



BENENDEN

Lower School Scholarship Exam 2022

SCIENCE

13+

1 Hour

Full Name:

Current school:

Date:

Instructions to Candidates:

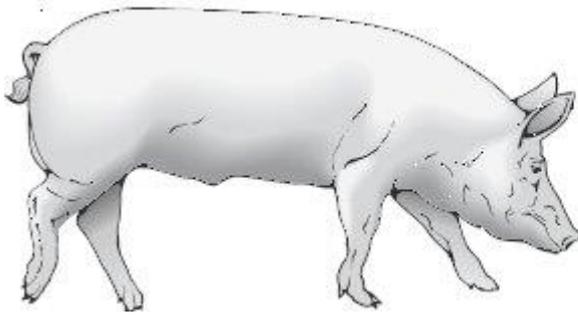
- Write your answers in the space provided in this booklet.
(total marks for paper 100)
- There are questions that cover Biology, Chemistry, and Physics topics, make sure you answer all of them
- Marks available are indicated in brackets

Equipment needed:

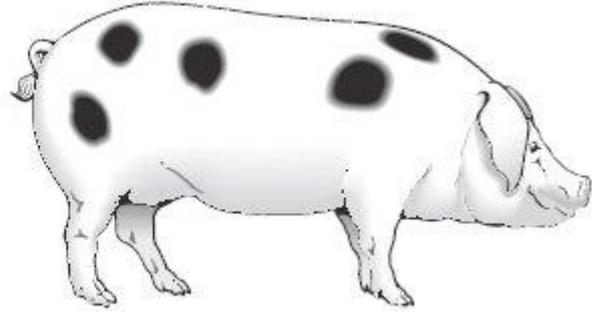
- Calculators are allowed
- Make sure you have ruler and a sharp pencil

Q1.

The drawings below show pigs from two different breeds.



Tamworth



Gloucester Old Spot

(a) (i) From the drawings above, give **two** ways in which the pigs are different.

1.

1 mark

2.

1 mark

(ii) What are these differences called?
Tick the correct box.

adaptations

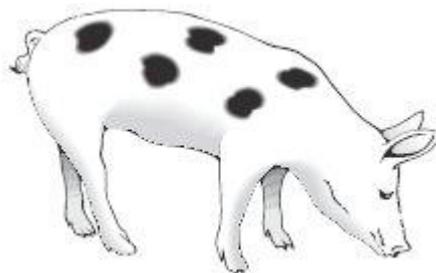
classification

fertilisation

variations

1 mark

(b) The drawing below shows a piglet bred from a Tamworth and a Gloucester Old Spot.



Give **one** way you can tell that one of its parents is a Tamworth.

.....

1 mark

(c) (i) When pigs reproduce, which **two** types of cell pass information from the pigs to

their piglets?
Tick the **two** correct boxes.

blood cell

nerve cell

cheek cell

egg cell

muscle cell

sperm cell

2 marks

(ii) When pigs reproduce, two cells join together.

What is this process called?
Tick the correct box.

adaptation

classification

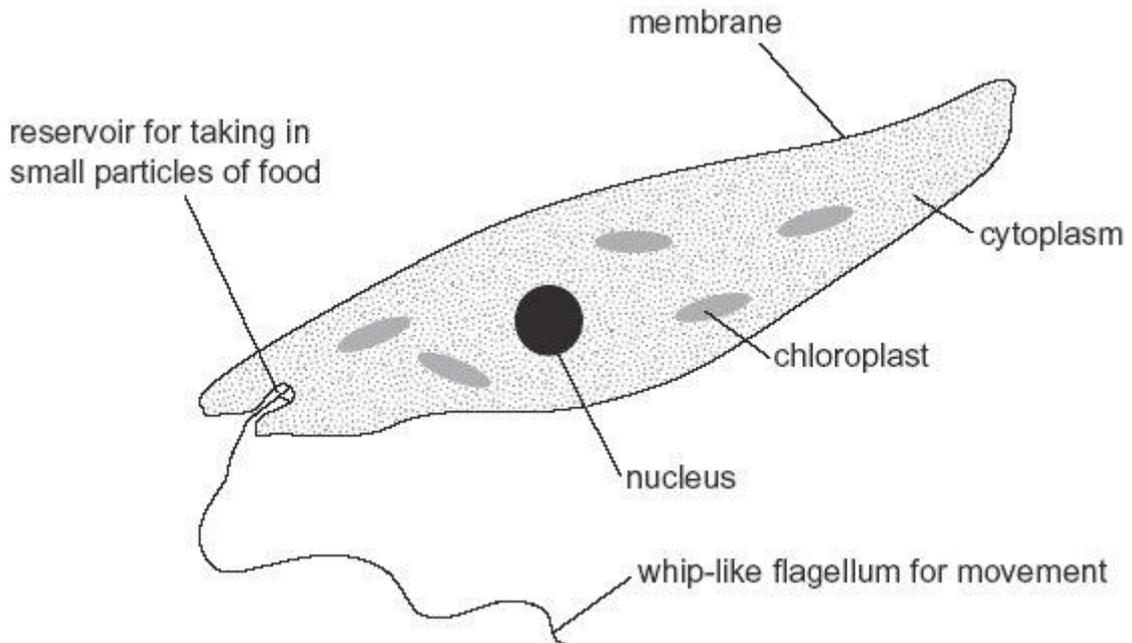
fertilisation

variation

1 mark
maximum 7 marks

Q2.

