Name:

OUNDLE
School

2019 Non Common Entrance Examination

For Third and Fourth Form Entry

Science

Time Allowed : 60 minutes

- *Please write your name in the box above*
- *Answer as many questions as you can in the time available*
- *The paper is out of 70 marks; 25 for Biology, 20 for Chemistry and 25 for Physics*

You will need:

- *A pen*
- *A pencil*
- *A ruler*
- *A calculator*

Biology mark / 25	
Chemistry mark / 20	
Physics mark / 25	
Total mark / 70	
Percentage	

Biology Section

For all multiple-choice questions in this the Biology Section, please write the letter which corresponds to you answer into the space provided.

Question 1

Oxygen molecules in high concentration in the lungs move into the bloodstream, where there is a lower concentration of glucose.

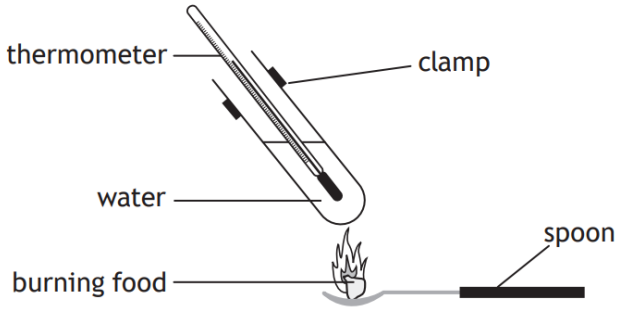
The process responsible for this action is:

A	osmosis
B	diffusion
C	passive transport
D	active transport

Answer: ..... **[1]**

Question 2

The diagram shows an experiment which can be used to find the energy content of different foods. Each food was completely burned and the energy content was estimated by the rise in temperature of the water.



The reliability of this experiment could be improved by

A	burning each food for the same length of time
B	repeating the experiment with each food several times
C	removing the thermometer from the tube to read it accurately
D	repeating the experiment using a different food each time

Answer: ..... **[1]**

Question 3

Pesticides sprayed onto crops can get into food chains. The following statements refer to stages in this process.

J	Pesticides are absorbed by plants.
K	Pesticides build up in animals.
L	Plants are eaten by animals.

Identify the order of steps by which pesticides could reach lethal levels in the bodies of animals.

	Step 1	*Step 2*	*Step 3*
A	J	K	L
B	L	J	K
C	L	K	J
D	J	L	K

Answer: ..... **[1]**

Question 4

Select the letter which correctly describes the functions of the cytoplasm, vacuole, mitochondria and chloroplasts.

	Site of respiration	*Site of photosynthesis*	*Site of cell reactions*	*Contains cell sap*
A	Cytoplasm	Mitochondria	Chloroplast	Vacuole
B	Chloroplast	Mitochondria	Vacuole	Cytoplasm
C	Mitochondria	Chloroplast	Cytoplasm	Vacuole
D	Chloroplast	Cytoplasm	Vacuole	Mitochondria

Answer: ..... **[1]**

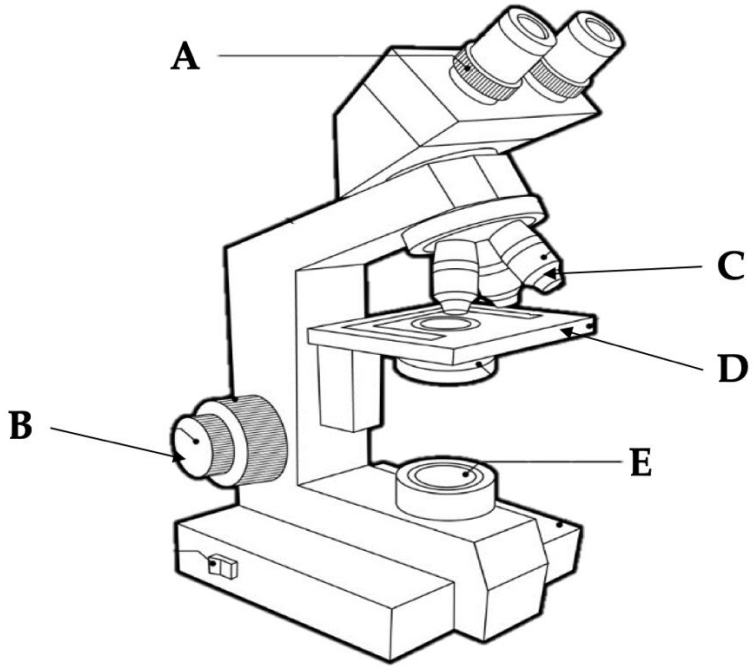
Question 5

A group of cells which do the same job is called:

A	an organ
B	a tissue
C	an organelle
D	an organ system

Answer: ..... **[1]**

Questions 6 to 9 refer to the diagram of a light microscope, below.



Question 6

Write the letter of the part of the microscope which you would use to adjust the focus.

Answer: ..... **[1]**

Question 7

Write the letter of the part of the microscope where the light is produced.

Answer: ..... **[1]**

Question 8

Write the letter of the part of the microscope where you would adjust the magnification.

Answer: ..... **[1]**

Question 9

Write the letter of the part of the microscope where you would mount a specimen.

Answer: ..... **[1]**

Question 10

The following statements (I to IV) refer to functions of the skeleton and muscles.

I	Contract to produce a force
II	Provides support
III	Makes blood cells
IV	Provides protection

A	I, II and III only
B	II and IV only
C	I, III and IV only
D	II, III and IV only

Answer: ..... **[1]**

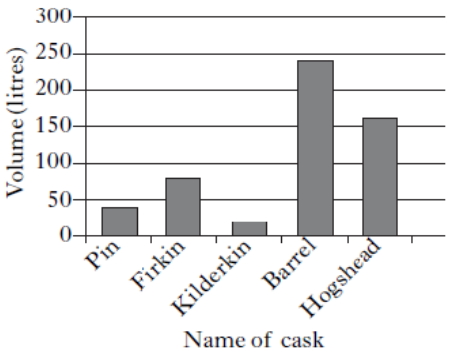
Question 11

The table below shows the volumes of five different containers used to contain liquid.

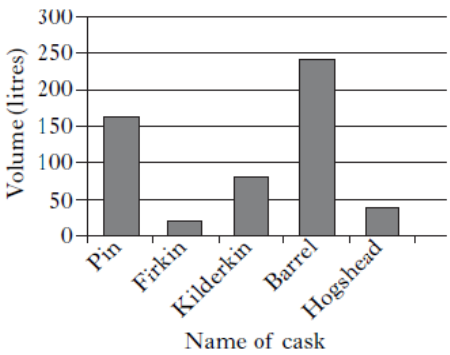
Name of Cask	Volume (litres)
Pin	20
Firkin	40
Kilderkin	80
Barrel	160
Hogshead	240

Which of the following bar charts represents this information?

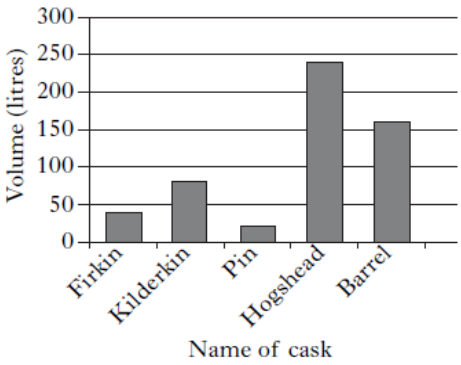
A



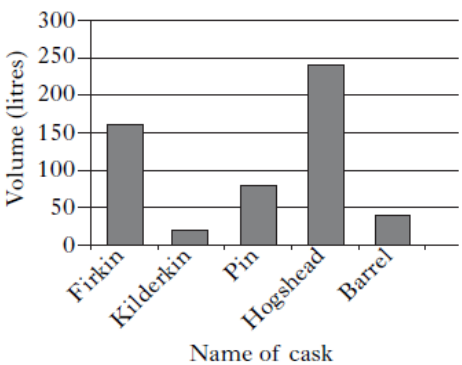
B



C



D



Answer: ..... **[1]**

Question 12

The information in the table below describes the food of some organisms that live in the arctic tundra.

