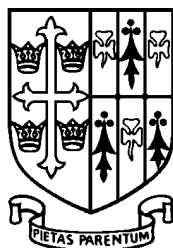


**ST EDWARD'S
OXFORD**



16+ ENTRANCE EXAMINATION

**For entry in
September 2015**

CHEMISTRY

Time: 1 hour

Candidates Name:

Element	Symbol
calcium	
	Pb
	S

(Total 3 marks)

2. (a) Sulphur is a yellow element. It is a non-metal.

(i) Complete the sentence.

In an element, all the atoms

.....

(1)

(ii) Give **two** properties you would expect sulphur to have because it is a non-metal.

1.

.....

2.

.....

(2)

(b) Use the names of metals from the box to complete the table.

copper	iron	magnesium	manganese	zinc
---------------	-------------	------------------	------------------	-------------

Use	Name of metal
for electric wiring in a house
for manhole covers
to galvanise iron

(3)

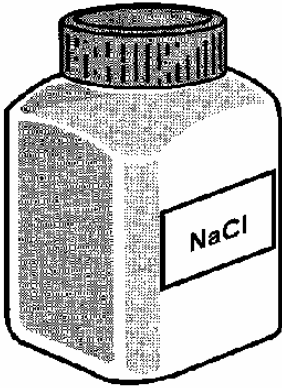
(c) Copper is used to make hot water pipes. Both iron and steel are cheaper.

Suggest **two** reasons why copper is used rather than iron or steel.

- 1.
.....
- 2.
.....

(2)

(d) The drawing shows a container of a compound called sodium chloride.



(i) Which other element has combined with sodium to form this compound?

.....

(1)

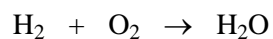
(ii) For every atom of sodium, how many atoms of the other element have combined with it?

.....

(1)

(Total 10 marks)

3. (a) Balance the symbol equation.



(2)

- (b) What atoms does each molecule of H_2O contain?

.....

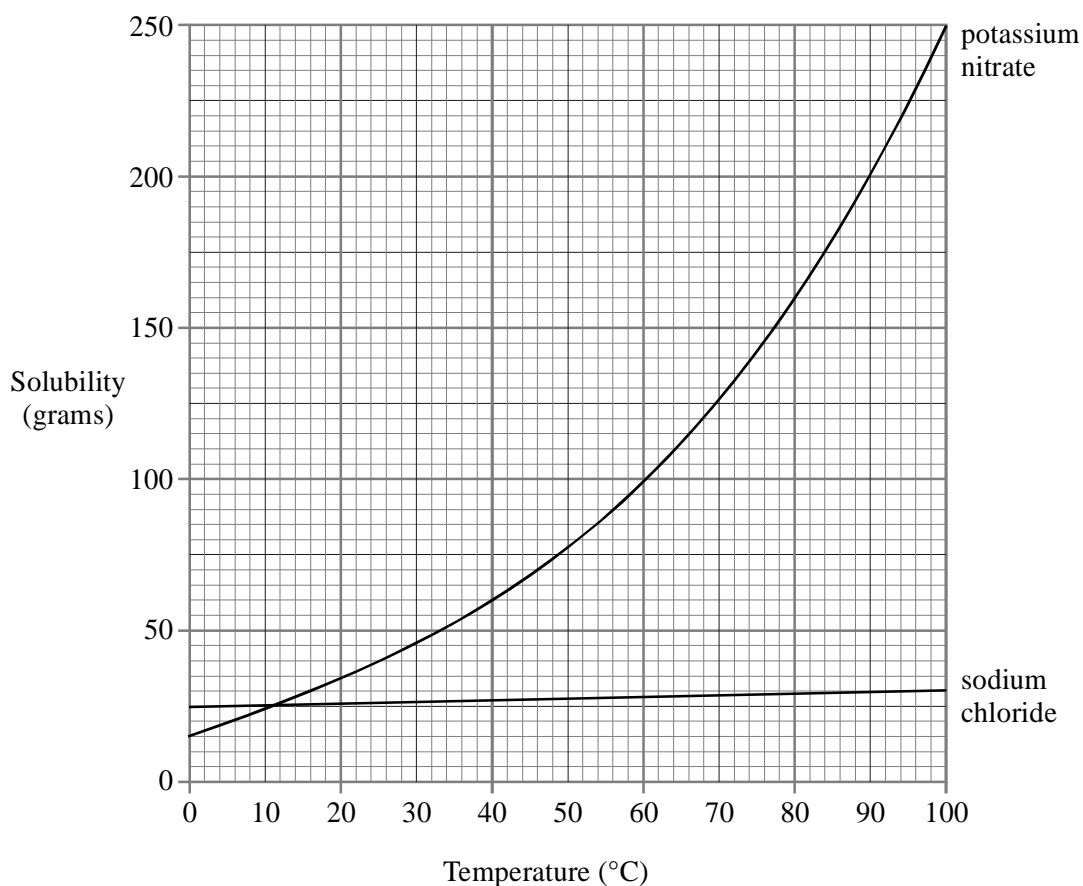
(2)

