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)

Friday 14 June 2024

Afternoon (Time: 1 hour 45 minutes) | **Paper reference** | **1PH0/2F**

Physics
PAPER 2

Foundation Tier

You must have:
Calculator, ruler, Equation Booklet (enclosed)

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 ▶

Pearson

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 circuit containing a battery and **four** other components.

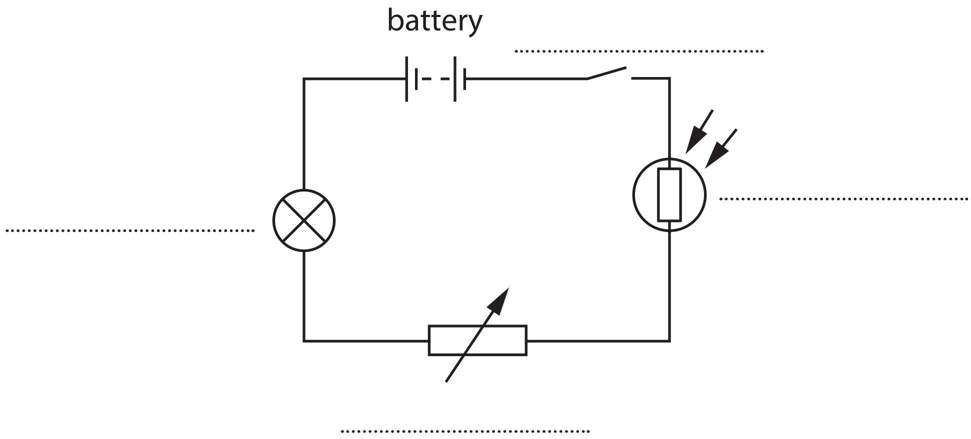

Figure 1

Label the **four** components in Figure 1, using words from the box.

ammeter	lamp	LDR
switch	thermistor	variable resistor

(4)

(b) The circuit in Figure 1 is switched on.

A charge of 1.2 C leaves the battery in a time of 4.0 s.

Calculate the current in the circuit.

Use the equation

$$\text{current} = \frac{\text{charge}}{\text{time}}$$

(2)

current = ... A

(Total for Question 1 = 6 marks)

2 (a) Figure 2 shows two gear wheels, **P** and **Q**.

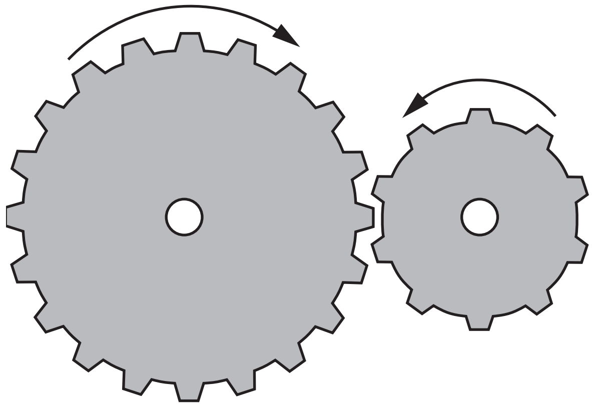

Figure 2

P has 20 teeth.

Q has 10 teeth.

(i) **P** rotates once.

How many times does **Q** rotate when **P** rotates once?

(1)

☒ **A** 200 times

☒ **B** 20 times

☒ **C** 10 times

☒ **D** 2 times

(ii) A third gear wheel is added to the system in Figure 2 so that this third wheel **rotates in the opposite direction** to **Q** but **at the same speed** as **Q**.

1. Draw an X on Figure 2 to show the position of this third gear wheel.

2. State how many teeth this third gear wheel has.

(2)

number of teeth = ...

(b) Figure 3 shows a 9.0 N force acting on a ruler.

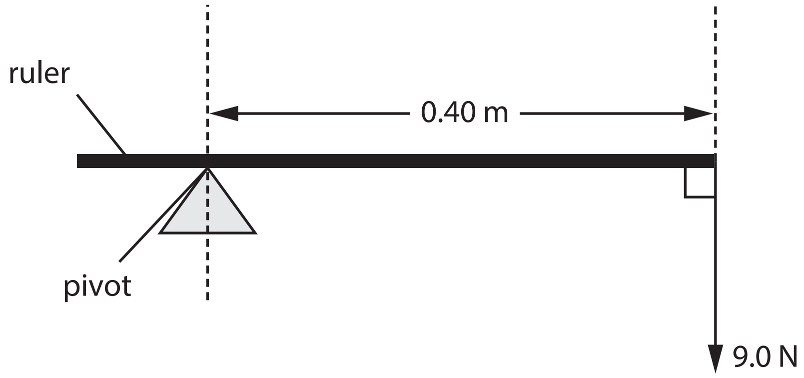

Figure 3

Calculate the moment of the 9.0 N force about the pivot.

Use the equation

moment = force × perpendicular distance of force from pivot

(2)

moment = ... N m

(c) Another ruler is balanced at its midpoint.

Figure 4 shows two forces, **F** and **G**, acting on this ruler.

The ruler is balanced (in equilibrium).

