Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Physics

Paper 1

Foundation Tier

Sample Assessment Material for first teaching September 2016

Time: 1 hour 45 minutes

Paper Reference **1PH0/1F**

You must have:
Calculator, ruler, protractor

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) Figure 1 shows a solar-powered charger for a mobile phone.

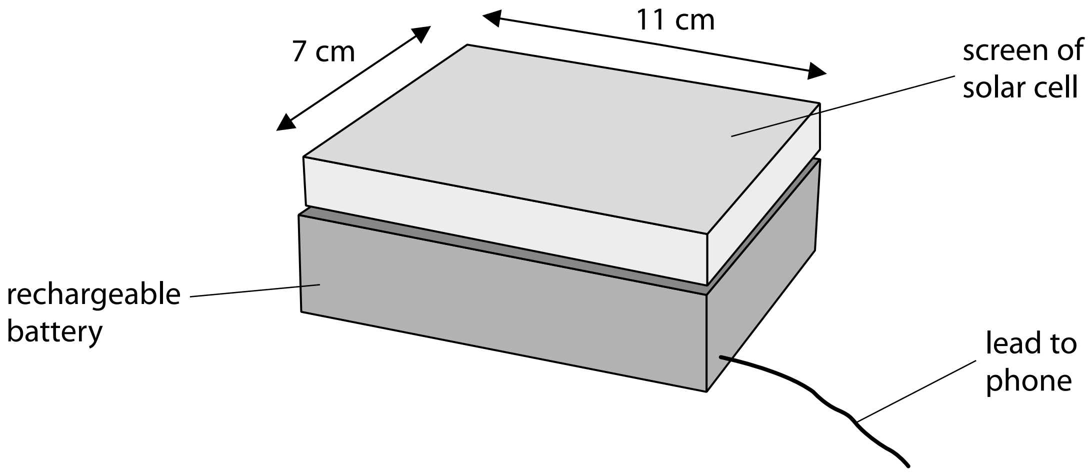

Figure 1

The screen of the solar cell takes in energy from the Sun.

(i) State how energy gets from the Sun to the screen.

(1)

....

....

(ii) State how energy is stored in the charger.

(1)

....

....

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(iii) Each second, 0.12 J of energy from the Sun reaches 1 cm^2 of the screen.

Calculate the total amount of energy reaching the whole screen in 1 second.

(3)

energy = ... J

(b) Mobile phones emit microwaves.

Microwave ovens emit microwaves.

Explain why a mobile phone does not have the same heating effect as a microwave oven.

(2)

....

....

....

....

(Total for Question 1 = 7 marks)

2 (a) A student is standing 600 m from a firework display.

A firework explodes with a loud bang, and a flash of light is seen.

Describe how a student can measure the time it takes for the sound wave from the loud bang to travel 600 m.

(2)

....

....

....

....

(b) Figure 2 shows a water wave.

