Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

PHYSICS **0625/33**

Paper 3 Theory (Core) **May/June 2021**

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 10 N (acceleration of free fall = 10 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.

© UCLES 2021

1 Fig. 1.1 shows the speed–time graph for a car travelling along a road.

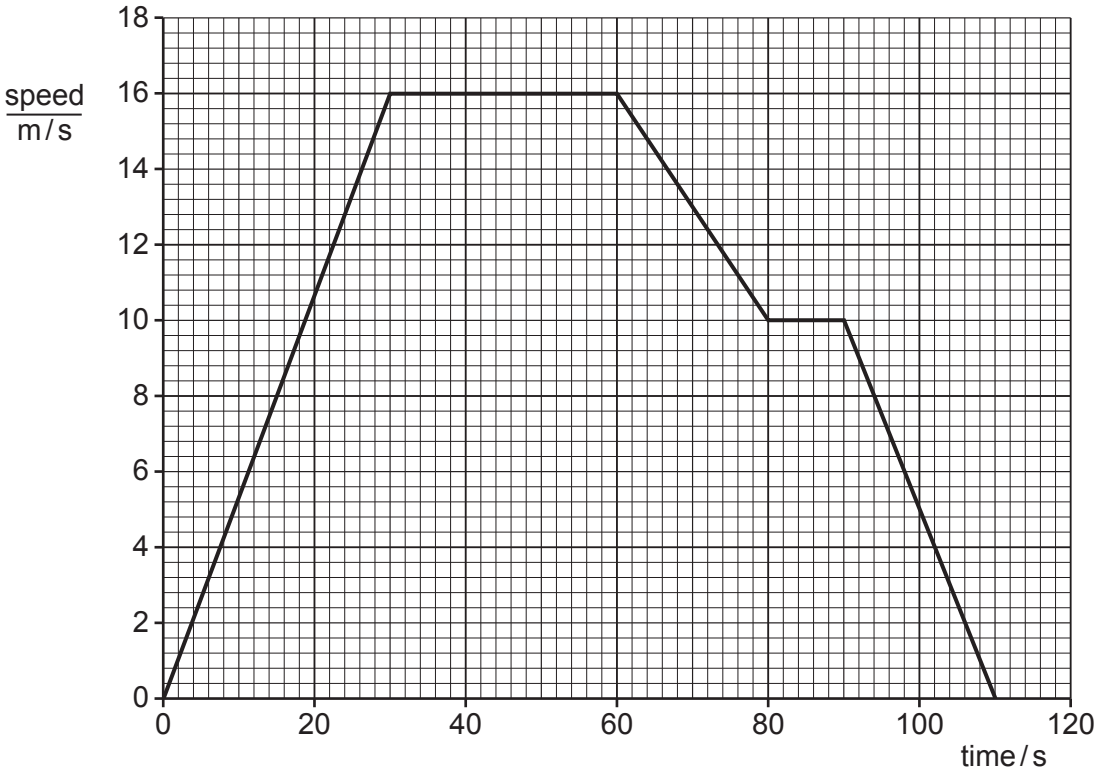


Fig. 1.1

(a) Determine the distance travelled by the car between 30 s and 60 s.

View solution

distance travelled = ... m [3]

(b) The distance travelled by the car between 60 s and 110 s is 460 m.

View solution

Calculate the average speed of the car between 60 s and 110 s.

average speed = ... m/s [4]

(c) Describe the motion of the car between 30 s and 60 s.

View solution

..... [1]

(d) Describe the motion of the car between 60 s and 80 s.

View solution

..... [1]

[Total: 9]

© UCLES 2021

2 **(a)** A scientist has a measuring cylinder, a beaker of sea water and an electronic balance.

View solution

Describe an experiment to determine the density of the sea water.

Include any equations in your answer.

.....

.....

.....

.....

.....

..... [5]

(b) A plank of wood floats on the sea.

View solution

Explain why the wood floats.

.....

..... [1]

[Total: 6]

3 **(a)** A girl and her brother sit on opposite sides of a see-saw as shown in Fig. 3.1.