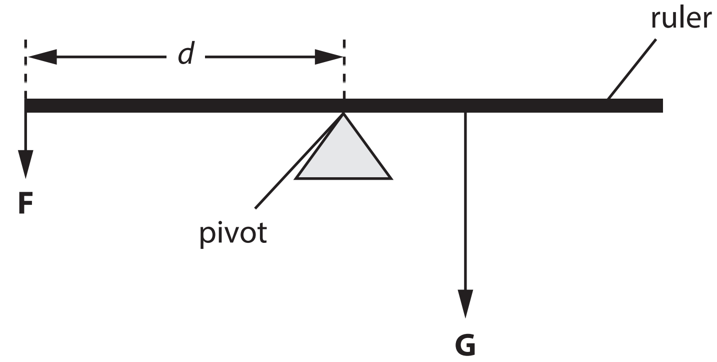

Figure 4

The moment of force **F** about the pivot = 2.4 N m.

(i) Use the principle of moments to state the moment of force **G** about the pivot. **(1)**

moment of force **G** = ... N m

(ii) Force **F** = 8.0 N.

The moment of force F about the pivot = 2.4 N m.

Calculate the distance, *d*, of force **F** from the pivot.

Use the equation

moment = force × perpendicular distance of force from pivot

(2)

distance = ... m

(Total for Question 2 = 8 marks)

3 A student rubs **two** balloons with a dry cloth.

The balloons become positively charged.

The student hangs the charged balloons using strings, as shown in Figure 5.

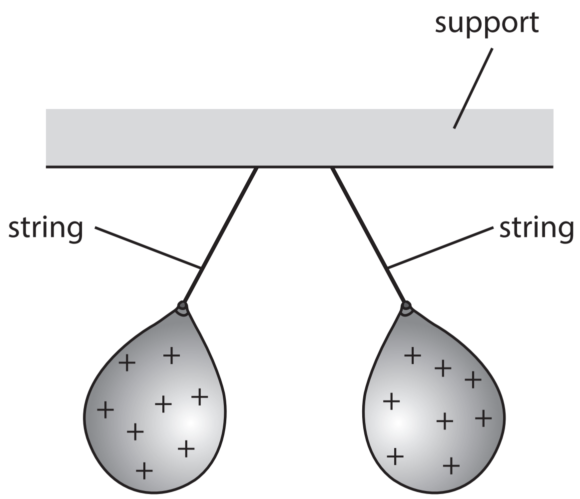

Figure 5

(a) Use words from the box to complete the sentences.

(4)

ampere	attract	coulomb	electrons
negative	positive	protons	repel

The balloons have the same charge.

This means that these balloons .... each other.

The charged particles transferred from the balloons to the cloth are

called ....

The cloth is left with a .... charge.

The unit of charge is the ....

P 7 4 4 8 8 A 0 6 3 6

(b) One of the charged balloons is moved so it nearly touches a wall, as shown in Figure 6.

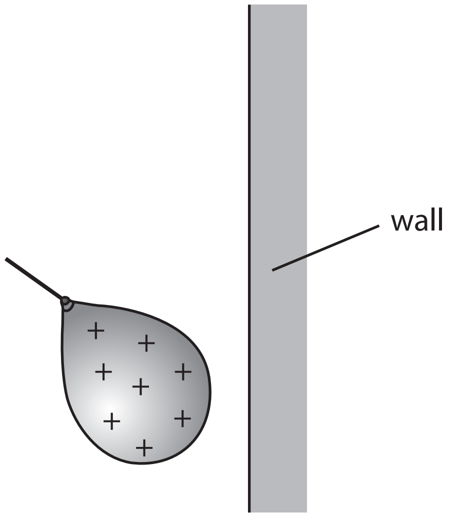

Figure 6

The balloon then sticks to the wall.

Explain why the balloon sticks to the wall.

You may add to the diagram to help your answer.

(2)

....

....

....

....

(c) Figure 7 shows a positively charged metal sphere above the ground.

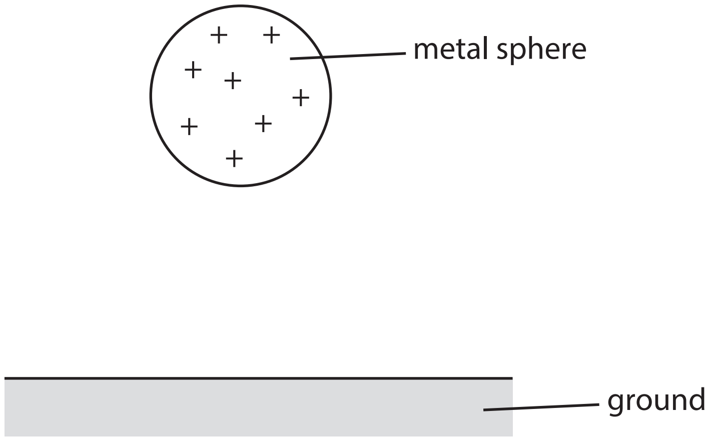

Figure 7

The metal sphere can be discharged by connecting the sphere to the ground with a metal wire.

Explain how this would discharge the sphere.

(2)

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....

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....

(Total for Question 3 = 8 marks)

4 (a) Figure 8 shows the shape of the magnetic field lines around a bar magnet.

