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SECTION A

1. The pictures show some uses of metals.

a coating to prevent rusting



electrical wiring



railway tracks



Complete the table.

Use	Name of metal with this use	Property on which the use depends
a coating to prevent rusting		
electrical wiring		
railway tracks		

(Total 6 marks)

Q1



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2. Use the Periodic Table on page 2 to help you answer this question.

(a) Identify the most reactive metallic element in the Periodic Table.

.....
(1)

(b) Give the formula of the compound formed between sodium and the most reactive element in Group 7.

.....
(1)

(c) All of the metals in Group 1 react with water. There are similarities between the reactions. Put a cross (☒) in **three** boxes to show which statements apply to the reactions of **all** Group 1 metals with water.

- a flame is seen
- a solution of the metal hydroxide is formed
- a solution of the metal oxide is formed
- carbon dioxide is formed
- hydrogen is formed
- the metal sinks
- the solution formed is acidic
- the solution formed is alkaline

(3)

(d) The elements in Group 0 were originally thought to be totally unreactive. However, in 1962 the first compound of xenon was made but it was not until 2000 that the first compound of argon was made.

What does this order of discovery suggest about the trend in reactivity of the elements in Group 0?

.....
.....
(1)

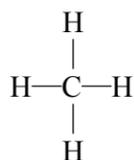
Q2

(Total 6 marks)



3. Methane, CH₄, is an organic compound. It is the first member of an homologous series of **saturated hydrocarbons**.

The displayed formula of methane is



- (a) What is meant by the term **hydrocarbon**?

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

(2)

- (b) What is meant by the term **saturated**?

.....
.....

(1)

- (c) Name the homologous series of which methane is the first member.

.....

(1)

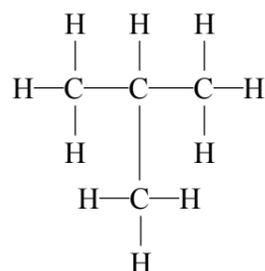
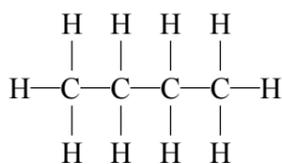
- (d) Draw the displayed formula of the second member of this homologous series.

(2)



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blank

(e) The displayed formulae of two other organic compounds are



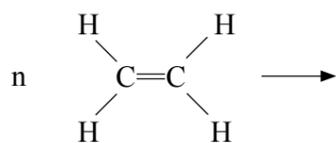
(i) What is the molecular formula of these two compounds?

..... (1)

(ii) What name is given to compounds that have the same molecular formula but different displayed formulae?

..... (1)

(f) Some other organic compounds are used to make polymers.
Poly(ethene) is an addition polymer made from many identical monomer molecules.
Complete the following equation to show the formation of poly(ethene).



(2)

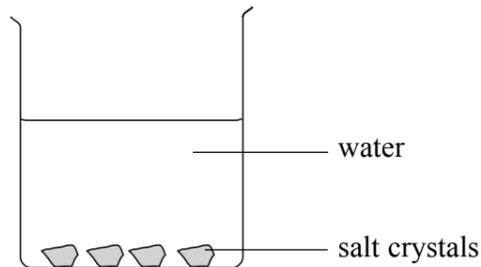
Q3

(Total 10 marks)



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4. A few crystals of a green salt are placed in a beaker of cold water. The crystals start to dissolve.



- (a) Describe how the appearance of the contents of the beaker change over a period of time.

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

(2)

- (b) Name the process that occurs after the crystals dissolve.

.....

(1)

- (c) How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.

Difference

.....

Explanation

.....

(2)

- (d) A sample of the solution is removed from the beaker. Describe a test, and its result, that would show the sample contains ammonium ions.

Test

.....

Result

.....

(3)

Q4

(Total 8 marks)

TOTAL FOR SECTION A: 30 MARKS



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N 3 4 0 3 5 A 0 9 2 0

<p>(d) Ammonia and sulphuric acid react together to make a compound used in fertilisers.</p> <p>(i) Name the compound formed when ammonia and sulphuric acid react together, and write a chemical equation for the reaction that occurs.</p> <p>Name</p> <p>Equation</p> <p>..... (3)</p> <p>(ii) State the type of reaction occurring.</p> <p>..... (1)</p> <p style="text-align: right;">(Total 16 marks)</p>	<p>Leave blank</p> <p style="text-align: center;">Q5</p>



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6. (a) The atoms in a molecule of hydrogen are joined by a strong covalent bond.