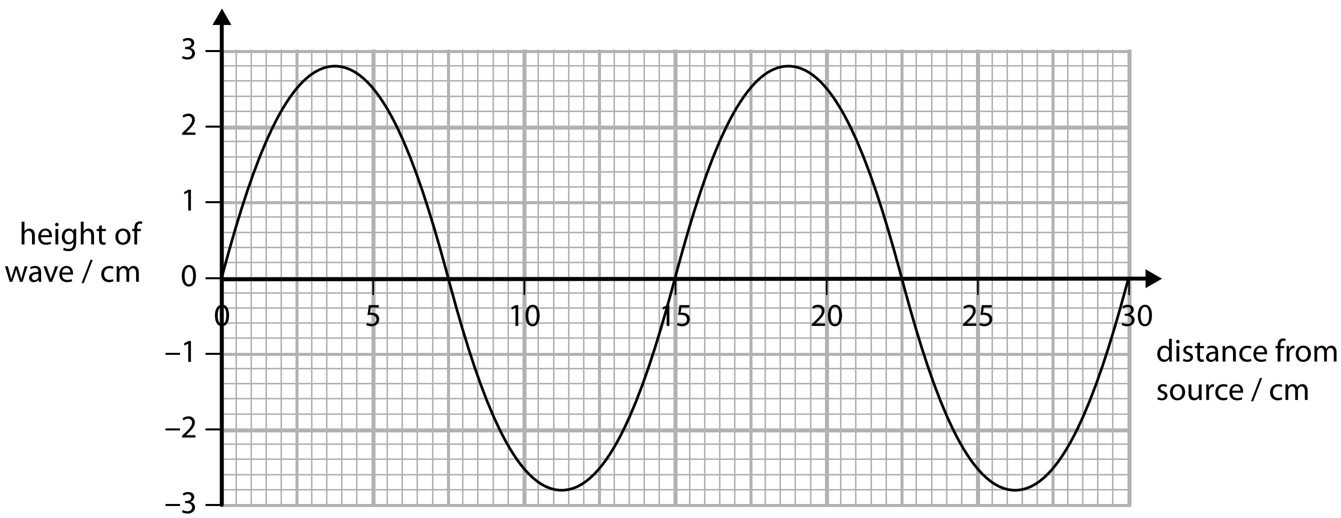

Figure 2

(i) What is the amplitude of this wave?

(1)

☒ **A** 2.8 cm

☒ **B** 5.6 cm

☒ **C** 7.5 cm

☒ **D** 15 cm

(ii) What is the wavelength of this wave?

(1)

☒ **A** 2.8 cm

☒ **B** 7.5 cm

☒ **C** 15 cm

☒ **D** 30 cm

(c) Water waves are transverse waves.

(i) Give **one** other example of a transverse wave.

(1)

....

(ii) Give **one** example of a longitudinal wave.

(1)

....

(d) An earthquake causes a sea wave.

This sea wave travels 26 400 m in two minutes.

Calculate the speed of the wave.

Use the equation

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

(3)

speed = ... m/s

(Total for Question 2 = 9 marks)

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3 (a) Figure 3 shows the structure of an oxygen-14 atom.

(i) Complete the four labels on Figure 3.

(4)

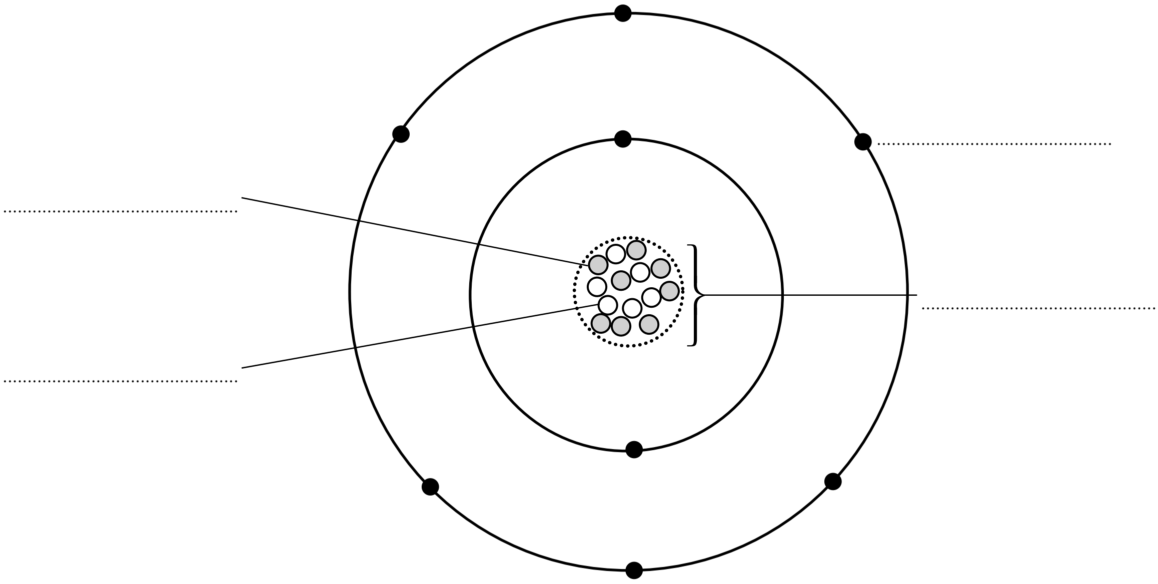

Figure 3

(ii) Which of these particles has a negative charge?

(1)

- ☐ **A** alpha particle
- ☐ **B** electron
- ☐ **C** neutron
- ☐ **D** nucleus

(iii) State the overall charge of the oxygen-14 atom.

(1)

....

....

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(b) A teacher uses a Geiger-Müller tube and a counter to measure background radiation.

The reading on the counter tube is 34 counts per minute.

(i) The teacher puts a source of beta radiation 15 cm in front of the same Geiger-Müller tube.

The reading on the counter tube is now 468 counts per minute.