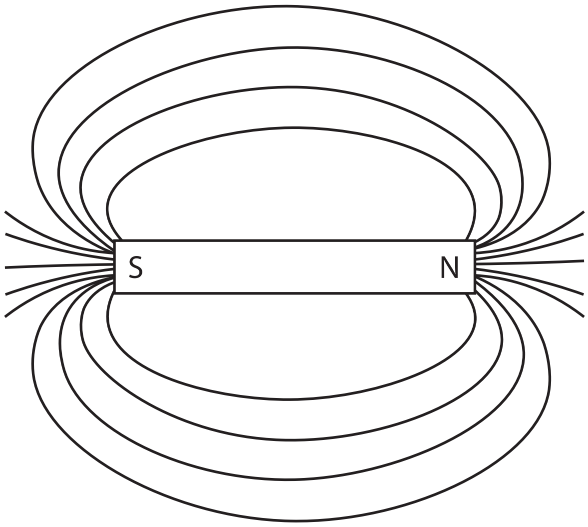

Figure 8

(i) Draw **one** arrow on a magnetic field line in Figure 8 to show the direction of that magnetic field line.

(1)

(ii) Draw an **X** on Figure 8 to show where the magnetic field is strongest.

(1)

(iii) Give a reason why Figure 8 shows the magnetic field is strongest at point **X**.

(1)

....

....

(b) A student places two magnets on a smooth bench.

The student holds the magnets close to each other, as shown in Figure 9.

Figure 9

(i) Draw some magnetic field lines on Figure 9 to show the shape of the magnetic field **between** the two magnets.

(2)

(ii) The student is holding the two magnets on the smooth bench.

State what would happen if the student let go of one of the magnets.

(1)

....

....

(c) A student is given two permanent magnets and some paper clips, as shown in Figure 10.

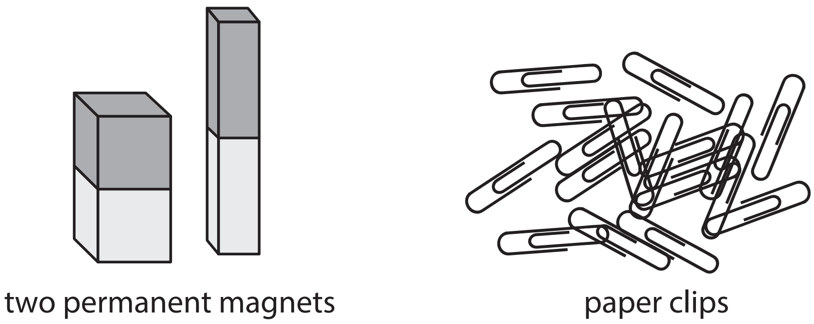

Figure 10

The paper clips are **not** magnets, but they are made from a magnetic material.

(i) Which of these is a magnetic material?

(1)

☒ **A** aluminium

☒ **B** iron

☒ **C** plastic

☒ **D** wood

(ii) Describe how the student could use the paper clips to find out which of the two permanent magnets is the stronger magnet.

(2)

....

....

....

....

....

(Total for Question 4 = 9 marks)

5 (a) Figure 11 shows a truck on a horizontal road.

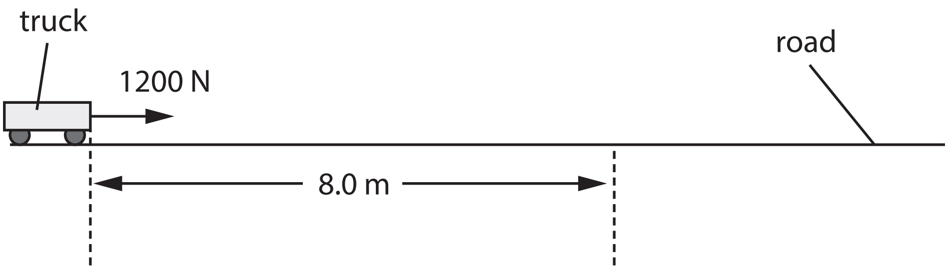

Figure 11

(i) A force of 1200 N pulls the truck along the road for a distance of 8.0 m.

Calculate the work done by the 1200 N force.

Use the equation

work done = force × distance moved in the direction of the force

State the unit of work done.

(3)

work done = ...

unit ....

(ii) At 8.0 m the force is removed and the truck slows down until it stops.

Describe the energy transfers as the truck slows down.

(2)

....

....

....

....

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P 7 4 4 8 8 A 0 1 2 3 6

(b) A box has a mass of 90 kg.

Which of these is the weight of the box?

(1)

- ☒ **A** 9 N
- ☒ **B** 90 N
- ☒ **C** 900 N
- ☒ **D** 9000 N

(c) Figure 12 shows a truck lifting a different box.

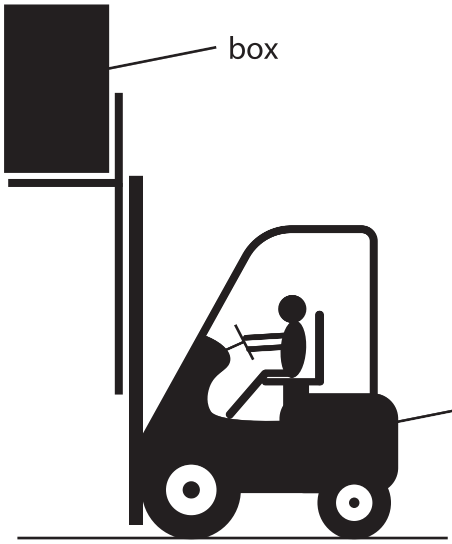

Figure 12

A student calculates the change in gravitational potential energy, ΔGPE, for the box at different heights.

