



2008 Physics

Intermediate 1

Finalised Marking Instructions

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Physics – Marking Issues

The current in a resistor is 1.5 amperes when the potential difference across it is 7.5 volts. Calculate the resistance of the resistor.

	Answers	Mark + Comment	Issue
1.	V=IR 7.5=1.5R R=5.0 Ω	(½) (½) (1)	Ideal answer
2.	5.0 Ω	(2) Correct answer	GMI 1
3.	5.0	(½) Unit missing	GMI 2 (a)
4.	4.0 Ω	(0) No evidence/wrong answer	GMI 1
5.	_____ Ω	(0) No final answer	GMI 1
6.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 4.0 \Omega$	(½) Arithmetic error	GMI 7
7.	$R = \frac{V}{I} = 4.0 \Omega$	(½) Formula only	GMI 4 and 1
8.	$R = \frac{V}{I} = \text{_____} \Omega$	(½) Formula only	GMI 4 and 1
9.	$R = \frac{V}{I} = \frac{7.5}{1.5} = \text{_____} \Omega$	(1) Formula + subs/No final answer	GMI 4 and 1
10.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 4.0$	(1) Formula + substitution	GMI 2 (a) and 7
11.	$R = \frac{V}{I} = \frac{1.5}{7.5} = 5.0 \Omega$	(½) Formula but wrong substitution	GMI 5
12.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 5.0 \Omega$	(½) Formula but wrong substitution	GMI 5
13.	$R = \frac{I}{V} = \frac{7.5}{1.5} = 5.0 \Omega$	(0) Wrong formula	GMI 5
14.	V = IR 7.5 = 1.5 × R R = 0.2 Ω	(½) Arithmetic error	GMI 7
15.	V = IR $R = \frac{I}{V} = \frac{1.5}{7.5} = 0.2 \Omega$	(½) Formula only	GMI 20

SECTION A

- | | | | |
|-----|----------|-----|----------|
| 1. | B | 11. | D |
| 2. | B | 12. | D |
| 3. | C | 13. | C |
| 4. | B | 14. | B |
| 5. | C | 15. | D |
| 6. | E | 16. | B |
| 7. | E | 17. | A |
| 8. | B | 18. | E |
| 9. | E | 19. | D |
| 10. | C | 20. | A |

SECTION B

Marks

21. Some mobile phones have GPS (Global Positioning System).



This means that you can find out where you are if you are lost.

(a) Complete the sentences below using some of these words.

- | | | | |
|--------------|------------|---------------|----------------------|
| light | 200 | radio | electrical |
| sound | 300 | energy | geostationary |

The GPS phone uses **radio (1/2)** waves to receive signals from satellites in space. These waves transfer **energy (1/2)**.

The waves travel at a speed of **300 (1/2)** million metres per second. A satellite which stays above the same point on the Earth's surface is called a **geostationary (1/2)** satellite.

2

(b) It takes 0.12 seconds for a signal to travel from a satellite 36 million metres above the Earth to the GPS phone.

(i) What time does a signal take to travel from a different satellite 18 million metres above the Earth?

0.06 seconds

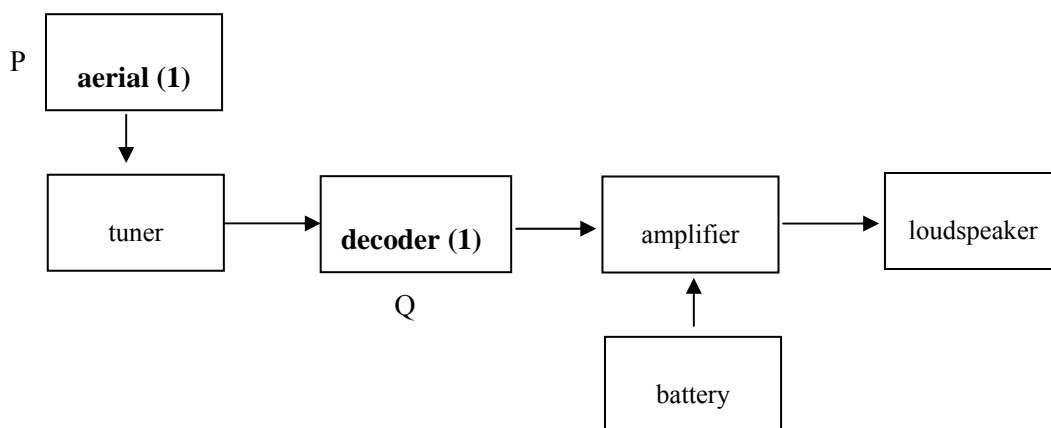
1

(ii) Explain your answer.