Organism	Food
Vole	Grass
Arctic fox	Voles and arctic hares
Snowy owl	Voles
Grass	Makes its own food by photosynthesis
Arctic hare	Grass
Wolf	Arctic hares and arctic foxes

a. In the space below, construct a food web to show the feeding relationship in the Arctic tundra.

[2]

b. From the information above, describe and explain what might happen to the number of snowy owls if the number of voles was reduced.

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.....

.....

.....

..... **[2]**

Question 13

Read the passage and then answer the questions below.

Bats, like most mammals, have a body covered in fur and give birth to live young. They are different from other mammals, however, because bats are the only mammals which can fly. Their wings are made from webs of skin stretched between long bones, similar to the bones in your hand. The bat's thumb has a hook on the end which helps it to hang when it is not flying. Bats are nocturnal. This means that they are active at night. During the day, they roost together, hanging upside down in dark sheltered places.

The most common bat in the UK is the Pipistrelle. This bat is very small, with a body length of 38mm, and weighs less than a 2p coin. It flies, twisting and diving, with sudden changes in direction. It snatches gnats, midges and moths from the air. One Pipistrelle can eat up to 3000 of these insects in one night. The Long-eared bat is also found in the UK. It is bigger, with a body length of 50mm. Its ears are as long as its body. It flies slowly, hovering among branches of trees, grabbing caterpillars, spiders and moths from the leaves.

a. What makes bats different to other mammals?

.....

..... **[1]**

b. What does "nocturnal" mean?

.....

..... **[1]**

c. What length are the ears of a long-eared bat?

..... **[1]**

d. Which insect do both the Pipistrelle and the Long-eared bat eat?

..... **[1]**

[Total: 4 marks]

Question 14

Why do species become extinct?

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.....

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.....

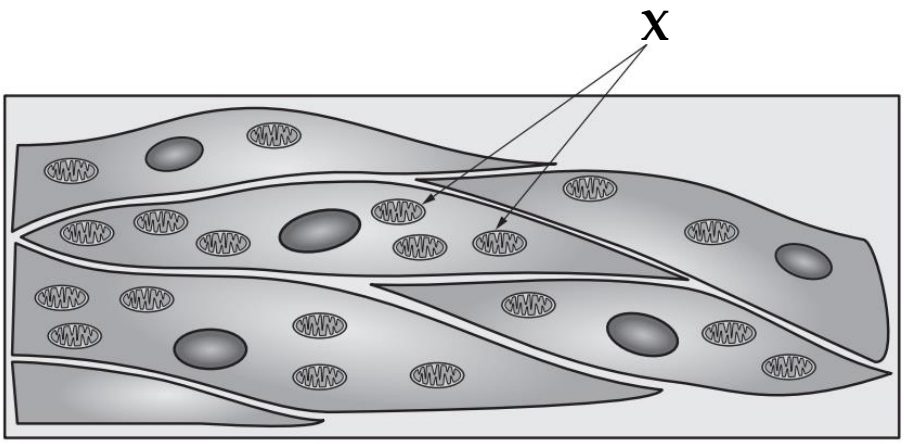
.....

..... **[3]**

[Total: 3 marks]

Question 15

The diagram below shows muscle cells where respiration occurs.



Describe what would happen to the process carried out by organelle X when no oxygen is present.

.....

.....

.....

.....

.....

..... **[3]**

[Total: 3 marks]

Chemistry Section

Question 1

a. Metals are extracted from rocks found in the Earth's crust.

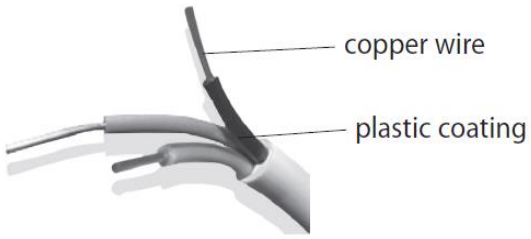
Complete the sentence by putting a tick (✓) in the box next to your answer.

Rocks from which metals are extracted are called

A	Alloys	
B	Elements	
C	Ores	
D	Polymers	

[1]

b. Copper is used as a wire in electric cables.



