

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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

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Friday 12 June 2020

Morning (Time: 1 hour 10 minutes)

Paper Reference **1SC0/2PH**

Combined Science

Paper 6

Higher Tier

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 60.
- 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.
- A list of equations is included at the end of this exam paper.

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 .

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 small piece of copper about 3 cm high.



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Figure 1

A student wants to determine the density of copper.

The student uses a balance to measure the mass of the piece of copper.

- (i) Explain how the student could measure the volume of the piece of copper. (3)

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- (ii) The mass of the piece of copper is 0.058 kg.
The volume of the piece of copper is $6.5 \times 10^{-6} \text{ m}^3$.
Calculate the density of copper. (2)

density of copper = kg/m³

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(b) A student wants to determine the specific heat capacity of copper.

Figure 2 shows a piece of copper, with a thread tied around it, in a glass beaker of boiling water.

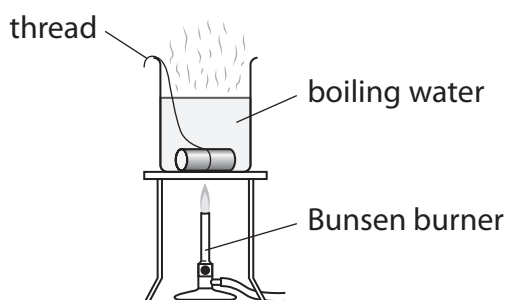


Figure 2

The student leaves the piece of copper in the boiling water so that the copper reaches a temperature of 100°C .

The student uses the thread to take the piece of copper out of the boiling water.

The student puts the hot piece of copper into a different beaker of cold water at 20°C .

The apparatus is shown in Figure 3.

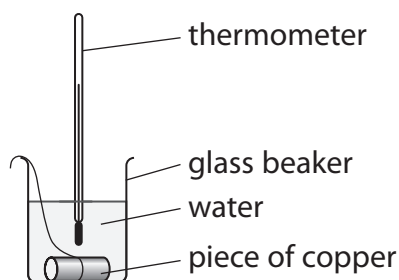


Figure 3

The student assumes that the thermal energy gained by the water equals the thermal energy lost by the piece of copper.

The water and copper both reach a temperature of 22°C .

The cold water gains 1050 J of energy.

The mass of the piece of copper is 0.058 kg .



(i) Calculate a value for the specific heat capacity of copper, using these results.

Use the equation

change in thermal energy = mass \times specific heat capacity \times change in temperature

$$\Delta Q = m \times c \times \Delta\theta \tag{2}$$

specific heat capacity of copper from these results = J/kg°C

(ii) The value for the specific heat capacity of copper obtained from the student's results is lower than the correct value.

State **two** ways that the experiment could be improved to give a value that is closer to the correct value.

(2)

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2

(Total for Question 1 = 9 marks)

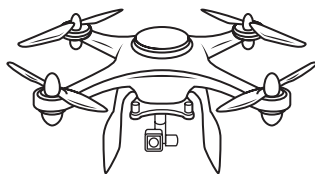
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2 (a) Figure 4 shows a drone.



© Liubov Kotliar/123RF

Figure 4

The drone has four spinning blades.

The upward force produced enables the drone to rise in the air.

The speed at which the blades spin is measured in turns per minute.

