



**2009 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.

	<b>Answers</b>	<b>Mark + Comment</b>	<b>Issue</b>
1.	$V=IR$ $7.5=1.5R$ $R=5.0 \Omega$	(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.	$V = IR \quad 7.5 = 1.5 \times R \quad R = 0.2 \Omega$	(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>C</b> | 11. | <b>E</b> |
| 2.  | <b>D</b> | 12. | <b>C</b> |
| 3.  | <b>B</b> | 13. | <b>E</b> |
| 4.  | <b>C</b> | 14. | <b>D</b> |
| 5.  | <b>B</b> | 15. | <b>A</b> |
| 6.  | <b>D</b> | 16. | <b>B</b> |
| 7.  | <b>E</b> | 17. | <b>E</b> |
| 8.  | <b>B</b> | 18. | <b>D</b> |
| 9.  | <b>E</b> | 19. | <b>A</b> |
| 10. | <b>A</b> | 20. | <b>C</b> |

**SECTION B**

**Marks**

21. (a) What is an optical fibre?

A **thin** piece of **glass** (or plastic)

**1**

(b) Describe **one** advantage of an optical fibre for carrying TV signals into the home rather than using an aerial on the roof.

**Less interference OR greater quantity of signals**

**1**

(c) Telephone signals can cross the Atlantic by metal wires or optical fibres.

(i) Two telephone signals are sent from Canada at the same time. One is sent through the metal wires, one through the optical fibres. Which signal arrives in Scotland first?

**Signal through the metal wires**

**1**

(ii) Explain your answer.

**Signal speed in metal wires greater than speed in optical fibres  
OR signal travels faster through metal wires than optical fibres**

**1**

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

**text**                      **radio**                      **electrical**  
**receiver**                  **sound**                      **light**

A mobile phone acts as a transmitter and a receiver (½) .

A mobile phone uses radio (½) waves to send text messages.

The loudspeaker in a mobile phone changes electrical (½)

energy into sound (½) energy.

2

(b) A mobile phone contains an amplifier. The input voltage to the amplifier is 0.02 volts. The output voltage from the amplifier is 3.2 volts. Calculate the voltage gain of the amplifier.

$\text{voltage gain} = \frac{\text{output voltage}}{\text{input voltage}} \left(\frac{1}{2}\right) = \frac{3.2}{0.02} \left(\frac{1}{2}\right) = 160 \text{ (1)}$
---

2

(c) A student looks at his mobile phone and notices that the signal **strength** is very low. Give **two** reasons why this might happen.

<b>Hills blocking signals</b> <b>Travelling in tunnel</b> <b>Poor signal coverage etc</b>	<b>Any two (1) (1)</b>
---	------------------------

2

23. (a) What type of radiation causes sun-burn?

**Ultraviolet**

**1**

(b) It is recommended that goggles should be worn when using a sun-bed.

Explain why.

**Ultraviolet radiation can damage your eyes**

**1**

(c) A student goes to a mountain ski resort. The temperature is always cold but the student is advised to wear sun-block. Explain why sun-block is necessary.

**Sunlight contains ultraviolet (which could damage skin)  
OR reflection of ultraviolet from the snow  
OR less absorption of ultraviolet at altitude**

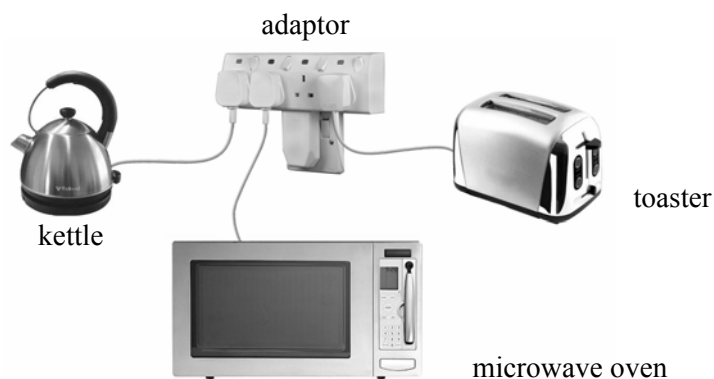
**1**

(d) Why should skin not be overexposed to sunlight?

**It can cause sunburn or skin cancer**

**1**

24. A student plugs a toaster, a kettle and a microwave oven into an adaptor.



The table shows information about the appliances.

