* 0000800000001 *

Cambridge Assessment International Education

# Cambridge IGCSE™

| | |
|---|---|
| CANDIDATE NAME | |
| CENTRE NUMBER | |
| CANDIDATE NUMBER | |

* 6 3 7 4 8 1 0 4 5 0 *

**PHYSICS** **0625/33**

Paper 3 Theory (Core) **October/November 2024**

**1 hour 15 minutes**

You must answer on the question paper.

No additional materials are needed.

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 $m/s^2$).

**INFORMATION**

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

DC (DE/SG) 338633/3

1 (a) Fig. 1.1 shows the speed–time graph for a cyclist at the beginning of a race.

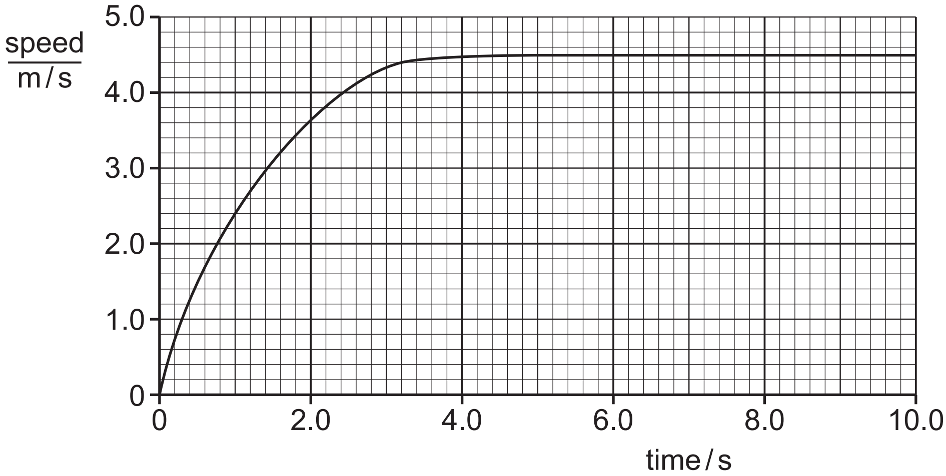


**Fig. 1.1**

(i) Describe the motion of the cyclist from time = 6.0 s to time = 10.0 s.

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

(ii) Determine the distance moved by the cyclist from time = 6.0 s to time = 10.0 s.

distance = ...................................................... m [3]

(b) Another cyclist travels 1000 m in 1 minute and 29 seconds.

(i) Determine how many seconds there are in 1 minute and 29 seconds.

number of seconds = ...................................................... s [1]

(ii) Calculate the average speed of this cyclist.

average speed = ................................................. m/s [3]

(c) The horizontal forces acting on a cyclist vary.
Fig. 1.2 shows the horizontal forces at one moment during a race.

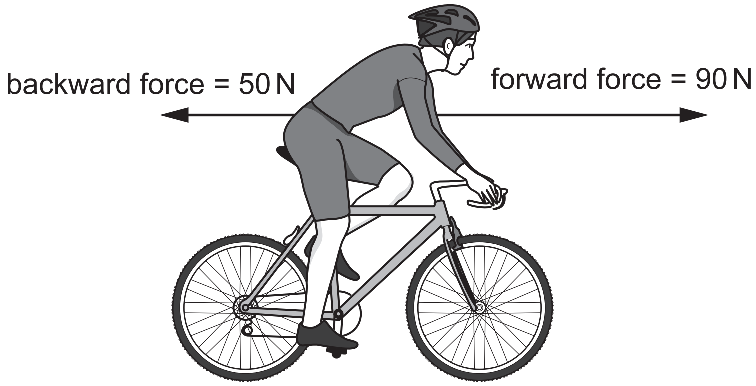


**Fig. 1.2** (not to scale)

**(i)** Calculate the resultant horizontal force acting on the cyclist.

resultant horizontal force = ............................................................ N

direction = ..............................................................
[2]

**(ii)** Describe the effect of the resultant horizontal force in **(c)(i)** on the motion of the cyclist.

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

[Total: 11]

2 A teacher uses a spring in a demonstration.

The spring is shown in Fig. 2.1.

