



2010 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.	$V=IR$ $7.5=1.5R$ $R=5.0 \Omega$	(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. | D | 11. | C |
| 2. | D | 12. | D |
| 3. | B | 13. | E |
| 4. | C | 14. | E |
| 5. | B | 15. | B |
| 6. | D | 16. | E |
| 7. | C | 17. | A |
| 8. | B | 18. | E |
| 9. | A | 19. | A |
| 10. | B | 20. | D |

SECTION B

Marks

21. A satellite dish is used to detect TV signals.

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

lower **higher** **340** **300 million**
200 million **stronger** **geostationary** **weaker**

TV signals have a frequency than radio signals.

TV signals travel at a speed of metres per second.

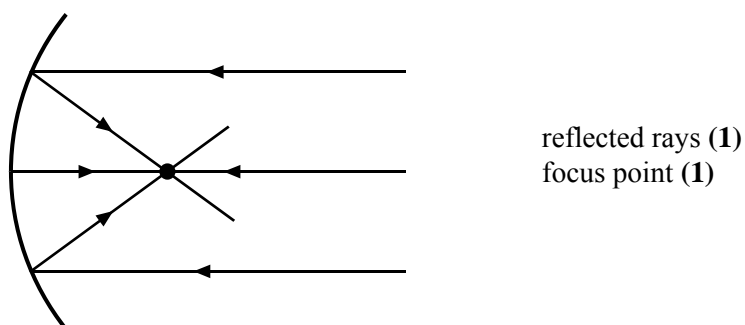
A satellite dish is curved to make the received signal .

A satellite that stays above the same point on the Earth's surface is called a

satellite.

2

(b) Complete the diagram to show the effect the satellite dish has on the TV signals received.



2

(c) (i) If the curved dish is made larger, does the received signal strength **increase**, **decrease** or **stay the same**?

1

(ii) Explain your answer.

1

22. Hand-held TV sets are popular with people on the move.



(a) What two colours are needed to create the colour magenta on the TV screen?

red and blue

1

(b) A TV station can be identified by name or by channel number. How else can a TV station be identified?

(by its) frequency

1

22. (continued)

(c) An amplifier in the hand-held TV is used to amplify the signal.

A technician tests the voltage across the amplifier.



(i) Calculate the voltage gain of the amplifier.

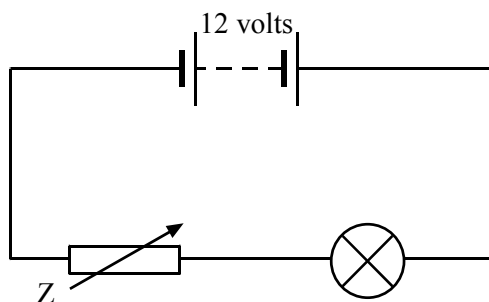
$\text{voltage gain} = \frac{\text{output voltage}}{\text{input voltage}} = \frac{12}{1.2} = 10$	2
--	---

(ii) One station transmits a signal of frequency 200 million hertz.

When the signal is amplified does this frequency **increase**, **decrease** or **stay the same**?

stay the same	1
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23. A student sets up the following circuit.



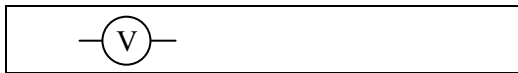
(a) What is component Z?

variable resistor

1

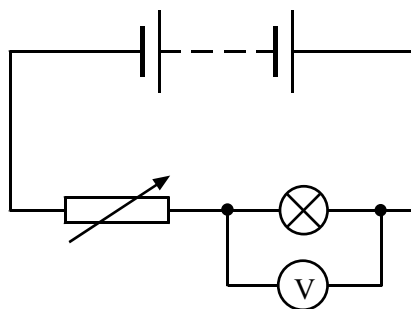
(b) The student measures the voltage across the lamp with a voltmeter.

(i) Draw the symbol for a voltmeter.



1

(ii) Add your symbol to the circuit diagram above to show the voltmeter measuring the voltage across the lamp.



1

(iii) The voltage across the lamp is 7 volts.