The diagram below shows an organism called Euglena. It is made of only one cell. It lives in ponds and streams. Euglena have features of both plants and animals.



(a) Look at the diagram of Euglena.

Give **two** pieces of evidence which suggest it is an **animal** cell and **not** a plant cell.

1.

1 mark

2.

1 mark

(b) Plant cells can carry out photosynthesis.

How can you tell from the diagram that Euglena can carry out photosynthesis?

.....

1 mark

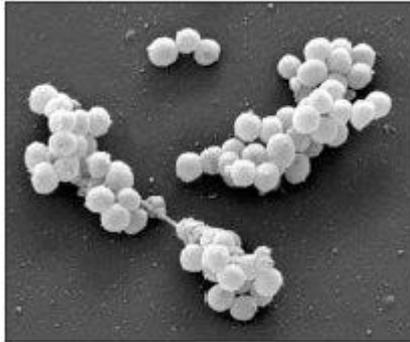
(c) Complete the word equation for photosynthesis.

carbon dioxide + → glucose +

2 marks
maximum 5 marks

Q3.

The photograph below shows bacteria that have developed resistance to antibiotics. They are called MRSA bacteria.



- (a) When MRSA bacteria reproduce, they pass on their resistance to antibiotics to the next generation.

What part of a cell passes on information?

.....

1 mark

- (b) MRSA bacteria can cause serious infections in people who are ill in hospital. The bacteria can live on a healthy person's **skin** or in their **lungs** without causing any harm.

Use this information to fill in the table below.

Suggest **two** ways MRSA bacteria can be spread from person to person.

Suggest how the spread of the bacteria can be prevented for each method.

	method of spread	method of prevention
1		
2		

2 marks

- (c) People can be vaccinated against some diseases caused by bacteria or viruses.

Describe how vaccination prevents a person getting a disease.

.....

.....

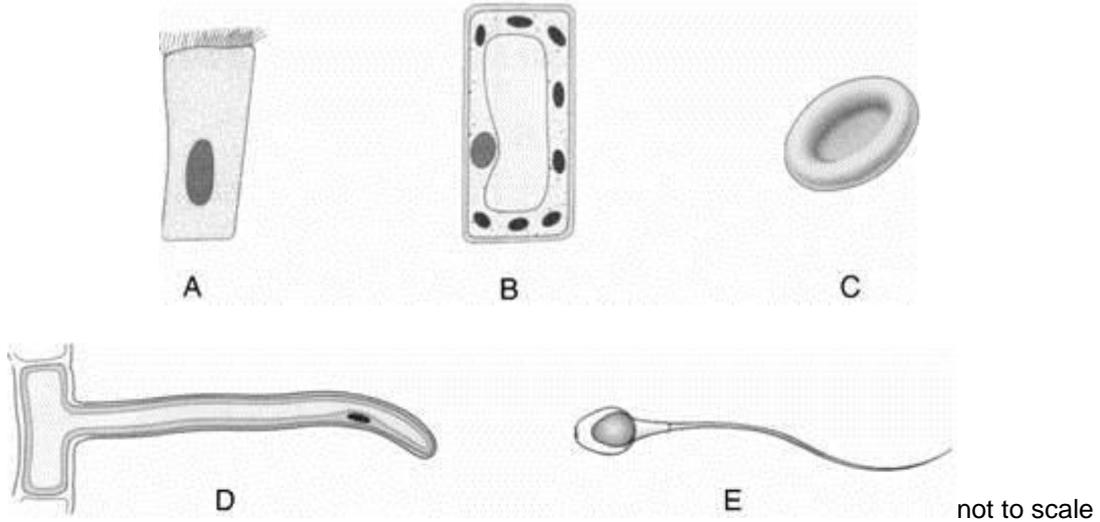
.....

.....

3 marks
maximum 6 marks

Q4.

The drawings show some plant and animal cells. Each cell has a different function.



(a) Give the name of cell C.

.....

1 mark

(b) The main functions of two of the cells are listed below.

Write the letter of the correct cell next to each function.

(i) photosynthesis

(ii) improvement of mucus

2 marks

(c) (i) Give the name of the organ where cell E is produced.

.....

1 mark

(ii) Give the name of the part of a plant where cell B is found.

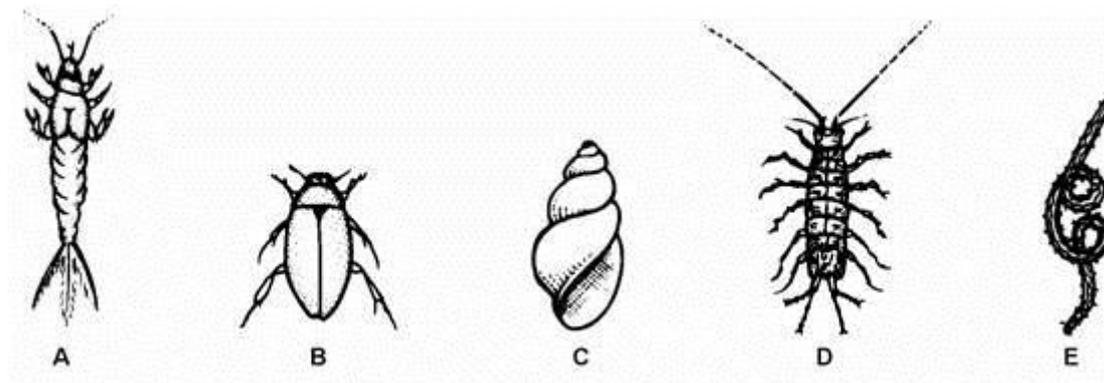
.....