View solution

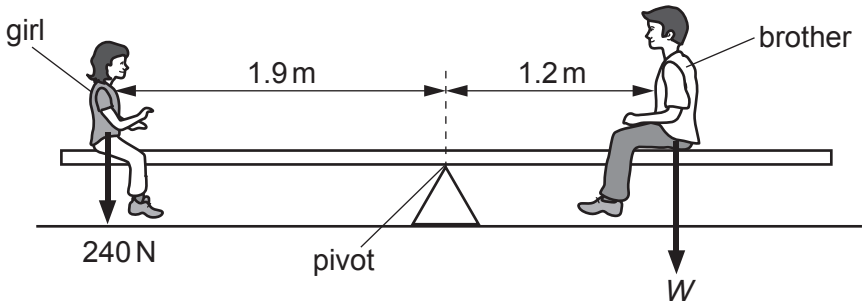


Fig. 3.1

(i) Calculate the girl's moment about the pivot and show that it is close to 460 N m.

[3]

(ii) The see-saw is balanced horizontally.

View solution

Calculate the weight *W* of the brother.

W = ... N [3]

(b) The weight of the girl in Fig. 3.1 is 240 N.

View solution

Calculate the mass of the girl. Include the unit in your answer.

mass of girl = ... unit ..... [4]

[Total: 10]

4 **(a)** A power station burns fossil fuel to produce electrical energy.

View solution

(i) State the form of the energy stored in the fuel.

..... [1]

View solution

(ii) Some of the energy stored in the fuel is **not** converted to electrical energy.

Suggest how energy is wasted in the generator.

.....

.....

..... [2]

(b) Solar panels produce electrical energy.

State **two** advantages and **two** disadvantages of using solar panels, rather than fossil fuels, to produce electrical energy.

View solution

advantages

1. .....

.....

2. .....

.....

disadvantages

1. .....

.....

2. .....

.....

[4]

[Total: 7]

5 **(a)** Fig. 5.1 shows a tractor and a car of the same weight.

View solution

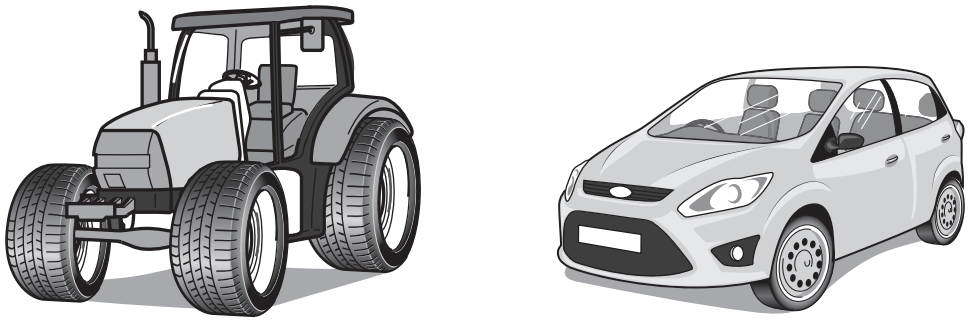


Fig. 5.1

The vehicles drive over the same soft ground.

Explain why the car sinks into the soft ground but the tractor does **not** sink.

.....

.....

.....

..... [3]

(b) The car driver measures the pressure of the air in a car tyre when the air is cool.

The Sun heats the air in the tyre. The driver measures the pressure of the air in the tyre when the air is warm.

View solution

The pressure of the air in the warm tyre is greater.

Explain the increase in the pressure of the air in the tyre. Use ideas about air molecules.

.....

.....

.....

..... [3]

[Total: 6]

© UCLES 2021

6 **(a)** Three rods are identical in size and shape, but each rod is made from a different material. On one end of each rod is a pin held in place by wax. The wax melts when it is warm.

The rods are placed on a block of wood and heated equally by a Bunsen burner as shown in Fig. 6.1.

View solution

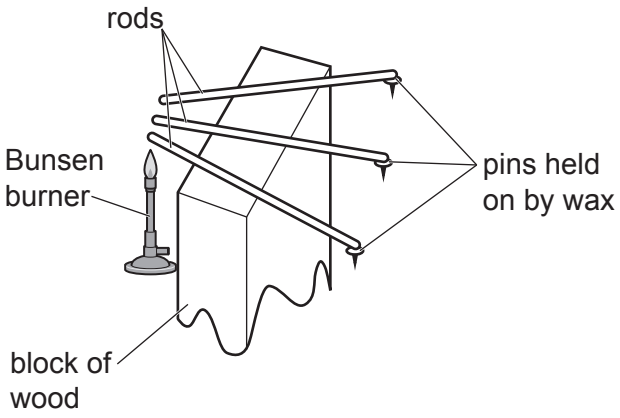


Fig. 6.1

(i) State the process of thermal energy transfer through the rods.