Figure 5 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

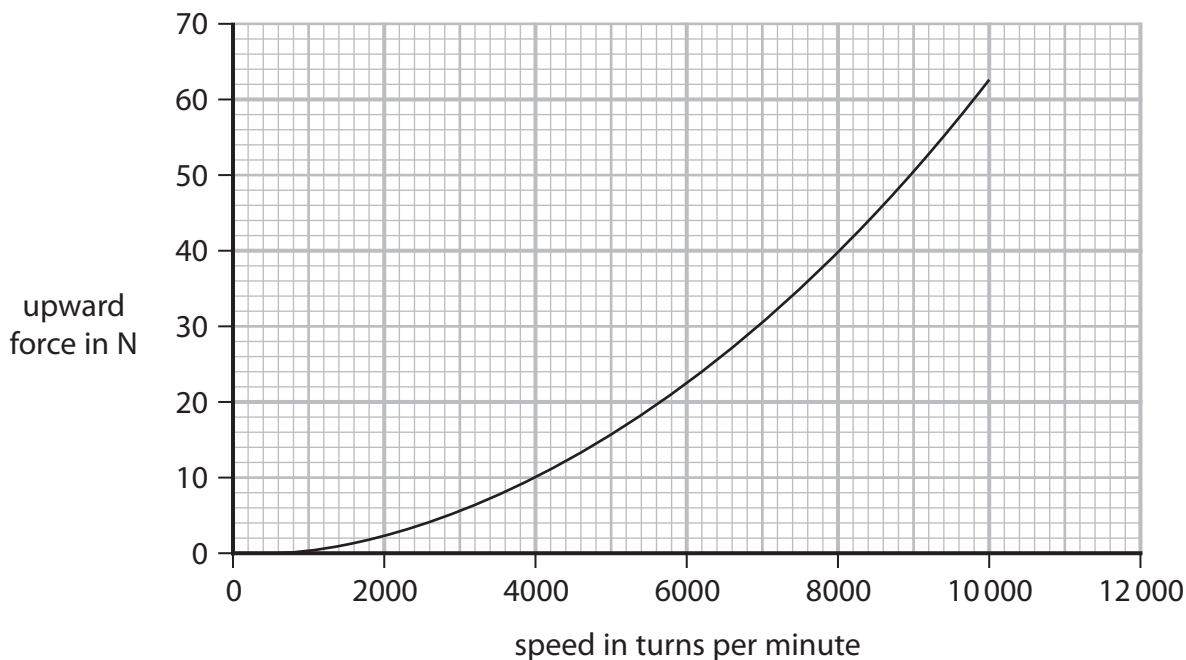


Figure 5

Describe the relationship between upward force and speed shown by this graph.

(2)

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(b) A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

- (i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength $g = 10 \text{ N/kg}$.

(2)

change in gravitational potential energy = J

- (ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = J

- (iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = W

(Total for Question 2 = 7 marks)



3 Figure 6 shows the magnetic field of a magnet.

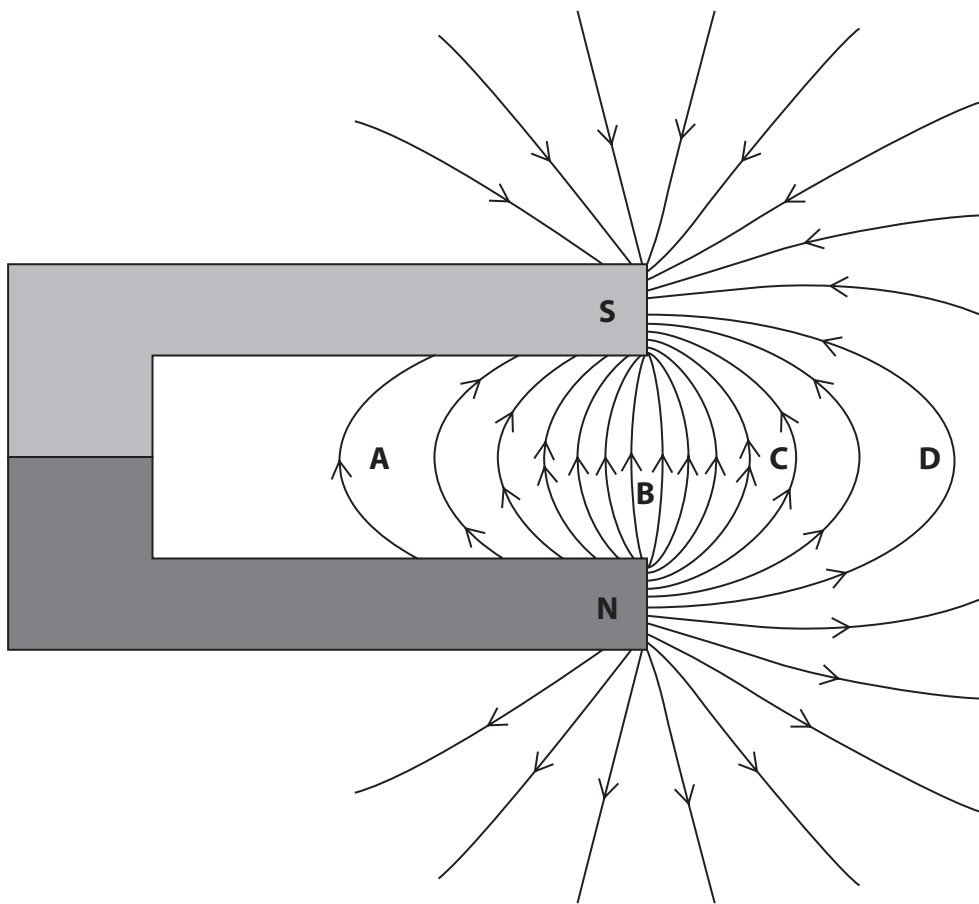


Figure 6

(a) At which point is the magnetic field strongest?

