Write your name here

Surname	Other names

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

Centre Number | Candidate Number

Physics

Paper 2

Higher Tier

Sample Assessment Materials for first teaching September 2016

Time: 1 hour 45 minutes

Paper Reference **1PH0/2H**

You must have:
Calculator, ruler

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.
- 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 ▶

S59297A

1/1/1/1/1/1/1/1/

S59297A0128

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 Figure 1 shows some gas in a container.

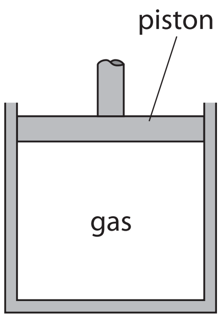


Figure 1

(a) Explain, in terms of particles, how the gas exerts a pressure on the piston.

(2)

....

....

....

....

(b) The piston is forced down to a new position, compressing the gas, as in Figure 2.

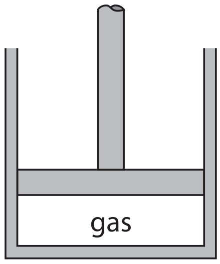


Figure 2

The temperature of the gas remains constant.
Explain, in terms of particles, why the pressure of the gas increases.

(2)

....

....

....

....

(c) The pressure of gas in Figure 1 is 103 kPa, and the volume of gas is $0.010\,m^3$.

Calculate the pressure of the gas in Figure 2 if the volume is now $0.0070\,m^3$.

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

(3)

pressure = ... kPa

(Total for Question 1 = 7 marks)

2 (a) Some forces act at a distance.

One example is the gravitational attraction between the Moon and the Earth.

Describe an example of another type of force acting at a distance, where the force is **not** gravitational.

(2)

....

....

....

....

(b) A rock falls off the top of a cliff of height *h*.

Figure 3 shows the rock falling.

The Earth exerts a force of 150 N on the rock.

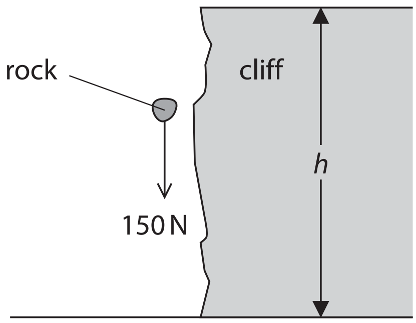


Figure 3

The work done by this force when the rock falls from the top to the bottom of the cliff is 2700 J.

(i) Calculate the height, *h*, of the cliff.

(2)

h = ... m

DO NOT WRITE IN THIS AREA

S 5 9 2 9 7 A 0 4 2 8

(ii) State the value of the kinetic energy of the rock just before it hits the ground.

(1)

kinetic energy = ... J

(iii) The mass of the rock in Figure 3 is 15 kg.

Calculate the velocity of the rock just before it reaches the bottom of the cliff.

(2)

velocity = ... m/s

(c) An electric motor is used to lift a box.

Figure 4 shows how the efficiency of the electric motor changes as the mass of the box increases.