Distance is halved (so time will be halved)

1

22. (a) A block diagram of a radio receiver is shown.



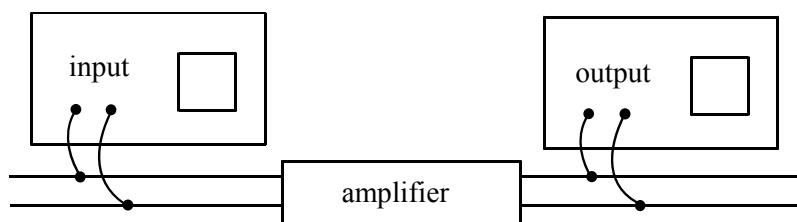
(i) Complete the diagram by labelling blocks P and Q. 2

(ii) What is the function of the tuner?

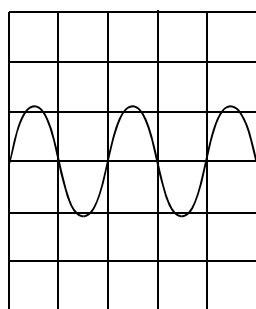
To select one signal/station/frequency (from many)

1

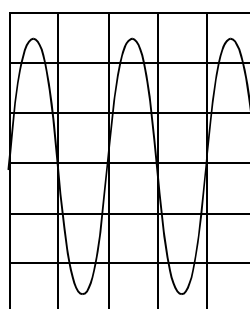
(b) Oscilloscopes are connected across the input and output of the amplifier. The settings on each oscilloscope are the same.



(i) The diagram below shows the input signal.



input



output

bigger amplitude (1)
same frequency (1)

2

On the output diagram draw the output signal from the amplifier.

22. (b) (continued)

Marks

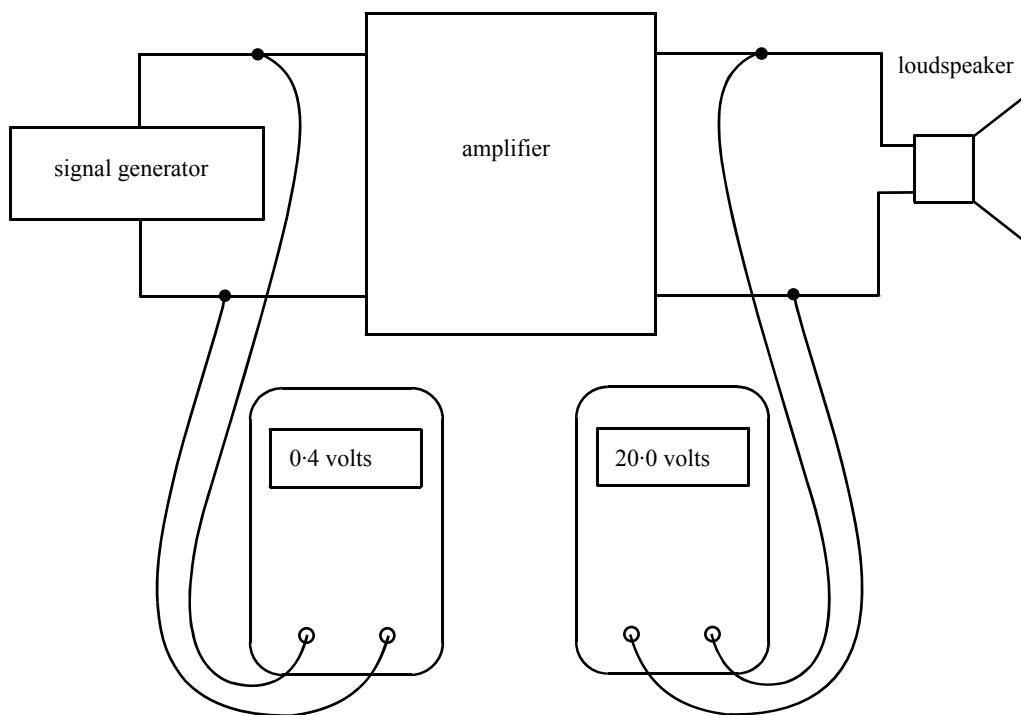
(ii) The frequency of the input signal is now increased.