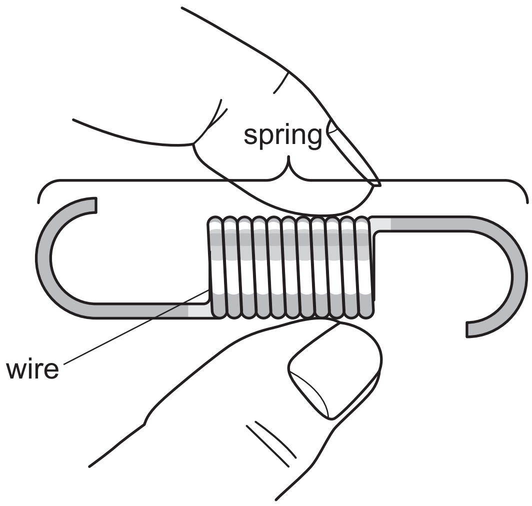


**Fig. 2.1**

**(a)** The spring is made from wire.
Describe how to determine the diameter of the **wire** accurately.
You may include a diagram as part of your answer.

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

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

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

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

**(b)** A student adds loads to the spring. She measures the extension for each load.
Fig. 2.2 shows the graph of extension against load for the spring.

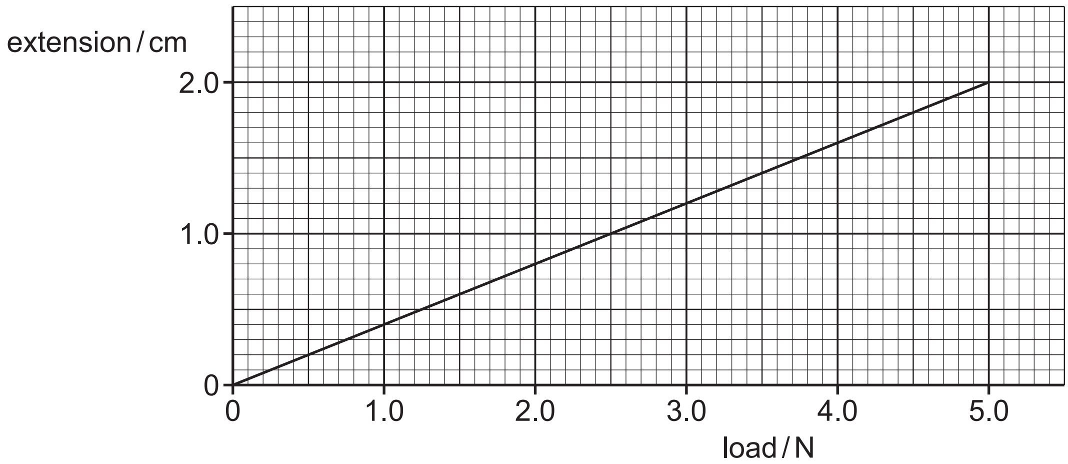


**Fig. 2.2**

**(i)** Using Fig. 2.2, determine the extension of the spring with a load of 4.0 N.

extension = ..................................................... cm [2]

**(ii)** The length of the spring without a load is 8.0 cm.
Calculate the length of the spring with a load of 4.0 N.

length = ..................................................... cm [1]

[Total: 6]

**3** **(a)** A boy weighs 620 N.
Calculate the mass of the boy.

mass of boy = ..................................................... kg [3]

**(b)** Fig. 3.1 shows another boy sitting on a solid block of wood.

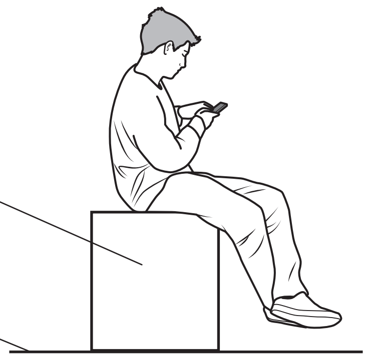


**Fig. 3.1**

The total weight of the boy and the block is 1200 N.
The area of the block of wood in contact with the ground is 0.16 $m^2$.

