

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

652/02

GCSE IN APPLIED SCIENCE (Double Award)

Unit 2: Science for the Needs of Society

HIGHER TIER (Grades D-A*)

A.M. WEDNESDAY, 18 January 2006

(1 hour 30 minutes)

For Examiner's use only	
Section A	
Section B	
Total	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

SECTION A (40 marks)

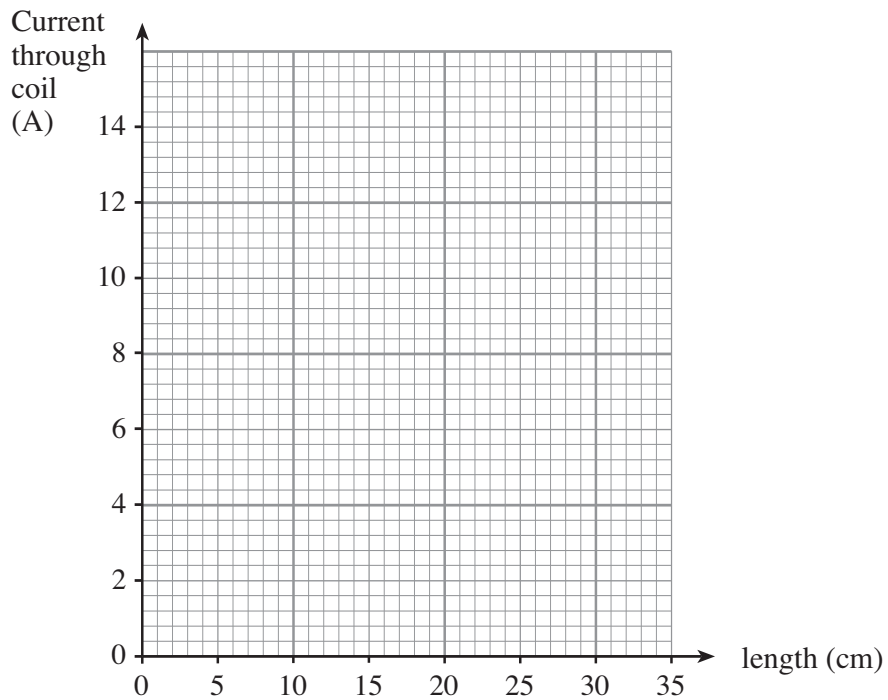
Answer all the questions in the spaces provided.

1. A manufacturer makes heating coils for 230V fan heaters.
They investigated how the current through the coil depended on the length of wire.
The results of their investigation are shown in the table.

Length (cm)	Current (A)
5	12
10	6
15	4
20	3
30	2

- (a) Plot these points on the grid and join them with a suitable line.

[3]



- (b) (i) The manufacturer decided to use a coil taking a current of 8A.
Use the graph to find the length of wire needed to make the coil.

[1]

Length = cm

- (ii) Write down **in words**, an equation connecting power, current and voltage.

[1]

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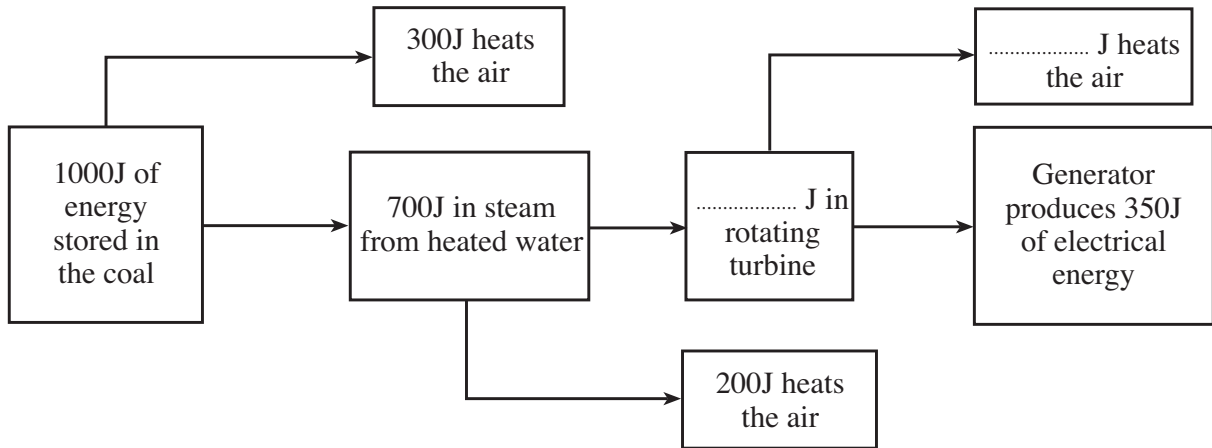
- (iii) Calculate the power in this coil when connected to 230V.