Figure 13 shows the results of the student's calculations.

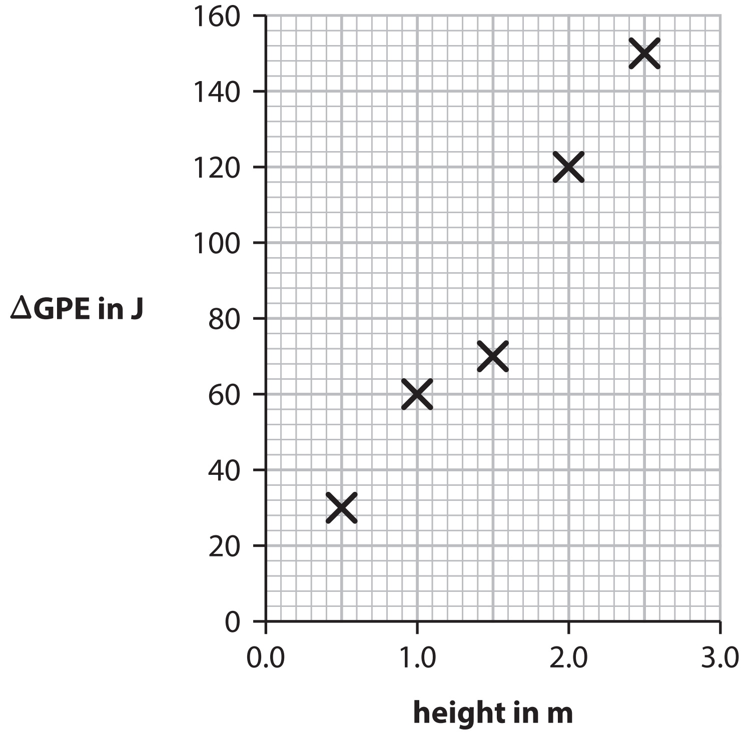

Figure 13

(i) The student has made one incorrect calculation.

On Figure 13, draw a circle round the **×** for this incorrect calculation.

(1)

(ii) The truck lifts the box from the ground to a height of 2.0 m.

This takes a time of 5.0 s.

Using data from the graph in Figure 13, calculate the power needed to lift the box.

(3)

Use the equation

$$\text{power} = \frac{\Delta GPE}{\text{time}}$$

power = ... W

(Total for Question 5 = 10 marks)

6 Figure 14 shows a saucepan of milk being heated on an electric cooker.

Figure 14

(a) Figure 15 is a table of data about the milk being heated.

mass of milk	0.82 kg
starting temperature of milk	10 °C
final temperature of milk	40 °C
change in thermal energy of milk	96 000 J

Figure 15

(i) Using data from the table in Figure 15, calculate the increase in temperature of the milk.

(1)

increase in temperature = ... °C

(ii) Using data from the table in Figure 15, calculate the specific heat capacity of the milk.

Use the equation

$$\text{specific heat capacity} = \frac{\text{change in thermal energy}}{\text{mass} \times \text{increase in temperature}}$$

(2)

specific heat capacity = ... J/kg °C

(b) The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

$$P = \frac{E}{t}$$

Give your answer to 2 significant figures.

(3)

power = ... W

(ii) The cooker supplies 130 000 J of energy but only 96 000 J of this energy is used to heat the milk.

Calculate the efficiency of heating the milk using this cooker.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(2)

efficiency = ...

(c) The wiring for the cooker has safety features.

(i) Which of these wires would help to protect a person from getting an electric shock if a fault developed in the cooker?

(1)

- ☒ **A** earth
- ☒ **B** live
- ☒ **C** negative
- ☒ **D** positive

(ii) Explain how a fuse can prevent overheating of the wiring for the cooker.

(2)

....

....

....

....

(Total for Question 6 = 11 marks)

7 (a) A technician is investigating the pressure and volume of some gas trapped in a container.

The table in Figure 16 shows the results from the investigation.

pressure in kPa	volume in cm³
100	270
110	245
130	208
150	180
170	159
190	142
210	129

Figure 16

Figure 17 is a graph of the results.