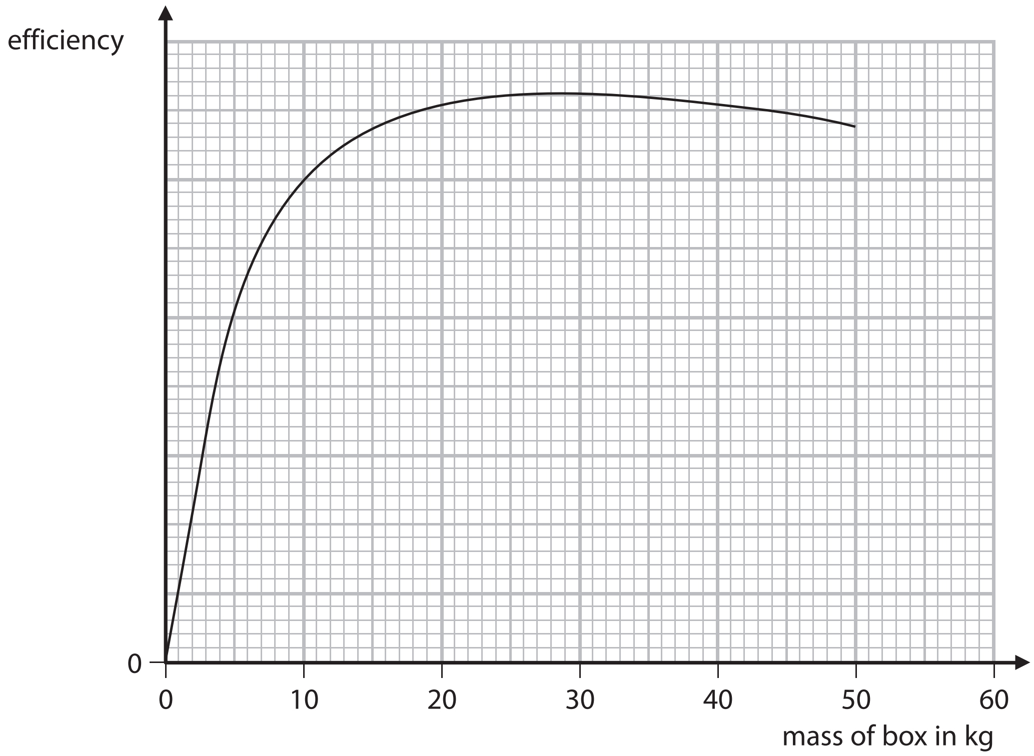


Figure 4

Describe how the efficiency of the electric motor depends on the mass of the box lifted.

(2)

....

....

....

....

(Total for Question 2 = 9 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

3 (a) An electric heater is connected to a 230 V supply.

The power supplied to the heater is 2.6 kW.

Calculate the current in the heater.

(3)

current = ... A

(b) A car headlamp has a power rating of 55 W when the current in the headlamp is 4.4 A.

(i) State the equation relating power, current and resistance.

(1)

(ii) Calculate the resistance of the headlamp.

(3)

resistance = ... Ω

(Total for Question 3 = 7 marks)

4 (a) Figure 5 shows a metal chair being sprayed with paint.

The paint droplets come from a gun with an electric charge.

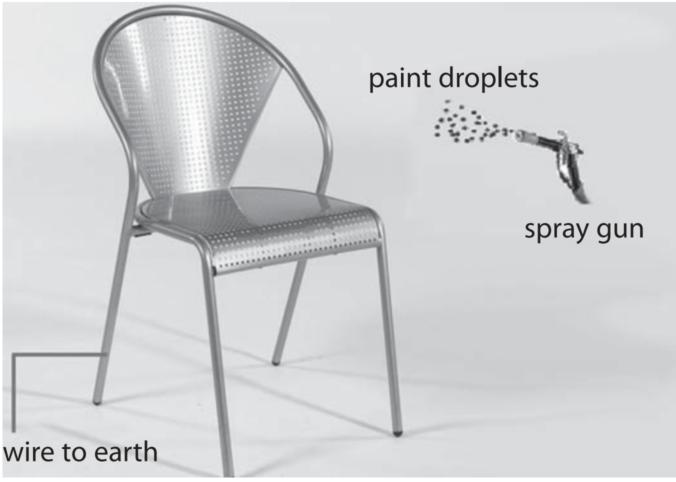


Figure 5

Inside the spray gun, electrons move along a charged wire towards the nozzle to charge the paint.

The charged paint droplets are sprayed from the nozzle.

The chair is connected to earth.

Which row of the table shows the correct combination of the charges as the charged paint droplets get near to the chair?

(1)

		paint droplets	chair
☒	**A**	negative	negative
☒	**B**	negative	positive
☒	**C**	positive	negative
☒	**D**	positive	positive

(b) Glass is an insulator.

A student rubs a piece of glass with some silk.

The glass becomes positively charged.

(i) Explain how rubbing silk charges the glass.

(2)

....

....

....

....

(ii) The silk is also charged when it rubs against the glass.

Explain how the silk becomes charged.

(2)

....

....

....

....

(c) (i) Describe **one** situation where separation of electric charge can create a spark.