1 mark

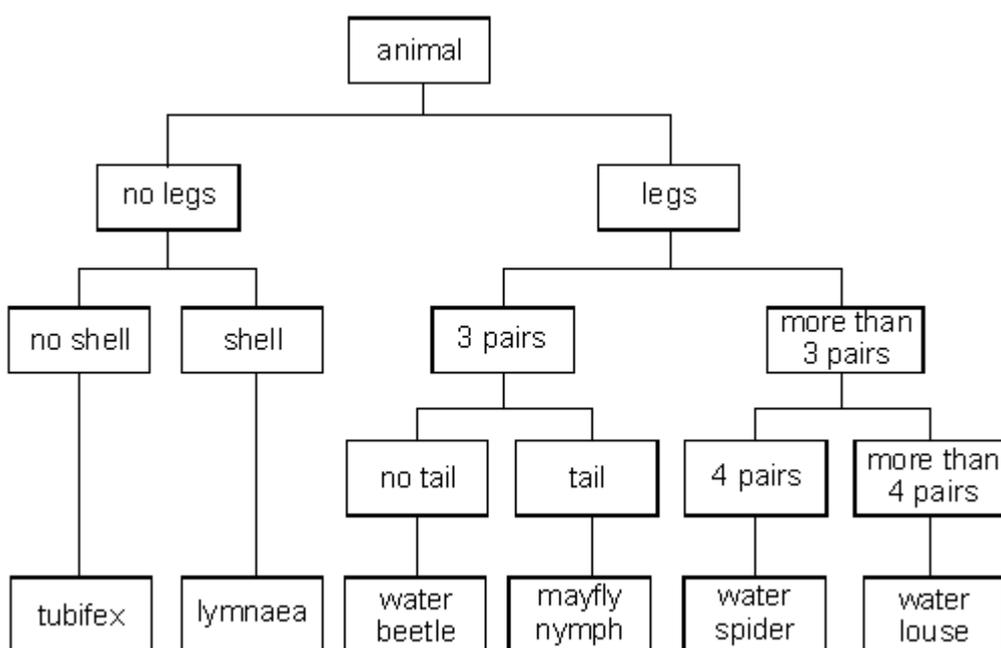
Maximum 5 marks

Q5.

The animals shown below live in different parts of a river.



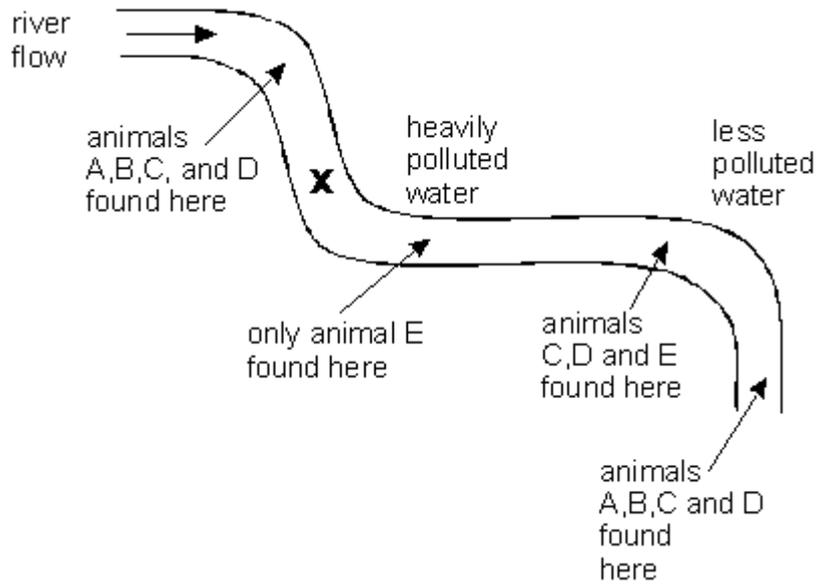
(a) Use this key to identify animals **A**, **B** and **C**.



- (i) Animal **A** is a
- (ii) Animal **B** is a
- (iii) Animal **C** is a

3 marks

- (b) The diagram shows a river. Sewage pollutes the river at **X**. The amount of pollution gets less as you go down the river from **X**. The animals A, B, C, D and E were found living in the river at the places shown.



- (i) Which animal survives best in polluted water? Give the **letter** of the animal.

.....

1 mark

- (ii) **Two** of the animals cannot live in polluted water. Give the **letters** of these two animals.

..... and

2 marks
Maximum 6 marks

Q6.