Calculate the pressure exerted on the ground.

pressure = ................................................ $N/m^2$ [3]

[Total: 6]

4 **(a)** State the principle of conservation of energy.

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

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

**(b)** Fig. 4.1 shows a stop-watch that is powered by a battery. The stop-watch measures a time period in minutes and seconds.

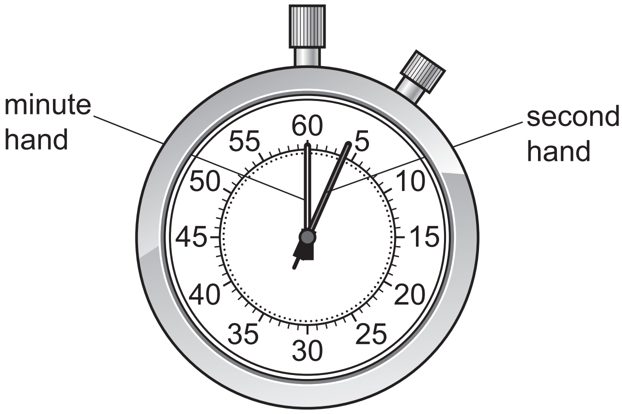


**Fig. 4.1**

Complete the sentences about energy transfers in the stop-watch that is measuring a time period.

**(i)** The type of energy stored in the battery is .................................... energy. [1]

**(ii)** The type of energy stored in the stop-watch's second hand is .................................... energy. [1]

**(iii)** The stop-watch has a bell.
When the bell rings, energy is transferred to the surroundings as .................................... energy. [1]

[Total: 4]

**5** **(a)** Table 5.1 defines three specific temperatures.

**(i)** Complete Table 5.1 by writing the correct temperature for each definition.

**Table 5.1**

| definition | temperature / °C |
|---|---|
| pure water boiling at standard atmospheric pressure | |
| pure ice melting at standard atmospheric pressure | |
| the lowest possible temperature of matter | |

[3]

**(ii)** The temperature of air in a room is 15 °C.
Calculate the temperature of the air in kelvin.

temperature = ........................................................K [2]

**(b)** A teacher demonstrates thermal energy transfer through some metal rods. Fig. 5.1 shows the arrangement.

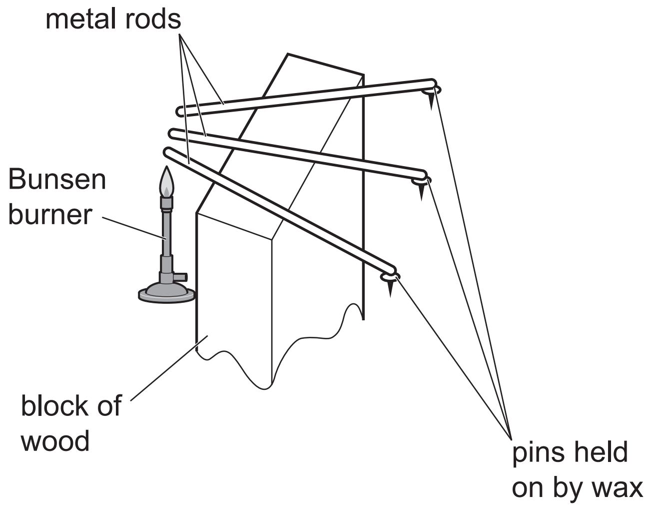


**Fig. 5.1**

The metal rods are placed on a block of wood.
The demonstration compares how quickly thermal energy is transferred to the wax at the end of each rod.

**(i)** State the name of the process for thermal energy transfer through the metal rods.

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

**(ii)** The rods are made from different metals. The rods have the same length and diameter. The ends of the rods in the Bunsen flame are at the same temperature.

State how the demonstration shows which metal transfers thermal energy at the greatest rate.