Calculate how much radiation detected by the Geiger-Müller tube comes from the source of beta radiation.

(1)

.... counts per minute

(ii) The teacher puts a thick sheet of aluminium between the source of beta radiation and the Geiger-Müller tube.

Estimate the reading on the counter tube.

(1)

.... counts per minute

(iii) Give a reason why the answer to (ii) is only an estimate.

(1)

....

....

(Total for Question 3 = 9 marks)

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4 A student investigates how light behaves as it leaves a clear plastic block.

Figure 4 shows some of her equipment and the path of a ray of light through the block.

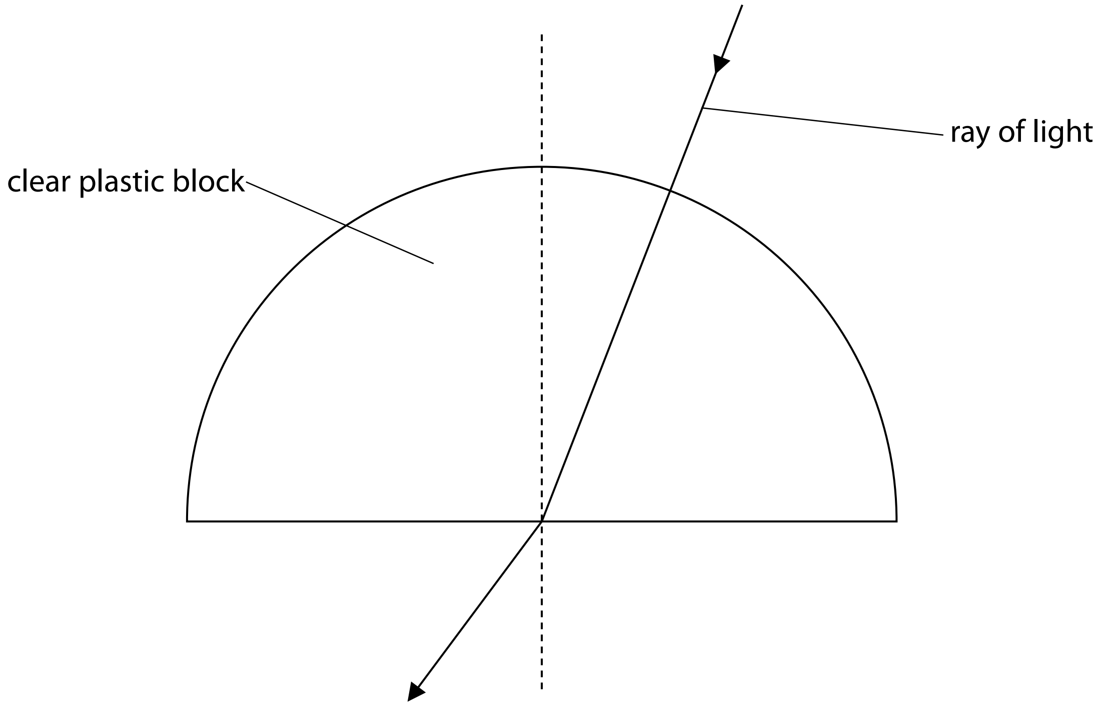


Figure 4

(a) Describe how the student can make sure the light does not change direction as it enters the block.

(2)

....

....

....

....

(b) She varies the angle of incidence inside the block and records the angle of refraction.

Figure 5 shows her results.