<i>Appliance</i>	<i>Voltage in volts</i>	<i>Power in watts</i>	<i>Current in amperes</i>
Microwave oven	230	690	3
Toaster	230	1150	5
Kettle	230	2070	

(a) Show by calculation that the current in the kettle is 9 amperes when operating.

You **must** show your working.

$\text{current} = \frac{\text{power}}{\text{voltage}} \text{ (}\frac{1}{2}\text{)} = \frac{2070}{230} \text{ (}\frac{1}{2}\text{)} = 9 \text{ (amperes) (1)}$
---

2

The adaptor is fitted with a 13 ampere fuse.

- (b) (i) Which **two** appliances must **not** be switched on at the same time?

**Kettle and toaster**

**1**

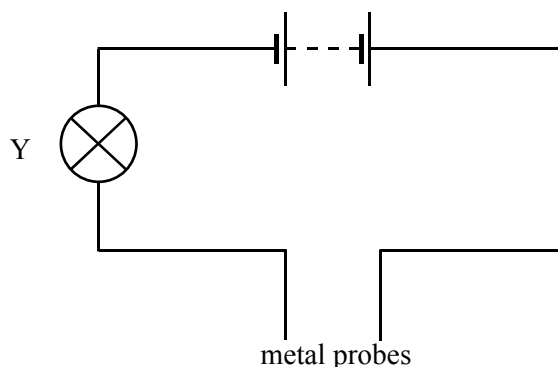
- (ii) Explain your answer.

**Total current = 14 amperes which is greater than fuse value**

**1**



25. A student's games console stops working. She builds the circuit below to test the fuse in the plug.



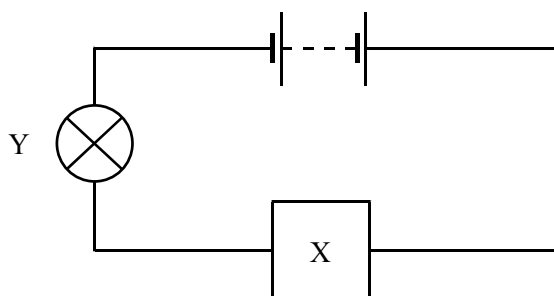
- (a) The student touches the metal probes together and bulb Y lights.

She connects the metal probes to the fuse for the games console. This time bulb Y does not light. What might be wrong with the fuse?

**Fuse broken (or blown)**

1

- (b) The student sets up a new circuit including the component X.

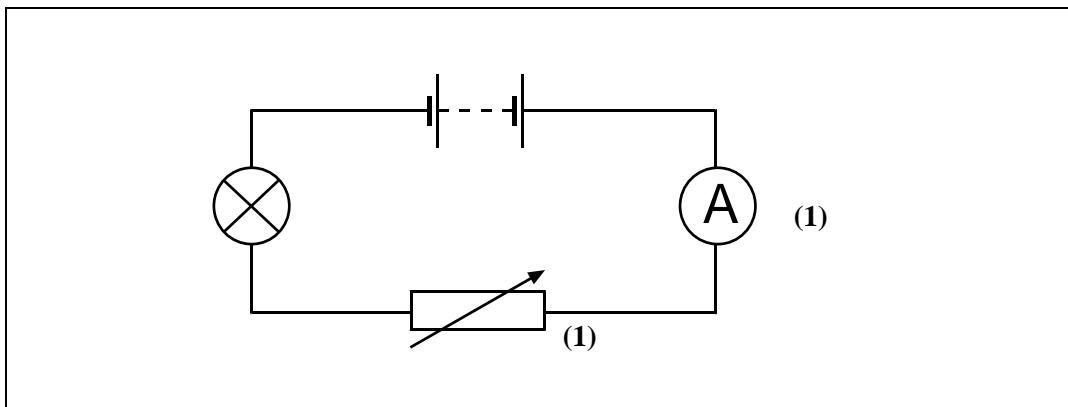


X is used to vary the brightness of bulb Y. What is component X?

**Variable resistor**

1

- (c) The student adds an ammeter to the circuit in (b) to measure the current. Draw this new circuit including the ammeter and the correct symbol for component X.