(1)

- A
- B
- C
- D

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(b) Figure 7 shows a wire carrying a current.

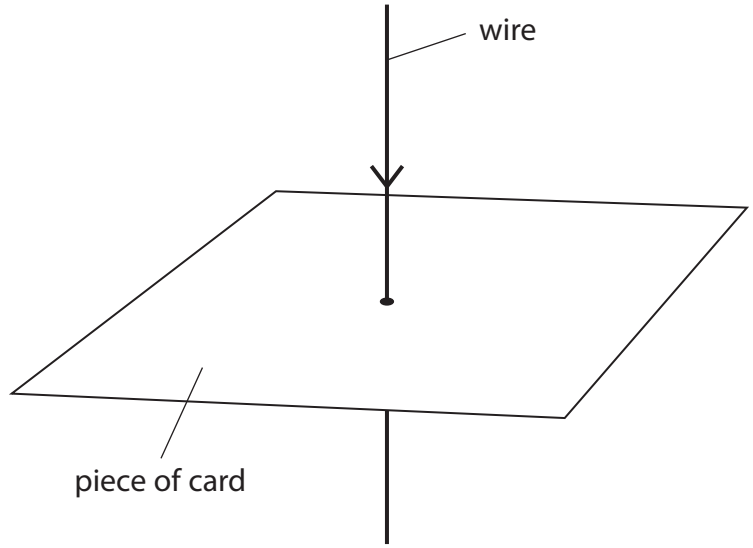


Figure 7

Draw, on the card in Figure 7, the magnetic field that is produced by the current.

(2)

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(c) Figure 8 shows two metal rods carrying a current.

A metal roller touches both rods and completes the circuit.
The roller is in the magnetic field produced by a magnet.

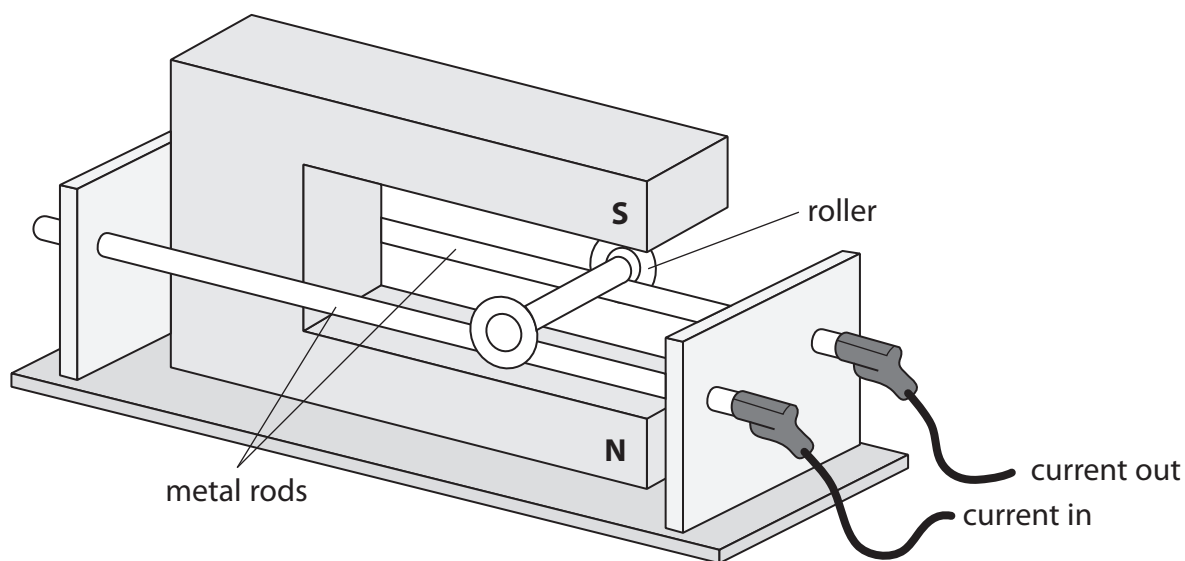


Figure 8

(i) The magnetic flux density of the magnetic field at the roller is 1.2T.