angle of incidence (°)	angle of refraction (°)
5	7
15	22
30	46
40	69
42	76

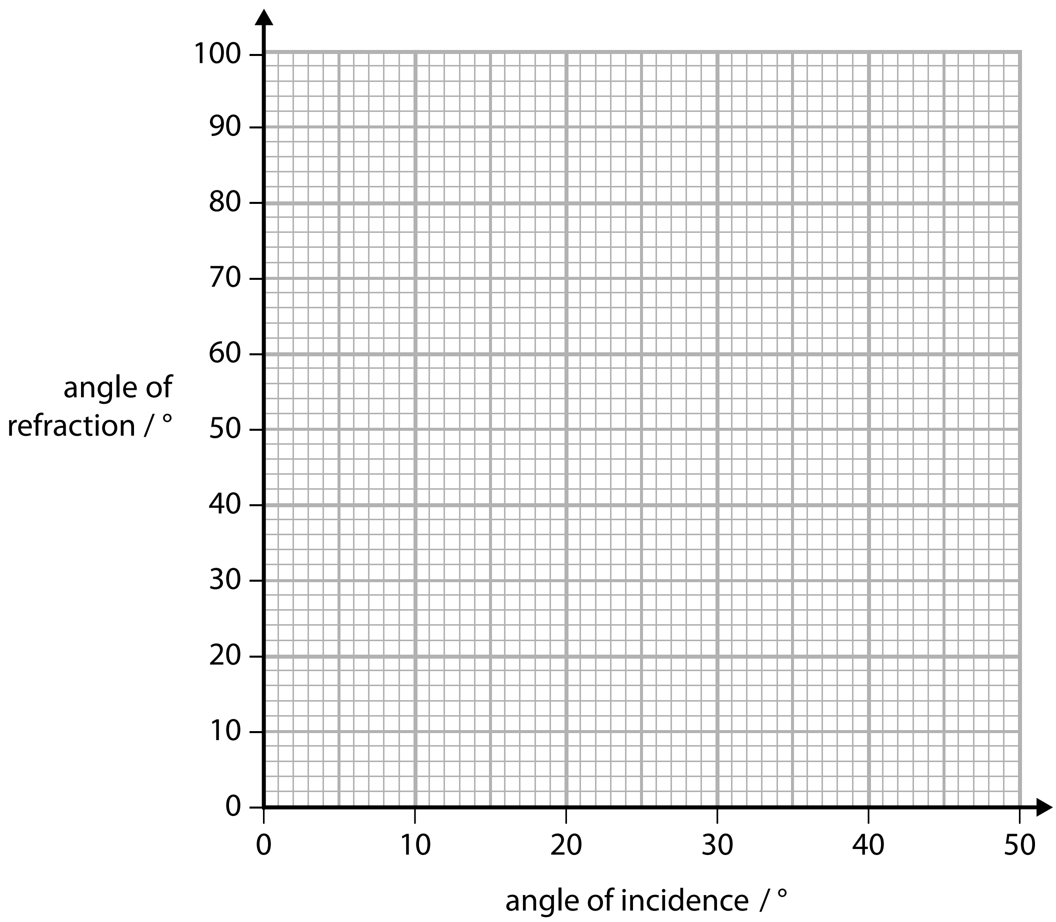
Figure 5

(i) Plot the points on the grid below.

(2)

(ii) Draw the best fit smooth curve through the points.

(1)



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(iii) Estimate the angle of incidence which gives an angle of refraction of 90°.

(2)

angle of incidence = ...

(c) Describe what happens to the ray of light when the angle of incidence is increased beyond the critical angle.

(2)

....

....

....

....

(Total for Question 4 = 9 marks)

5 (a) A car driver sees a rabbit on the road.

The driver makes an emergency stop after he sees the rabbit.

Figure 6 shows the speed of the car from the time the driver sees the rabbit until the car stops.

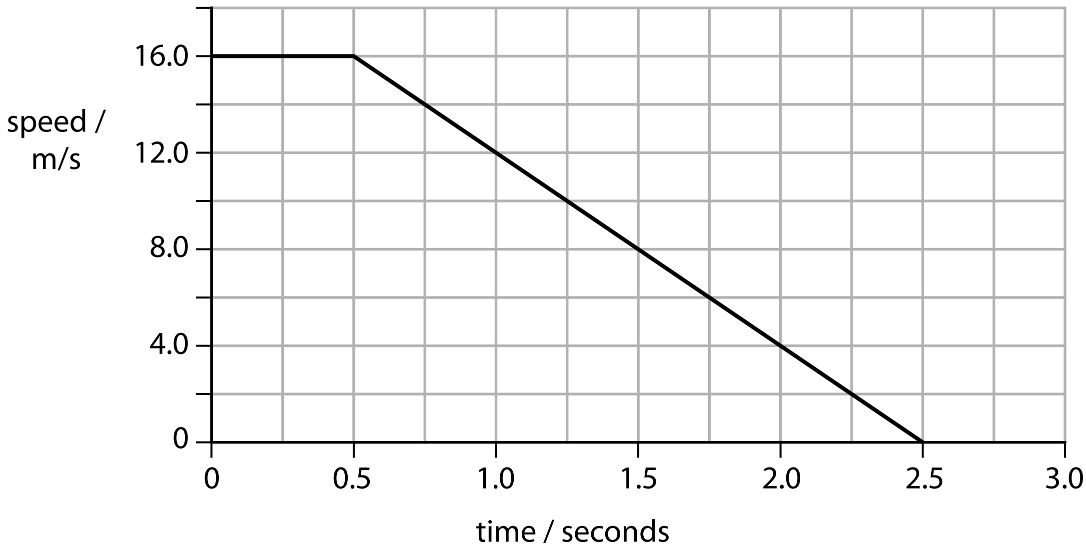

Figure 6

(i) The distance travelled by the car from the time the driver first sees the rabbit to when car starts to slow down is the

(1)

☒ **A** average distance

☒ **B** braking distance

☒ **C** stopping distance

☒ **D** thinking distance

(ii) Calculate the distance that the car travels in the first 0.5 seconds.