[2]

Power = W

2. Some power companies produce electricity by using coal.
Not all the energy stored in the coal is eventually converted into electrical energy.

(a) The diagram below shows the energy flow in the process of producing electricity.



- (i) Complete the flow diagram by filling in the missing energy values. [2]
- (ii) State the useful energy output from an input of 1000J. [1]
- (iii) Explain what is meant by the following sentence:
“The efficiency of producing electricity from coal is 35%.” [2]

.....

.....

- (iv) State what happens to the rest of the input energy. [1]

.....

.....

- (b) Give **two** reasons why the power company should look for other methods of producing electricity instead of using coal. [2]

1.
2.

3. Sodium chloride is a very important mineral with many uses in industry.
It is made from the metal, sodium and the gas, chlorine.
Before industry can use sodium chloride, it has to be separated from rock salt.

(a) (i) From the paragraph above, **name** an element. [1]

(ii) From the paragraph above, **name** a mixture. [1]

(iii) From the paragraph above, **name** a compound. [1]

(b) Write down the formula for sodium chloride. [1]

(c) Sodium is a metal, but sodium chloride is a non metal.
Give **two** differences between metals and non metals. [2]

1.

2.

(d) Explain why the following stages are necessary when separating salt from rock salt: [5]

(i) adding to water;

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.....

(ii) filtering;

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.....

(iii) evaporation.

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4. A supermarket sells two groups of vegetables.
One group of vegetables is obtained from intensive farming and the other from organic farming.
The vegetables from organic farming are more expensive because of the different methods used at the farm.

(a) Intensive farming makes use of weed killers.

(i) Give **one** disadvantage of using weed killers. [1]

.....

(ii) Give **one** method of controlling weeds in organic farming. [1]

.....

(b) Fertilisers are added to soil to make sure plants get the minerals they need.
Name **two** minerals that plants need for healthy growth. [2]

1. 2.

(c) Intensive farming makes use of artificial fertilisers.

(i) Give **one** advantage of using artificial fertilisers. [1]

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(ii) Give **one** disadvantage of using artificial fertilisers. [1]

.....

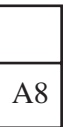
(d) Give **two** reasons why organic farm vegetables are more expensive than those produced by intensive farming methods. [2]

1.

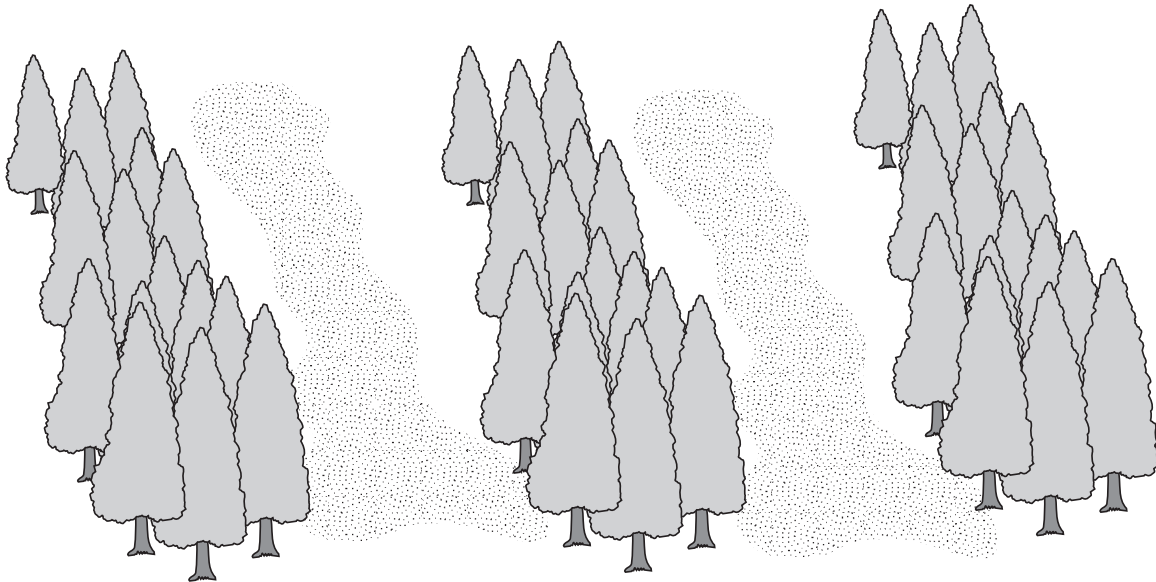
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2.