(Total 4 marks)

4. Some substances dissolve in water.

The solubility of a substance is the number of grams that will dissolve in 100 grams of water.

The diagram below shows how the solubilities of two substances, potassium nitrate and sodium chloride, vary between 0 – 100°C.



(a) How much potassium nitrate dissolves in 100 grams of water at 60°C?

..... grams

(1)

(b) Describe what happens to the solubilities of potassium nitrate and sodium chloride between 0 – 100°C.

Answer in as much detail as you can.

.....

.....

.....

.....

.....

.....

.....

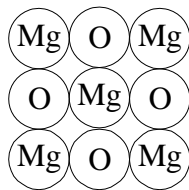
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(5)

(Total 6 marks)

5. Magnesium oxide is a compound, made up of magnesium ions and oxide ions.

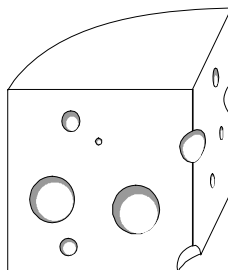


(a) What is the charge on each magnesium ion? (1)

(b) Explain how the magnesium ions get this charge.
.....
.....
..... (2)

(Total 3 marks)

6. The salt sodium hydrogen phosphate (Na_2HPO_4) is used as a softening agent in processed cheese.



It can be made by reacting phosphoric acid (H_3PO_4) with an alkali.

(a) Complete the name of an alkali that could react with phosphoric acid to make sodium hydrogen phosphate.
..... hydroxide (1)

(b) What is the name given to a reaction in which an acid reacts with an alkali to make a salt?
..... (1)

(c) How would the pH change when alkali is added to the phosphoric acid solution?

.....
.....

(1)

(d) What ions are present when any acid is dissolved in water?

.....

(1)

(e) What ions are present when any alkali is dissolved in water?

.....

(1)

(f) Write a chemical equation for the reaction which takes place between the ions you have named in (e) and (f).

.....

(1)

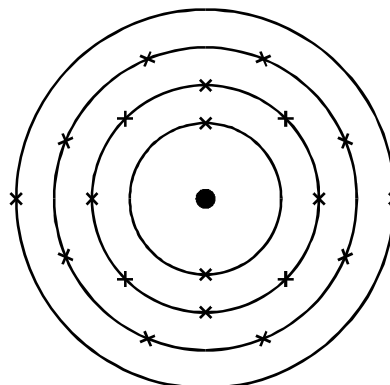
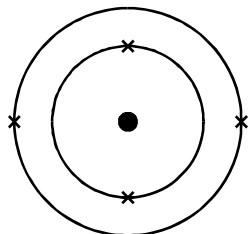
(Total 6 marks)

7. Three elements in Group 2 of the periodic table are beryllium (Be), magnesium (Mg) and calcium (Ca). Their mass numbers and proton numbers are shown below. The electronic structure is shown for beryllium and calcium.

9
Be
4

24
Mg
12

40
Ca
20



- (a) In a similar way, draw the electronic structure for magnesium.

(3)

- (b)
- The three elements have similar chemical properties
 - The reactivity of these elements with non-metals, increases from beryllium to magnesium to calcium.

Explain these two statements in terms of atomic structure.

.....

.....

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.....

.....

.....