(3)

distance = ... m

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(iii) Which equation relates acceleration to change in velocity and time?

(1)

☒ **A** $a = \frac{(v - u)}{t}$

☒ **B** $a = \frac{t}{(v - u)}$

☒ **C** $a = t(v - u)$

☒ **D** $a = v - \frac{u}{t}$

(iv) Calculate the deceleration of the car.

(3)

deceleration = ... m/s^2

(b) Two students, Alice and Bob, carry out an experiment to measure the speed of cars.

Alice paces out the distance between two lamp posts.

She records:

'*Distance between lamp posts = 20 paces*'

Bob starts to count when a car passes the first lamp post. He stops counting when he thinks it has passed the second lamp post.

He records:

'My estimate for the time taken for the car to pass between the two lamp posts = 3'

Give **three** ways the students could improve their experimental procedure.

(3)

1 ....

....

2 ....

....

3 ....

....

(Total for Question 5 = 11 marks)

6 (a) A student investigates how the surface of an object affects the radiation it emits.

Figure 7 shows the equipment he uses.

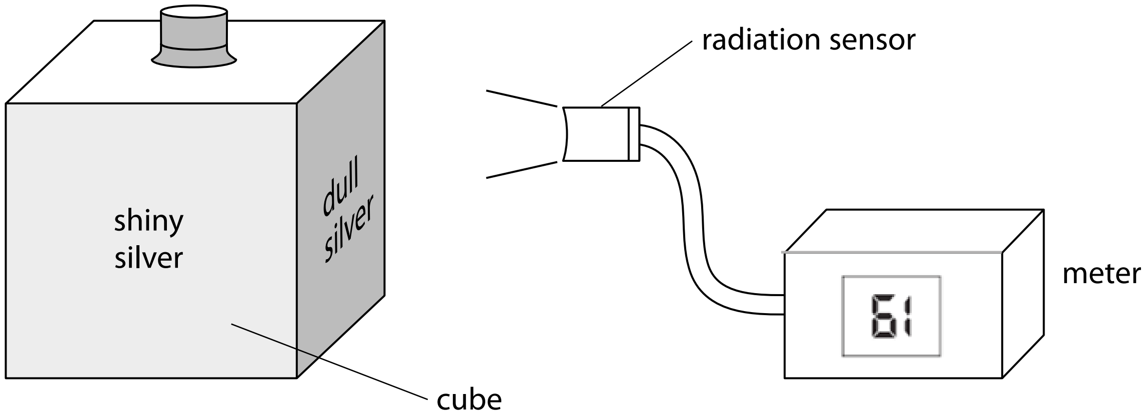


Figure 7

The cube has four different surfaces.