..... [1]

(ii) Explain how the arrangement in Fig. 6.1 can show which rod transfers thermal energy the most quickly.

.....

.....

.....

..... [2]

(b) **(i)** State the process by which infrared waves transfer thermal energy.

View solution

..... [1]

(ii) State the process of thermal energy transfer which does **not** require a medium.

..... [1]

View solution

(c) Fig. 6.2 shows a heater for warming a room. When there is hot water in the heater, the thermal energy of the water transfers to the room.

View solution

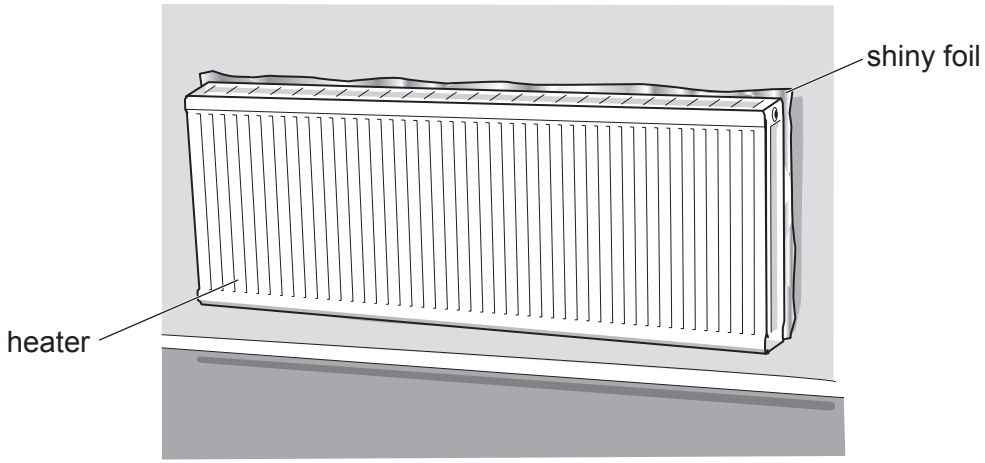


Fig. 6.2

The shiny foil on the wall increases the efficiency of the heater.

Explain how the shiny foil increases the efficiency of the heater.

.....

.....

..... [2]

[Total: 7]

7 This question is about the electromagnetic spectrum.

(a) (i) State the name of a region of the electromagnetic spectrum which has **longer** wavelengths than visible light.

..... [1]

(ii) State the name of a region of the electromagnetic spectrum which has **shorter** wavelengths than visible light.

..... [1]

(iii) Electromagnetic waves are travelling through a vacuum. Indicate the property that is always the same for all the waves.

View solution

Tick (✓) **one** box.

frequency	
speed	
amplitude	

[1]

(iv) Indicate the correct statement about the nature of electromagnetic waves.

Tick (✓) **one** box.

All electromagnetic waves are transverse.	
All electromagnetic waves are longitudinal.	
Some electromagnetic waves are transverse and some are longitudinal.	

[1]

(v) Indicate the correct statement about the action of electromagnetic waves.

Tick (✓) **one** box.

They transfer energy from one place to another.	
They transfer atoms from one place to another.	
They transfer molecules from one place to another.	

[1]

(b) State the type of electromagnetic radiation used:

View solution

(i) for a remote controller to operate a television

..... [1]

(ii) in a hospital to produce an image of broken bones.

View solution

..... [1]

[Total: 7]

© UCLES 2021

8 **(a)** Fig. 8.1 shows a ray of light incident on a plane mirror.