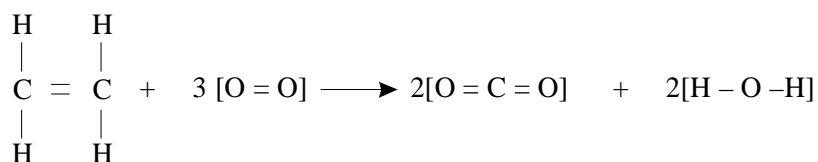
(6)
(Total 9 marks)

8. You will find the information on the Data Sheet helpful when answering this question.

This equation shows the reaction between ethene and oxygen.



The structural formulae in the equation below show the bonds in each molecule involved.



Use the three stages shown at (a), (b) and (c) below to calculate the net energy transfer when the formula mass (1 mole) of ethene reacts with oxygen

- (a) Write down the bonds broken and the bonds formed during the reaction. (Some have already been done for you.)

Bonds broken	
Number	Type
4	[C – H]
1	[C = C]

Bonds formed	
Number	Type
4	[C = O]

(2)

- (b) Calculate the total energy changes involved in breaking and in forming all of these bonds. (Some have already been done for you.)

Total energy change in breaking bonds	
[4 × 413] =	1652
[1 × 612] =	612
Total =	kJ

Total energy change in forming bonds	
4 × [805] =	3220
Total =	kJ

(4)

(c) Describe, as fully as you can, what the figures in (b) tell you about the overall reaction.

.....

.....

.....

.....

.....

(2)
(Total 8 marks)

9. John Newland produced a periodic table in 1866. The first 21 elements in his table are shown in the diagram.

Column						
1	2	3	4	5	6	7
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe

Use the periodic table on the Data Sheet to help you to answer these questions.

- (a) In which **two** columns of Newland's periodic table do all the elements have similar properties?

.....

(1)

- (b) The modern periodic table is arranged in a different order to Newland's table.

- (i) What order is used in the modern periodic table?

.....

(1)

- (ii) Argon has a higher relative atomic mass than potassium. Explain why.

.....

.....

(1)

- (iii) Describe the changes in the number of electrons in the atoms of elements in the period which begins with potassium and ends with krypton.

.....

.....

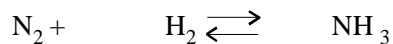
.....

(2)

(Total 5 marks)

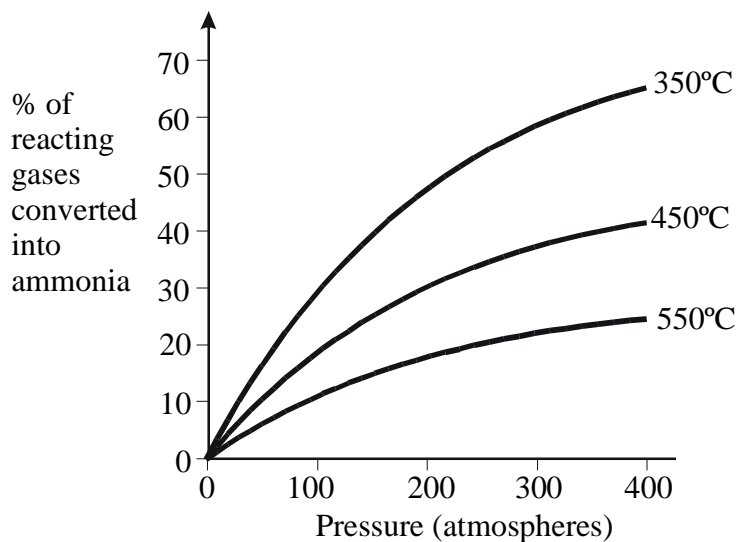
10. Ammonia is manufactured in the Haber Process, from nitrogen and hydrogen.

(a) Balance this symbol equation for the process.



(2)

(b) The graph below shows the percentage of reacting gases converted into ammonia, at different temperatures and pressures.



(i) What does the graph suggest about the temperature and pressure needed to convert the maximum percentage of reacting gases into ammonia?

.....
.....
.....

(2)

(ii) Suggest reasons why the manufacture of ammonia in the Haber Process is usually carried out at about 400°C and 200 atmospheres pressure.

.....
.....
.....

(2)

(Total 6 marks)