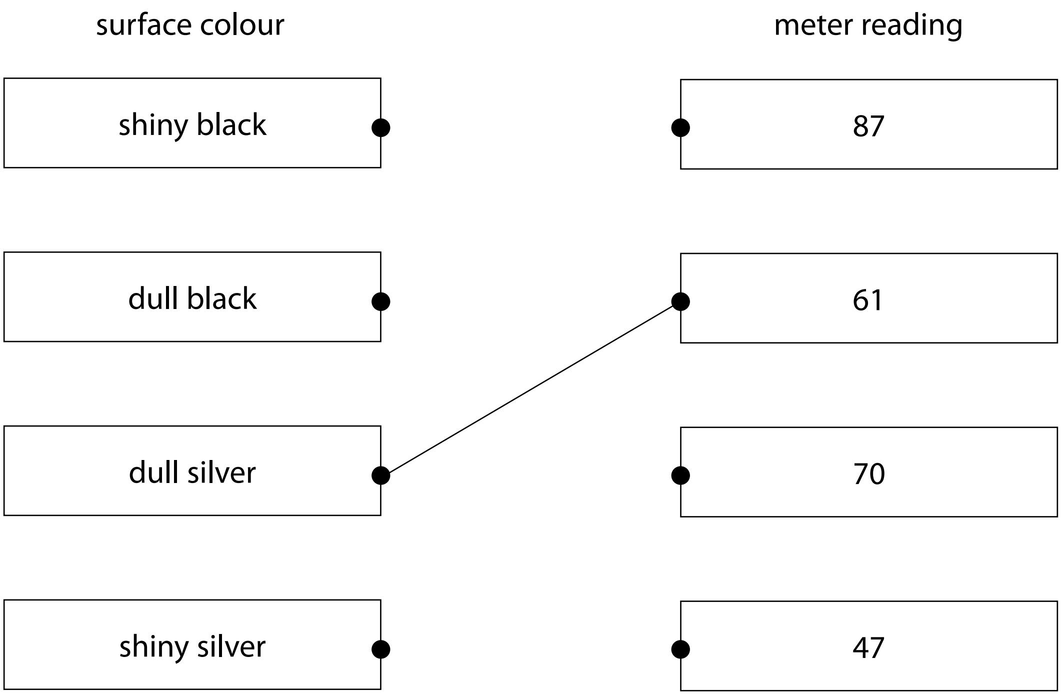
He fills the cube with boiling water so that the temperature of each surface is the same.

He uses the radiation sensor to measure the radiation emitted from each surface.

(i) His readings are shown.

Draw a line from each surface colour to its correct meter reading.
One has been done for you.

(2)



(ii) The temperature of each surface is the same.

Give a reason why the radiation sensor gives a different reading for each surface.

(1)

....

....

(b) (i) What do all waves in the electromagnetic spectrum have in common?

(1)

☒ **A** the same frequency in a vacuum

☒ **B** the same speed in a vacuum

☒ **C** the same colour in a vacuum

☒ **D** the same amplitude in a vacuum

(ii) Blue light has a wavelength of 470 nm and a frequency of 6.30×10^{14} Hz

Calculate the velocity of blue light.

(2)

velocity = ... m/s

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(c) All objects emit electromagnetic radiation.

The intensity and wavelength of the emitted radiation vary with the temperature of the object.

Figure 8 shows this variation for an object at two different temperatures.

The visible region of the electromagnetic spectrum is also shown.

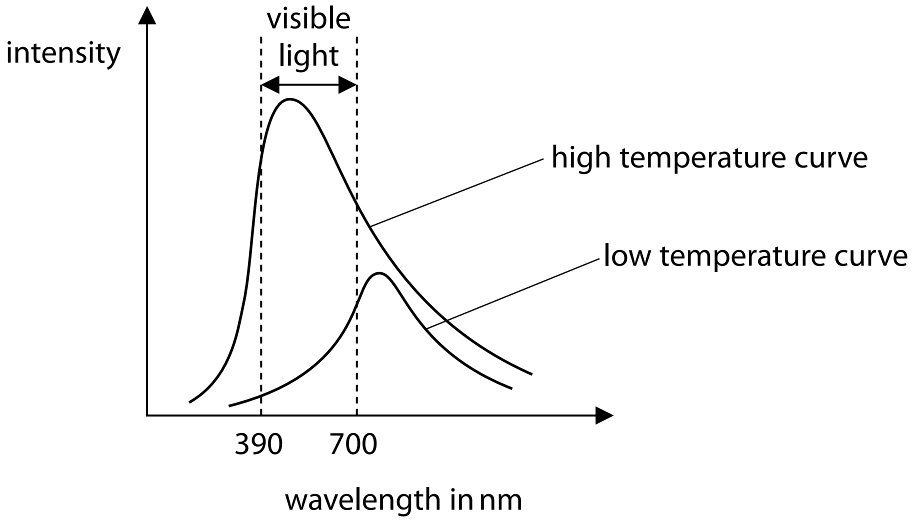

Figure 8

(i) In which part of the electromagnetic spectrum is the peak of the low temperature curve?

(1)

☒ **A** gamma

☒ **B** infrared

☒ **C** radio

☒ **D** ultra violet

(ii) Describe how intensity of the emitted radiation changes with temperature.

(2)

....

....

....

....

(Total for Question 6 = 9 marks)

7 (a) Scientists no longer accept the geocentric model of the universe but it was the accepted theory for hundreds of years.

Explain why the evidence available at the time supported the geocentric model.

(3)

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....

(b) The Big Bang theory and the Steady State theory are two theories about the origin of the universe.