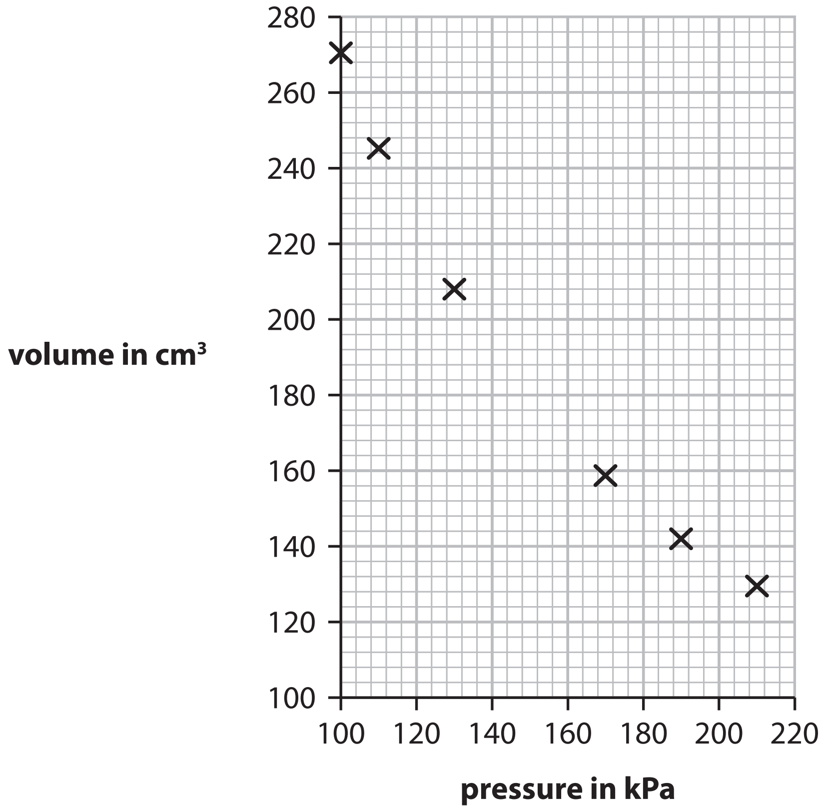

Figure 17

(i) One point has not been plotted on the graph in Figure 17.

The values for this point are shaded in the results table in Figure 16.

Plot the missing point on the graph in Figure 17.

(1)

(ii) Draw a smooth curve through the points on the graph in Figure 17.

(1)

(iii) Use the graph in Figure 17 to estimate the volume at a pressure of 120 kPa.

(1)

volume = ... cm^3

(iv) The temperature of the gas in the container is 293 K.

Which of these is the same temperature as 293 K?

(1)

☒ **A** −20 °C

☒ **B** 0 °C

☒ **C** 20 °C

☒ **D** 273 °C

(b) (i) Figure 18 shows a cylinder containing some gas.

Figure 18

The cylinder of gas warms up and the temperature of the gas increases.

Complete the following sentence to describe what happens as the gas warms up.

(1)

Thermal energy transfers to .... energy of the gas particles.

(ii) Figure 19a shows a container of gas.

The gas has a pressure of P_1 and volume V_1.

Figure 19b shows the same container after the gas has been compressed.

The pressure is now P_2 and the volume is V_2.

The temperature of the gas does not change.

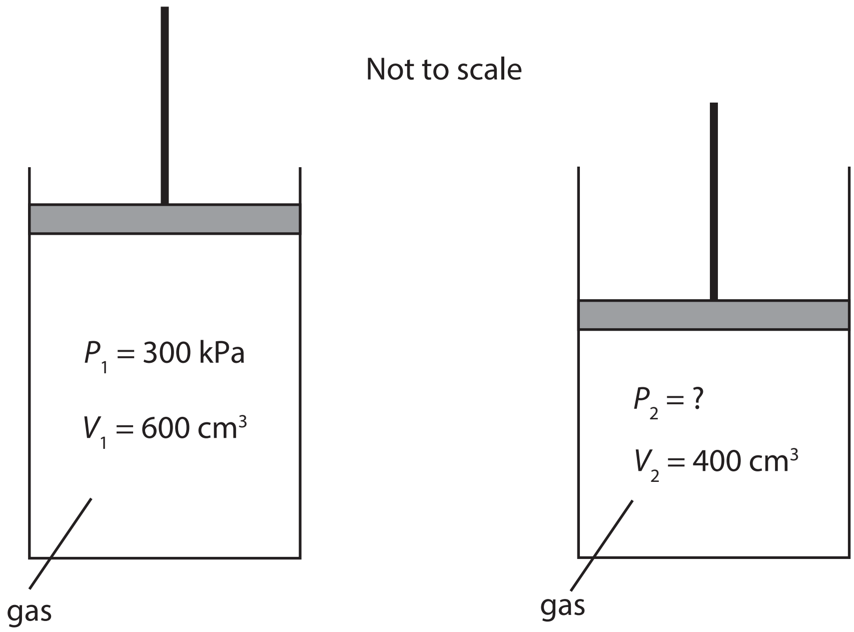

Figure 19a **Figure 19b**

Use data from Figure 19a and Figure 19b to calculate the pressure P_2 of the gas in Figure 19b.

Use the equation

$$P_2 = \frac{P_1 \times V_1}{V_2}$$

(2)

P_2 = ... kPa *(c) Some gas is trapped in a container similar to the container in Figure 19a. The gas is compressed at a constant temperature.

Explain, **in terms of gas particles**, why the pressure of the gas increases when the volume decreases.

Your answer should refer to

- how the gas particles exert a pressure
- why the pressure increases when the volume decreases.

(6)

(Total for Question 7 = 13 marks)

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P 7 4 4 8 8 A 0 2 2 3 6

8 (a) Figure 20 is a circuit diagram.