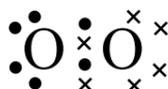
What is a covalent bond?

.....
.....
(1)

(b) Explain why hydrogen is a gas at room temperature.

.....
.....
(2)

(c) A molecule of oxygen can be represented by a dot and cross diagram:



Draw a dot and cross diagram, showing only the outer electrons, to represent a molecule of water.

(2)



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blank

(d) The combustion of hydrogen gives out a lot of heat.

(i) What term is used to describe reactions that give out heat?

.....
(1)

(ii) State whether the heat energy change, ΔH , for the reaction is positive or negative.

.....
(1)

(iii) Explain your answer by referring to the strengths of the bonds in the molecules of the reactants and products.

.....
.....
.....
.....
.....
(3)

(e) On cooling, the $\text{H}_2\text{O}(\text{g})$ produced in the combustion of hydrogen is converted into $\text{H}_2\text{O}(\text{l})$.

Describe how the speed of, and the distance between, the particles change during this conversion.

Speed of particles

Distance between particles

(2)

(f) When water is added to white anhydrous copper(II) sulphate, blue hydrated copper(II) sulphate is formed.

Write a chemical equation for the reaction that occurs. Include state symbols in the equation.

.....
.....
(3)

(Total 15 marks)

Q6

13

Turn over



7. A sample of copper contains two isotopes.

(a) What are isotopes?

.....

(2)

(b) (i) Complete the table for these isotopes of copper.

Atomic number	Mass number	Number of protons	Number of neutrons	Percentage of each isotope in sample
29	63			69
		29	36	31

(3)

(ii) Use information from the table to calculate the relative atomic mass of this sample of copper. Give your answer to one decimal place.

(2)

(c) Identify the element, and its mass number, which is used in the definition of relative atomic mass.

.....

(2)

(d) Why do the two isotopes of copper have the same chemical properties?

.....

(1)



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- (e) Copper is a transition metal. State two properties of copper or its compounds that are typical of transition metals but not of other metals.

1

2

(2)

- (f) Copper(II) sulphate is formed when copper(II) carbonate is added to dilute sulphuric acid.

Describe the colour change seen and write a chemical equation for the reaction. Include state symbols in the equation.

Colour change

Chemical equation

.....

(4)

- (g) The presence of copper(II) ions in copper(II) sulphate solution can be tested for using aqueous solutions of sodium hydroxide and ammonia.

- (i) State the formula and colour of the precipitate formed when aqueous sodium hydroxide is added to copper(II) sulphate solution.

Formula

Colour

(2)

- (ii) When a small amount of aqueous ammonia is added to copper(II) sulphate solution, the same precipitate forms as in (g)(i).

Describe what you would observe when excess aqueous ammonia is added to this precipitate.

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.....

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.....

(2)

Q7

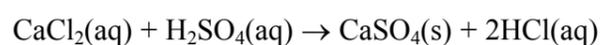
(Total 20 marks)

15

Turn over



8. Calcium sulphate can be prepared using a precipitation reaction between calcium chloride solution and dilute sulphuric acid.



- (a) State three steps needed to produce a pure dry sample of calcium sulphate from the mixture formed in this reaction.

Step 1

Step 2

Step 3

(3)

- (b) A 5.55 g sample of calcium chloride ($M_r=111$) is dissolved in water to make a solution.

- (i) Calculate the amount, in moles, in the sample of calcium chloride.

.....

.....

.....

(2)

- (ii) What amount, in moles, of sulphuric acid is needed to react completely with the calcium chloride solution?

.....

.....

(1)

- (iii) Calculate the relative formula mass of calcium sulphate. Use data from the Periodic Table on page 2.

.....

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(1)



(iv) Calculate the mass, in grams, of calcium sulphate formed.

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.....
.....

(2)

(Total 9 marks)

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Q8

TOTAL FOR SECTION B: 60 MARKS

TOTAL FOR PAPER: 90 MARKS

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