The discovery of CMB led scientists to accept only one of the theories.

Explain why redshift supports both theories but CMB supports only one of them.

(3)

....

....

....

....

....

....

(c) (i) A star with a mass very much larger than the Sun

(1)

☒ **A** has a longer main sequence than the Sun and ends as a white dwarf

☒ **B** has a longer main sequence than the Sun and ends as a black hole

☒ **C** has a shorter main sequence than the Sun and ends as a white dwarf

☒ **D** has a shorter main sequence than the Sun and ends as a black hole

(ii) Which row has two correct statements about black holes?

(1)

	the gravitational field of a black hole	**a black hole is formed when**
☒ **A**	allows only electromagnetic radiation to escape	a nebula collapses
☒ **B**	allows nothing to escape	a very large star collapses
☒ **C**	allows nothing to escape	a nebula collapses
☒ **D**	allows only electromagnetic radiation to escape	a very large star collapses

(d) Figure 9 shows some lines in the absorption spectra from four different galaxies (A, B, C, and D) and from a laboratory source.

All the spectra are aligned and to the same scale.

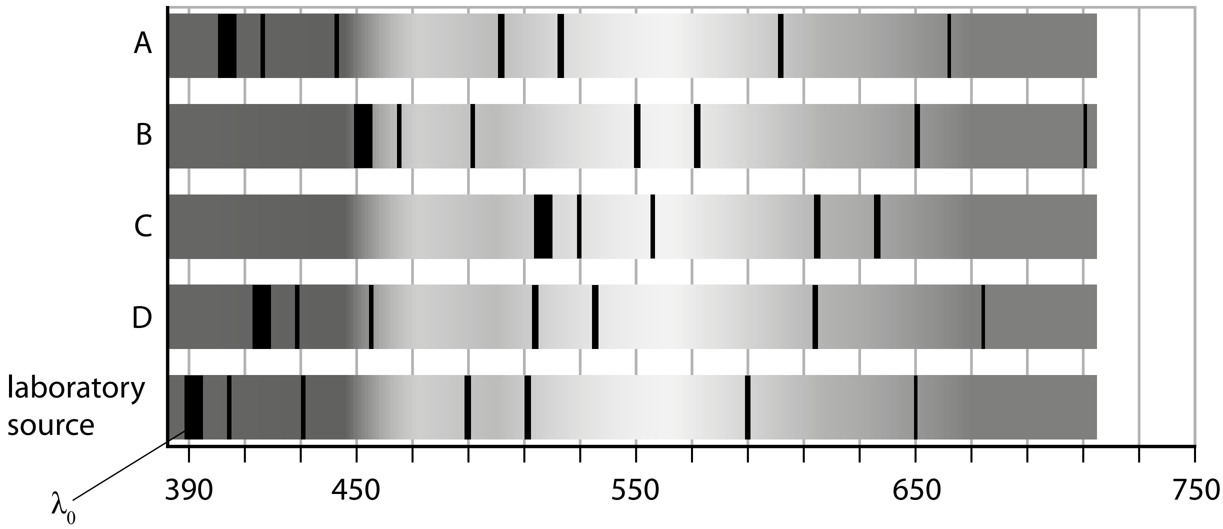

Figure 9

Explain, using Figure 9, which galaxy is furthest away from us.

(3)

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(Total for Question 7 = 11 marks)

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8 Figure 10 shows two students investigating reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can with his left hand.

The investigation is repeated with the right hand of student B.