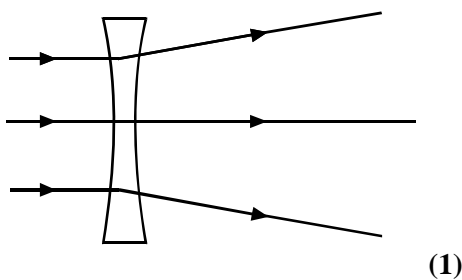
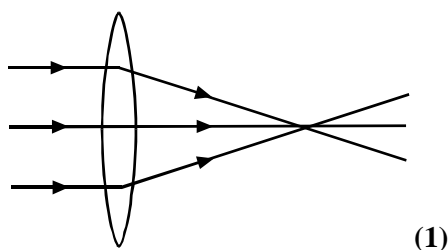
2

- (d) The voltage of the battery in the circuit is 6 volts. The ammeter shows a current of 0.1 amperes. Calculate the resistance of the circuit.

$$\text{resistance} = \frac{\text{voltage}}{\text{current}} \text{ (1/2)} = \frac{6}{0.1} \text{ (1/2)} = 60 \text{ ohms (1)}$$

2

26. (a) Complete the diagrams to show the paths of the rays of light through each lens.



2

- (b) A student can see clearly when looking at distant objects, but has to use spectacles when reading a book.

- (i) What is this eye defect called?

**Long sight**

1

- (ii) What type of lens is used in the spectacles to correct this defect?

**Convex OR converging**

1

27. The statements below have been made about X-rays. Some of the statements are **true** and some are **false**.

- A X-rays can be used to detect broken bones
- B X-rays are invisible to the human eye
- C Heat is another name for X-rays
- D X-rays can be used to scan luggage at airports
- E Photographic film can detect X-rays
- F X-rays can damage living cells
- G X-rays travel at the speed of sound

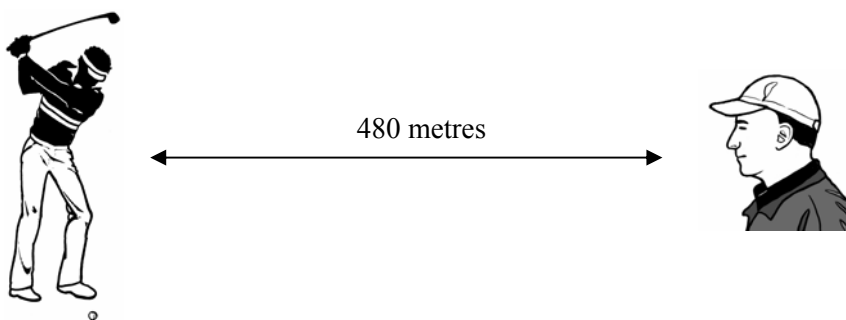
Complete the table by entering the letter for each statement in the correct column.

The first letter has been entered for you.

<b>True</b>	<b>False</b>
A	C (½)
<b>B</b> (½)	<b>G</b> (½)
<b>D</b> (½)	
<b>E</b> (½)	
<b>F</b> (½)	

3

28. A spectator watches a golfer from a distance of 480 metres. He sees the club hitting the ball but notices a time delay before he hears the sound of the club hitting the ball.



- (a) Explain why there is a time delay.

**Speed of light greater than speed of sound  
OR light travels faster than sound**

1

- (b) The sound takes 1.5 seconds to travel 480 metres from the golfer to the spectator. Use these figures to calculate the speed of sound.

$$\text{speed} = \frac{\text{distance}}{\text{time}} \text{ (1/2)} = \frac{480}{1.5} \text{ (1/2)} = 320 \text{ metres per second (1)}$$

2

- (c) The golfer plays a second shot using the same club but this time he wants the ball to travel a greater distance. State **two** things the golfer could change to make the ball travel further.

**Hit ball with greater force OR increase speed of swing (1)  
Hit ball at a different angle (1)**

2

29. (a) In each of the sentences below, circle one word from the boxes to make the statements correct.

(i) Sound can/cannot pass through a vacuum. 1

(ii) Sound can/cannot pass through solids. 1

(b) Describe a method for measuring the speed of sound in air.

Your description should include:

The equipment you would require:

- **two microphones**
- **timer**
- **metre stick** (1)

The measurements you would make:

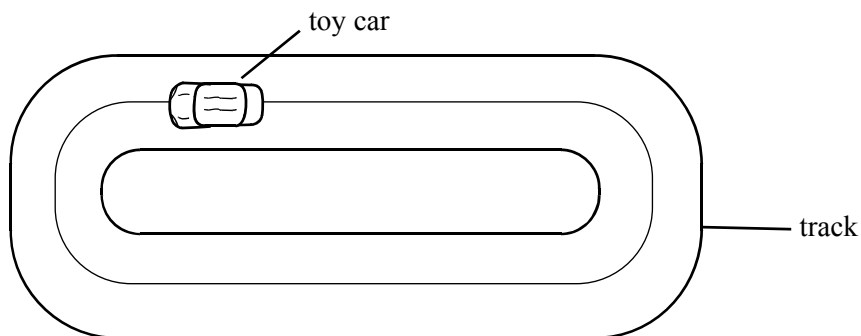
- **distance between microphones** (½)
- **time for sound to travel this distance** (½)

How you would calculate the speed of sound:

**speed =  $\frac{\text{distance (between microphones)}}{\text{time (for sound to travel this distance)}}$**  (1) 3

**Note: similar marking scheme for any other correct experimental method**

30. A toy car is timed going round a track. The car takes 8 seconds to cover 4 laps of the track. One lap of the track is a distance of 3 metres.



- (a) Calculate the average speed of the car on the track.

**4 laps = 12 (metres) (1)**

$$\text{average speed} = \frac{\text{distance}}{\text{time}} \text{ (1/2)} = \frac{12}{8} \text{ (1/2)} = 1.5 \text{ metres per second (1)}$$

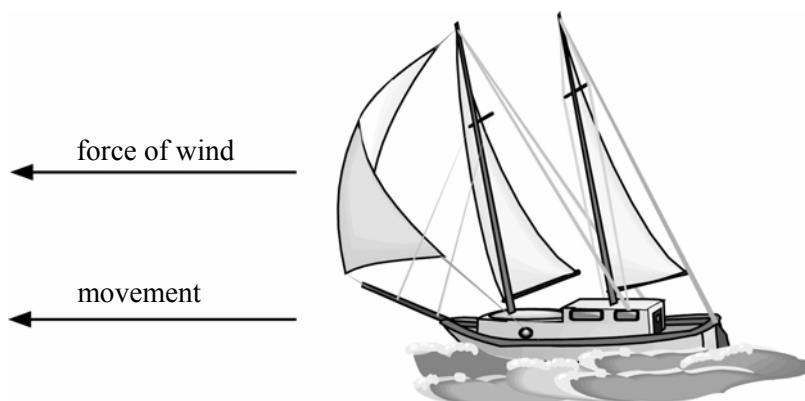
3

- (b) The original car is replaced by a more streamlined one. Explain the term **streamlined**.

**Smoother shaped car OR less air resistance**

1

31. Wind exerts a forward force on a yacht causing it to move in the direction shown.



(a) There is another force on the yacht acting in the opposite direction to the direction of movement. Name this force.

**(Force of) friction**

**1**

(b) The yacht must be lifted out of the water for repairs.

A machine for lifting yachts can exert a maximum upwards force of 14000 newtons. The yacht has a mass of 1500 kilograms.

(i) Calculate the weight of the yacht.

**weight = 10 × mass (½) = 10 × 1500 (½) = 15000 newtons (1)**

**2**

(ii) Will the machine be able to lift the yacht out of the water?

**No**

**1**

(iii) Explain your answer.

**Machine force (14000 newtons) is less than weight of yacht (15000 newtons)**

**1**



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

- keyboard**                      **processor**  
**monitor**                      **program**

An input device for a computer is a keyboard (½)

An output device for a computer is a monitor (½)

1

(b) The table below shows the cost of running electrical appliances during one day.

<i>Appliance</i>	<i>Power</i>	<i>Time used in hours</i>	<i>Electrical units used</i>	<i>Cost per unit</i>	<i>Total cost</i>
Electric heater	2	4	8	10 p	80 p
Dishwasher	3	1	3	10 p	30 p
Computer	0.2	6		10 p	

The *Electrical units used* can be calculated by  $Power \times Time\ used\ in\ hours$ .

(i) Calculate the *Electrical units* used by the computer.

$0.2 \times 6$  (½) =  $1.2$  (½)

1

(ii) Calculate the *Total cost* of running the computer.

$$1.2 \times 10^{1/2} = 12 \text{ p }^{1/2}$$

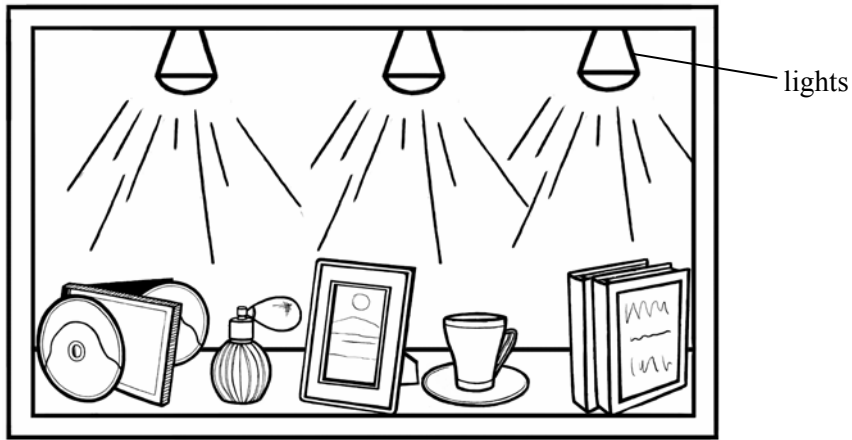
1

(c) The dishwasher is an electronic system. Name the three parts of an electronic system.

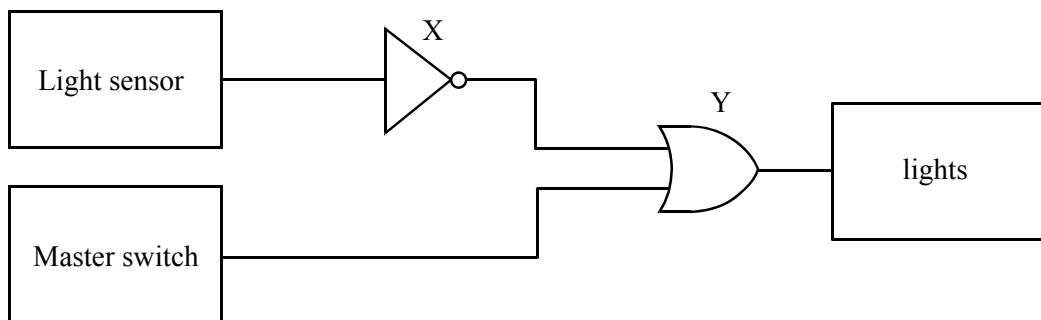
input – process – output

1

33. Lights in a shop window are connected to an electronic system which switches them on when it becomes dark. The lights can also be switched on by a master switch.



(a) A diagram for the electronic system is shown below.



**Light sensor in darkness gives a logic 0**  
**Light sensor in light gives a logic 1**

(i) Name logic gate X.

**NOT (gate)** **1**

(ii) Explain the function of logic gate X.

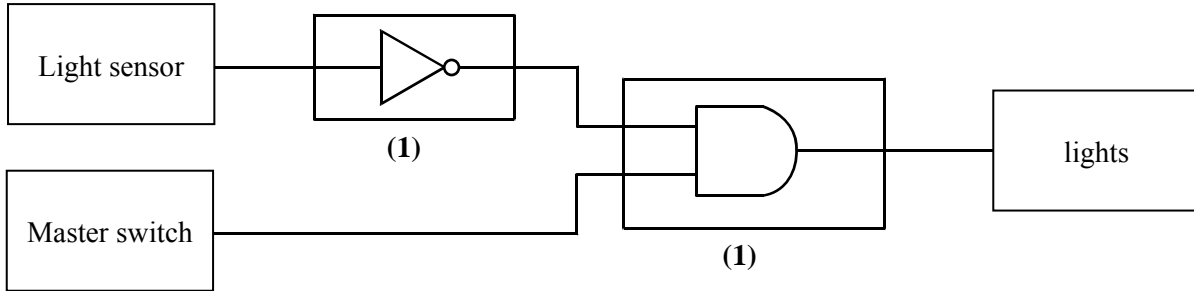
**To change logic 0 to logic 1 (1)**  
**and to change logic 1 to logic 0 (1)** **2**

(iii) Name logic gate Y.

**OR (gate)** **1**

- (b) The shop owner buys a new electronic system which requires both darkness and the master switch to be on to make the lights come on.

Complete the diagram below by drawing in the symbols for the logic gates required for the new system.



2

[END OF MARKING INSTRUCTIONS]