(a) The table below shows information about five elements.

element	melting point (°C)	boiling point (°C)	conducts electricity	colour
A	-7	59	no	brown
B	-218	-183	no	colourless
C	1535	2750	yes	silvery
D	113	445	no	yellow
E	1083	2567	yes	orange

(i) Which **two** of these elements are likely to be metals?

Write the letters.

..... and

2 marks

(ii) Which element in the table is liquid at room temperature?

Write the letter.

.....

1 mark

(b) What is the chemical symbol for copper?

Tick the correct box.

Cr Cu C Co Ca

1 mark

(c) How many atoms of iron and oxygen are there shown in the formulas for FeO and Fe₂O₃?

Complete the table below.

compound	number of atoms of iron	number of atoms of oxygen
FeO		
Fe ₂ O ₃		

2 marks
maximum 6 marks

Q7.

- (a) Amy's family are at the beach during the summer.
Amy and her sister have a bucket containing seawater and sand.



Read the following statements.
Which are **true** and which are **false**?

Tick **one** box for each statement.

true **false**

Water is a solvent for salt.

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

Sand sinks in water because water is more dense than sand.

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

When a solid dissolves in water, the solid is called a solute.

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

2 marks

- (b) Seawater contains dissolved salt.
Describe what Amy can do to separate **and** collect pure water from seawater.

.....

.....

2 marks

- (c) Draw a line from each of the **substances** below to the **group** that it belongs to.
Draw only **three** lines.

Draw a line from each **group** to the correct **description**.
Draw only **three** lines.

substance	group	description
seawater	compound	It contains two or more types of atoms or molecules which can be physically separated.
salt	mixture	It contains only one type of atom.
oxygen	element	Two or more types of atoms are chemically joined together.

2 marks
maximum 6 marks

Q8.

Matthew measured the pH of different soils.

- (a) Tick **one** box in each row to show if each soil is acidic, neutral or alkaline.

soil	pH of soil	acidic	neutral	alkaline
A	4.5			
B	5.5			
C	6.3			
D	7.0			
E	7.8			

2 marks

- (b) A hydrangea is a flowering plant. Matthew notices that the colour of hydrangea flowers is different for plants grown in different places.



hydrangea flower

He records the colour of the flowers on each plant.

His results are shown in the table below.

soil	pH of soil	colour of flowers			
		blue	violet	light pink	dark pink
A	4.5	✓			
B	5.5		✓		
C	6.3		✓		
D	7.0			✓	
E	7.8				✓

Look at Matthew's results.

Do his results support the statement that the colour of hydrangea flowers depends on pH?

yes no

Explain your answer.

.....

1 mark

- (c) Matthew measured the pH of the soil near hydrangea plants found in different places.

Suggest one **other** variable Matthew could **not** control in his investigation.

.....

1 mark

- (d) Matthew wants to find out if the colour of blue hydrangea flowers depends on inherited factors **or** environmental factors.
The flowers were growing in soil of pH 4.5.
He plants them in soil of pH 6.3.

Complete the table below to show the colours of the new flowers in soil of **pH 6.3**

- (i) if the colour is due to inheritance
(ii) if the colour is due to the environment

Use the table above to complete the table below.

	colour
starting colour of hydrangea flowers	blue
colour of new flowers if only due to inheritance	
colour of new flowers if only due to environment	

2 marks
maximum 6 marks

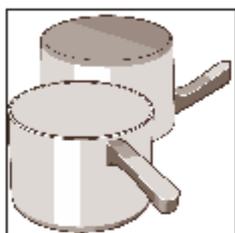
Q9.

(a) The drawings below show three objects made from copper.

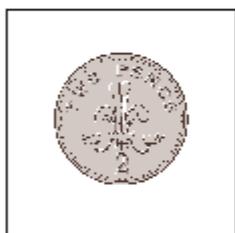
Draw a line from each object to the reason for using copper for that object.
Draw only **three** lines.

**object made
from copper**

**reason for using
copper**



base of a saucepan



coin



wires in a cable

It does **not** rust.

It is a good conductor
of electricity.

It is a good conductor
of heat.

It is **not** magnetic.

3 marks

(b) Brass is a mixture of copper and zinc. Some keys are made from brass



Why is brass more suitable than copper for a **key**?
Tick the **two** correct boxes.

Brass does **not** bend as easily as copper.

Brass is a paler colour than copper.

Brass is harder than copper.

Brass is **not** as shiny as copper.

Brass is **not** such a good conductor of electricity as copper.

Brass is **not** such a good conductor of heat as copper.

2 marks

(c) Zinc melts at 420°C.

Copper melts at 1085°C.

A scientist heated a mixture of pieces of zinc and pieces of copper to 600°C in a dish.

What would be in the dish at 600°C?

liquid zinc and liquid copper

liquid zinc and solid copper

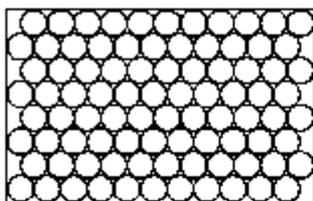
solid zinc and liquid copper

solid zinc and solid copper

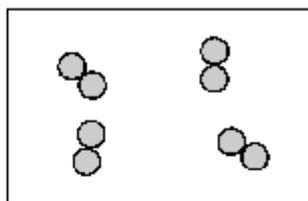
1 mark
maximum 6 marks

Q10.