State two reasons why copper is used as the wire in electric cables.

.....

.....

.....

.....

..... **[2]**

c. Iron is formed by heating a mixture of iron oxide and carbon.

i. Complete the word equation for this reaction

iron oxide + carbon → ..... + ...

[2]

ii. In this reaction iron oxide is reduced to iron.

Describe what is meant by the term reduced.

.....

..... **[1]**

d. Metals in waste products are often recycled.

Describe the benefits of recycling.

.....

.....

.....

.....

..... **[2]**

[Total: 8 marks]

Question 2

Limestone is a naturally occurring form of calcium carbonate.

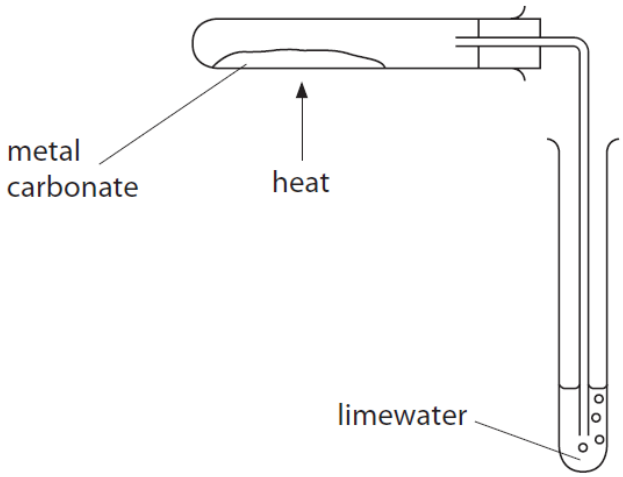
Calcium carbonate can be broken down by heating to form calcium oxide and carbon dioxide.

a. Write the word equation for this reaction.

[2]

A student investigated the ease of decomposition of three metal carbonates.
Equal masses of each metal carbonate were heated.
The time taken for carbon dioxide to be detected was measured.

The following apparatus was used.



b. What do you understand by the term 'thermal decomposition'?

.....

..... **[1]**

The table below shows the observations and the time taken for carbon dioxide to be detected.

Metal carbonate	Observations	Time taken for carbon dioxide to be detected (s)
Calcium carbonate	Powder remains white	180
Zinc carbonate	White powder turns yellow when hot but is white when cold.	105
Copper carbonate	Green powder turns black	36

c. All the carbonates have undergone a reaction

Give the evidence that shows that all three carbonates have reacted.

.....

..... **[1]**

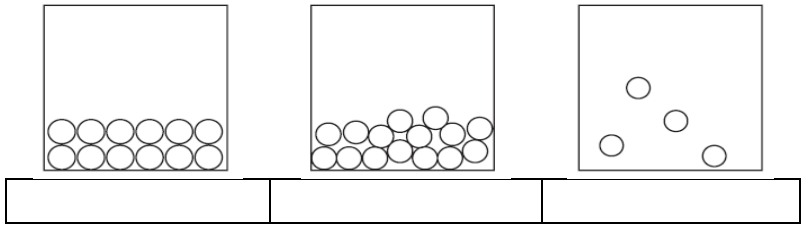
[Total: 4 marks]

Question 3

This question is about the elements hydrogen and oxygen.

The circles in the diagrams represent molecules of hydrogen.

a. Place a tick (✓) in the box under the diagram that represents hydrogen gas.



[1]

b. The diagram below shows two different atoms of hydrogen.

i. Complete the sentence by putting a tick (✓) in the box next to your answer.

The particle furthest from the centre of each atom is

A	An electron	
B	A neutron	
C	A nucleus	
D	A proton	

[1]

[Total: 2 marks]

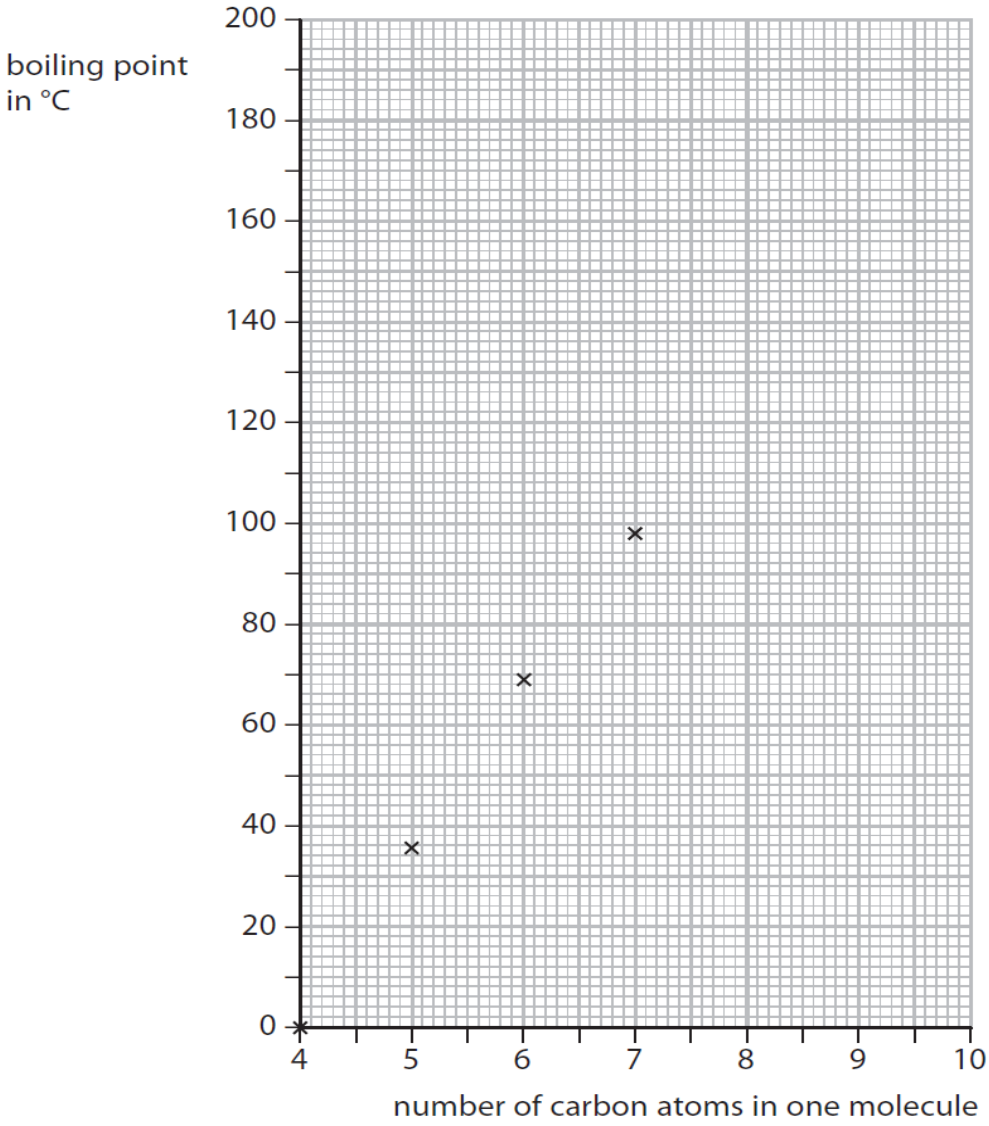
Question 4

a. The alkanes are hydrocarbons.

The table shows the number of carbon atoms per molecule and the boiling point for some alkanes.

Alkane	Number of carbon atoms in one molecule	Boiling point (°C)
Butane	4	0
Pentane	5	36
Hexane	6	69
Heptane	7	98
Octane	8	126
Nonane	9	151

The boiling points for butane, hexane, and heptane are plotted on the graph below.



i. Plot the boiling points for octane and nonane, and draw a line of best fit.

[2]

ii. Describe the trend shown by the line of best fit on the graph.

.....

.....

.....

.....

..... **[2]**

iii. Extend the line on your graph to estimate the boiling point of alkanes with 10 carbon atoms in one of its molecules.

Boiling point = ... **[2]**

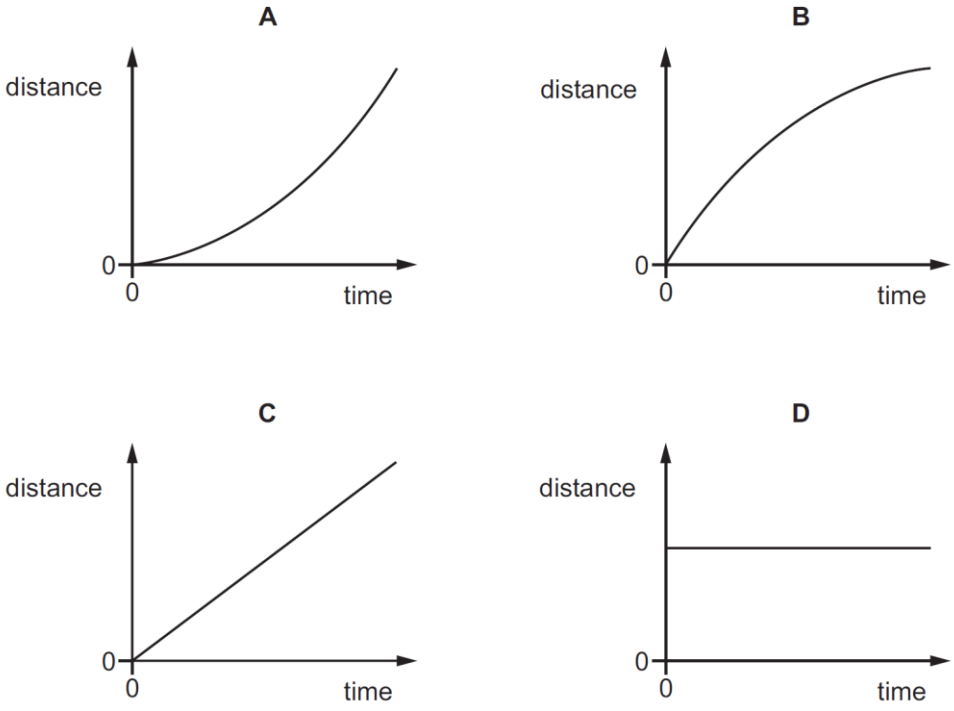
[Total: 6 marks]

Physics Section

For all multiple-choice questions in this the Physics Section, please write the letter which corresponds to your answer into the space provided.

Question 1

Which distance time graph represents an object slowing down?



Answer: ..... **[1]**

Question 2

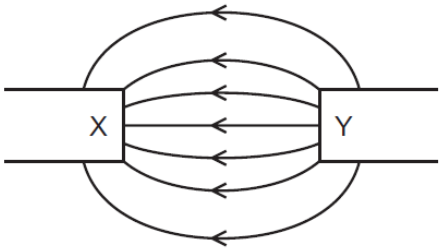
Which row gives the speed of sound in air, in water and in steel?

	speed in air m/s	speed in water m/s	speed in steel m/s
A	330	1500	6000
B	330	6000	1500
C	6000	330	1500
D	6000	1500	330

Answer: ..... **[1]**

Question 3

The diagram shows the pattern and the direction of the magnetic field between two magnetic poles X and Y.



Which types of poles are X and Y?

	X	Y
A	N-pole	N-pole
B	N-pole	S-pole
C	S-pole	N-pole
D	S-pole	S-pole

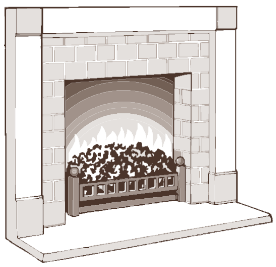
Answer: ..... **[1]**

End of multiple-choice questions

Question 4

The drawings below show six ways of providing energy.