The current in the roller is 2.5 A.

The length of the roller carrying the current is 0.060 m.

Calculate the force on the roller.

Use the equation

$$F = B \times I \times l$$

(2)

force on the roller = N



(ii) Describe how Fleming's left-hand rule can be used to determine the direction of the force acting on the roller.

You may draw a diagram to help your answer.

(3)

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(iii) Draw an arrow on Figure 8 to show the direction of the force acting on the roller.

(1)

(Total for Question 3 = 9 marks)

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4 Figure 9 shows a spring standing on a table.

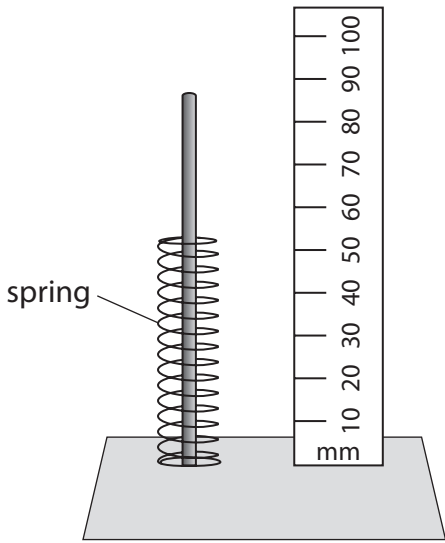


Figure 9a

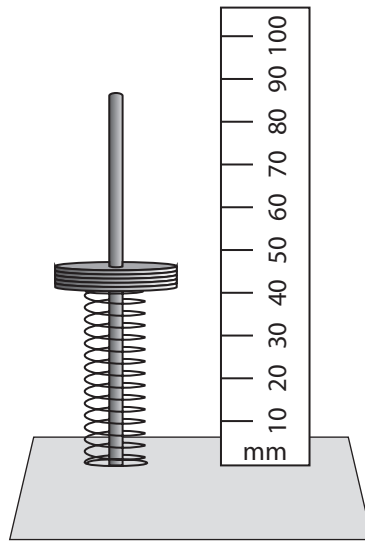


Figure 9b

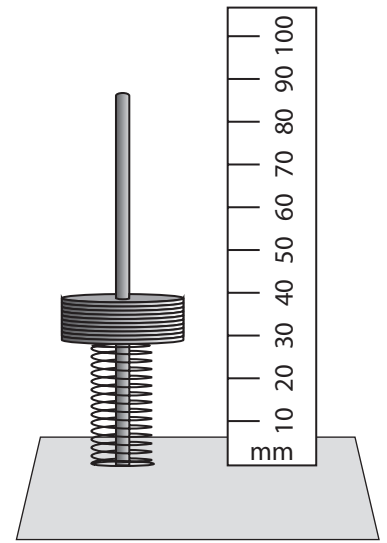


Figure 9c

Weights are added to the spring as shown in Figures 9b and 9c.

(a) (i) Estimate the original length of the spring as shown in Figure 9a.

(1)

original length = mm

(ii) Describe how the reduction in the length of the spring when weights are added can be determined.

(2)

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(iii) State **two** ways that the experimental procedure could be improved.

(2)

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(iv) Give **one** reason why the reduction in length eventually reaches a limit as more weights are added.

(1)

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(b) A different spring is extended.

A force of 0.50 N gives an extension of 13 mm.

Calculate the spring constant k in N/m.

(3)

spring constant $k =$ N/m

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P 6 2 1 0 2 A 0 1 3 2 4

(c) Another spring is extended.

The work done to extend the spring is 0.14 J.

The spring constant of the spring is 175 N/m.

Calculate the extension of the spring.

Use an equation selected from the list of equations at the end of this paper.

(3)

extension of spring = m

(Total for Question 4 = 12 marks)



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- 5 (a) A student investigates resistors connected in parallel using a number of resistors. Each resistor has the same resistance.

Figure 10 shows a circuit diagram with one resistor, R .