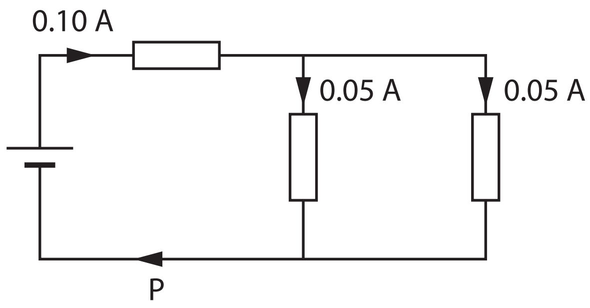

Figure 20

The current at P is

(1)

☒ **A** 0.05 A

☒ **B** 0.10 A

☒ **C** 0.15 A

☒ **D** 0.20 A

(b) Some students investigate resistors in parallel.

The students set up a circuit containing **four** identical resistors.

The circuit used is shown in Figure 21.

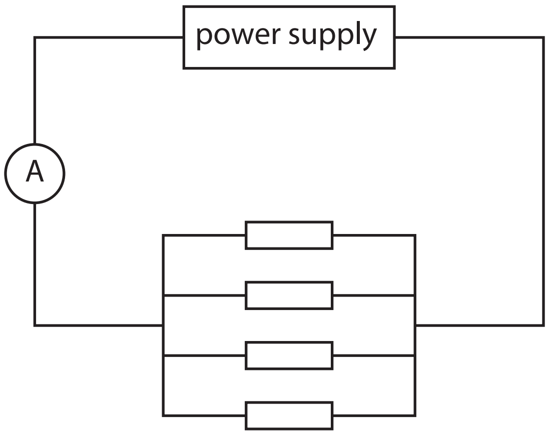

Figure 21

The students measure the current from the power supply and the voltage (p.d.) across the resistors.

(i) On Figure 21, draw a voltmeter connected to measure the voltage (p.d.) across the resistors.

(1)

The students remove one resistor and measure the current and voltage again with only 3 resistors in the circuit.

They repeat the measurements of current and voltage with only 2 resistors in the circuit and then with only 1 resistor in the circuit.

Figure 22 is a table of their results.

number of resistors	current in mA	voltage in V
4		6.00
3	27.3	6.00
2	18.2	6.00
1	9.1	6.00

Figure 22

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(ii) Using data from the table in Figure 22, predict the current from the power supply when there are 4 resistors in the circuit.

(1)

current = ... mA

(iii) Using data from the table in Figure 22, calculate the resistance of **only 1** resistor.

(3)

resistance = ... Ω

(iv) Using data from the table in Figure 22, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

....

....

....

....

....

....

(c) An electric fire is connected to a 230 V mains supply.

A current of 9.0 A is supplied to the fire.

Calculate the power supplied to the fire.

Use the equation

$$\text{power} = \text{current} \times \text{voltage}$$

(2)

power = ... W

(Total for Question 8 = 11 marks)

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9 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

$$\rho = \frac{m}{V}$$

(3)

volume = ... cm^3

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(b) Figure 23 gives information about the density of aluminium.

	density in g/cm^3
solid aluminium	2.70
liquid aluminium	2.38

Figure 23

Explain the difference between the density of solid aluminium and the density of liquid aluminium in terms of the arrangement of particles.

(2)

....

....

....

....

(c) A student boils some water.

Calculate the amount of thermal energy needed to change 60.0 g of water to steam at its boiling point.

The specific latent heat of vaporisation of water, L, is 2.26×10^6 J/kg.

Use the equation

$$Q = m \times L$$

(2)

amount of thermal energy = ... J *(d) A student is investigating the melting of ice.

The student has some crushed ice in a beaker at a temperature of –20 °C.

The student heats the beaker and its contents for 20 minutes.

Figure 24 is a graph of the student's results.

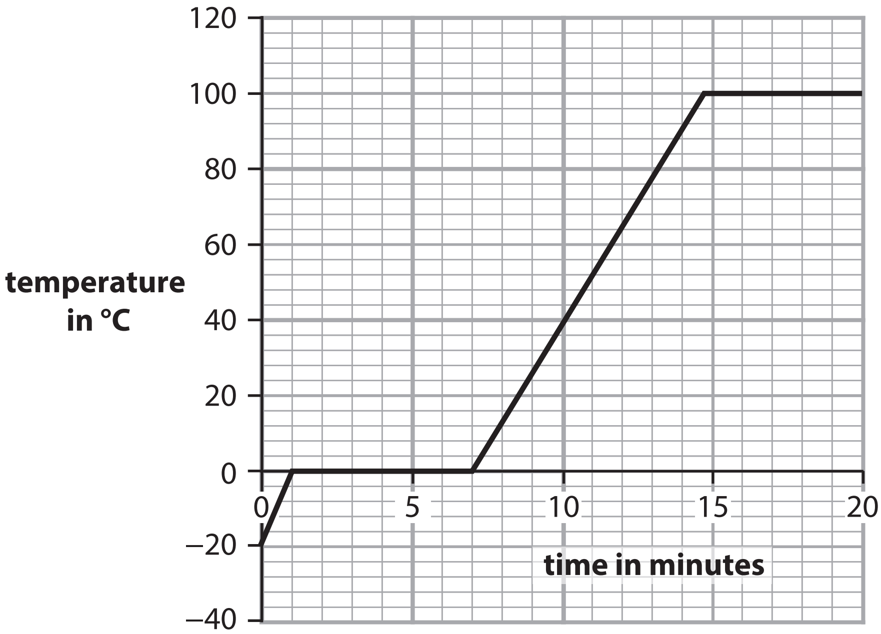


Figure 24

Using information from the graph, describe the changes that take place in the 20 minutes shown on the graph.