What change will there be in the output signal shown on the oscilloscope?

There will be more waves (on the screen.)

1

(c) The diagram below shows an amplifier connected to a signal generator and a loudspeaker. Voltmeters measure the input and output voltages of the amplifier.

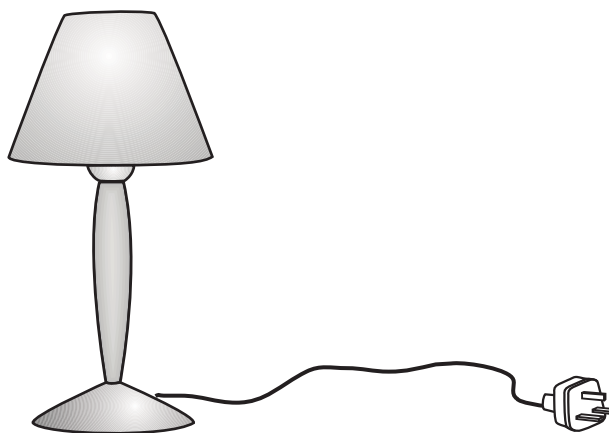


Using information from the diagram, calculate the voltage gain of the amplifier.

$$\text{voltage gain} = \frac{\overset{(1/2)}{\text{output voltage}}}{\text{input voltage}} = \frac{\overset{(1/2)}{20.0}}{0.4} = \overset{(1)}{50}$$

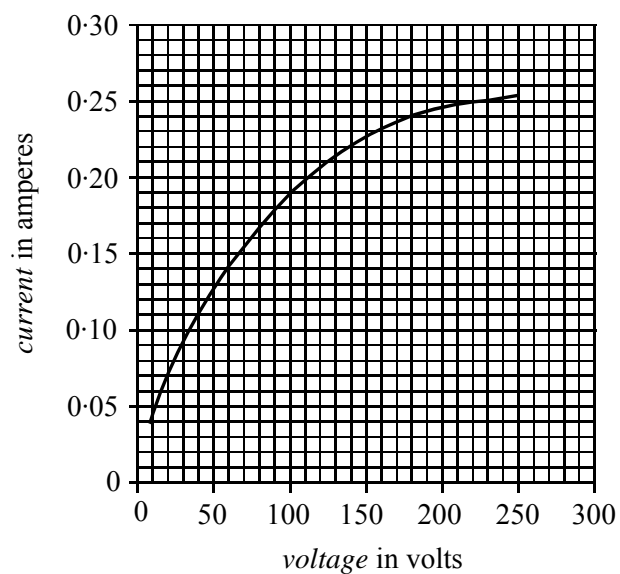
2

23. (a) A technician for a lamp company is investigating the properties of a lamp at different voltages.



For different voltages the technician measures the current in the lamp.

The graph of her results is shown below.



- (i) What is the value of mains voltage?

230 volts

1

23. (a) (continued)

(ii) What is the current in the lamp when it is being operated at mains voltage?

0.25 amperes

1

(iii) Calculate the resistance of the bulb at mains voltage.

$$\text{resistance} = \frac{\overset{(1/2)}{\text{voltage}}}{\text{current}} = \frac{\overset{(1/2)}{230}}{0.25} = \overset{(1)}{920} \text{ ohms}$$

2

(b) The bulb is now operated at a lower voltage than mains voltage.

(i) Will the resistance of the bulb be **bigger, smaller** or **the same as** your answer in (a) (iii)?