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

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

**(c)** A playground includes a concrete area with white and black squares, as shown in Fig. 5.2.

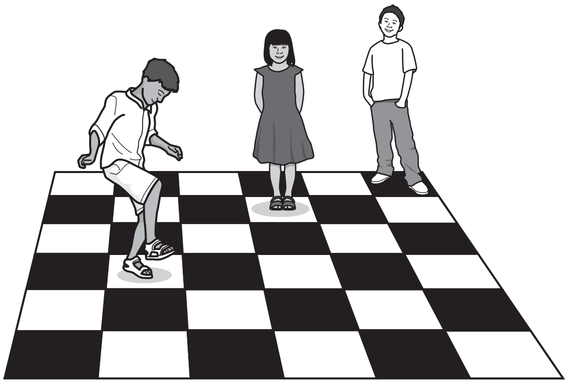

**Fig. 5.2**

The Sun shines on the concrete area during the day. The temperature of the concrete area increases. During the afternoon, students compare the temperature of the white squares with the temperature of the black squares.

State and explain whether the white squares or the black squares have the higher temperature. Include the name of the process of thermal energy transfer from the Sun to the squares.

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

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

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

[Total: 10]

6 A teacher uses a ripple tank to demonstrate the properties of waves.

**(a)** When a wave travels on the surface of the water in the ripple tank, the water particles vibrate at right angles to the direction of travel of the wave.
State the term for a wave in which particles vibrate at right angles to the direction of travel.

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

**(b)** The teacher demonstrates waves moving from deep water into shallow water.
Fig. 6.1 shows the crests of the waves, viewed from above. The arrows show the direction of wave travel.

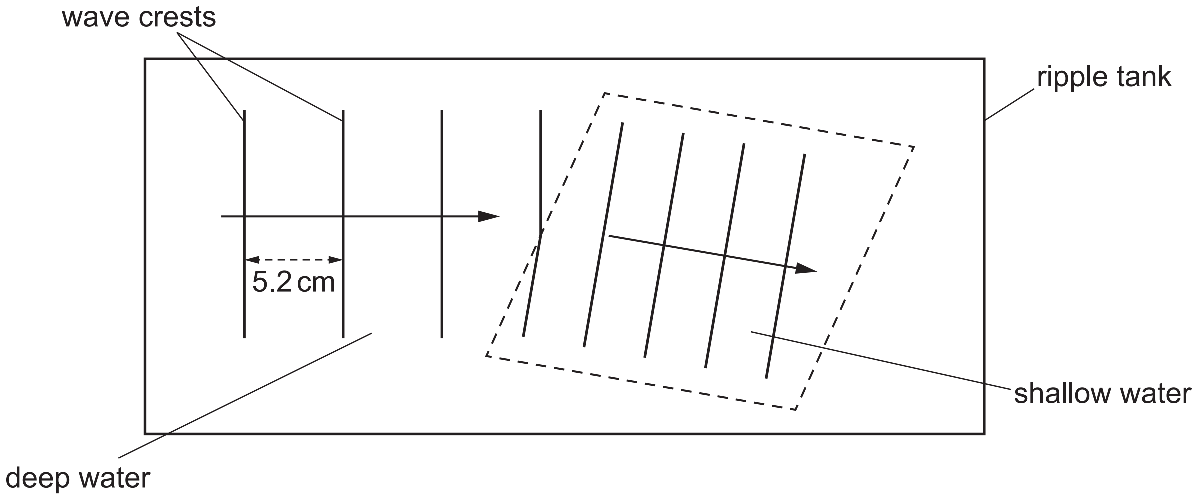


**Fig. 6.1**

**(i)** Complete the sentence about the wave property shown in Fig. 6.1.

The change of direction of the wave is called ...................................................... . [1]

**(ii)** Fig. 6.1 shows that the direction of the wave changes as the wave enters the shallow water.
State why the wave changes direction.

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

**(iii)** The speed of the wave in the deep water is 35 cm / s.
Determine the frequency of the wave. Use the information in Fig. 6.1.

frequency = ......................................................Hz [3]

[Total: 6]



DO NOT WRITE IN THIS MARGIN

7 **(a)** Table 7.1 lists three uses of electromagnetic (e.m.) waves.
Complete Table 7.1 by adding a suitable type of electromagnetic wave for each use.