(2)

....

....

....

....

(ii) In a spark, the total charge of 0.22 μC (microcoulombs) flows in 2 ms (milliseconds).

Calculate the average current in that time.

(4)

average current = ... A

(Total for Question 4 = 11 marks)

DO NOT WRITE IN THIS AREA

S 5 9 2 9 7 A 0 1 0 2 8

5 (a) Explain how unwanted energy transfers may be reduced in mechanical systems.

(2)

....

....

....

....

(b) In which of the following situations is a non-zero resultant force acting?

(1)

☒ **A** a book rests on a table

☒ **B** a car travels along a road at a constant speed

☒ **C** a javelin moves through the air after leaving an athlete's hand

☒ **D** a steel ball bearing descends through some car oil at a constant velocity

(c) Figure 6 shows a book resting on a table with some forces involved.

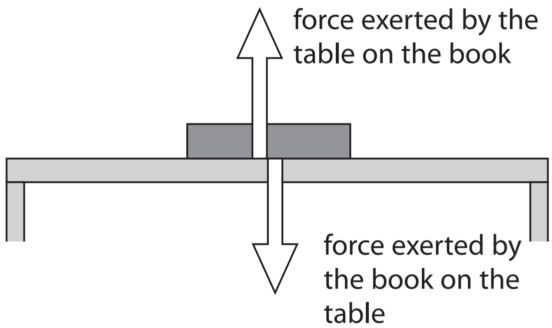


Figure 6

State why this diagram is **NOT** a free body force diagram.

(1)

....

....

(d) Figure 7 shows two astronauts in space pushing at a satellite.

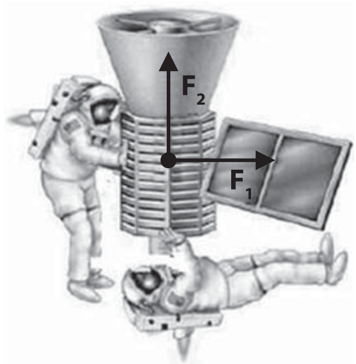
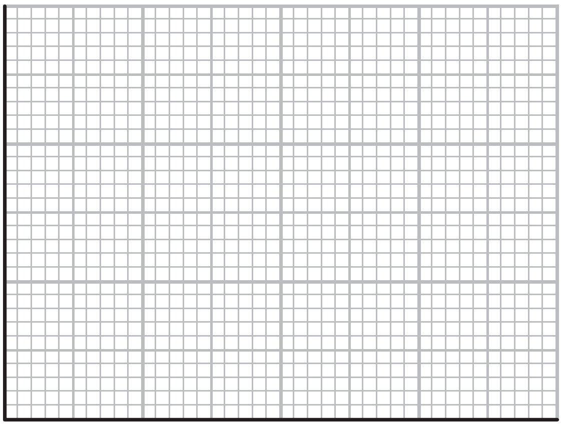


Figure 7

(i) The force F_1 is 3.0 N and the force F_2 is 2.0 N, acting at right angles to each other. Draw a vector diagram to scale showing these forces.

(2)



(ii) Use the diagram in (i) to estimate the magnitude of the resultant force acting on the satellite.

(2)

resultant force = ... N

(e) Figure 8 shows a box sliding down a slope in the direction shown.

(3)

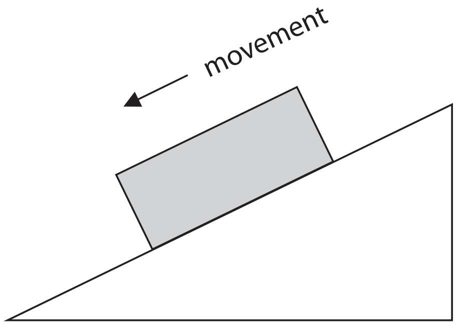


Figure 8

Draw two vector arrows on this diagram showing the 'normal contact force' and 'friction' acting on the box.
Label these two forces.

(Total for Question 5 = 11 marks)

6 (a) A steel ball has a volume of $3.6\,cm^3$ and a mass of 28 g.

(i) Calculate the density of steel in kg/m^3.