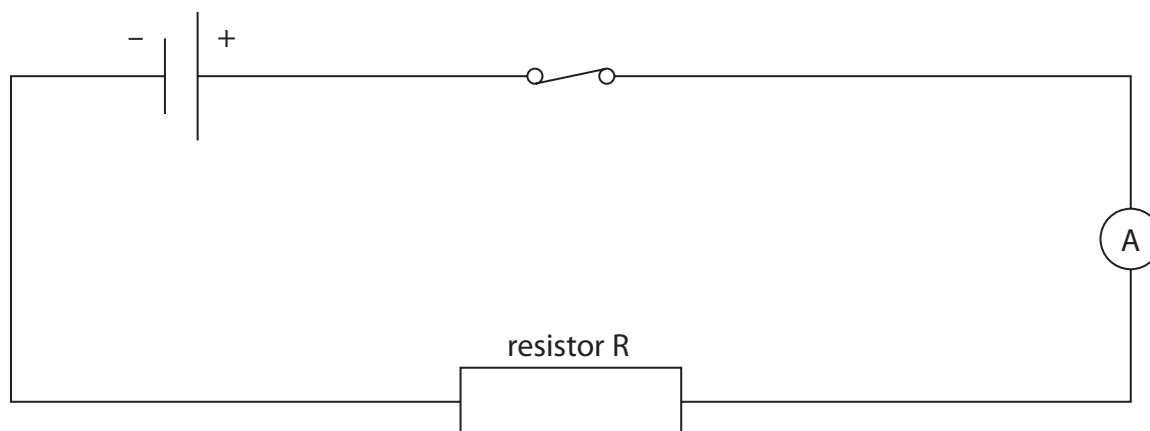


Figure 10

- (i) Add to Figure 10:
- a voltmeter to find the potential difference across resistor R
 - another resistor in parallel with resistor R .
- (2)
- (ii) State the measurements that the student must take to find the overall resistance of the resistors in parallel.
- (2)

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- (iii) The student investigates how the overall resistance of the circuit changes when additional resistors are added in parallel to R.

Each resistor has the same resistance.

Figure 11 shows the results of the student's investigation.

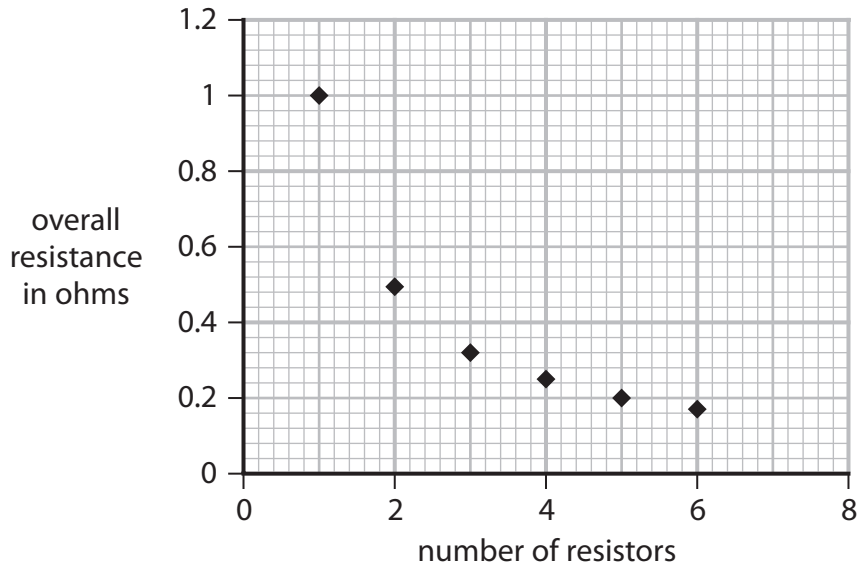


Figure 11

State the resistance of a single resistor.

(1)

resistance = Ω

- (iv) Comment on the relationship between the overall resistance of the circuit and the number of resistors in parallel.

Use information from Figure 11 to support your answer.

(3)

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(b) A different circuit is then set up with two resistors as shown in Figure 12.



Figure 12

(i) Calculate the potential difference across the 15 Ω resistor.

(2)

potential difference = V

(ii) Calculate the total power dissipated when there is a current of 0.20 A in the two resistors.

Use the equation

$$P = I^2 \times R$$

(2)

power produced W

(Total for Question 5 = 12 marks)



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- 6 (a) The magnitude and direction of a force can be represented by a vector.
Figure 13 shows the forces acting on four identical trolleys. The arrows show the magnitude and direction of the forces.

Which diagram shows a pair of forces that will produce zero acceleration?