View solution

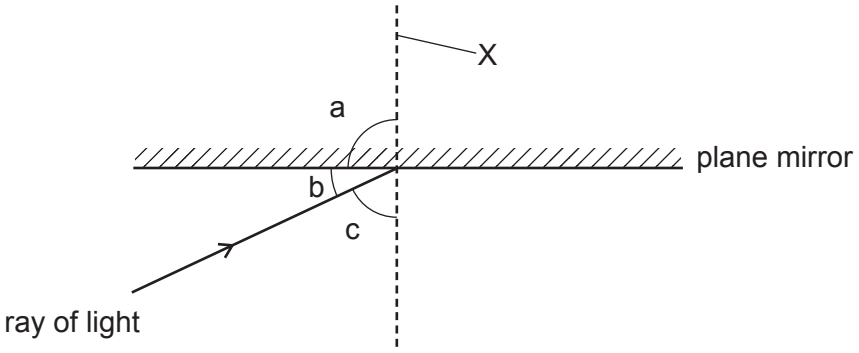


Fig. 8.1

(i) State which angle, a, b or c, is the angle of incidence.

angle of incidence = ... [1]

(ii) State the name of the line labelled X.

View solution

..... [1]

(iii) The mirror reflects the ray of light.

On Fig. 8.1, draw the reflected ray. [2]

View solution

(b) Fig. 8.2 shows a ray of red light travelling through a semicircular glass block.

View solution

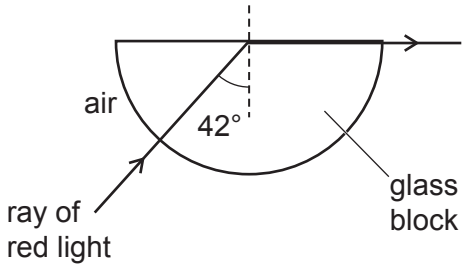


Fig. 8.2

(i) Fig. 8.3 shows another ray of red light entering the semicircular glass block at 60°.

Continue the path of this ray through the glass block and into the air.

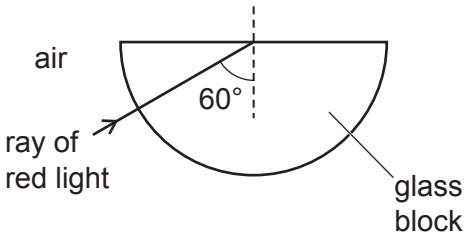


Fig. 8.3

[2]

(ii) Fig. 8.4 shows another ray of red light entering the semicircular glass block at 20°.

View solution

Continue the path of this ray through the glass block and into the air.

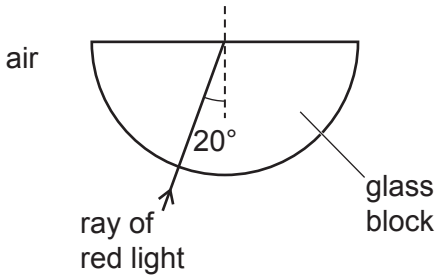


Fig. 8.4

[2]

[Total: 8]

© UCLES 2021

9 **(a)** Fig. 9.1 shows two uncharged balloons suspended from a beam by light thread.

View solution

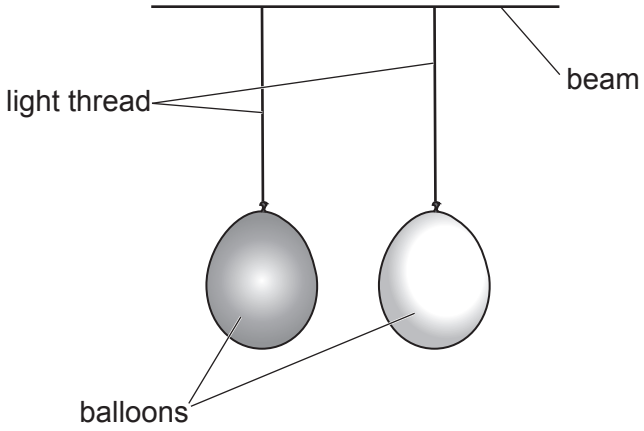
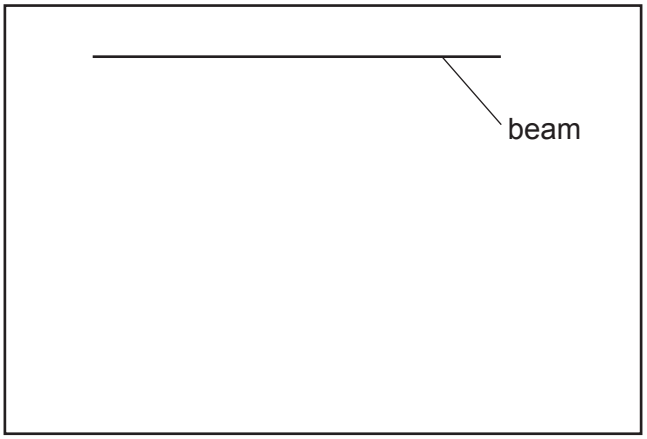


Fig. 9.1

The balloons are close to each other but not touching.