Your answer should refer to

- data from the graph
- the state (solid, liquid or gas) of the contents of the beaker.

(6)

Answer lines for this question start on page 31

(Total for Question 9 = 13 marks)

10 (a) Figure 25 shows an object at the bottom of a beaker of water.

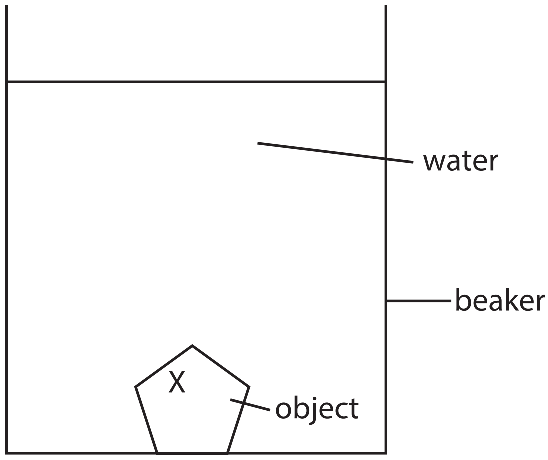
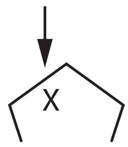
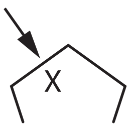


Figure 25

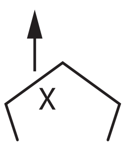
Which diagram shows the direction of the force exerted by the water on the object at point X?

(1)

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(b) Figure 26 shows an ice skater standing on one skate.

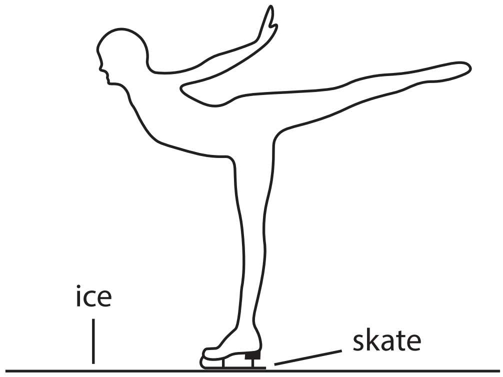


Figure 26

Calculate the force the skate exerts on the ice.

pressure of skate on ice = 4.8×10^{7} Pa

area of blade in contact with ice = 1.2×10^{-5} m^2

Use the equation

$$\text{force} = \text{pressure} \times \text{area}$$

Give your answer to 2 significant figures.

(3)

force = ... N

(c) Figure 27 shows how atmospheric pressure changes with height above sea level.