**Table 7.1**

| use | type of e.m. wave |
|---|---|
| electric grills | |
| to treat cancer | |
| to detect fake bank notes | |

[3]

**(b)** The arrows on Fig. 7.1 show the path of satellite television (TV) signals travelling from a transmitter to a receiver.

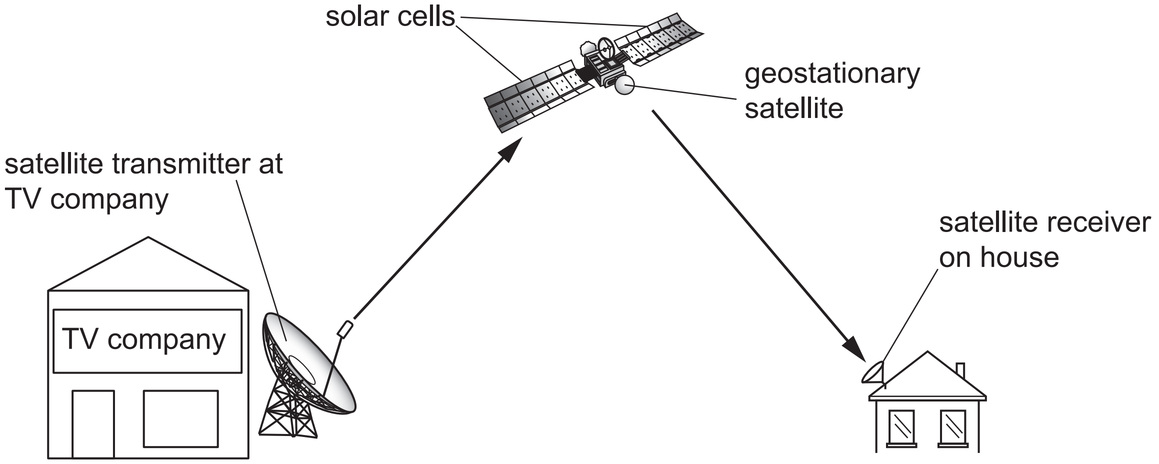


**Fig. 7.1** (not to scale)

**(i)** State the type of electromagnetic (e.m.) wave used for the satellite television signal.

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

**(ii)** The geostationary satellite is in orbit.
Describe the orbit of a geostationary satellite used for satellite television signals.

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

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

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

**(iii)** State the source of the energy that powers the solar cells.

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

**(iv)** State how energy is transferred from the solar cells for use by the satellite.

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

[Total: 8]

8 (a) A student connects a circuit with two lamps and three switches, $S_1$, $S_2$ and $S_3$, as shown in Fig. 8.1.

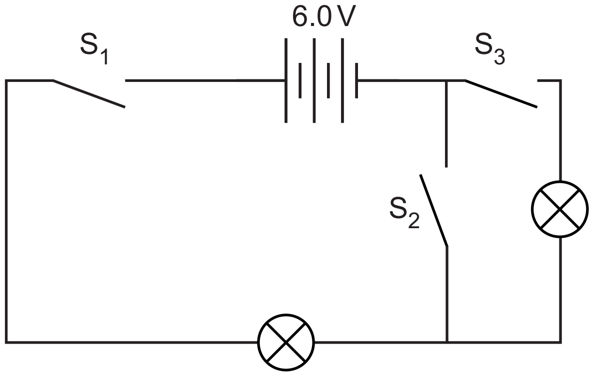


**Fig. 8.1**

(i) The student switches on **one** lamp.
State which switches the student closes to switch on only **one** lamp.

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

(ii) The student opens all the switches then switches on **two** lamps.
State which switches the student closes to switch on **two** lamps.