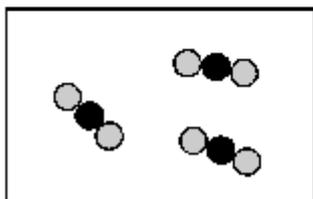
The diagrams represent the arrangement of atoms or molecules in four different substances, A, B, C and D.



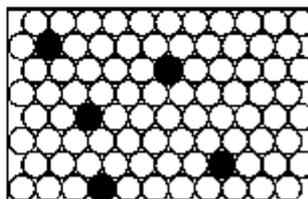
A



B



C



D

not to scale

Each of the circles, ,  and  represents an atom of a different element.

(a) (i) Which substance is a compound?

.....

1 mark

(ii) Which substance is a mixture?

.....

1 mark

(iii) Which **two** substances are elements?

..... and

1 mark

(iv) Which **two** substances could be good thermal conductors?

..... and

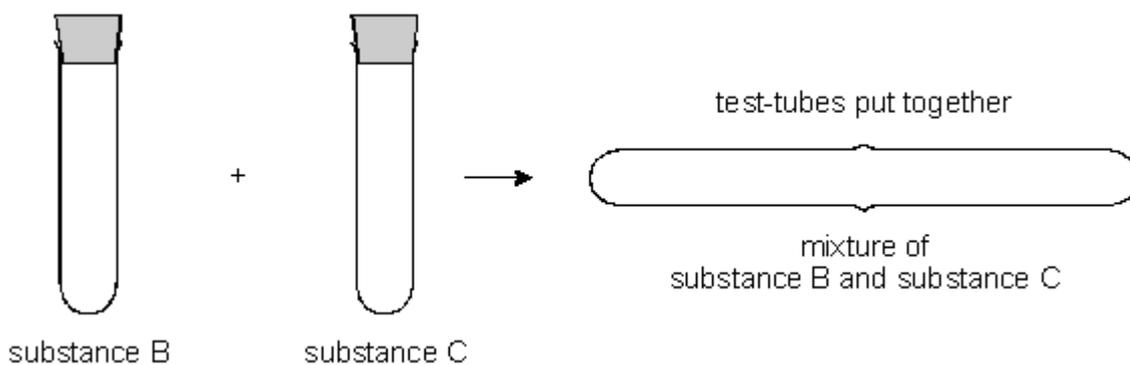
1 mark

(v) Which substance could be carbon dioxide?

.....

1 mark

- (b) The following experiment was set up. Test-tubes containing substances B and C were placed together as shown. The substances did **not** react. They were left for five minutes.

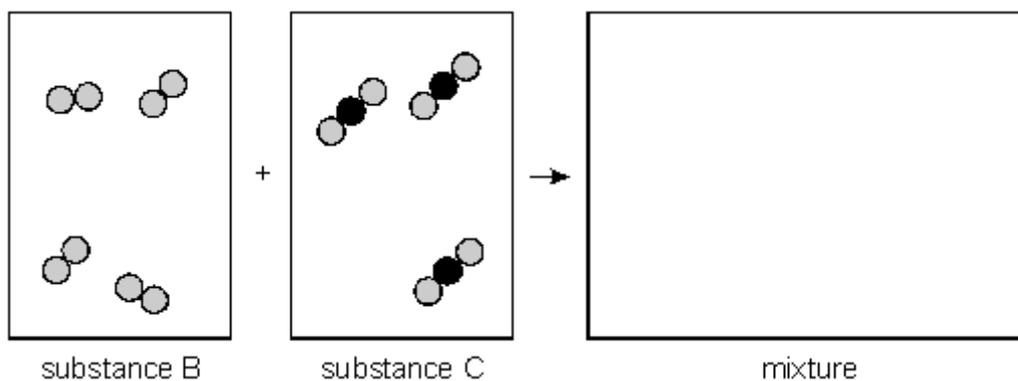


- (i) How many molecules are there in the mixture compared to the total number in substances B and C?

.....

1 mark

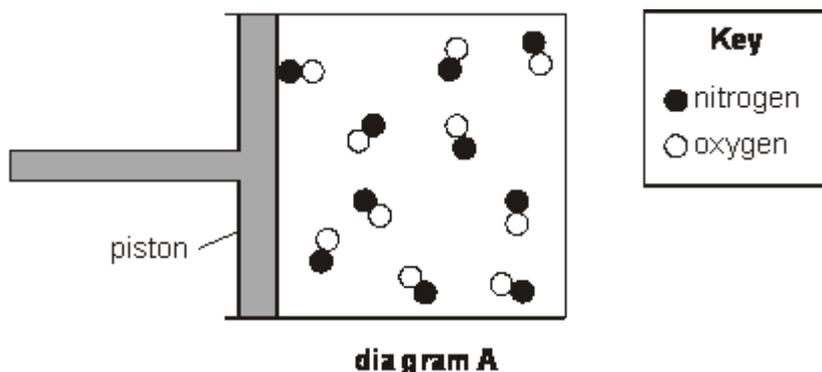
- (ii) Complete the diagram which is a model of this experiment.



1 mark
Maximum 7 marks

Q11.

Diagram **A** represents a gas in a container.
The gas can be compressed by moving the piston to the right.



(a) (i) How can you tell that the substance in the container is a gas?