Smaller

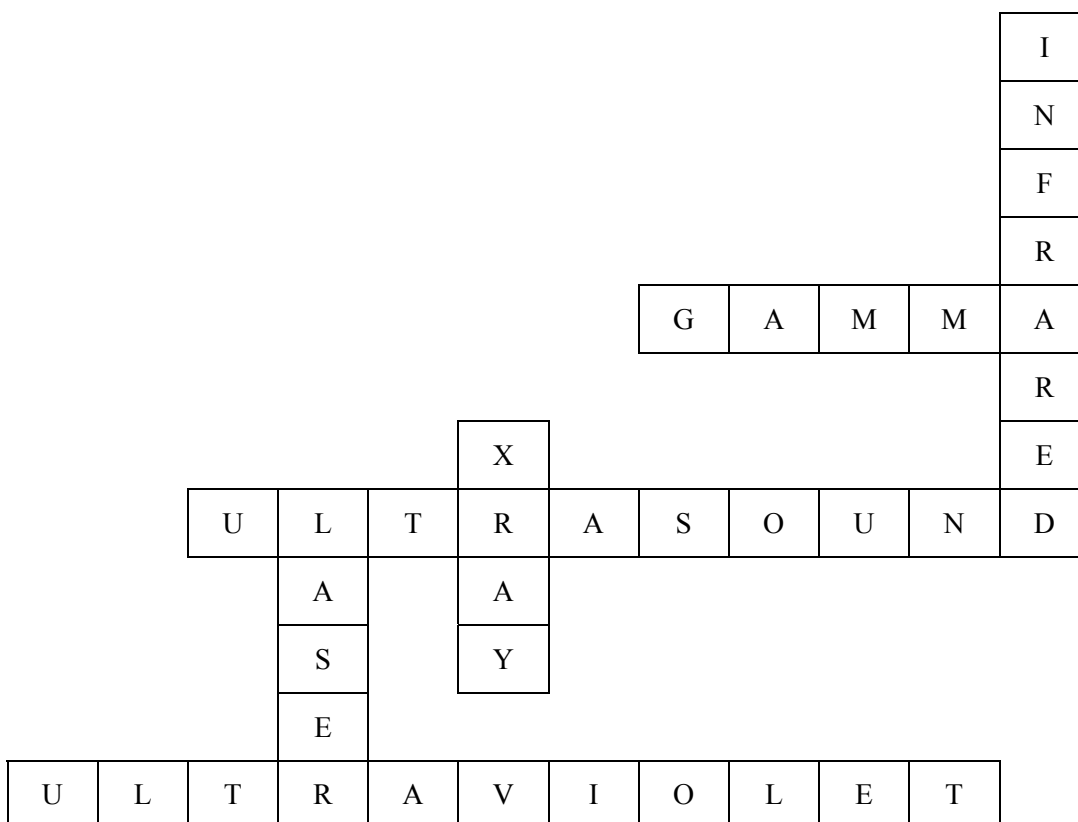
1

(ii) Explain your answer.

By calculation eg $\frac{100}{0.19} = 526 \text{ ohms}$

1

24. The following is part of a crossword.



(a) Select **three** answers from the crossword to complete the table below.

<i>Medical use</i>	<i>Answer from crossword</i>	
Scanning an unborn baby	ultrasound	(1)
Detecting broken bones	x-ray	(1)
Treating vitamin deficiency	ultraviolet	(1)

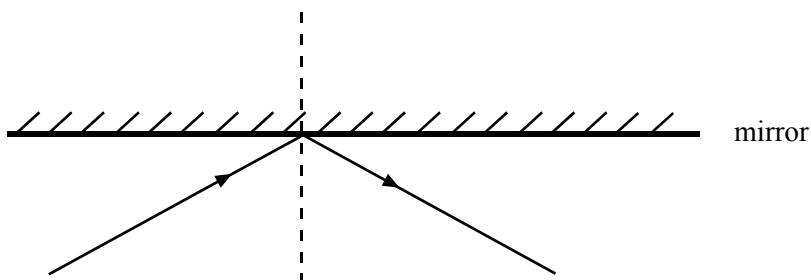
3

(b) What is another name for infrared?

Heat (radiation)

1

25. (a) Laser light reflects in the same way as light from a filament lamp. Complete the diagram to show the normal and the reflected beam.