(3)

density = ... kg/m^3

(ii) The steel ball is at a room temperature of 20 °C.

It is then put in a pan of boiling water maintained at 100 °C.

Calculate how much thermal energy the ball gains as its temperature increases from 20 °C to 100 °C.

Specific heat capacity of steel = 510 J/ kg °C

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

(2)

thermal energy gained = ... J

(iii) The steel ball is put into a furnace where it melts.
Compare the motion of particles in the steel when they are in the solid state with their motion when in the molten (liquid) state.

(3)

....

....

....

....

....

....

(b) As part of the testing of different types of steel, a steelworker needs to obtain a temperature-time graph for **solidifying** molten steel.

Figure 9 shows an arrangement the steelworker could use.

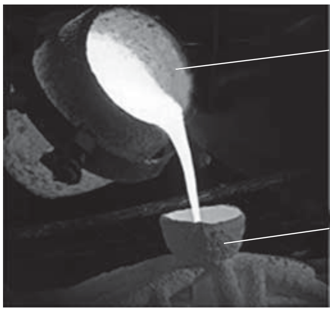


Figure 9

The following devices are available to the steel worker.
The melting point of these steels is between 1425 and 1540 °C

device	range of temperatures	other notes
Thermocouple thermometer	–50 to 1800 °C	Fast response time Probe inserted into melt
Infrared thermometer (pyrometer)	1200 to 2000 °C	Remotely read, using infrared radiation, measures the temperature of the surface it is aimed at
Platinum resistance thermometer	–200 to 850 °C	The most accurate of thermometers based on how resistance changes with temperature

Describe how the steelworker could obtain a temperature-time graph for steel as it goes from the liquid to the solid state.

(4)

(Total for Question 6 = 12 marks)

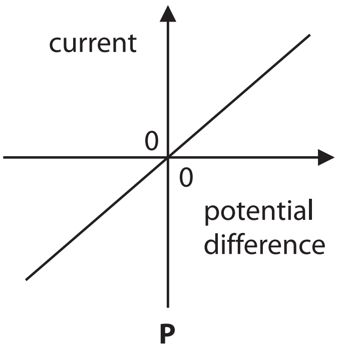
7 (a) Draw a circuit diagram you could use to investigate the relationship between potential difference, current and resistance for a filament lamp.

(3)

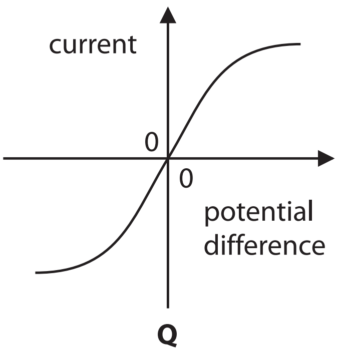
(b) The graphs P, Q and R in Figure 10 each show how the current in a component varies with the potential difference (voltage) across that component.

In each box, state the name of the component that matches the graph.

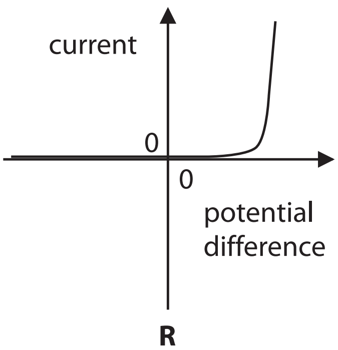
(3)



....



....



....

Figure 10

S59297A01728

(c) Explain how current varies with potential difference for the component that matches graph R. Refer to the resistance of the component in your answer.

(3)

....

....

....

....

....

....

....

(Total for Question 7 = 9 marks)

8 (a) Which of these is designed to convert pressure variations in sound waves into alternating currents in electrical circuits?

(1)

☒ **A** an amplifier

☒ **B** headphones

☒ **C** a loudspeaker

☒ **D** a microphone

(b) Figure 11 shows a magnet moving into a coil.

This generates a current.

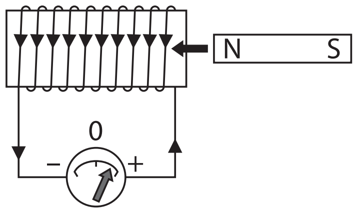


Figure 11

The meter deflects to the right.