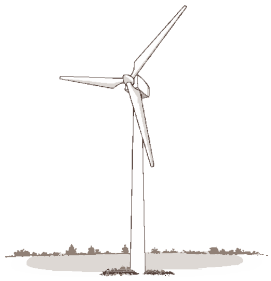
coal fire



burns coal to provide heat

A

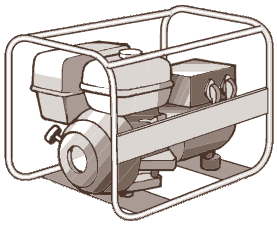
turbine



turns a generator to provide electricity

B

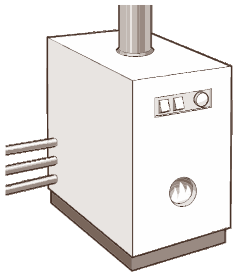
petrol generator



burns petrol to provide electricity

C

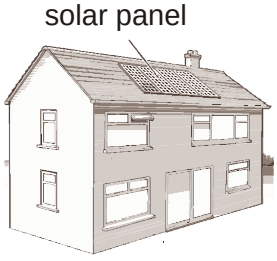
gas boiler



burns gas to provide heat

D

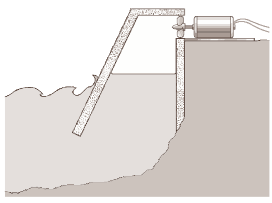
solar panel



uses solar energy to provide heat

E

wave turbine



uses wave energy to provide electricity

F

a. From the drawings, give the names of two fossil fuels.

1. .....

2. ..... **[2]**

b.

i. What is the source of energy for solar power?

..... **[1]**

ii. Why will the solar panel not work at night?

..... **[1]**

c. What makes the blades of the turbine in drawing B go around?

..... **[1]**

d. Renewable energy resources will not run out.
From the drawings, give one energy source that will not run out.

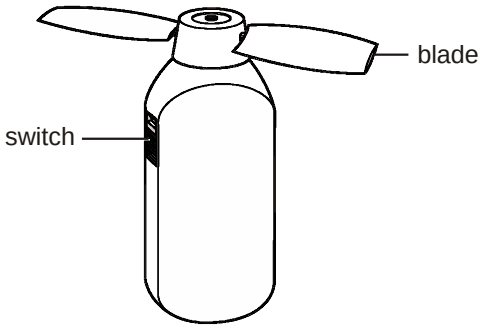
..... **[1]**

[Total: 6 marks]

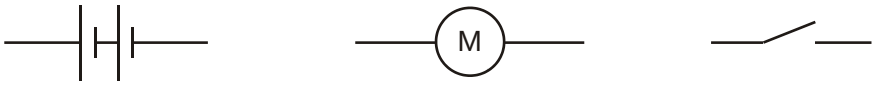
Question 5

Susan has a small fan to keep herself cool.

When she switches it on, a motor turns the blades to blow air.



a. The diagrams below show the symbols for a battery, a motor and a switch.



battery motor switch

In the space below, draw a series circuit diagram for the fan using these symbols.

[2]

b.

i. Which part provides the energy for the circuit?

..... **[1]**

ii. Some of this energy is used to turn the blades. The rest of the energy is wasted.
Complete the sentence below. Choose words from the list.

chemical heat light sound

When the blades are turning, energy is wasted as ..... energy and ..... energy.

[1]

c. Susan built a circuit using a battery, a motor and a switch.
She closed the switch to turn the motor on.

i. Susan added a bulb to the circuit. The current in the circuit decreased**.**
How did this affect the motor?

