



Answer ALL the questions. Write your answers in the spaces provided.

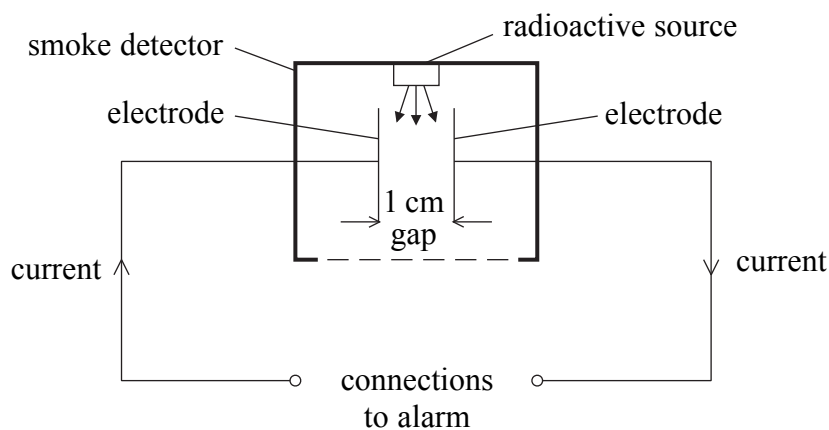
1. (a) Radioactive sources emit three different types of radiation.  
Draw a line to join each type of radiation to its penetrating power.

type of radiation	penetrating power
alpha particles very strongly ionising	penetrate air or paper but are absorbed by 3 mm of aluminium
beta particles quite strongly ionising	penetrate air up to 5 cm but are absorbed by paper
gamma rays very weakly ionising	penetrate materials but are mostly absorbed by thick lead or concrete

(2)

- (b) Fire-fighters suggest people fit smoke alarms in their homes.

Most smoke alarms use a radioactive source.  
The radiation given out by the source ionises air so that there is an electric current between the electrodes.  
When there is a fire, smoke reduces the current between the electrodes.



Which of the three types of radiation is used in the alarm?  
Give a reason for your choice.

Type of radiation .....

Reason .....

.....

(2)

Q1

(Total 4 marks)



2. (a) Building surveyors can use an echo sounding device to measure length.  
The device sends out pulses of ultrasound.  
The diagram shows Alan measuring the length of a room with such a device.



- (i) Explain why Alan does not hear the ultrasound.

..... (1)

- (ii) Explain what happens to a pulse of ultrasound when the device is used to measure the length of a room.

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

- (b) Ultrasound is often used in hospitals instead of X-rays.  
Give one example of this and explain why ultrasound is preferable.



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

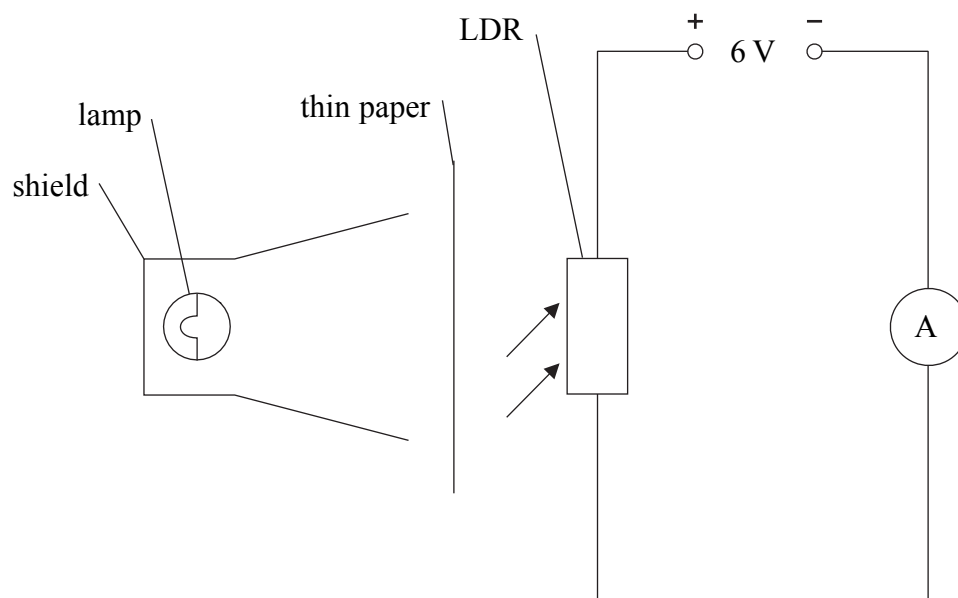
(Total 6 marks)

Q2



N 2 1 4 2 0 A 0 3 0 8

3. Robert does an experiment to find out how the resistance of a light-dependent resistor (LDR) is affected by the light level.



He carries out his experiment by

- taking the reading on the ammeter
- placing a piece of paper over the LDR to reduce the amount of light it receives
- taking another ammeter reading
- adding another piece of paper and repeating the reading
- continuing until he has a total of six pieces of paper.

(a) (i) How will the resistance of the LDR change as the light level is reduced?