.....
.....

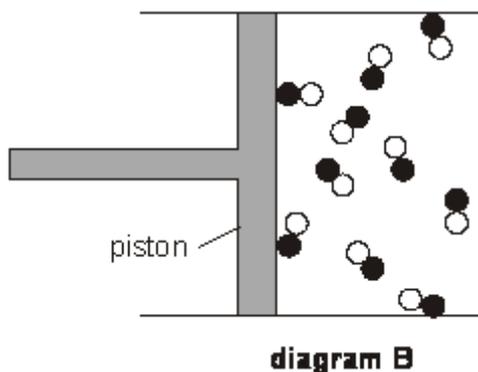
1 mark

(ii) How can you tell from the diagram that the gas is pure?

.....
.....

1 mark

(b) The piston is moved to the right as shown in diagram **B**.

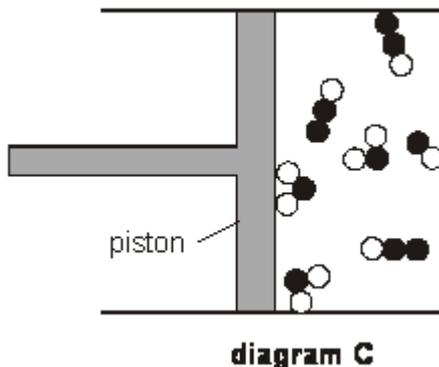


How can you tell, from diagram **B**, that the pressure of the gas has increased?

.....
.....

1 mark

- (c) Diagram **C** shows what happened to the molecules after the gas was compressed more.



- (i) How can you tell that a chemical reaction happened when the gas was compressed?

.....

1 mark

- (ii) The mass of the gas in both diagrams **B** and **C** was 0.3 g.
 Why did the mass of the gas **not** change when it was compressed?

.....

1 mark

- (iii) Complete the table below with the correct chemical formula of each substance. Use the key to help you.

substance	formula

Key

● nitrogen

○ oxygen

1 mark

- (iv) What is the **name** of the substance represented by the symbol ●○?

.....

1 mark
 maximum 7 marks

Q12.

- (a) The diagrams below show how much heat is lost from different parts of a house every second.



Through which part of the house above is most heat lost?

.....

1 mark

- (b) Part of the house is insulated to reduce the loss of heat. This is shown below.



- (i) Which part of the house has been insulated?

.....

1 mark

- (ii) Explain your answer.

.....
.....

1 mark

- (c) The table below gives information about three fossil fuels that can be used to heat a house.

fuel	physical state	energy released when 1g is burned (J)	Does the fuel produce these substances when burned?	
			water	sulphur dioxide
coal	solid	25000	yes	yes
oil	liquid	42000	yes	yes
methane	gas	55000	yes	no

- (i) Which fuel in the table releases the **least** energy when 1 g is burned?

.....

1 mark

- (ii) Methane **can** be compressed.
Which information in the table shows that methane can be compressed?

.....

1 mark

- (iii) Sulphur dioxide causes acid rain.
Use the table to explain why burning methane does **not** produce acid rain.

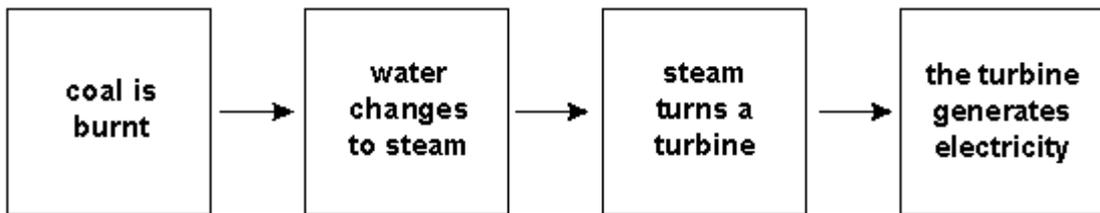
.....

.....

1 mark
maximum 6 marks

Q13.

In a power station, coal can be used to generate electricity.



(a) Use words from the box to answer the questions below.

chemical	electrical	gravitational potential	
kinetic	light	sound	thermal

1 mark

(i) What is the useful energy transfer when coal is burnt?

..... energy is transferred to energy

1 mark

(ii) Some of the energy stored in coal is wasted when it is burnt. Give the name of **one** type of energy released that is **not** useful.

.....

1 mark

(b) Wind turbines are also used to generate electricity. The wind turns the turbine blades and the turbine blades turn a generator.



Use words from the **box above**. Complete the sentence to show the useful energy transfer in a wind turbine and generator.

..... energy is transferred to energy

1 mark

- (c) Suggest **one** disadvantage of using wind to generate electricity.

.....
.....

1 mark

- (d) Sugar cane is a plant.

The sugar from the cane is used to make alcohol.
Alcohol is a fuel.



- (i) Which energy source do plants use to produce sugar?

.....

1 mark

- (ii) Is sugar cane a renewable **or** non-renewable source of energy?
Tick one box.

renewable source non-renewable source

Give a reason for your answer.