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5. The Forestry Commission is planning a new forest.
They are planting conifer trees in groups.
Each group of trees will be separated by a strip of land.
Grass grows on the strips of land, but no grass grows amongst the groups of conifers.



(a) Green plants make their food by photosynthesis.

(i) Name **three** things needed by plants for photosynthesis to occur. [3]

- 1.
- 2.
- 3.

(ii) Name the **two** products of photosynthesis. [2]

- 1.
- 2.

(b) Give **one** reason why no grass grows amongst the conifers. [1]

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SECTION B (60 marks)

Answer **all** the questions in the spaces provided.

6. Caravan manufacturers are continually researching ways of making the caravans lighter for cars to tow. However, the caravans must be strong enough for use.

The table shows information about some of the materials used to make the body of caravans.

Material	Density (g/cm^3)	Strength (MN/m^2)
Steel	7.8	1200
Aluminium	2.7	90
Polyester	1.9	250

- (a) Most modern caravan bodies are made from aluminium metal.
- (i) Using the table, give **one** advantage and **one** disadvantage of making caravan bodies from aluminium instead of steel. [2]
- Advantage
- Disadvantage
- (ii) Explain in terms of the arrangement of atoms, why aluminium is malleable. [2]
-
-
- (b) (i) The polyester used in some modern caravans is a new polymer. It is hard and does not easily stretch or bend. Describe the structure of this polyester in terms of molecules. [2]
-
-
- (ii) Explain why polyester is a more suitable material than aluminium for caravan bodies. [2]
-
-
- (c) The wheels on modern caravans are made from an alloy which is not malleable. Explain how the molecular structure of the alloy is different from aluminium. [2]
-
-

(d) The tyres are made from rubber. Rubber is a polymer.

(i) Give **one** difference in the properties of rubber and polyester. [1]

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(ii) Give **one** reason why the structure of the polymers, rubber and polyester, makes them behave differently. [1]

.....

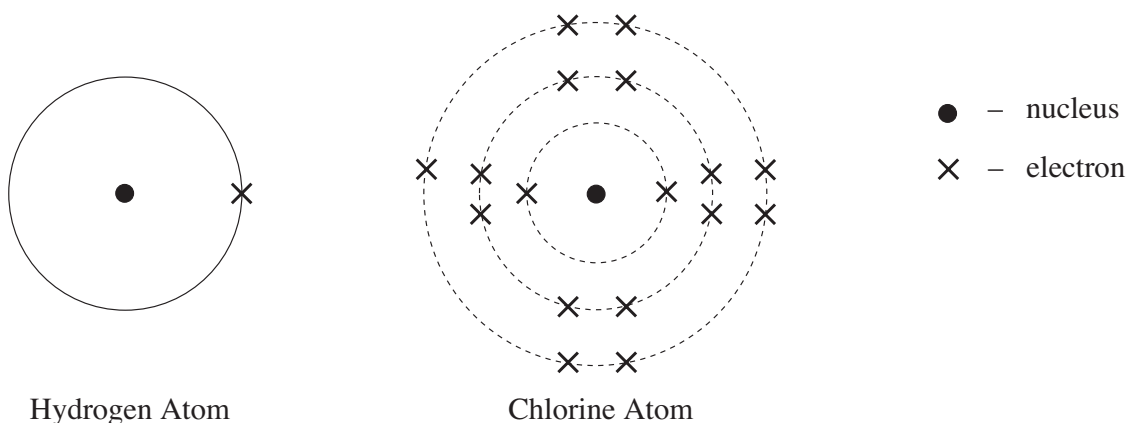
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B12

7. Hydrogen chloride (hydrochloric acid) is a useful chemical produced in large quantities. It is used in the production of fertilisers, medicines and cosmetics. The chlorine used in the process comes from sodium chloride.

Hydrogen chloride and sodium chloride contain different types of bonds.

- (a) (i) **Name** the type of bond present in hydrogen chloride. [1]
 (ii) The diagrams below show an atom of hydrogen and an atom of chlorine.



