made.

The electronic structure of fluorine is 2.7.

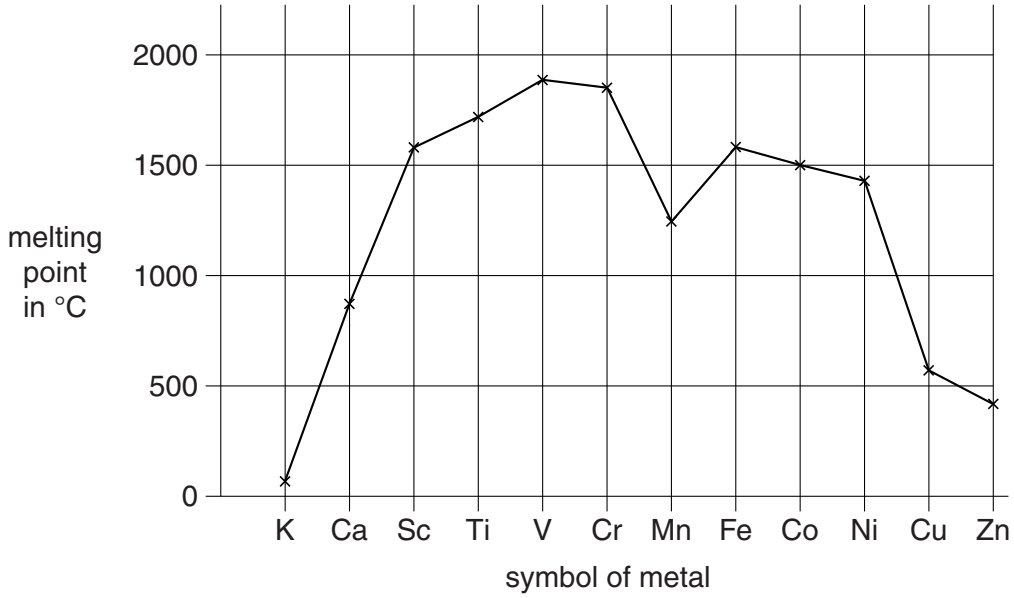
Draw a 'dot and cross' diagram to show the electronic structure of a sodium ion and of a fluoride ion. Include the charges on the ions.

[2]

[Total: 7]

8 Most metals have high melting points.

Look at the graph. It shows the melting points of some metals.



(a) Write the symbol of the metal which has the **weakest** metallic bonds.

..... **[1]**

(b) Describe, using a labelled diagram, what is meant by metallic bonding.

.....

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..... **[2]**

[Total: 3]