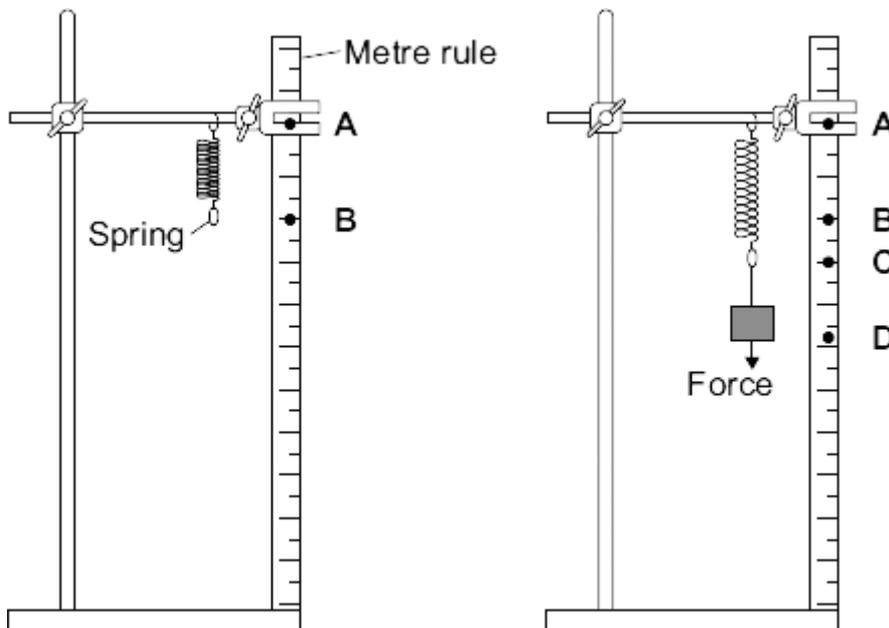
.....

1 mark
maximum 7 marks

Q14.

A student investigated how the extension of a spring depends on the force applied to the spring.

The diagram shows the spring before and after a force had been applied.



(a) (i) Complete the following sentence using letters, **A**, **B**, **C** or **D**, from the diagram.
The extension of the spring is the distance between the positions labelled
.....and on the metre rule.

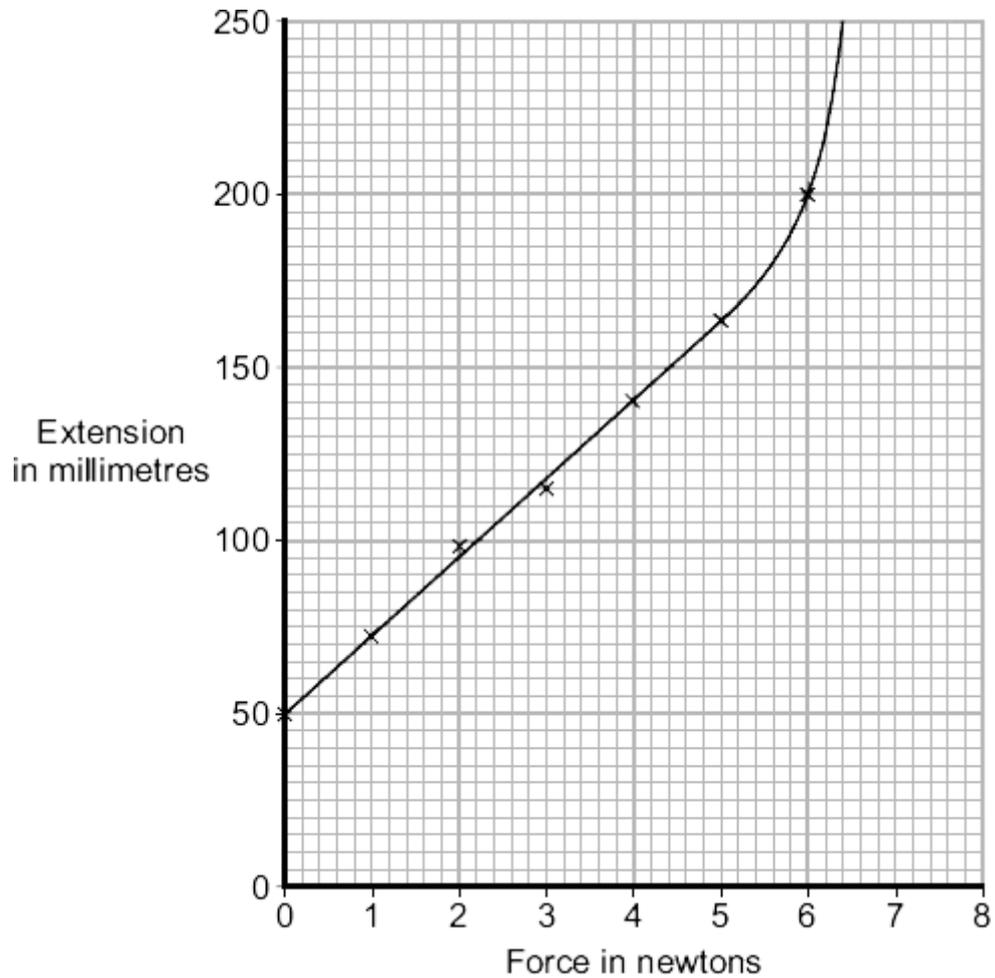
(1)

(ii) What form of energy is stored in the stretched spring?