..... (1)

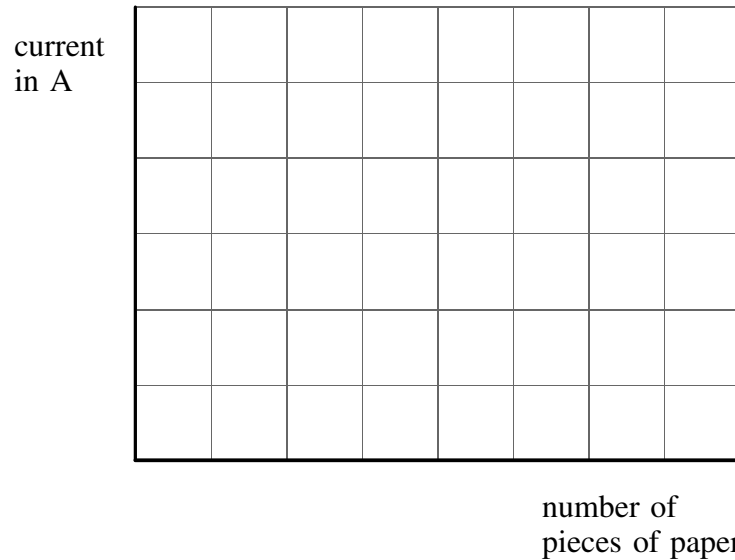
(ii) Robert measured the current when there was no paper over the LDR. The ammeter reading was 0.01 A. What was the resistance of the LDR under these conditions?

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



Leave blank

(b) Use the grid below to draw the graph you expect Robert to obtain from his results.



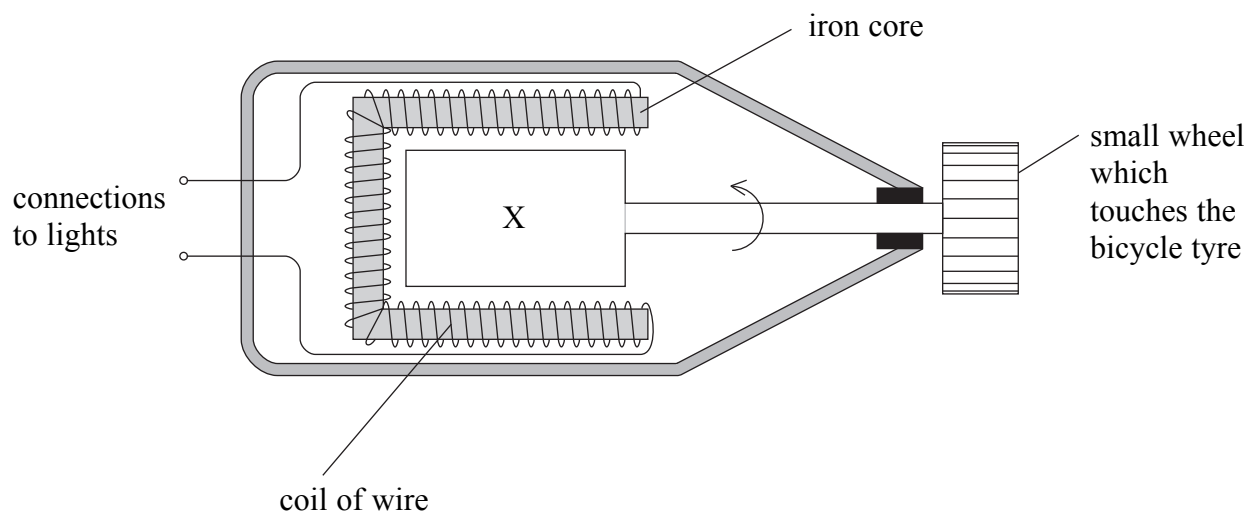
(1) Q3

(Total 5 marks)



N 2 1 4 2 0 A 0 5 0 8

4. Rachel's bicycle has a dynamo to supply electricity for its lights. The diagram shows the dynamo.  
Part X rotates when the bicycle moves.



- (a) Name part X.

..... (1)

- (b) Suggest one way that Rachel could increase the amount of electrical energy given out by the dynamo to make the lights brighter.

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

- (c) Suggest an advantage and a disadvantage of using a dynamo instead of a battery for her bicycle lights.

Advantage .....

.....

Disadvantage .....

..... (2)

(Total 4 marks)

Q4



5. (a) Shaun is cutting a large area of grass with an electric mower. He is worried that he might cut through the mains cable of the mower. He decides to use a residual current circuit breaker (RCCB) as well as a fuse because he knows that this will give him more protection.

(i) Describe how a fuse provides protection.

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

(2)

(ii) Explain how an RCCB provides additional protection.

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

(2)

(b) When people receive an electric shock, a current goes through them. The table shows how different currents are likely to affect people.

current in mA	effect on people
1	none
5	tingling effect
10	could become harmful
100	probably fatal

Shaun's RCCB switches off if it detects a residual current of 30 mA. It takes just 0.02 s to switch off. Use the data in both columns of the table to suggest how effectively this RCCB would protect Shaun.

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

(2)

(Total 6 marks)

Q5



Leave  
blank

6. (a) Light emitted from a star usually shows a red shift.  
Describe what is meant by a **red shift** and explain how it is caused.

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

**(2)**

- (b) Many scientists believe that the red shift gives evidence that the Universe is expanding.  
What other evidence supports the Big Bang theory?

.....  
.....

**(1)**

- (c) Heather is an astronomer. She discovers a galaxy. She thinks it is a spinning disc of stars but she can only see the edge. She measures the red shift from different parts of the galaxy to find out if she is right.  
How could she use observations of light from the galaxy to show that it is spinning?  
You may draw a diagram to help your answer.

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

**(2)**

**(Total 5 marks)**

**Q6**

**TOTAL FOR PAPER: 30 MARKS**

**END**