In the box below, draw the position of the balloons when they both have a positive charge.



[1]

(b) Table 9.1 includes a list of materials.

View solution

State whether each material is an electrical conductor or an electrical insulator.

The first example is done for you.

Table 9.1

material	conductor or insulator
copper	conductor
rubber	
wood	
iron	
gold	

[2]

(c) An uncharged cloth rubs an uncharged plastic rod. The cloth becomes positively charged and the plastic rod becomes negatively charged.

View solution

Explain how the cloth becomes positively charged.

.....

.....

.....

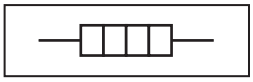
..... [3]

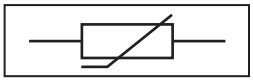
[Total: 6]

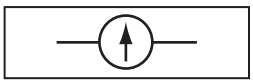
10 (a) Fig. 10.1 shows the circuit symbols for three electrical components.

View solution

Draw a line from each circuit symbol to the correct electrical component.







fuse

heater

variable resistor

galvanometer

thermistor

Fig. 10.1

[3]

(b) Fig. 10.2 shows a circuit consisting of a battery, a fixed resistor and an ammeter.

View solution

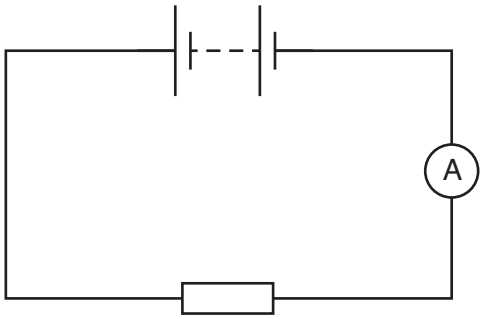


Fig. 10.2

(i) A voltmeter is connected in the circuit to measure the potential difference (p.d.) across the fixed resistor.

By drawing on Fig. 10.2, show how the voltmeter is connected. Use the correct circuit symbol for the voltmeter. [2]

(ii) The potential difference (p.d.) across the fixed resistor is 11.5 V. The reading on the ammeter is 0.25 A.

View solution

Calculate the resistance of the fixed resistor.

Include the unit in your answer.

resistance = ... unit ..... [4]

[Total: 9]

11 **(a)** A nucleus of nitrogen-13 has the nuclide notation: $^{13}_{7}N$.

View solution

Determine:

(i) the number of protons in one nucleus of nitrogen-13 ..... [1]

(ii) the number of neutrons in one nucleus of nitrogen-13 ..... [1]

(iii) the number of electrons in one neutral atom of nitrogen-13. ..... [1]

(b) Fig. 11.1 shows a counter measuring the radioactivity of a sample of nitrogen-13.

View solution

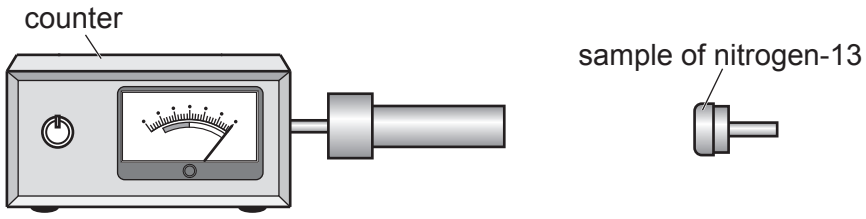


Fig. 11.1

The counter shows the count rate in counts per minute.

Table 11.1 shows the count rate every 5 minutes.

Table 11.1

time / min	count rate due to nitrogen-13 / counts / min
0	300
5	212
10	150
15	106
20	75
25	53

Calculate the half-life of nitrogen-13 using information from Table 11.1.

half-life of nitrogen-13 = ... min [2]

[Total: 5]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2021