.....

(1)

(b) The results from the investigation are plotted on the following graph.



- (i) The graph shows that the student has made an error throughout the investigation.

What error has the student made?

.....

Give the reason for your answer.

.....

(2)

- (ii) The student has loaded the spring beyond its *limit of proportionality*.

Mark on the graph line the *limit of proportionality* of the spring. Label the point **P**.

Give the reason for choosing your point **P**.

.....

(2)

- (c) The student uses a different spring as a spring balance. When the student hangs a stone from this spring, its extension is 72 mm.

The spring does not go past the limit of proportionality.

Calculate the force exerted by the stone on the spring.

spring constant = 25 N/m

Use the equation Force = spring constant x extension

Show clearly how you work out your answer.

.....

.....

Force = N

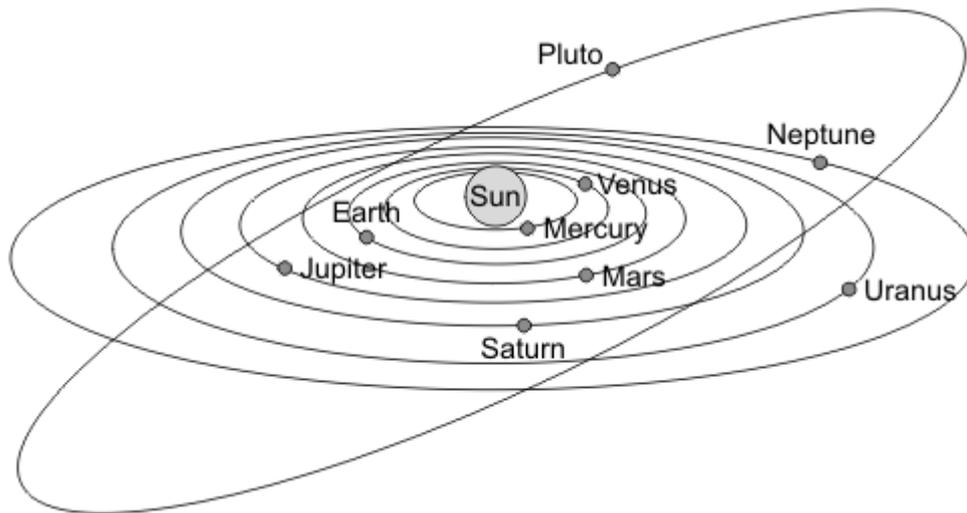
(2)

(Total 8 marks)

Q15.

Pluto was discovered in 1930. It was classified as a planet. In 2006, scientists agreed that Pluto is **not** a planet.

- (a) The diagram below shows our solar system.



not to scale

- (i) **From the diagram**, what supports the idea that Pluto is a planet?

.....

1 mark

- (ii) **From the diagram**, what supports the idea that Pluto is **not** a planet?

.....

1 mark

(b) The table below shows information about planets in our solar system.

planet	diameter (km)
Mercury	4800
Venus	12200
Earth	12800
Mars	6800
Jupiter	142600
Saturn	120200
Uranus	49000
Neptune	50000

Pluto has a diameter of 2 300 km.
How does this information suggest to scientists that Pluto is **not** a planet?

.....

1 mark

(c) An object called Charon orbits Pluto.

How does the presence of Charon support the idea that Pluto is a planet?

.....

1 mark

(d) The table below shows the composition of the atmosphere of some of the objects in our solar system.

object	atmosphere
Mercury	none
Venus	mainly carbon dioxide
Earth	mainly nitrogen and oxygen
Neptune	hydrogen, helium and methane
Earth's moon	none
Titan (a moon)	nitrogen and methane
Pluto	nitrogen and methane

Atmosphere is **not** used to classify objects as moons or planets.
Use the information above to suggest a reason for this.

.....
.....

1 mark

- (e) Why do you think scientists found it difficult to decide how Pluto should be classified?

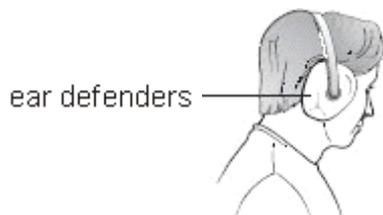
.....
.....

1 mark
maximum 6 marks

Q16.

Three pupils watched a firework display.

- (a) A man lit the fireworks. He wore ear defenders.



Why should he wear ear defenders when he is close to loud fireworks?

.....
.....

1 mark

- (b) A rocket exploded making a loud sound and a bright flash. Peter, Sabrina and Jan were standing at different distances from the rocket.



Jan



Sabrina



Peter



When the rocket exploded, Jan heard the quietest sound. Why did Jan hear the quietest sound?

.....
.....

1 mark

- (c) Jan saw the flash before she heard the sound.

What does this tell you about the speed of light and the speed of sound?

.....
.....

1 mark

(d) Complete the sentences below using words from the list.

chemical electrical heat light sound

(i) Jan, Sabrina and Peter could **see** the rocket explode because it gave out energy.

1 mark

(ii) They could **hear** the rocket explode because it gave out energy.

1 mark

(e) When the rocket stopped burning it fell to the ground. What force caused it to fall to the ground?

.....

1 mark
maximum 6 marks
End of paper