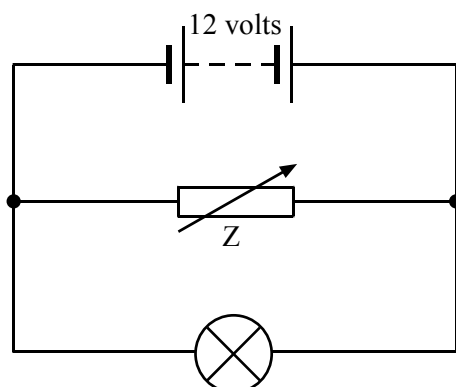
What is the voltage across component Z?

5 volts

1

23. (continued)

(c) The student rearranges the circuit so that the components are connected as shown below.



The resistance of component **Z** is now reduced.

(i) State whether the total current in the circuit **increases, decreases** or **stays the same**.

increases

1

(ii) Explain your answer.

current through Z increases

1

24. (a) Ceramic hair straighteners rated at 46 watts are connected to the mains voltage of 230 volts.

When the straighteners are switched on, an LED lights up on the handle.



- (i) Calculate the current in the straighteners when they are switched on.

$\text{current} = \frac{\text{power}}{\text{voltage}} \text{ (1/2)} = \frac{46}{230} \text{ (1/2)} = 0.2 \text{ amperes (1)}$	2
---	----------

- (ii) Calculate the resistance of the straighteners.

$\text{resistance} = \frac{\text{voltage}}{\text{current}} \text{ (1/2)} = \frac{230}{0.2} \text{ (1/2)} = 1150 \text{ ohms (1)}$	2
---	----------

- (b) The straighteners have a “sleep mode”. This means that after 30 minutes the straighteners no longer give off any heat energy but the LED remains on.

- (i) Give **one** advantage of having a “sleep mode”.

saves energy (or money) OR reduces fire risk	1
---	----------

- (ii) State the useful energy change of the LED.

electrical to light	1
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25. A student downloads a ringtone onto a mobile phone. The ringtone has a single frequency of 17 000 hertz.

The table below shows the highest frequency that members of the student's household can hear.

<i>Member of household</i>	<i>Highest frequency heard in hertz</i>
Student	20 000
Mum	18 000
Dad	16 000
Gran	15 000
Dog	25 000

- (a) (i) What is the meaning of frequency?

the number of waves per second

1

- (ii) Which members of the household would hear the ringtone?

Student, Mum, Dog (two correct = 1 mark, all three correct = 2 marks)

2

- (b) The student uses the infrared port on the mobile phone to send a picture to a friend's mobile phone.

- (i) What is another name for infrared radiation?

heat (radiation)

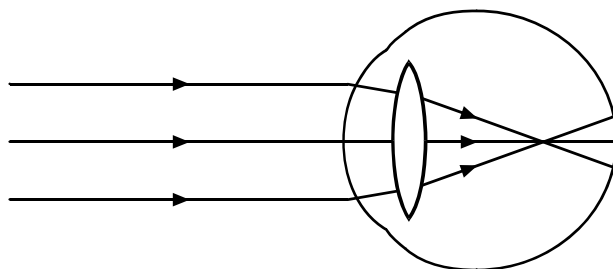
1

- (ii) Give another example of a use for infrared radiation.

**treating muscle strain OR night vision binoculars OR remote controls
OR any other acceptable correct answer**

1

26. A student has an eye defect and needs to wear glasses to correct her vision. The diagram shows what happens to the rays of light entering her eye when she is not wearing glasses.



(a) (i) Name the eye defect.

short sight

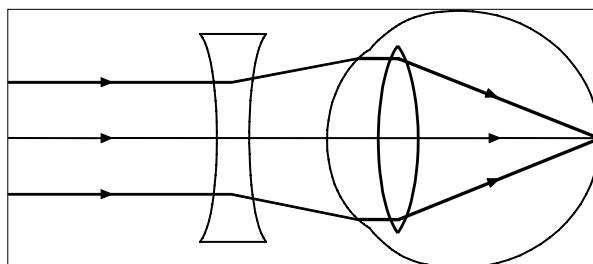
1

(ii) Complete the diagram below to show:

the type of lens used in her glasses

and

the path of the three rays of light when she is wearing her glasses.



2

correct lens (1)
correct rays (1)

26. (continued)

(b) The student might consider laser eye surgery to correct her vision.

