



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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0625/33

May/June 2022

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

- 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).

- 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.

- 1 Fig. 1.1 shows children about to run a race. They have to run 25 m, pick up a small plastic ring and run back to the base line. Each child finishes when they cross the base line holding the plastic ring.

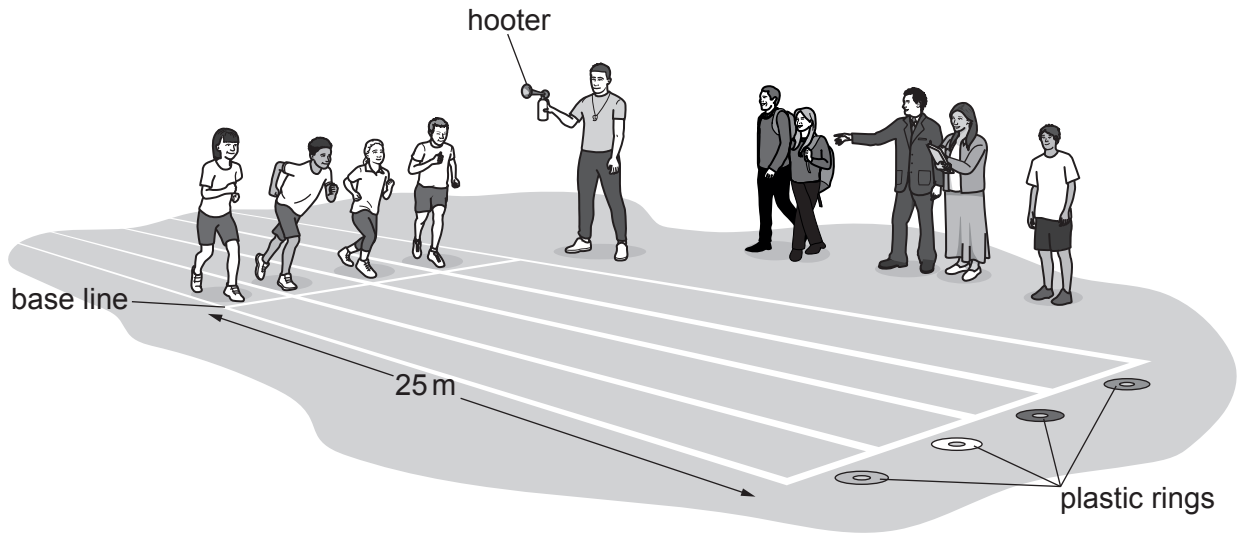


Fig. 1.1

- (a) (i) Suggest what equipment the teacher uses to measure the length of 25 m.
 [1]
- (ii) Determine the total distance for the race.
 distance = m [1]

- (b) The teacher records the following information for **one** of the children.

The child starts to run at time = 0.

The child picks up the ring at time = 9.0 s.

The child finishes the race at time = 17.0 s.

The highest speed occurs as the child finishes the race.

Using this information, sketch a speed–time graph on Fig. 1.2, suggesting how the speed of this child varies during the race.

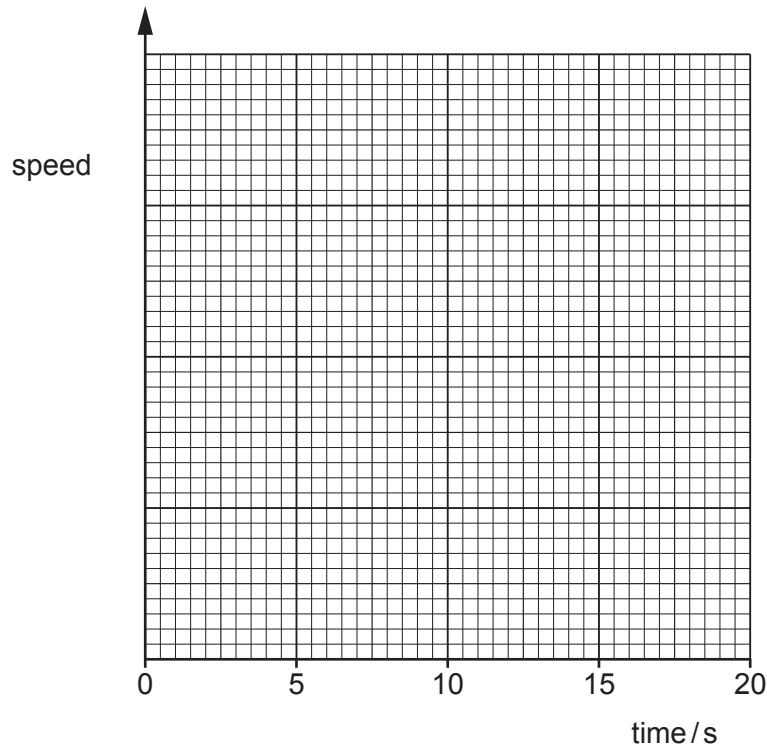


Fig. 1.2

[3]

- (c) In a different race, a child runs 500 m in 4 minutes and 20 seconds.

- (i) Determine how many seconds there are in 4 minutes and 20 seconds.

time = s [1]

- (ii) Calculate the average speed of the child.

average speed = m/s [3]

[Total: 9]

- 2 Fig. 2.1 shows two identical metal blocks, A and B, being lifted 3.0 m from ground level.

Block A is lifted by a motor. Block B is lifted by a person.

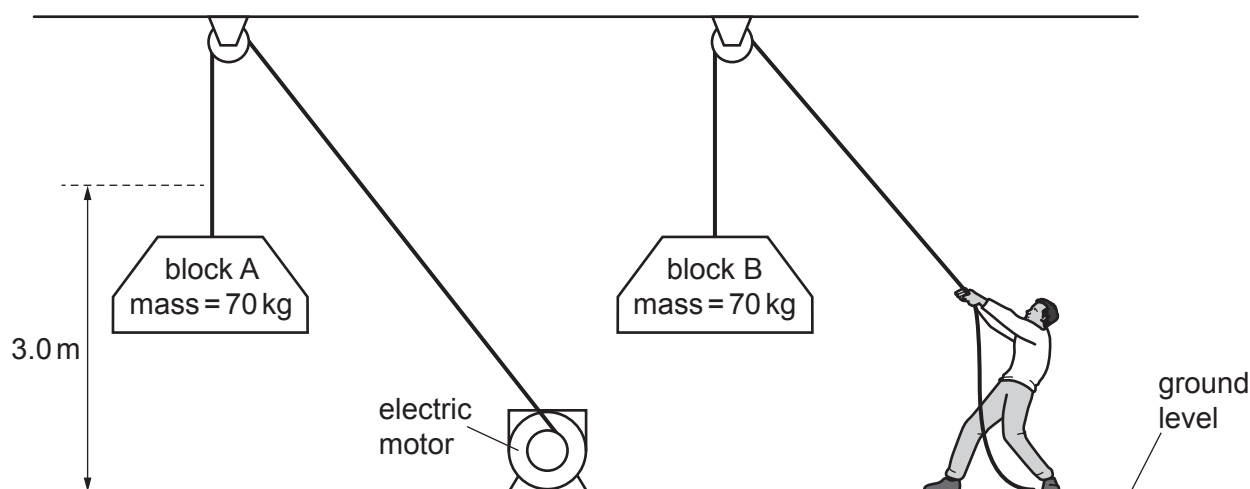


Fig. 2.1

- (a) Complete the following sentences.

(i) As the motor starts turning, it usefully transfers energy to
..... energy. [2]

(ii) Both blocks gain energy. [1]

- (b) Both blocks are lifted at the same steady speed. The blocks are then held at a height of 3.0 m.

(i) Compare the energy gained by block A with the energy gained by block B.
..... [1]

(ii) Explain why the energy input to the motor is more than the energy gained by block A.
.....
.....
..... [2]

- (iii) An engineer determines the power output of the motor.

State the **three** measurements that the engineer needs to determine the power output of the motor.

1.
 2.
 3.
- [2]

- (c) The volume of block A is 0.0089 m^3 . The mass of block A is 70 kg.

Calculate the density of block A.

density = kg/m^3 [3]

[Total: 11]

- 3 Fig. 3.1 shows a vehicle that is designed to travel on snow.

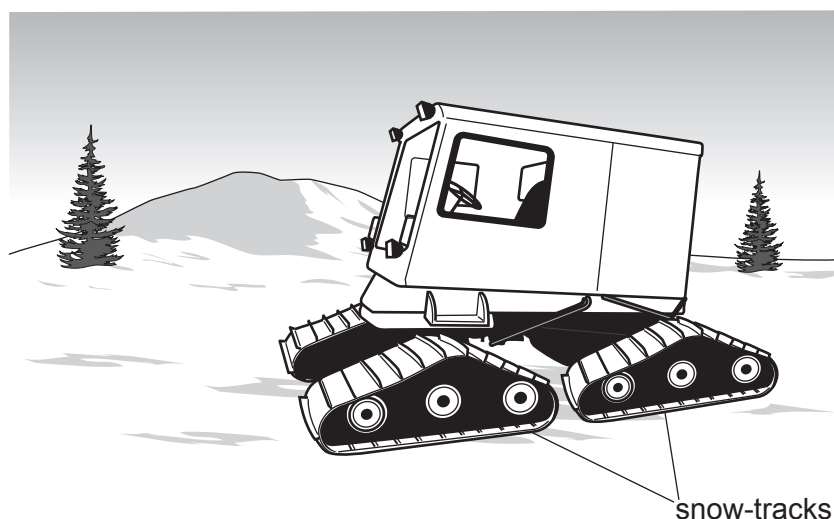


Fig. 3.1

The vehicle has four snow-tracks.

- (a) Explain why the snow-tracks are better than wheels for travelling on snow.

.....

.....

..... [2]

- (b) The weight of the vehicle is 4000 N.

- (i) Calculate the mass of the vehicle.

mass = kg [3]

- (ii) The area of each snow-track in contact with the ground is 2.0 m^2 . Each snow-track supports a quarter of the weight of the vehicle.

Calculate the pressure that each snow-track exerts on the ground. Include the unit in your answer.

pressure exerted by each snow-track = unit [4]

[Total: 9]

- 4 (a) State and explain **one** application of thermal expansion.

You may draw a diagram to support your answer.

.....

.....

.....

..... [2]

- (b) Fig. 4.1 shows a flask with air trapped inside it.

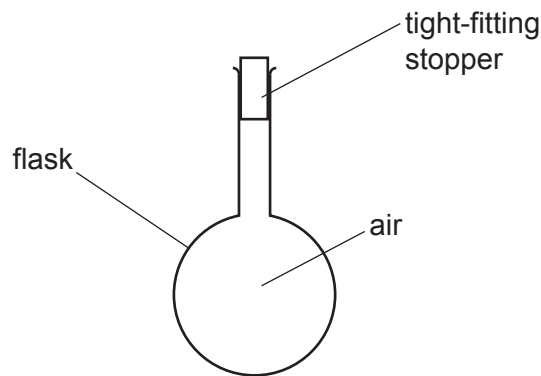


Fig. 4.1

Initially, the flask and air are at room temperature. The flask is then cooled in a refrigerator.

- (i) State the change in the pressure of the air in the flask as the air cools.

..... [1]

- (ii) Explain your answer to (b)(i). Use your ideas about air molecules.

.....

.....

.....

..... [3]

[Total: 6]

- 5 An engineer makes a device that absorbs thermal energy from the Sun. The absorbed energy heats water.

In the device, cold water flows slowly from an upper tank, through a white plastic pipe, to a lower tank. Energy from the Sun heats the water as it flows, as shown in Fig. 5.1.

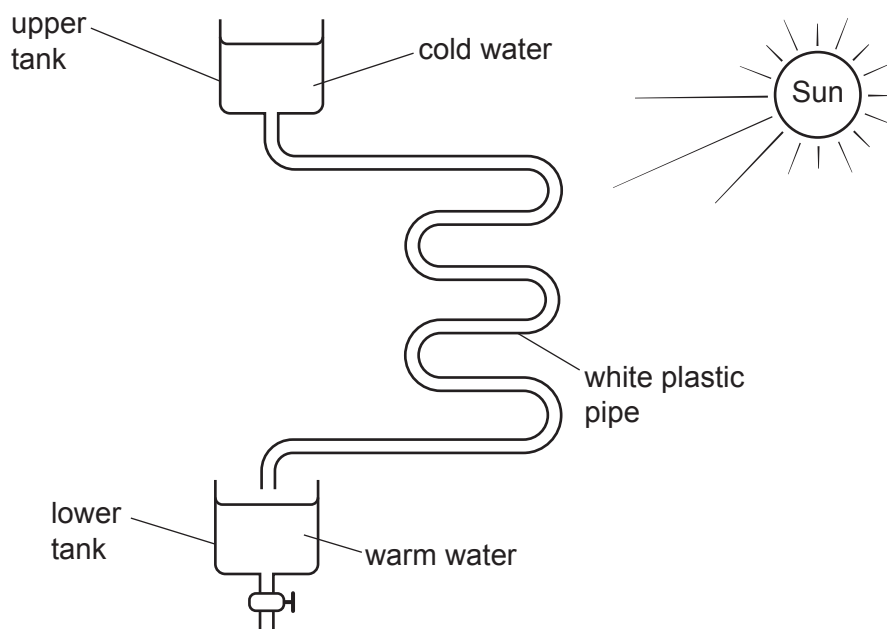


Fig. 5.1

- (a) The engineer measures the temperature of the water in each tank.

State the name of the instrument used for measuring temperature.

..... [1]

- (b) (i) State the name of the process that transfers thermal energy from the Sun to the white plastic pipe.

..... [1]

- (ii) State the name of the process that transfers thermal energy through the plastic wall of the pipe to the water inside the pipe.

..... [1]

- (c) The engineer wants to increase the thermal energy absorbed by the water in the pipe.

Suggest **two** improvements he can make to increase the thermal energy absorbed.

In each case, explain why the suggestion increases the thermal energy absorbed.

improvement 1

.....

explanation

.....

improvement 2

.....

explanation

.....

[4]

[Total: 7]

- 6 A diver is swimming under water. She uses a torch emitting red light. Fig. 6.1 shows three rays of red light coming from the torch.

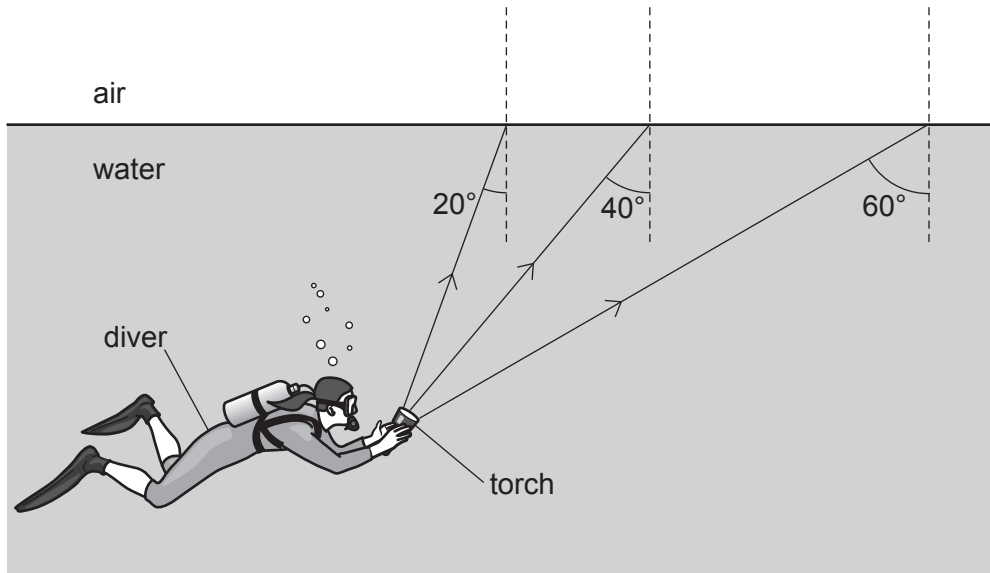


Fig. 6.1

- (a) State the name of the dashed lines in Fig. 6.1.

..... [1]

- (b) The critical angle for red light travelling from water into air is 48° .

- (i) State the meaning of the term critical angle.

.....
 [2]

- (ii) On Fig. 6.1, draw the path of each ray after it reaches the water–air boundary. [3]

[Total: 6]

7 This question is about the following **four** types of wave.

infrared

microwaves

ultrasound

radio waves

(a) Answer the questions, choosing words from this list.

(i) State which of the types of wave are electromagnetic.

..... [1]

(ii) State which type of electromagnetic wave has the longest wavelength.

..... [1]

(iii) State **two** types of wave that can travel through a vacuum.

..... [1]

(iv) State which of the types of wave is used to produce an image of an unborn baby.

..... [1]

(b) State **two** uses for infrared waves.

1.

2. [2]

(c) Indicate whether the types of wave in Table 7.1 are transverse or longitudinal.

Show your answer for each type of wave by placing a tick (✓) in **one** column.

Complete all the rows in Table 7.1.

Table 7.1

type of wave	transverse	longitudinal
infrared		
microwaves		
ultrasound		
radio waves		

[2]

[Total: 8]

- 8 (a) The device in Fig. 8.1 is connected to a 240 V mains supply.

The device produces a potential difference (p.d.) of 12 V between A and B.

A 12 V lamp is connected between A and B.

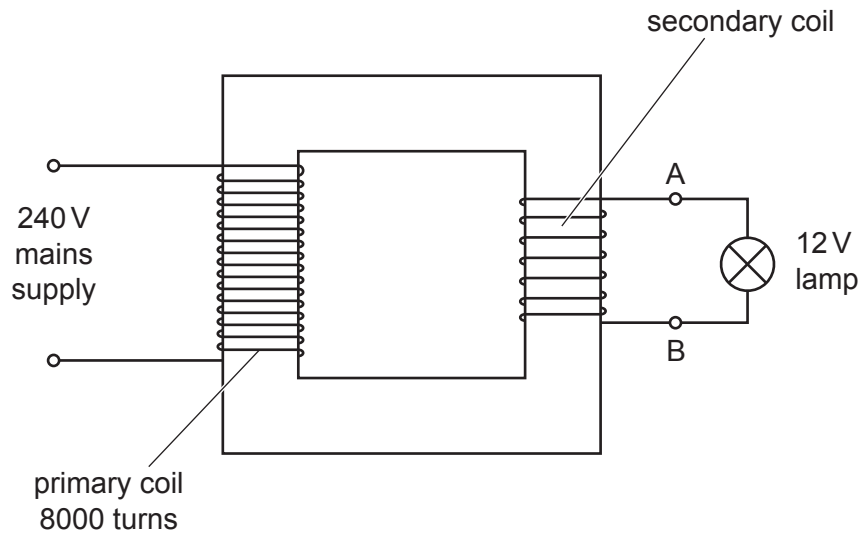


Fig. 8.1

- (i) Calculate the number of turns on the secondary coil. Use information from Fig. 8.1.

number of turns = [3]

- (ii) State the name of the device shown in Fig. 8.1.

..... [1]

- (iii) The device includes two coils.

State the material used for the coils.

..... [1]

(b) The 12 V lamp is disconnected.

Two 6.0 V lamps and a 12 V motor are connected between A and B. The p.d. across each lamp is 6.0 V and the p.d. across the motor is 12 V.

Draw on Fig. 8.2 to show how to connect the lamps and the motor between A and B.



Fig. 8.2

[3]

[Total: 8]

- 9 The circuit in Fig. 9.1 shows two resistors, a battery, a voltmeter and a switch connected by metal wires.

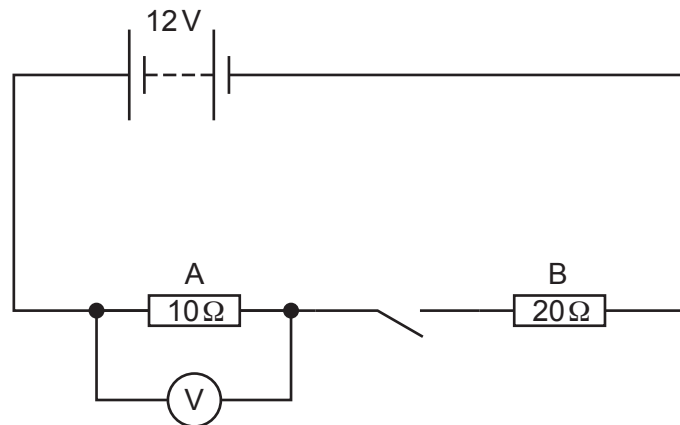


Fig. 9.1

- (a) State a quantity that a voltmeter measures.

..... [1]

- (b) The switch is closed. There is a current in the circuit.

- (i) State the name of the type of particle that flows in the metal wires.

..... [1]

- (ii) State the name of an instrument that measures electric current.

..... [1]

- (c) The reading on the voltmeter is 4.0 V.

- (i) Calculate the current in the 10 Ω resistor.

current = A [3]

- (ii) Determine the current in the 20 Ω resistor.

current = A [1]

- (iii) The 10 Ω resistor is replaced by a 15 Ω resistor **and** the 20 Ω resistor is also replaced by a 15 Ω resistor.

State the effect, if any, on the current in the circuit. Explain your answer.

.....
 [2]

[Total: 9]

10 (a) State the names of **three** types of radioactive emission.

1.

2.

3.

[3]

(b) In nuclide notation, ${}^{35}_{17}\text{Cl}$ represents one nuclide of chlorine.

For one neutral atom of ${}^{35}_{17}\text{Cl}$, state:

(i) the nucleon number [1]

(ii) the proton number [1]

(iii) the number of neutrons. [1]

(c) Complete the sentence:

In a neutral atom, the number of protons is equal to the number of [1]

[Total: 7]

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