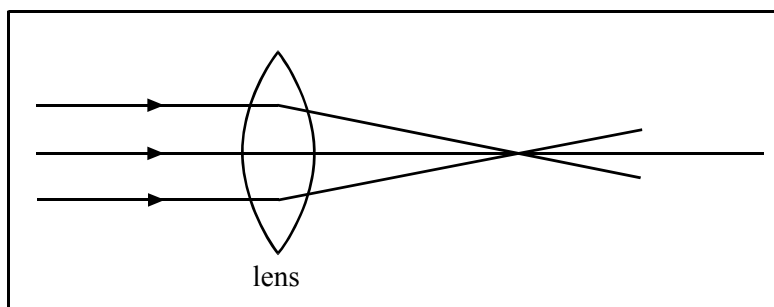


normal (1)
angle of reflection = angle of incidence (1)

2

- (b) Lasers can be used to cut sheets of metal.
 A lens is used to focus the laser light onto the metal.

Complete the following diagram showing the correct shape of the lens and the effect it has on the beam of light.



convex lens (1)
three rays converge (1)

2

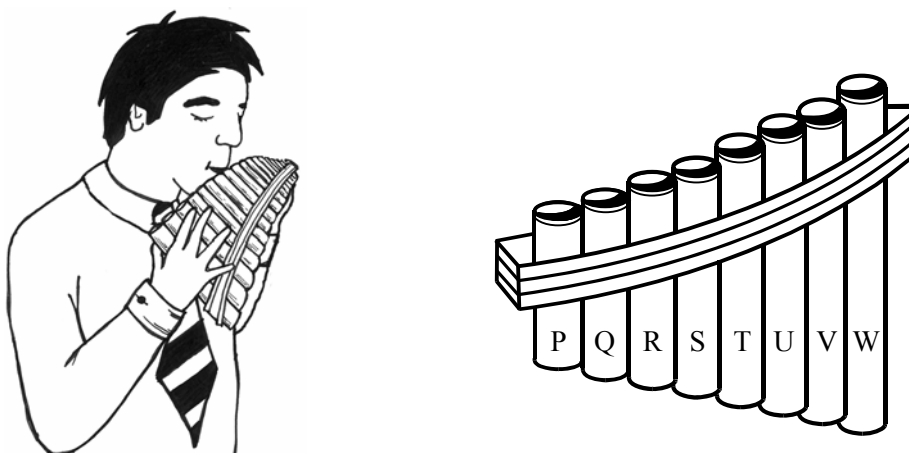
- (c) Some students use a low power laser to try to show the security markings on bank notes. They are not successful.

What type of radiation should they use?

Ultraviolet

1

26. (a) A student is learning to play the panpipes. He blows across the pipes and each one produces a different note.



- (i) What must the air in the pipes be doing to produce the notes?

Vibrate/Vibrating

1

- (ii) Which pipe will produce the highest frequency note when the student blows across it?

P

1

- (iii) The notes from pipes Q and W are an octave apart.

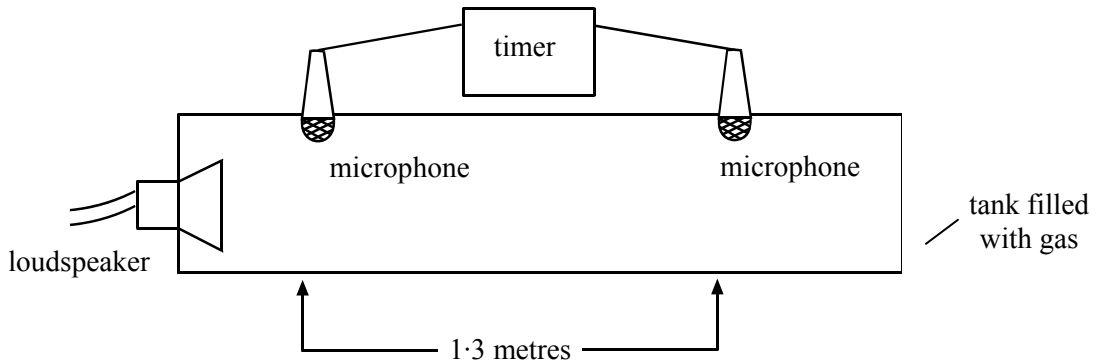
Pipe W produces sound of frequency 256 hertz.