Draw a diagram to show the bonding in hydrogen chloride. [1]

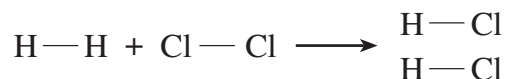
- (b) (i) Explain clearly how a **sodium** atom bonds with a **chlorine** atom. [2]

.....

- (ii) The reaction where chlorine is obtained from sodium chloride is an example of an **endothermic reaction**. Explain the meaning of the term **endothermic reaction**. [2]

.....

- (c) Hydrogen and chlorine are combined to produce hydrogen chloride as shown by the equation below:



In the reaction, one hydrogen bond and one chlorine bond are broken, then two hydrogen-chlorine bonds are produced. The bond energies are shown in the table.

Bond	Bond energy (kJ)
H—H	436
Cl—Cl	242
H—Cl	431

- (i) Calculate the energy required to **break** the bonds in the reaction. [1]

Energy = kJ

- (ii) Calculate the energy released when the bonds in the hydrogen chloride form. [1]

Energy = kJ

- (iii) Calculate the overall energy transfer in the reaction. [1]

Energy = kJ

- (iv) What type of chemical reaction is this? [1]

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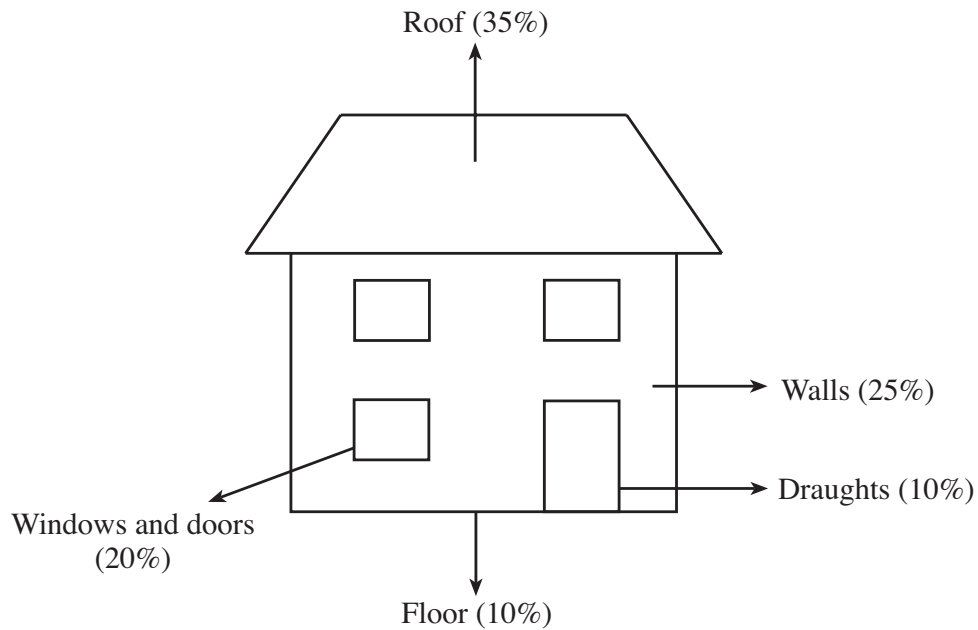
- (d) Hydrogen chloride (hydrochloric acid) can also be produced by adding sulphuric acid to sodium chloride. Sodium sulphate is also produced as a by product.

Sodium chloride + sulphuric acid = hydrogen chloride + sodium sulphate

Using the correct chemical formulae, write down a balanced equation for this reaction. [4]

..... + = +

8. A homeowner is trying to reduce the amount of money spent on heating the home. The diagram shows the percentage of heat energy lost through various parts of the house.



- (a) (i) **Name and explain** the process by which heat energy transfers through the walls. [3]

Name

Explanation

.....
.....