(1)

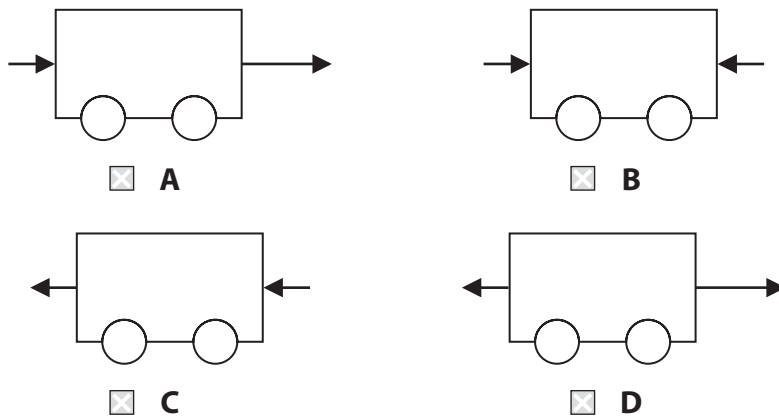


Figure 13

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(b) Figure 14 shows two small boats pulling a much larger ship.

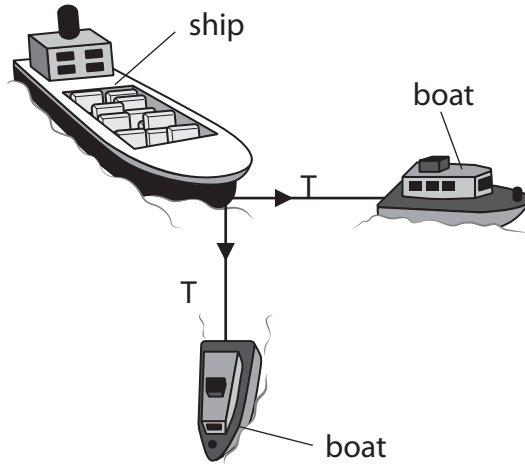


Figure 14

The ship is connected to the boats with ropes.

The tension, T , in each of the ropes has a magnitude of 20 kN.

The ropes are at right angles to each other.

Draw a vector diagram and use it to determine the resultant force that the boats exert on the ship.

(4)

magnitude of resultant force on the ship = kN

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*(c) Figure 15 shows a wooden block connected to a weight by a string. The string goes over a pulley.

The surfaces of the table and the wooden block are both rough.

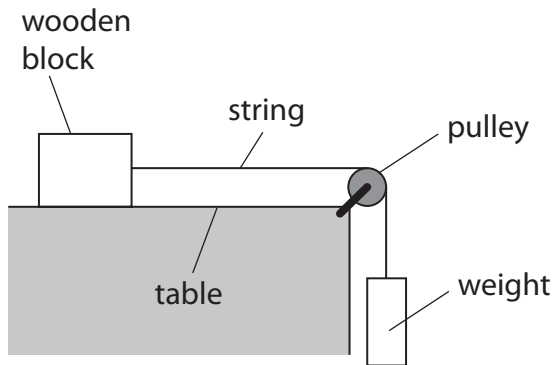


Figure 15

The wooden block moves across the table at a constant horizontal velocity.

Several vertical and horizontal forces act on the wooden block as it moves.

Explain how the forces keep the wooden block moving across the table at a constant horizontal velocity.

Your answer should refer to all forces acting on the wooden block.

You may add to the diagram to help with your answer.

(6)

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(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS



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Equations

(final velocity)² – (initial velocity)² = 2 × acceleration × distance

$$v^2 - u^2 = 2 \times a \times x$$

force = change in momentum ÷ time

$$F = \frac{(mv - mu)}{t}$$

energy transferred = current × potential difference × time

$$E = I \times V \times t$$

force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length

$$F = B \times I \times l$$

$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil

$$V_p \times I_p = V_s \times I_s$$

change in thermal energy = mass × specific heat capacity × change in temperature

$$\Delta Q = m \times c \times \Delta\theta$$

thermal energy for a change of state = mass × specific latent heat

$$Q = m \times L$$

to calculate pressure or volume for gases of fixed mass at constant temperature

$$P_1 V_1 = P_2 V_2$$

energy transferred in stretching = 0.5 × spring constant × (extension)²

$$E = \frac{1}{2} \times k \times x^2$$

pressure due to a column of liquid = height of column × density of liquid × gravitational field strength

$$P = h \times \rho \times g$$