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

(b) Fig. 8.2 shows the manufacturer's information for one of the lamps.

voltage = 6.0 V

current = 0.53 A

**Fig. 8.2**

Calculate the resistance of the lamp when it is connected to a 6.0 V power source.

resistance = ...................................................... Ω [3]

(c) Calculate the electrical power transferred in the lamp when it is connected to a 6.0 V power source.
Include the unit.

power transferred = .............................. unit .................. [4]

[Total: 9]

DO NOT WRITE IN THIS MARGIN

**9** **(a)** Fig. 9.1 shows a magnet spinning steadily near to a coil. There is a reading on the voltmeter.

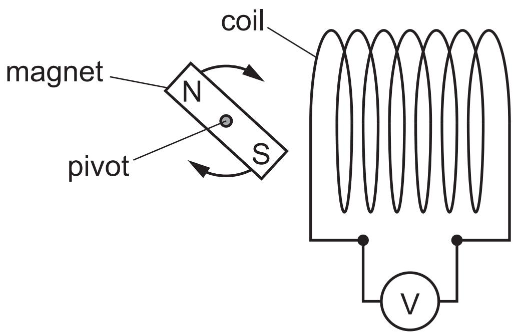


**Fig. 9.1**

Explain why there is a reading on the voltmeter.

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

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

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

**(b)** A step-down transformer reduces the mains voltage of 220 V a.c. to 12 V a.c.
The transformer has 5000 turns on the primary coil.

Calculate the number of turns on the secondary coil.

number of turns = ........................................................ [3]

[Total: 5]

10 **(a)** **(i)** State how a neutral atom becomes a positive ion.

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

**(ii)** State the type of nuclear emission which is the most ionising.

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

**(b)** Isotopes of copper (Cu) include: Cu - 63 and Cu - 65.
Explain what is meant by 'isotopes of copper'.

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

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

**(c)** A teacher provides the data in Table 10.1 about the decay of a radioactive sample.

**Table 10.1**

| time / s | $\frac{\text{count rate}}{\text{counts/s}}$ |
|---|---|
| 0 | 300 |
| 22 | 200 |
| 44 | 150 |
| 66 | 100 |
| 88 | 75 |

Use the information in Table 10.1 to determine the half-life of the radioactive sample.

half-life = ........................................................ s [2]

**(d)** Describe how to store radioactive materials safely.

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

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

[Total: 7]

DO NOT WRITE IN THIS MARGIN

**11** **(a)** Fig. 11.1 shows the Moon orbiting the Earth.

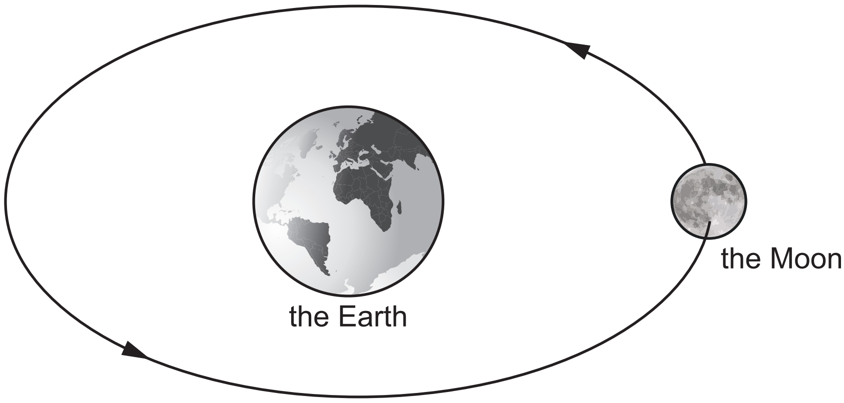


**Fig. 11.1**

**(i)** State the name of the force that keeps the Moon in orbit around the Earth.

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

**(ii)** State the time taken by the Moon to complete **one** orbit of the Earth. Include the unit.

time for **one** orbit = ................................. unit ................ [1]

**(iii)** A device on the Moon sends a radio signal to the Earth.
The distance from the Moon to the Earth is $3.8 \times 10^8$ m.
The speed of a radio wave is $3.0 \times 10^8$ m/s.

Calculate the time the radio signal takes to travel from the Moon to the Earth.

time = ....................................................... s [3]

**(b)** An astronomer observes light from a distant galaxy.

She writes this conclusion:

'*The observed wavelength of light from the distant galaxy is longer than the wavelength of the light emitted by the galaxy.*'

Explain how this conclusion supports the Big Bang Theory of the Universe.

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

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

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

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

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

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

[Total: 8]

BLANK PAGE