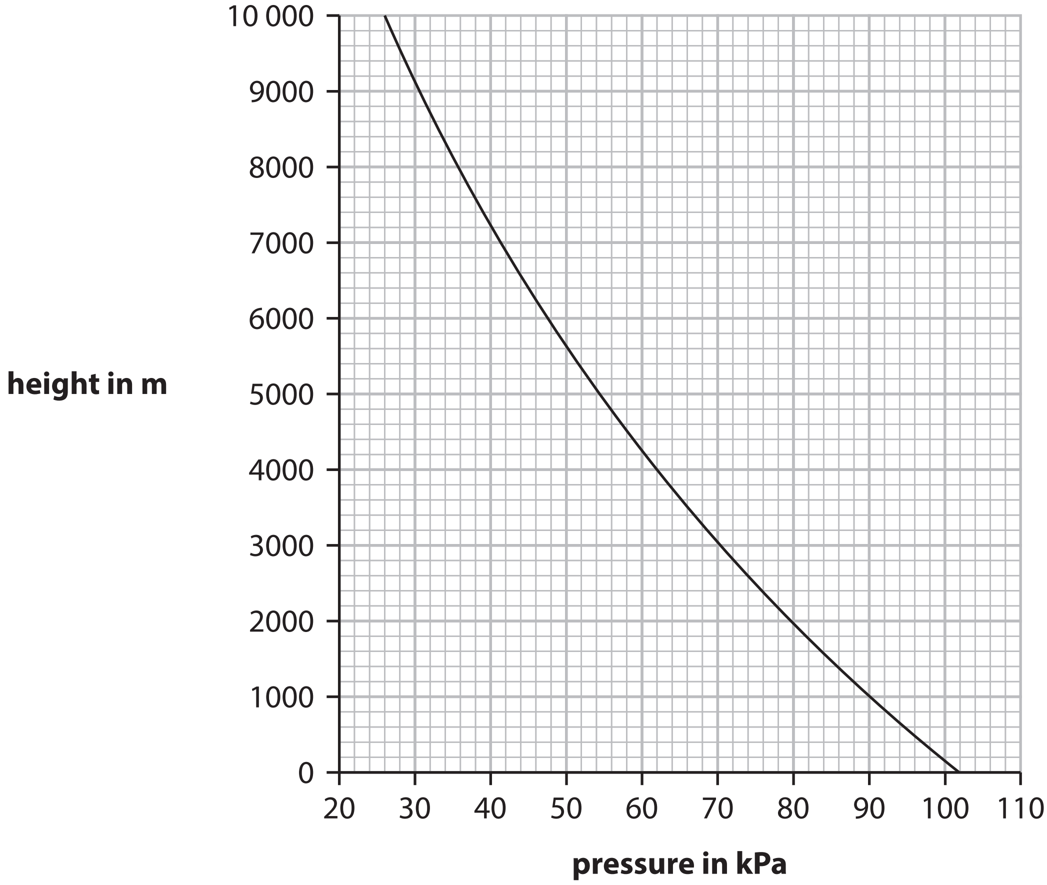


Figure 27

(i) Using the graph, describe how atmospheric pressure changes with height above sea level.

(2)

....

....

....

....

(ii) The top of Mount Everest is 8850 m above sea level.
Using the graph, estimate the atmospheric pressure at the top of Mount Everest.

(1)

pressure = ... kPa

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(iii) On a different day, the pressure at sea level is 104 kPa and the pressure at a height of 2500 m is 74 kPa.

Calculate the percentage change in pressure from sea level to the height of 2500 m.

(2)

percentage change = ... %

(d) Figure 28 is a model representing molecules of the Earth's atmosphere.

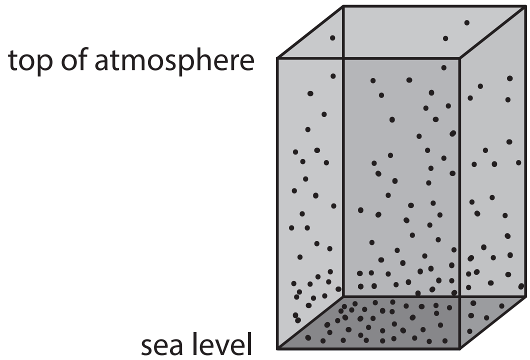

Figure 28

Use Figure 28 to explain how the density of the air varies with height above sea level.

(2)

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(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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

Friday 14 June 2024

Paper reference **1PH0/2F**

Physics

PAPER 2

Foundation Tier

Equation Booklet

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If you're taking **GCSE (9–1) Combined Science** or **GCSE (9–1) Physics**, you will need these equations:

HT = higher tier

	distance travelled = average speed × time	
	acceleration = change in velocity ÷ time taken	$a = \frac{(v - u)}{t}$
	force = mass × acceleration	$F = m \times a$
	weight = mass × gravitational field strength	$W = m \times g$
HT	**momentum = mass × velocity**	$\boldsymbol{p = m \times v}$
	change in gravitational potential energy = mass × gravitational field strength × change in vertical height	$\Delta GPE = m \times g \times \Delta h$
	kinetic energy = 1/2 × mass × (speed)^2	$KE = \frac{1}{2} \times m \times v^2$
	efficiency = $\frac{\text{(useful energy transferred by the device)}}{\text{(total energy supplied to the device)}}$	
	wave speed = frequency × wavelength	$v = f \times \lambda$
	wave speed = distance ÷ time	$v = \frac{x}{t}$
	work done = force × distance moved in the direction of the force	$E = F \times d$
	power = work done ÷ time taken	$P = \frac{E}{t}$
	energy transferred = charge moved × potential difference	$E = Q \times V$
	charge = current × time	$Q = I \times t$
	potential difference = current × resistance	$V = I \times R$
	power = energy transferred ÷ time taken	$P = \frac{E}{t}$
	electrical power = current × potential difference	$P = I \times V$
	electrical power = (current)^2 × resistance	$P = I^2 \times R$
	density = mass ÷ volume	$\rho = \frac{m}{V}$

	force exerted on a spring = spring constant × extension	$F = k \times x$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 \times a \times x$
HT	**force = change in momentum ÷ time**	$\boldsymbol{F = \frac{(mv - mu)}{t}}$
	energy transferred = current × potential difference × time	$E = I \times V \times t$
HT	**force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length**	$\boldsymbol{F = B \times I \times l}$
	For transformers with 100% efficiency, 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	$Q = m \times L$
	energy transferred in stretching = 0.5 × spring constant × (extension)^2	$E = \frac{1}{2} \times k \times x^2$

If you're taking **GCSE (9–1) Physics**, you also need these extra equations:

	moment of a force = force × distance normal to the direction of the force	
	pressure = force normal to surface ÷ area of surface	$P = \frac{F}{A}$
HT	$\dfrac{\textit{\textbf{potential difference across primary coil}}}{\textit{\textbf{potential difference across secondary coil}}} = \dfrac{\textit{\textbf{number of turns in primary coil}}}{\textit{\textbf{number of turns in secondary coil}}}$	$\boldsymbol{\frac{V_p}{V_S} = \frac{N_p}{N_S}}$
	to calculate pressure or volume for gases of fixed mass at constant temperature	$P_1 \times V_1 = P_2 \times V_2$
HT	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength**	$\boldsymbol{P = h \times \rho \times g}$

END OF EQUATION LIST

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