..... **[1]**

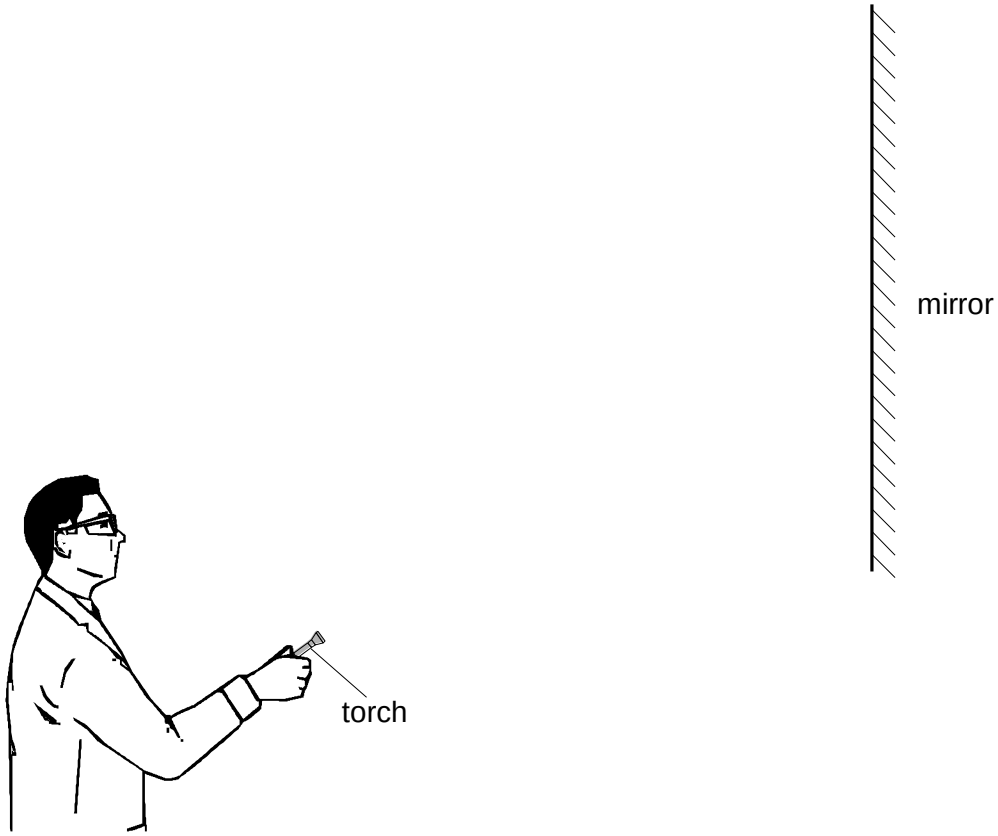
ii. Susan removed the motor from the circuit. The current in the circuit increased.
How did this affect the bulb?

..... **[1]**

[Total: 6 marks]

Question 6

A teacher has a small torch. He switches it on and points it towards a mirror.



a. A ray of light from the torch reflects off the mirror. Use a ruler to draw the ray of light:

i. From the torch to the mirror.

[1]

ii. Reflecting off the mirror.

[1]

Add arrows to the rays to show the direction of travel of the light.

b. A laser beam is a very bright and powerful beam of light. It is very dangerous to point a laser beam towards people or animals.

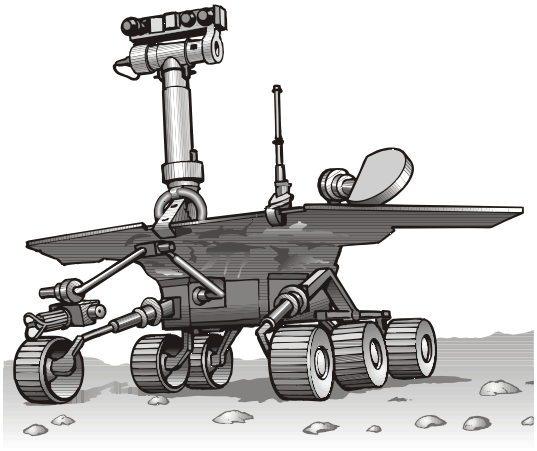
Which part of the body can be most easily damaged by a laser beam?

..... **[1]**

[Total: 4 marks]

Question 7

The drawing below shows a space buggy on the surface of Mars.



a. The distance between Earth and Mars is 192 000 000 km.
It took a spacecraft 200 days to take the buggy from Earth to Mars.

Calculate the average speed at which the spacecraft travelled. Give the unit.

.....

.....

.....

.....

..... **[2]**

b. The weight of the buggy was 105 N on Earth and 40 N on Mars.

Why was the weight of the buggy less on Mars than on Earth?

.....

.....

.....

.....

..... **[2]**

c. The buggy uses solar panels to generate electrical energy.

The solar panels generate less electrical energy on Mars than on Earth.

Give a reason why.

.....

.....

.....

.....

..... **[1]**

d. The weight of the buggy was 40 N on Mars. When the buggy landed on Mars it rested on an area of 0.025 m^2.

Calculate the pressure exerted by the buggy on the surface of Mars. Give the unit.

.....

.....

.....

.....

..... **[2]**

[Total: 7 marks]