What is the frequency of the sound from pipe Q?

512 hertz

1

- (b) The student investigates the speed of sound in different gases. He designs an experiment as shown below. A short note is produced by the loudspeaker and the sound travels through the tank from one microphone to the other.



- (i) The tank is filled with carbon dioxide. The sound travels a distance of 1.3 metres from the first microphone to the second microphone. The timer records a time of 0.005 seconds.

Calculate the speed of sound in carbon dioxide.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{1.3}{0.005} = 260 \text{ metres per second}$$

2

- (ii) The tank is now filled with a different gas. The time recorded on the timer is less than 0.005 seconds.

- (A) Is the speed of sound in this gas **less than, equal to** or **more than** the speed of sound in carbon dioxide?

More than

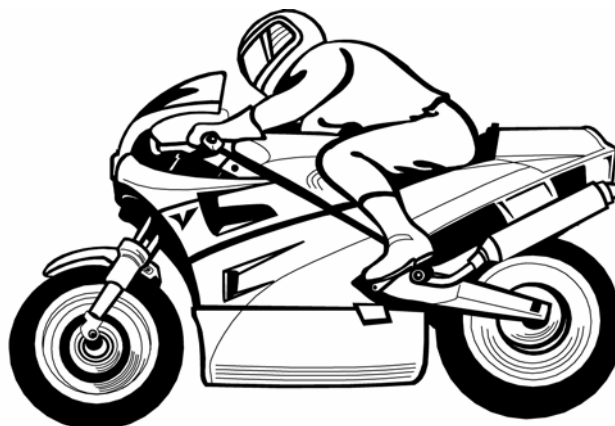
1

- (B) Explain your answer.

Less time for the same distance.
 OR eg $\frac{1.3}{0.002} = 650 \text{ metres per second}$

1

27. The picture shows a motorcyclist on a motorbike.



(a) The motorbike goes from 0 to 28 metres per second in 3 seconds.

(i) The motorbike covers a distance of 42 metres during this time.

Calculate the average speed.

$\text{average speed} = \frac{\text{distance}}{\text{time}} = \frac{42}{3} = 14 \text{ metres per second}$
--

2

(ii) The motorcyclist is comparing the performance of his motorbike with another bike. The performances of the two bikes are shown in the table.

	<i>Shortest time for 0-28 metres per second in seconds</i>	<i>Engine power in brake horse power</i>	<i>Mass in kilograms</i>
Bike 1	3	150	181
Bike 2	anytime > 3	121	181

Complete the table to show a possible time for Bike 2.

1

27. (continued)

Marks

(b) The headlamp of one of the motorbikes uses a 12 volt, 60 watt bulb.

(i) Calculate the current drawn from the battery when the headlamp is operating.

$$\text{current} = \frac{\overset{(1/2)}{\text{power}}}{\text{voltage}} = \frac{\overset{(1/2)}{60}}{12} = \overset{(1)}{5} \text{ amperes}$$

2

(ii) Circle the most suitable size of fuse required to protect the bulb circuit.