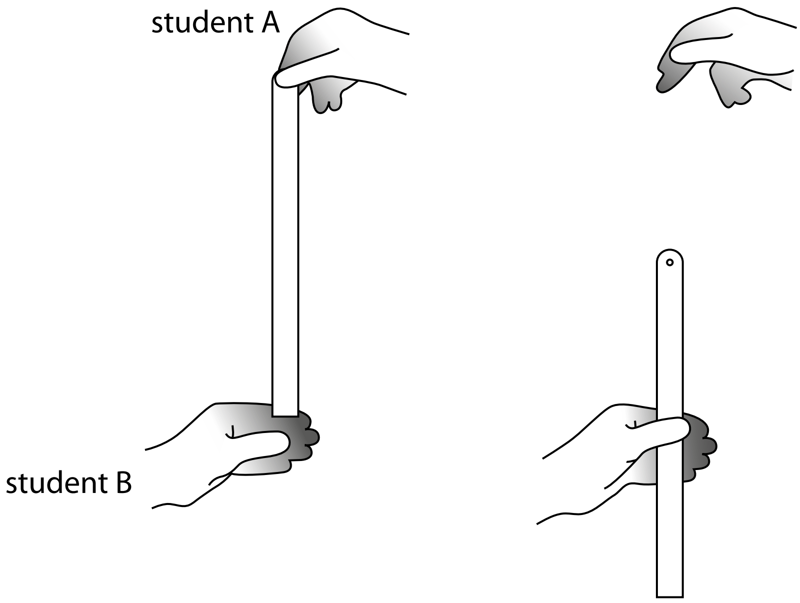

Figure 10

(a) Give a reason why it is better to have the 0 cm mark at the bottom of the ruler rather than at the top.

(1)

....

....

(b) Give a reason why two students are needed for this investigation.

(1)

....

....

(c) The students took five results for the left hand and five results for the right hand.

Figure 11 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	....

Figure 11

(i) Calculate the average distance dropped for the right hand. Give your answer correct to 2 significant figures.

(2)

distance = ... cm

(ii) Calculate the average time for the left hand.

Use the equation

$$\text{time}^2 = \frac{\text{distance}}{500}$$

(2)

average time = ... s

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(d) Explain whether any of the readings are anomalous.

(2)

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(e) Give **two** ways that the students can improve the quality of their data, other than ignoring anomalous results.

(2)

1 ....

....

2 ....

....

(f) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

....

....

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....

(Total for Question 8 = 12 marks)

9 A car accelerates at a constant rate of 1.83 m/s^2 along a flat straight road.

(a) The force acting on the car is 1.870 kN.

Calculate the mass of the car.

Give your answer to three significant figures.

(3)

mass = ... kg

(b) The car accelerates from rest for 16 s.

Calculate the speed of the car after 16 s.

(3)

speed = ... m/s *(c) Figure 12 is a speed-time graph for a different car moving on a horizontal road.

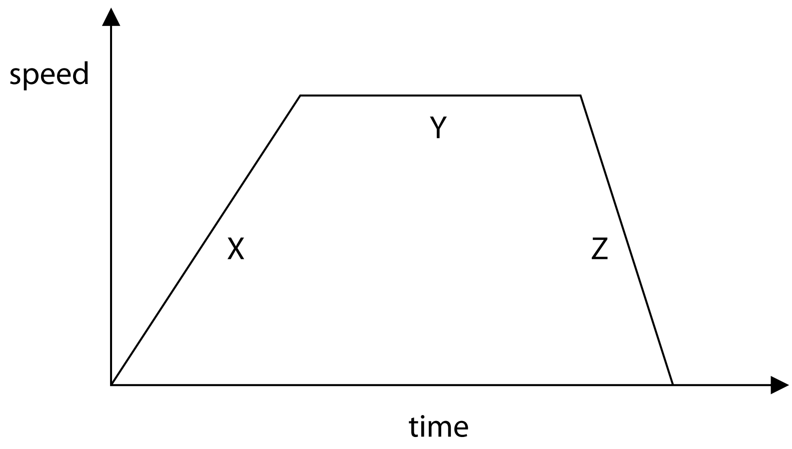

Figure 12

Describe the energy transfers taking place during the movement of the car.

You should refer to energy stores as well as transfers between energy stores for all three sections of the graph.

(6)

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(Total for Question 9 = 12 marks)

10 (a) Americium-241 is a radioactive isotope that emits alpha particles.

Americium-241 is used in smoke alarms.

Give a reason why it is safe to use americium-241 in smoke alarms.

(1)

....

....

(b) Iodine-131 is a radioactive isotope with a half-life of 8 days.

The activity of a sample of iodine-131 is 480 Bq.

Calculate the activity of the sample after 16 days.

(2)

activity = ... Bq

(c) A student uses 59 dice to model radioactive decay.

He starts by rolling all the dice at the same time.

He removes all the dice that show a six.

He then rolls the remaining dice.

The student repeats this process five more times.

State **two** improvements the student could make to his model of radioactive decay.

(2)

1 ....

....

2 ....

....

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*(d) Radioactive isotopes can be used to investigate cancer and other illnesses.

The thyroid gland in the neck absorbs most of the iodine that our bodies need.

A person can become ill if their thyroid absorbs too little iodine.

Explain how a radioactive isotope with suitable properties may be used to investigate the uptake of iodine by this gland.

(6)

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(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS