

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

652/01

GCSE IN APPLIED SCIENCE (Double Award)

Unit 2: Science for the Needs of Society

FOUNDATION TIER (Grades G-C)

A.M. WEDNESDAY, 14 June 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.

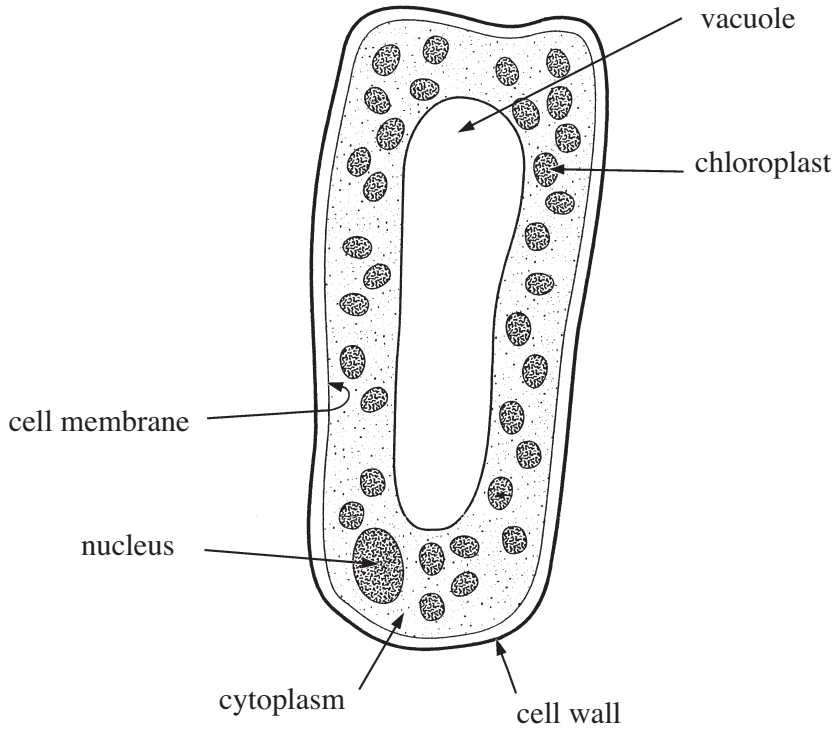
You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

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

SECTION A (50 marks)

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

1. Police officers were looking at evidence from a crime scene. The labels had fallen off two of the microscope slides. A cell from one of the microscope slides is shown below.



The police officers knew this was a plant cell.

Using the diagram, **name three** structures that are only found in a plant cell.

[3]

- 1.
- 2.
- 3.

2. The table below shows the properties of four materials.
These materials are used to make parts of a car.

Material	Does it conduct electricity?	Is it transparent?	Does it rust?	Can it be moulded?
Glass	No	Yes	No	No
Copper	Yes	No	No	No
Fibreglass	No	No	No	Yes
Polythene	No	No	No	Yes

- (a) (i) Which of these materials is a metal? [1]
- (ii) Which of these materials is a polymer? [1]
- (b) The electrical cables in the car are made from copper wires covered in polythene.
- (i) Give **one** reason why copper is suitable for electrical wiring. [1]
-
- (ii) Give **one** reason why the copper wiring is covered in polythene. [1]
-
- (c) Give **one** reason why glass is suitable for windows. [1]
-
- (d) Give **one** reason why fibreglass is suitable for making bumpers on the car. [1]
-

3. A company has developed hand warmers for use in very cold conditions. They contain two chemicals kept apart by a brittle barrier. When the hand warmers are squeezed, the barrier breaks. The two chemicals then react and produce heat.

A laboratory technician working for the company tests different pairs of chemicals, in reactions **A**, **B**, **C** and **D**.

She measures the temperature before, and after, the reaction takes place.

Her results are shown in the table below.

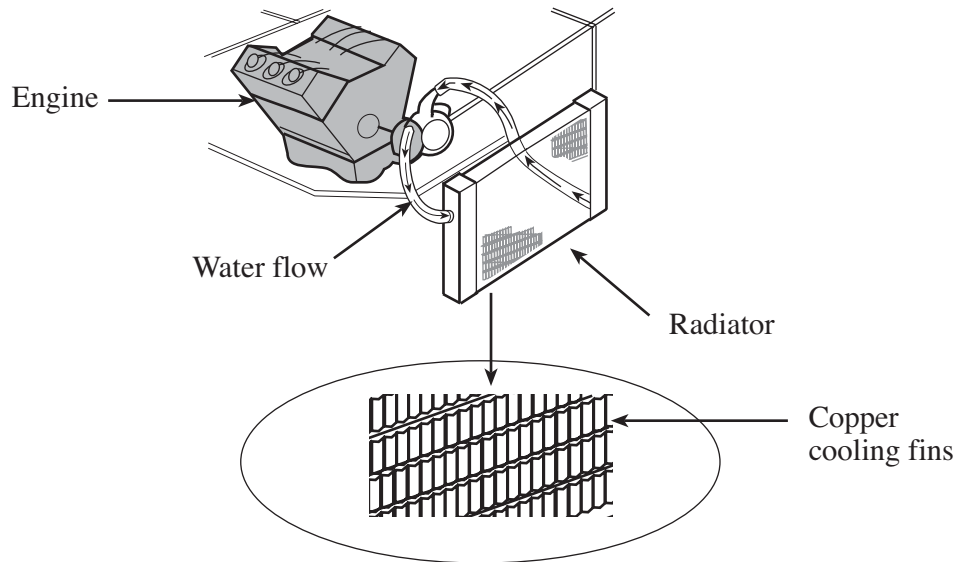
Reaction	Temperature at the start (°C)	Temperature at the end (°C)	Temperature change (°C)
A	20	35	+ 15
B	21	- 8
C	15	35
D	18	+ 12

- (i) Fill in the gaps in the table. [3]
- (ii) Which reaction, **A**, **B**, **C** or **D**, is the most exothermic? [1]
- (iii) Which reaction did the technician decide is best for using in the hand warmers? [1]

.....

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4. Car engines become very hot when in use.
A cooling system is used to prevent overheating.



As hot water flows into the radiator, the cooling fins become hot.
As air passes between the fins, it cools them.

- (a) (i) Give **one** reason why the fins are made from copper. [1]

.....

- (ii) Give **one** reason why the fins are usually painted black. [1]

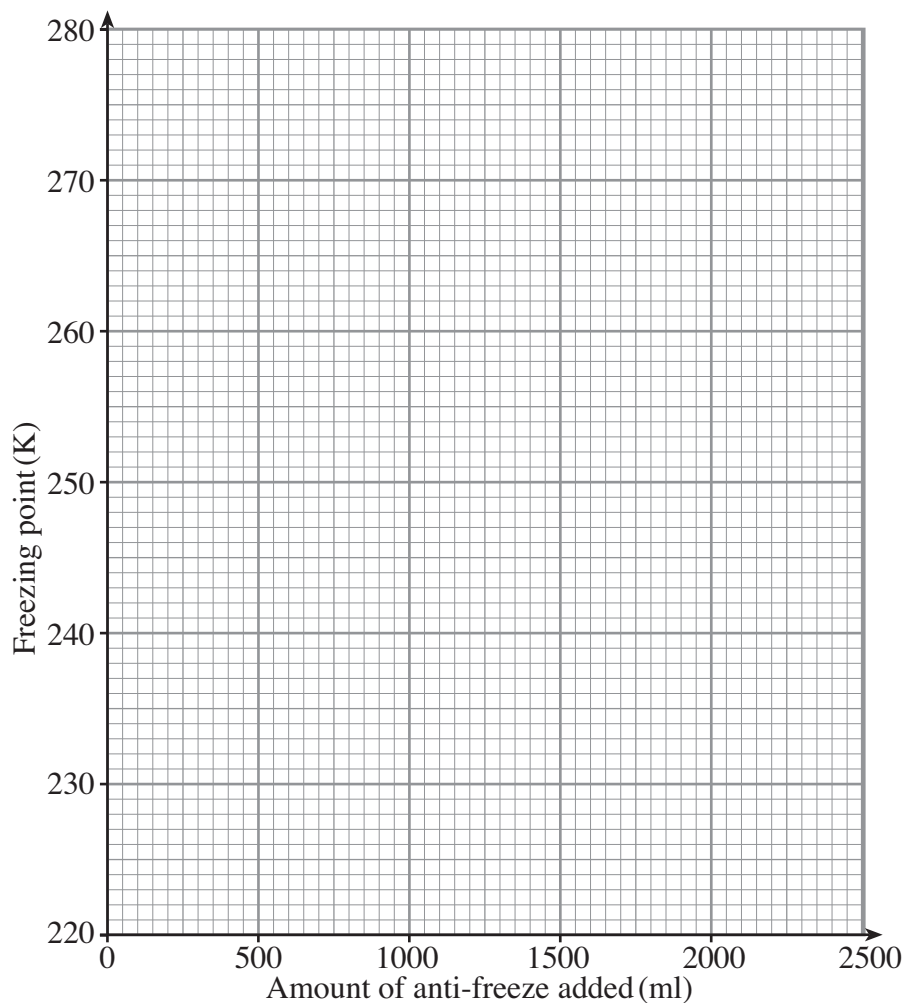
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- (b) In winter, there is a danger that the water in the cooling system may freeze. To stop this happening, anti-freeze is mixed with the water. The table shows how the freezing point of water changes, as more anti-freeze is added to the water.

Amount of anti-freeze added to the water (ml)	Freezing point (K)
0	270
500	265
1000	260
1500	255
2000	250

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

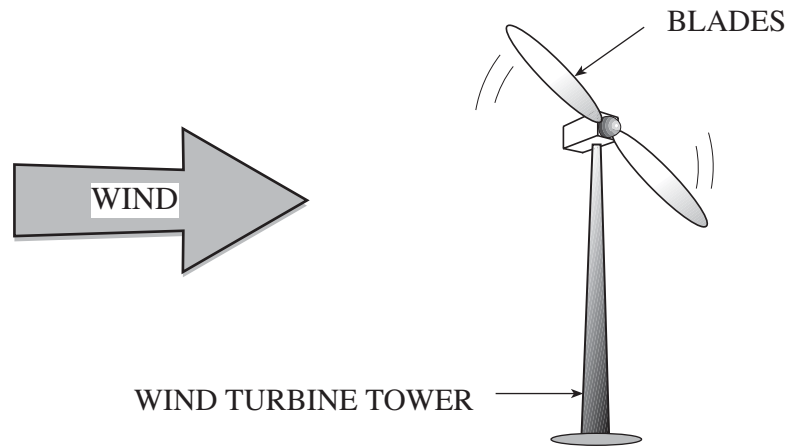
[3]



- (ii) Describe what happens to the freezing point as more anti-freeze is added to the water.

[1]

5. A power company uses wind energy to produce electricity.



- (a) For every **1000 J** of wind energy that blows on the blades, **700 J** of electricity is produced.

- (i) For every **700 J** of electricity produced, how much wind energy is wasted? [1]

.....

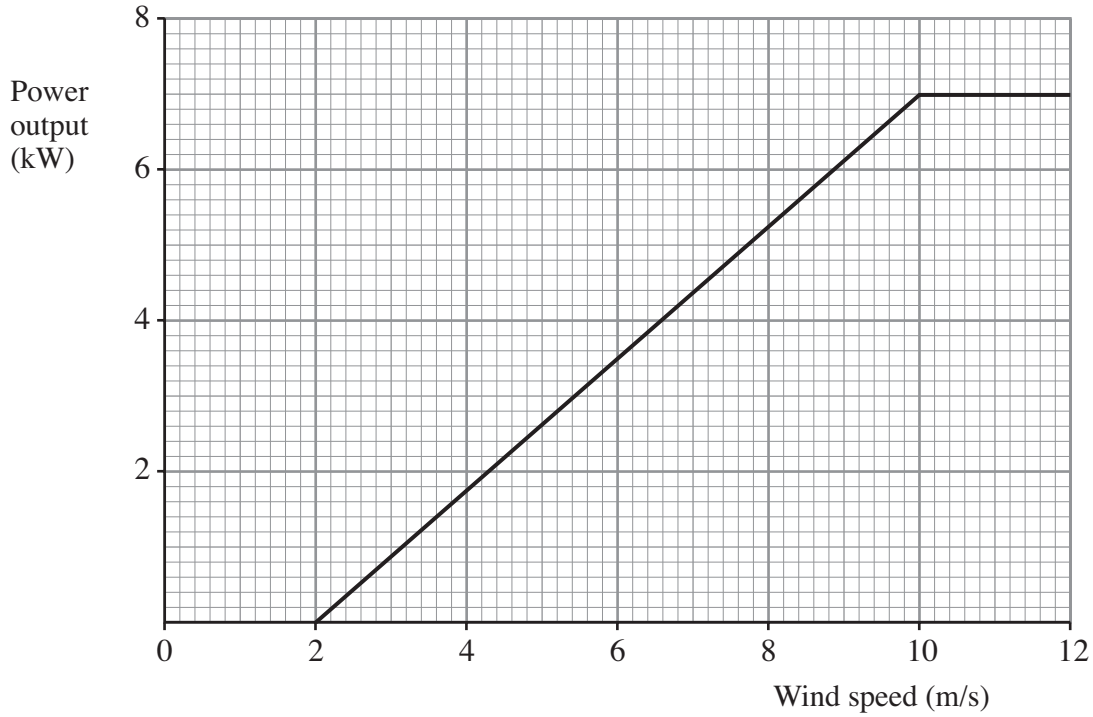
- (ii) Use the equation:

$$\text{Efficiency} = \frac{\text{useful output energy}}{\text{total input energy}}$$

to calculate the efficiency of the wind generator. [2]

Efficiency =

- (b) The power company decides to test a small scale model of the wind generator. They test it to find out how much electrical power is produced at different wind speeds. The graph of their results is shown below.



- (i) Use the graph to find the maximum electrical power produced by the generator. [1]

Maximum power = kW

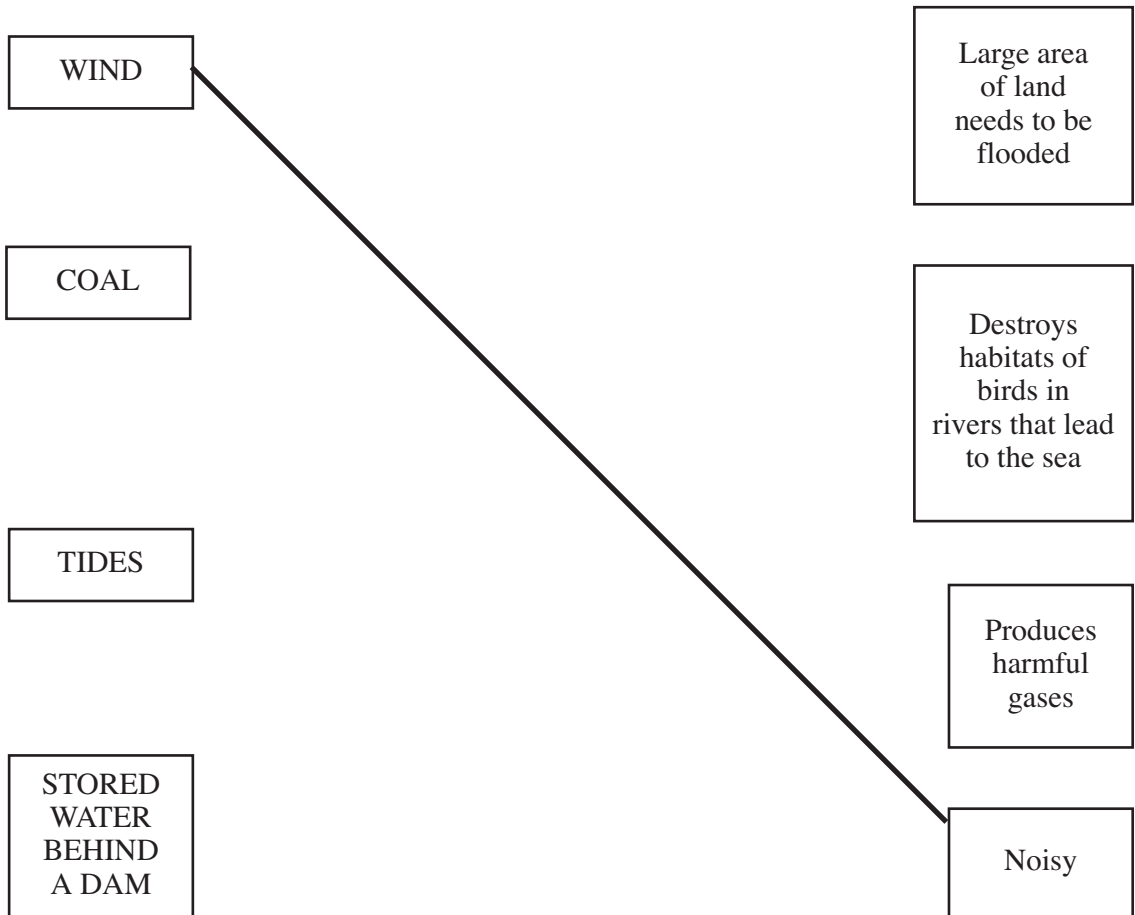
- (ii) Use the graph to find the wind speed needed before the wind generator starts to produce electricity. [1]

Wind speed = m/s

- (iii) Give **one** reason why using wind energy to produce electricity is unreliable. [1]

.....

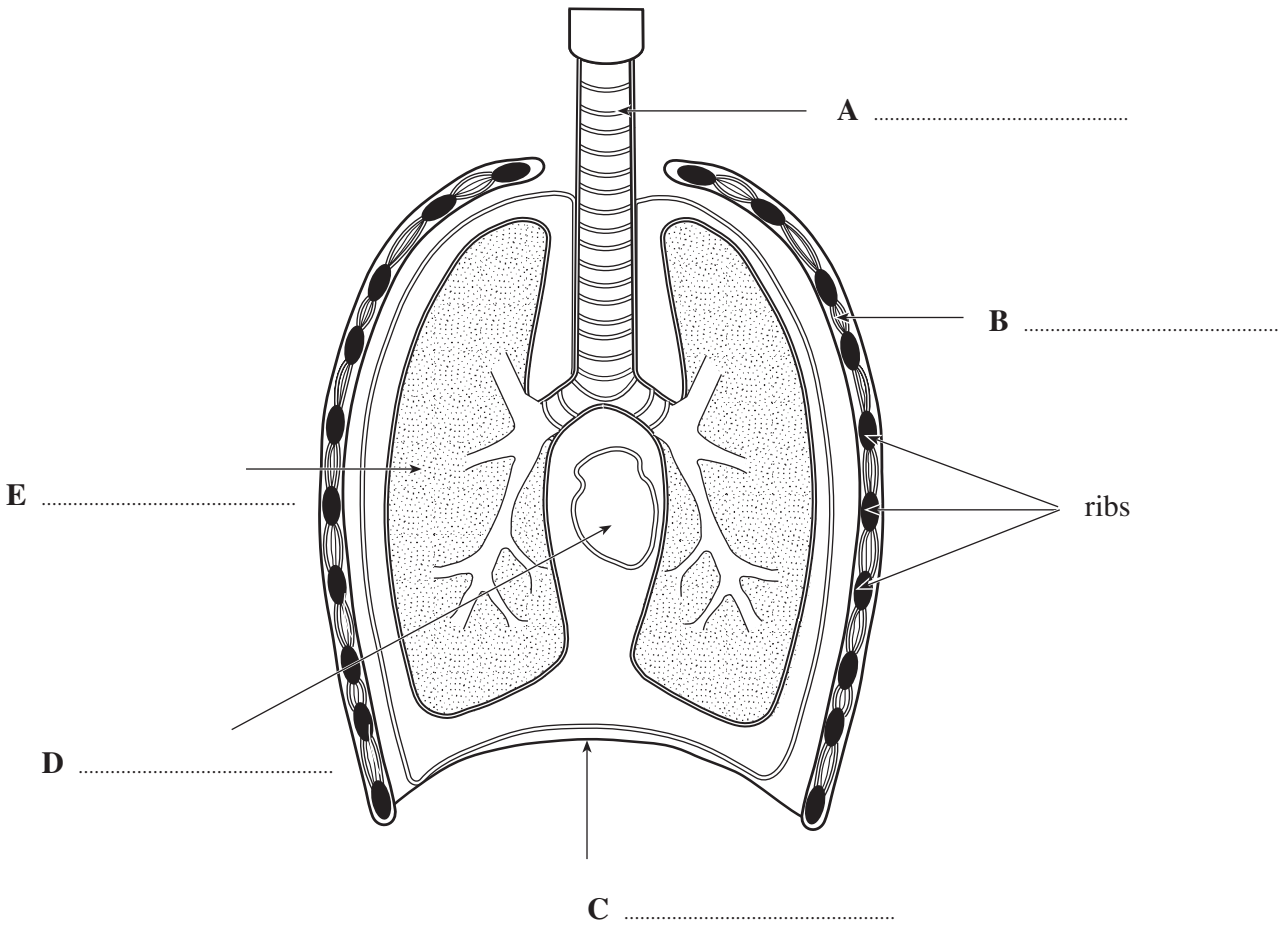
- (c) The power company also thought about using energy from tides, energy from coal, and energy from water. Each energy source has a disadvantage. The energy sources and the disadvantages are shown below. Draw a line from each energy source to its disadvantage. One has been done for you as an example. [3]



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6. Students of Sports Science are finding out how the body produces energy. They find out that energy is produced in body cells, using oxygen and glucose.

(a) Oxygen is taken into the body through the lungs. The diagram below shows the structure of the chest.



Use the words from the boxes below to label parts **A**, **B**, **C**, **D** and **E** on the diagram. [5]

- | | | | | |
|------|---------|-----------|-------|--------------------|
| lung | muscles | diaphragm | heart | windpipe (trachea) |
|------|---------|-----------|-------|--------------------|

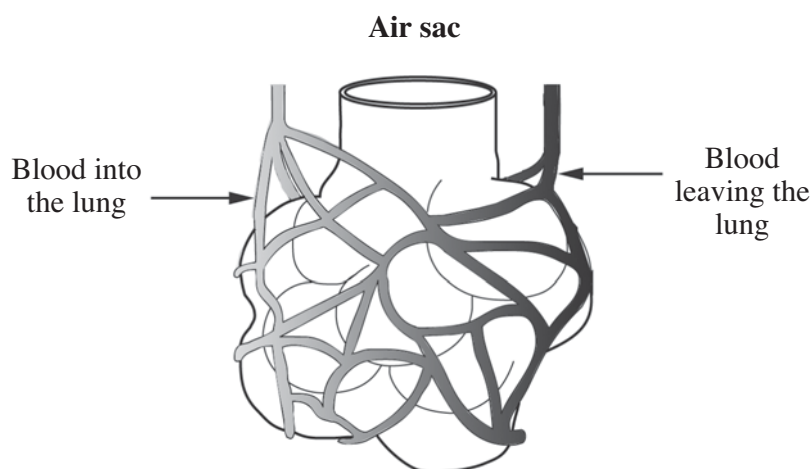
- (b) The students find out that as air enters and leaves the lungs, some gases are exchanged (swapped).

The table shows the gas content of the air as it enters the lungs and as it leaves.

Air entering lungs contains	Air leaving lungs contains
0.03 % carbon dioxide	3 % carbon dioxide
79 % nitrogen	79 % nitrogen
21 % oxygen	18 % oxygen

- (i) Which gas is not exchanged (swapped) in the lungs? [1]
- (ii) How much does the oxygen content of the air drop inside the lungs?% [1]

The gas exchange takes place in air sacs.



- (iii) Name the **two** gases exchanged (swapped) in the air sacs. [2]
..... and
- (c) (i) **Name** the part of the blood that carries oxygen. [1]
- (ii) **Name** the part of the blood that carries carbon dioxide. [1]
- (d) When the oxygen and glucose arrive in body cells, a reaction takes place to produce energy.
- (i) What is the name of this reaction? [1]
- (ii) Apart from energy, name **one** other product of this reaction. [1]

7. A group of gardeners grew tomato plants.
Pictures of the plants from all gardeners are shown below.



Plant A - healthy



Plant B - poor growth
of stem



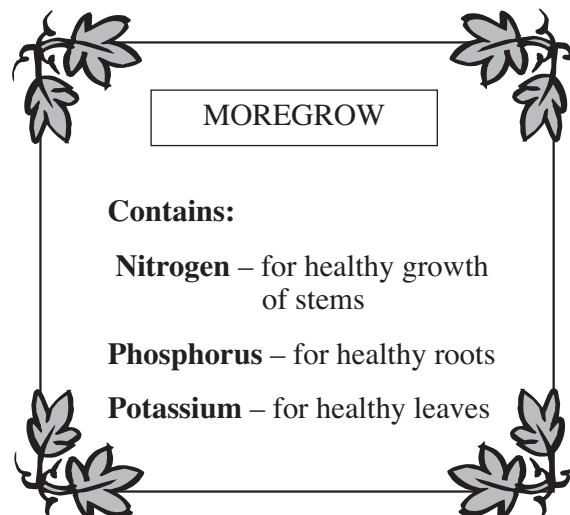
Plant C - had poor
root growth



Plant D - poor development
of leaves

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Only one of the gardeners grew healthy plants. He had used fertiliser from the package shown below.

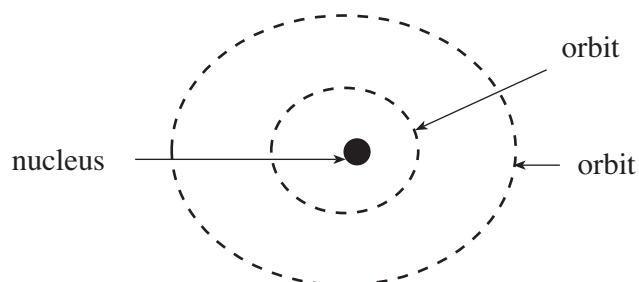


- (a) (i) **Name** the nutrient needed by **plant B**. [1]
- (ii) **Name** the nutrient needed by **plant C**. [1]
- (iii) **Name** the nutrient needed by **plant D**. [1]
- (b) Plants make their own food by photosynthesis.
 - (i) Where in the plant does photosynthesis take place? [1]
 - (ii) If a plant grew in soil lacking in magnesium, it would not produce chlorophyll.
How would this affect the look of the plant? [1]
.....
 - (iii) Complete the equation to show the products of photosynthesis. [2]
Carbon dioxide + water \longrightarrow +
 - (iv) **Name** what else is needed for photosynthesis to occur. [1]

SECTION B (40 marks)

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

8. The diagram below shows an atom of carbon.



- (a) (i) **Name** the two types of particle found in the nucleus. [2]

..... and

- (ii) An atom of carbon contains **six** electrons.
An electron can be shown as an **X**.
Add **Xs** to the diagram above to show how the electrons are arranged in the orbits. [2]

- (b) Different chemicals are made from different atoms joined together.
The table below shows how atoms are combined for some chemicals.
Fill in the gaps in the table.
The first line has been completed as an example. [4]

Chemical	Formula	Structure
Methane	CH ₄	
Carbon dioxide	
Sulphuric acid SO ₄	
.....	

- (c) (i) Using the table, **name one** bulk chemical. [1]
- (ii) Using the table, **name one** organic chemical. [1]

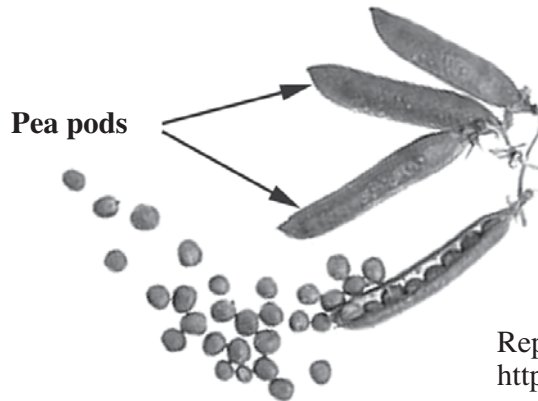
9. Barium (symbol Ba) is a heavy metal.
Its water soluble compounds are highly toxic.
One barium salt, called barium sulphate, is used in hospitals for certain X-ray investigations.
A patient drinks a liquid containing barium sulphate.



Barium sulphate is insoluble in water.
This protects patients from absorbing harmful amounts of the metal.

- (a) The formula for barium sulphate is BaSO_4 .
Name the **two** non-metals that make up barium sulphate. [2]
..... and
- (b) (i) When barium sulphate powder is added to water, it does not dissolve.
Name this type of mixture. [1]
.....
- (ii) Another barium salt, barium carbonate, dissolves when mixed with water.
Name this type of mixture. [1]
.....
- (c) An impurity, such as toxic barium carbonate, dissolves in water and can be absorbed into a patient's body.
Barium carbonate has been accidentally mixed with barium sulphate.
Describe how a hospital technician separates the barium sulphate from the mixture. [3]
.....
.....
.....
.....

10. A gardener noticed that some of his pea pods were yellow, but others were green. He found out that the colour was affected by a gene pair.



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The gene for yellow pods is **Y**.
The gene for green pods is **y**.

- (a) When the gene pair is **Yy**, the pea pods are yellow.
- (i) Write down another gene pair that would give yellow pea pods. [1]
 - (ii) Write down a gene pair that would give green pea pods. [1]
 - (iii) Write down the gene pair that is heterozygous. [1]
- (b) The gardener decided to cross a plant with green pea pods, with a plant with yellow pea pods. He found that half the offspring had green pods, and half had yellow pods. This is shown in the Punnett square (cross diagram) below. Complete the Punnett square to show the parent genes from the plant with yellow pods. [2]

Parent genes	y	y
.....	Yy	Yy
.....	yy	yy

- (c) This effect was first explained by a scientist called Mendel.



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He explained that the features of offspring were determined by **dominant** and **recessive alleles**.

Using the example of pea pod colour, explain what is meant by **dominant allele**. [1]

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11. Health workers are learning about diseases.
The table shows some information about diseases.

Disease	Caused by	How	Vaccine
E-coli	bacteria	contaminated food and contact with animals	No
Whooping cough	bacteria	through the air – coughs and sneezes	Yes
Tetanus	bacteria	infected soil	Yes
Hepatitis A	virus	contaminated food or water	Yes
Hepatitis B	virus	infected blood	Yes
Hepatitis C	virus	infected blood	No

- (a) **Name two** diseases that could be treated with antibiotics. [2]

..... and

- (b) Give **one** reason why you should not work in the garden if you have an open cut on your hand. [1]

.....

- (c) Nurses, doctors and dentists have vaccinations to protect them from hepatitis B.

- (i) Give **one** reason why they are at risk from becoming infected with the hepatitis B virus. [1]

.....

- (ii) Using the information in the table, give **one** reason why they still need to be careful not to come into contact with blood when treating patients. [1]

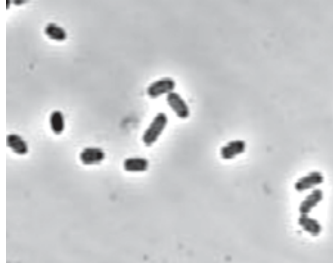
.....

- (iii) Give **one** way nurses, doctors and dentists can protect themselves from coming into contact with patients' blood. [1]

.....

(d) An infection from E-coli can cause serious illness.

E-coli bacteria



Give **two** precautions that should be taken, when preparing food.

[2]

- 1.
- 2.

12. Stores sell different types of ovens.
The table below gives information about three types of ovens.

Type of oven	Power
Conventional / full oven	3 kW
Microwave oven	0.8 kW
Combination microwave & grill oven	Microwave – 0.7 kW Grill – 1.3 kW

All of the ovens are connected to the mains electricity supply of **230 V**.

- (a) Each of the ovens takes a different current when being used.
- (i) Write down, **in words**, an equation connecting power, current and voltage. [1]
-
- (ii) One of the ovens takes a current of **3.5 A** when switched fully on. Use your equation to calculate the power of this oven. [2]

Power = W

- (iii) Use your answer to name the oven that was probably being used. [1]
-

- (b) A joint of meat is cooked in the combination oven using the microwave and grill. Both are switched on at full power for 0.5 hour.

- (i) Use the equation:
Energy used = power x time
to find the energy used by the combination oven in **kilowatt hours**. [2]

Energy used = kWh

- (ii) If electrical energy costs 8p for one kilowatt hour, use the equation:
Cost = energy used x cost of one kilowatt hour
to find the cost of using this oven to cook the meat. [1]

Cost = p.

- (c) The same joint of meat would have taken 1.5 hours to cook in the conventional/full oven. Explain why this would cost more than using the combination oven. [2]
-