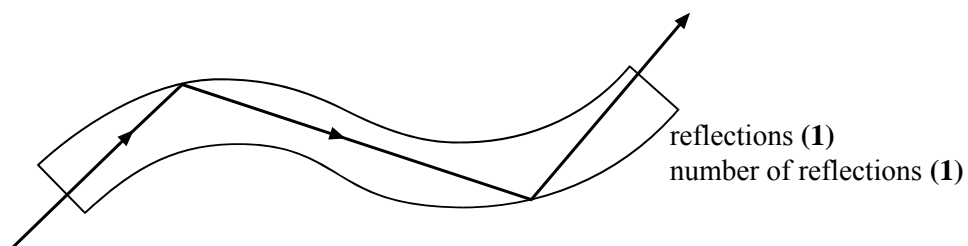
(i) Give **one** way that laser light is different from white light.

single colour OR concentrated beam

1

(ii) Lasers can also be used in keyhole surgery using an endoscope.

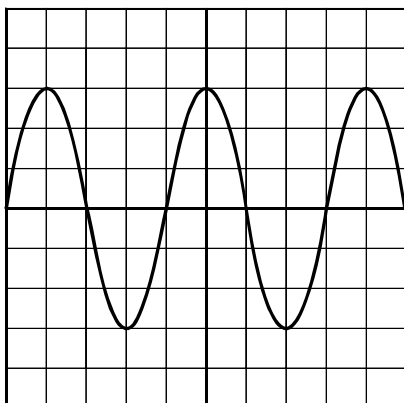
Complete the diagram below to show how the light passes along an optical fibre.



2

27. (a) The output signal from an electric guitar is connected to an oscilloscope.

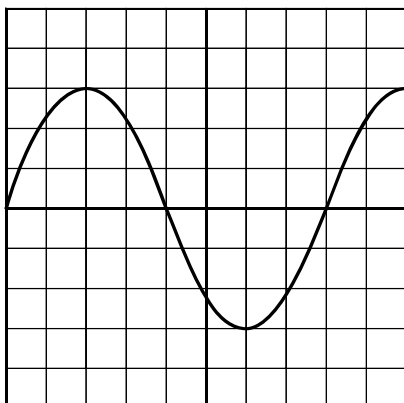
The following trace is produced when a note is played.



The guitarist plays a different note on the same string.

A new trace is produced on the oscilloscope as shown below.

The settings on the oscilloscope have not been changed.



The guitarist could have made **two** changes to the string.

What are the two changes?

Change 1

slacken the string

Change 2

increase (vibrating) length of string

2

27. (continued)

(b) The guitarist uses a sound level meter to measure the loudness.

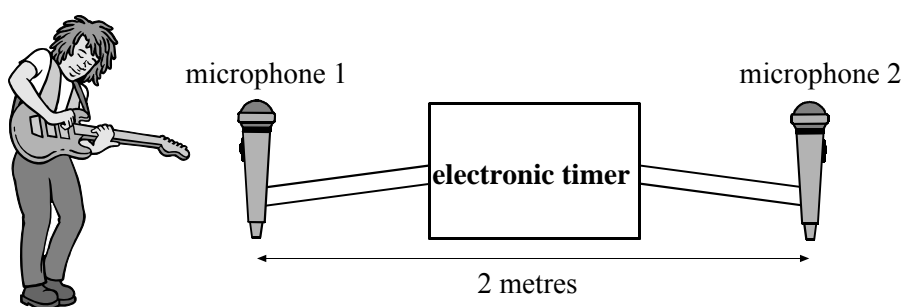
(i) The unit of sound level is the decibel . 1

(ii) Explain why it is important to keep the sound level below the safety limit.

prevent damage to hearing 1

(c) The guitarist measures the speed of sound in air.

He sets up the experiment shown below.



He plays a note on the guitar. The electronic timer measures the time taken for the sound to travel from microphone 1 to microphone 2.

The time recorded on the electronic timer is 0.00625 seconds.