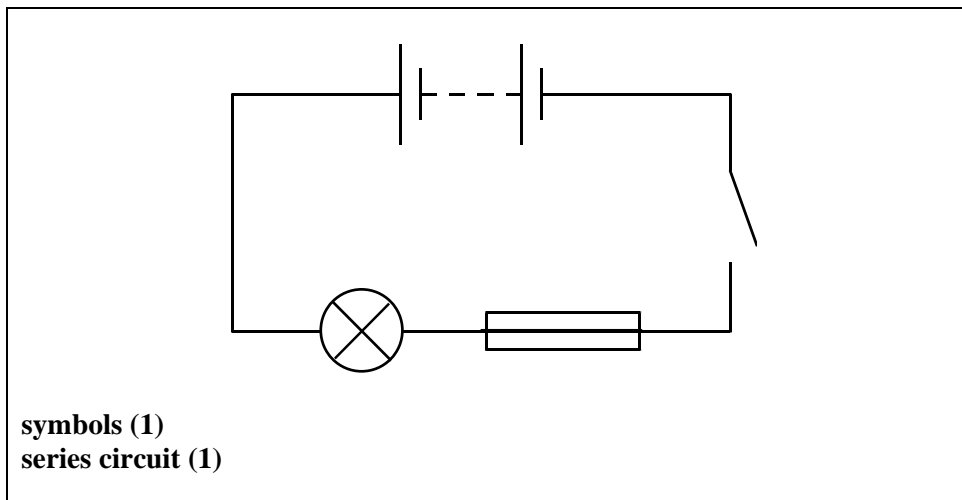
3 amperes

10 amperes

13 amperes

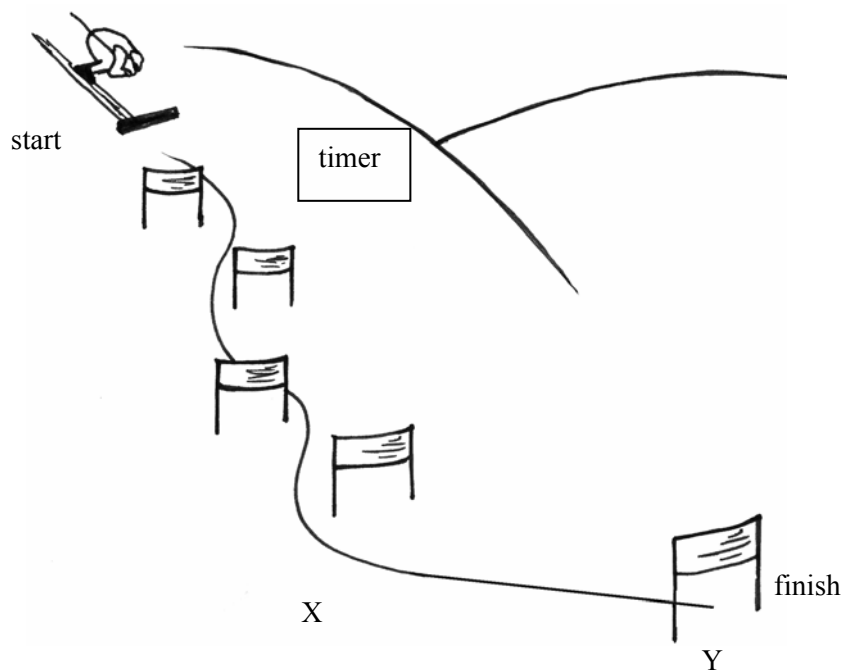
1

(iii) Draw a circuit diagram showing how the bulb, battery, ignition switch and fuse are connected.



2

28. At the end of a week of skiing lessons, students are given a chance to try a short downhill course.



(a) The students want to calculate the average speed of a skier down the course. An electronic timer is used to measure the time between the start and finish lines.

(i) What electronic device could be used to stop the timer at the finish line?

Light gate

1

(ii) What other measurement is needed to calculate the average speed?

Distance

1

(iii) How would these measurements be used to calculate the average speed?

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

1

28. (continued)

Marks

(b) (i) The mass of the skier is 60 kilograms.

Calculate the weight of the skier

$$\text{weight} = 10 \times \text{mass} = 10 \times 60 = 600 \text{ newtons}$$

(1/2) (1/2) (1)

2

(ii) Between points X and Y the forces on the skier are balanced.

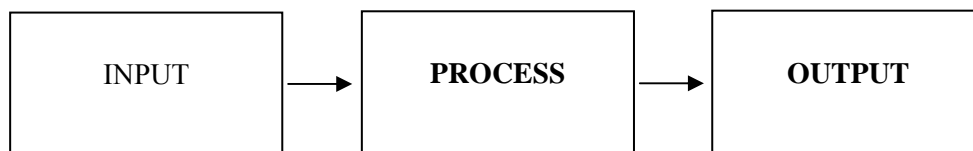
What happens to the speed of the skier between points X and Y?

Stays the same/steady/constant

1

29. (a) An electronic system consists of three parts.

Complete the block diagram below.



1

(b) Some electronic devices are listed below

- | | | |
|--------------------|--------------|---------------|
| microphone | motor | switch |
| loudspeaker | lamp | LED |

(i) Complete the table below by putting each device in the correct column.