- (ii) **Name and explain** the process by which heat energy transfers through the roof space. [2]

Name

Explanation

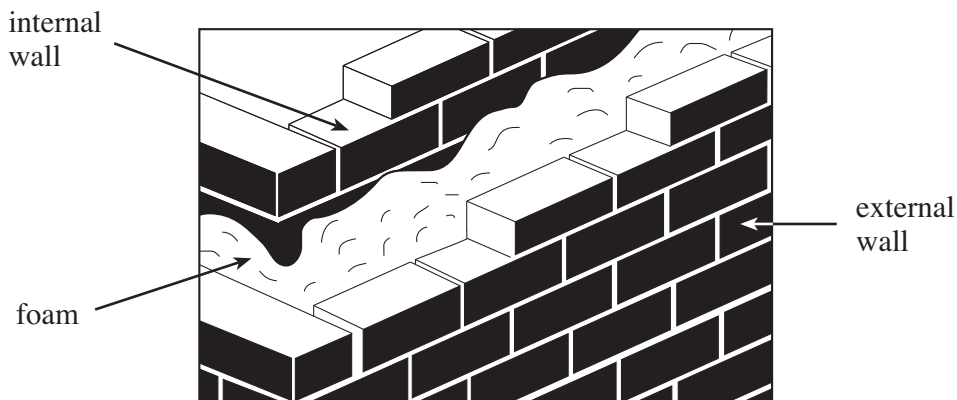
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(b) The homeowner finds out about methods of reducing heat loss from the home. Information about these methods is shown in the table.

Method	Cost of Installation	Savings per year	Payback time
Loft insulation	£600	£150	4 years
Double glazing	£5000	£50	100 years
Cavity wall insulation	£2000	£100	20 years
Draught proofing	£90	£9	10 years

(i) Explain how cavity wall insulation reduces heat transfer.

[3]



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(ii) Using the information in the table above **explain** why loft insulation is the first priority.

[3]

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B11

9. A couple find out that they are both carriers of a blood disorder called sickle cell anaemia. This affects the shape of the red blood cells. However, they both have normal red blood cells. They are **heterozygous** for the sickle cell **characteristic**. **S** is the **allele** for normal red blood cells and **s** is the allele for sickle cells.

They speak to a genetics counsellor to find out whether their children will suffer from this blood disorder.

- (a) (i) Write down the gene pair for the **characteristic** carried by the parents. [1]
- (ii) Draw a Punnett square (cross diagram), and determine the chance of their first child having sickle cell anaemia. [4]

Chance = %

- (b) State the meaning of the following terms:

(i) allele; [1]

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(ii) recessive allele; [1]

.....

(iii) heterozygous. [1]

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10. A student nurse is finding out how the human body adapts to try and keep itself in a steady state. Her studies include how the control of body temperature takes place, and also how the body controls blood glucose levels.

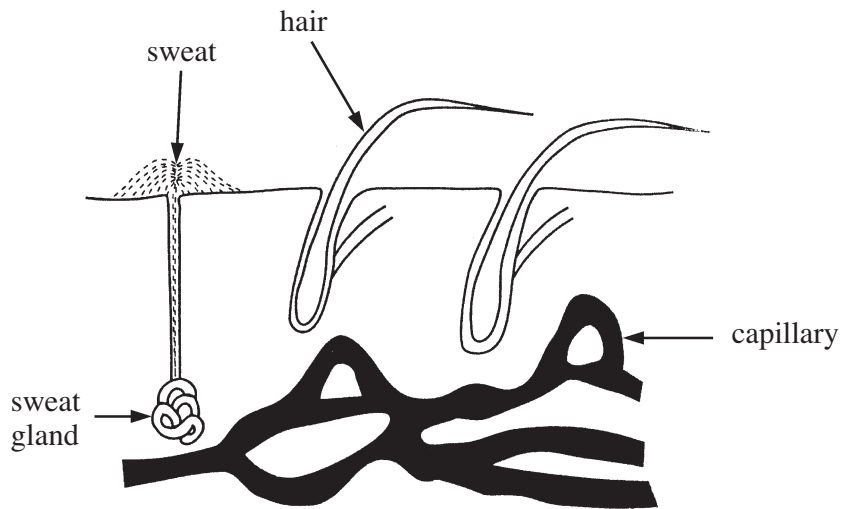
(a) (i) **Describe** the process by which the body uses glucose to release energy. [2]

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(ii) **Describe** how the body reacts when the blood glucose level rises. [3]

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(b) The diagram shows the structures in the skin on a hot day.



Describe how these structures adapt when the temperature drops. [3]

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11. Medical researchers are studying how wounds and broken bones heal. They know that the cells required for this healing process are produced by **mitosis**.

(a) **Describe** cell division by mitosis. [4]

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(b) There is another type of cell division called meiosis.

(i) Where does meiosis take place? [1]

(ii) Give **two** differences between mitosis and meiosis. [2]

1.

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2.

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B7