Calculate the speed of sound in air.

$$\text{speed} = \frac{\text{distance}}{\text{time}} \text{ (1/2)} = \frac{2}{0.00625} \text{ (1/2)} = 320 \text{ metres per second (1)}$$

2

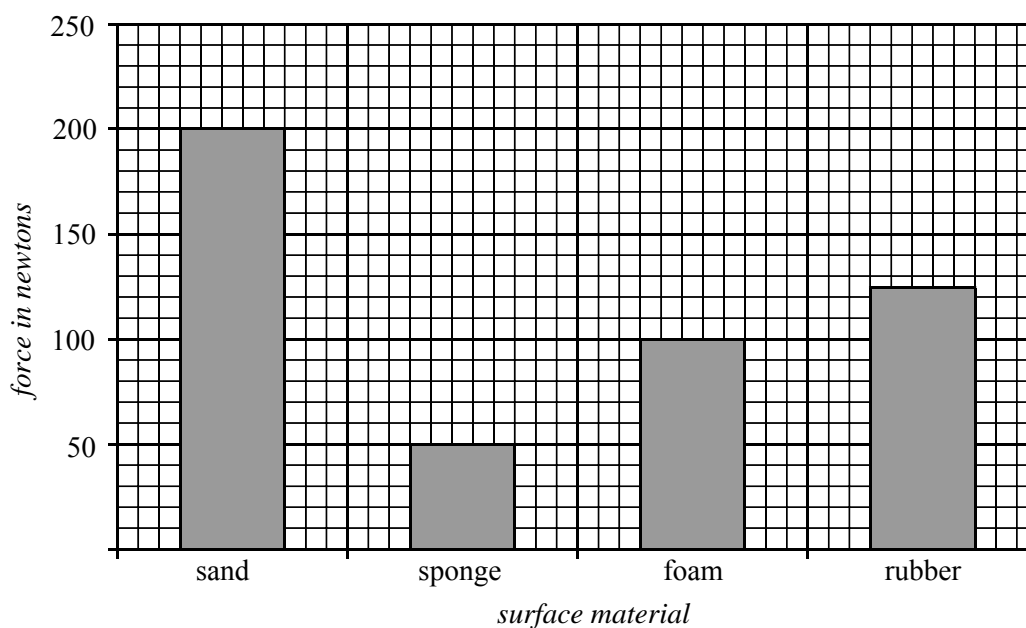
28. A pole vaulter wants to find out which material is best for making a landing surface. Four materials are tested in a lab.

A dummy body is dropped onto each surface in turn.

The maximum force exerted on the dummy by each surface is measured.

The dummy is dropped from the same height each time.

The graph shows the maximum force exerted by the different surfaces.



(a) (i) Which material should be used for the landing surface?

sponge 1

(ii) Explain your answer.

smallest force 1

(iii) Why is the height kept the same each time?

to make fair comparison between substances 1

28. (continued)

(b) The experiment is repeated with a dummy of smaller mass.

- (i) Will the maximum force exerted on the dummy **increase, decrease or stay the same?**

decrease

1

- (ii) Explain your answer.

effect of collisions decreases (with decreasing mass)

1

29. (a) A bungee jumper wants to calculate his average speed during a jump. On the first descent he falls 63 metres in 4.5 seconds.

(i) What device can be used to measure the time of the descent?

stopwatch

1

(ii) Calculate his average speed during the descent.

$$\text{average speed} = \frac{\text{distance}}{\text{time}} \text{ (1/2)} = \frac{63}{4.5} \text{ (1/2)} = 14 \text{ metres per second (1)}$$

2

(b) During a second descent the bungee jumper wears baggy clothing and spreads his arms out as he falls.



He falls 63 metres in 5 seconds.

(i) Why was the time greater for the second descent?

more air resistance

1

(ii) The bungee jumper has a mass of 65 kg. Calculate his weight.

$$\text{weight} = 10 \times \text{mass (1/2)} = 10 \times 65 \text{ (1/2)} = 650 \text{ newtons (1)}$$