<i>Input Device</i>	<i>Output Device</i>
microphone (½)	loudspeaker (½)
switch (½)	lamp (½)
	motor (½)
	LED (½)

3

(ii) What is the energy change in an LED?

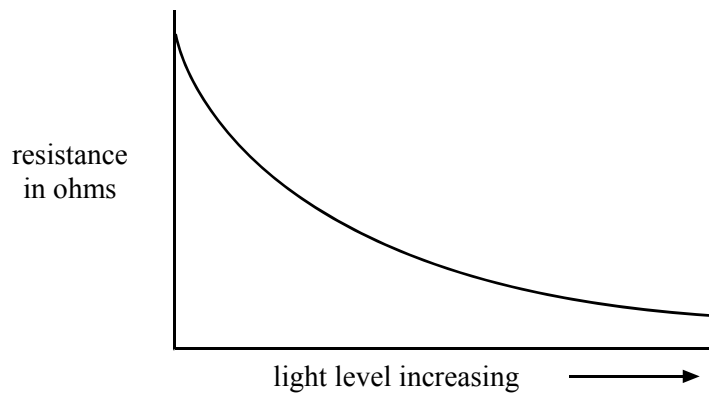
Electrical to light

1

29. (continued)

Marks

- (c) The resistance of an LDR is measured as the light level increases. The results are shown on a graph.



- (i) Looking at the graph, state what happens to the resistance of the LDR as the light level increases.

(resistance) decreases

1

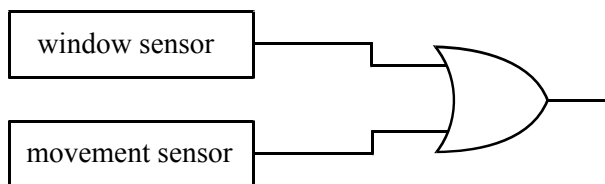
- (ii) Name the meter used to measure resistance.

Ohmmeter

1

30. A car alarm system has two sensors.
 One sensor activates if someone smashes a window.
 The second sensor activates if someone tries to move the car.
 Each sensor gives a high output when activated.

(a) The two sensors are connected to a logic gate as shown.

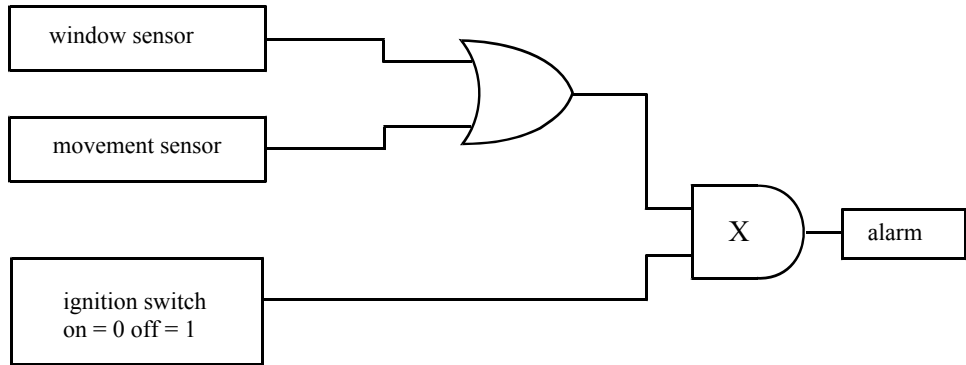


Complete the table to show the output from the logic gate.

<i>Logic level of window sensor</i>	<i>Logic level of movement sensor</i>	<i>Output logic level of gate</i>
0	0	0
0	1	1
1	0	1
1	1	1

1

(b) If the owner wants to drive the car, the alarm must be switched off.



(i) Name logic gate X.

AND gate

1

(ii) Is the output from the ignition switch **high** or **low** when the switch is on?

low

1

(iii) Explain why the alarm will not sound if the car is moved when the ignition switch is on.

**the AND gate requires two high inputs (to activate the alarm) (1)
if ignition switch is on then one of the inputs is low (1)**

2

[END OF MARKING INSTRUCTIONS]