2

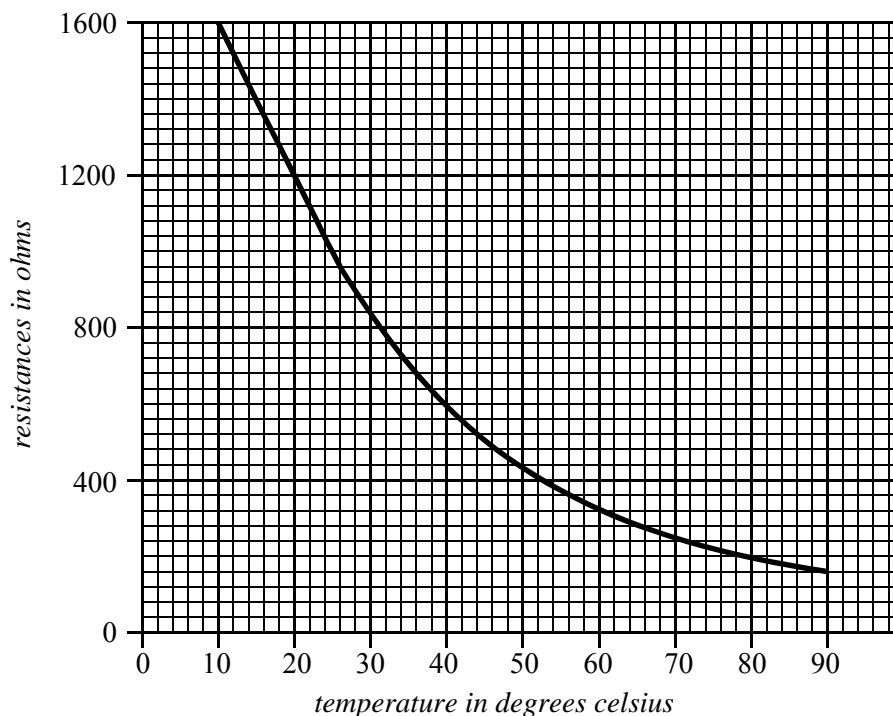
30. A student investigates the properties of a thermistor. The student places the thermistor in a water bath and measures the resistance of the thermistor as the temperature rises.

(a) Is the thermistor an **input**, **process** or **output** device?

input

1

(b) A graph of the student's results is shown below.



(i) What is the resistance at 20 degrees celsius?

1200 ohms

1

(ii) What is the resistance at 80 degrees celsius?

200 ohms

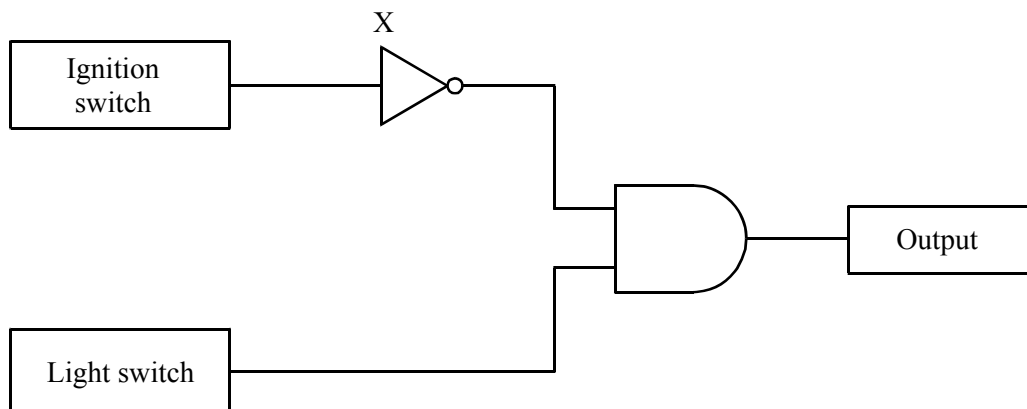
1

(iii) What happens to the resistance of the thermistor as the temperature increases?

resistance decreases

1

31. In a car, a warning sounds if the lights are left on after the ignition switch is turned off. The system has two inputs, one from the ignition switch and the other from the light switch.



- (a) Name logic gate X.

NOT gate

1

- (b) Complete the logic table for gate X.

<i>Logic level from ignition switch</i>	<i>Output logic level from the gate</i>
0	1
1	0

1

- (c) Some electronic devices are listed below.

microphone buzzer LDR thermistor motor

Select an appropriate output device for this system.

buzzer

1

31. (continued)

(d) Explain why the output device is **on** when the ignition switch is **off** but the lights are **on**.

(ignition switch off) means high after NOT gate (1)
two highs to the AND gate gives high output (1)

2

[END OF MARKING INSTRUCTIONS]