Which one of these would cause a deflection to the left?

(1)

☒ **A** move the north pole to the left more rapidly

☒ **B** keep the magnet still and move the coil to the left

☒ **C** keep the magnet still and move the coil to the right

☒ **D** move the north pole in to the left and then suddenly stop it

(c) The magnet is now dropped through three identical coils as shown.

The coils are connected to a data logger that can produce the graph shown in Figure 12.

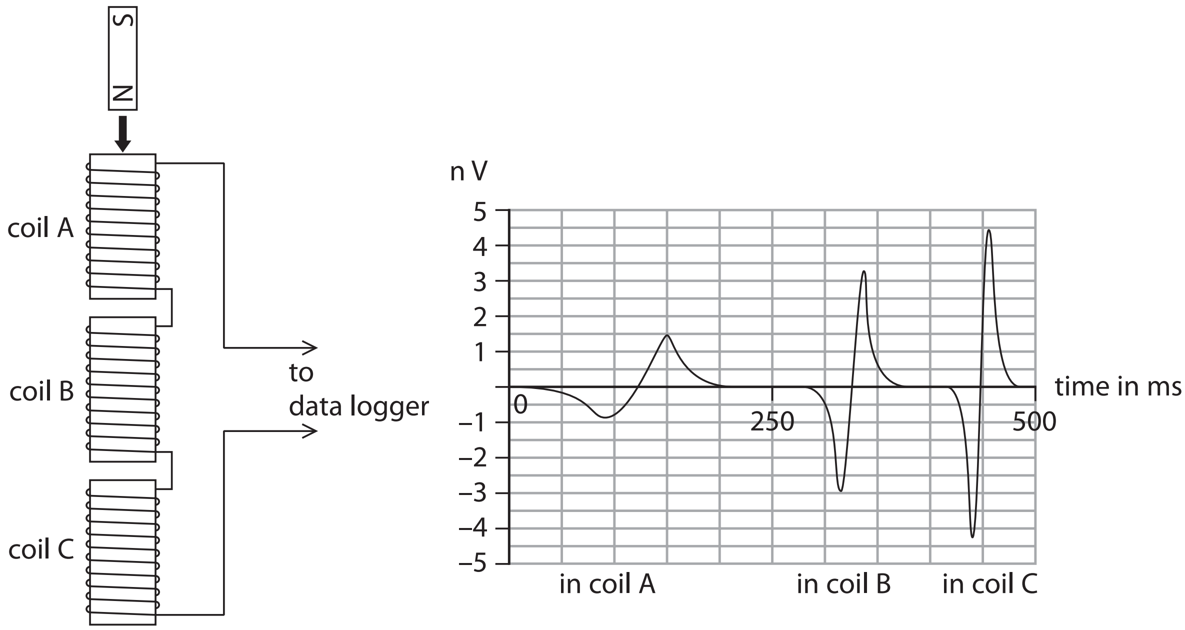


Figure 12

(i) State and explain **two** ways in which the voltage-time graph shows you that the magnet accelerated as it travelled through the coils.

(4)

1 ....

....

....

....

2 ....

....

....

....

(ii) Explain why the meter in Figure 11 could not be used to obtain the data for the graph in Figure 12.

(2)

....

....

....

....

....

(d)

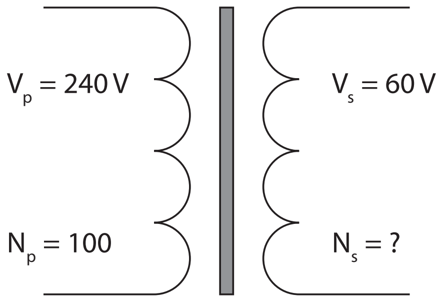


Figure 13

Figure 13 represents a transformer.
Calculate the number of turns in the secondary coil.

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

(2)

number of turns ....

(Total for Question 8 = 10 marks)

9 (a) Figure 14 shows a demolition ball of mass 400 kg.

The ball is used to demolish a wall.

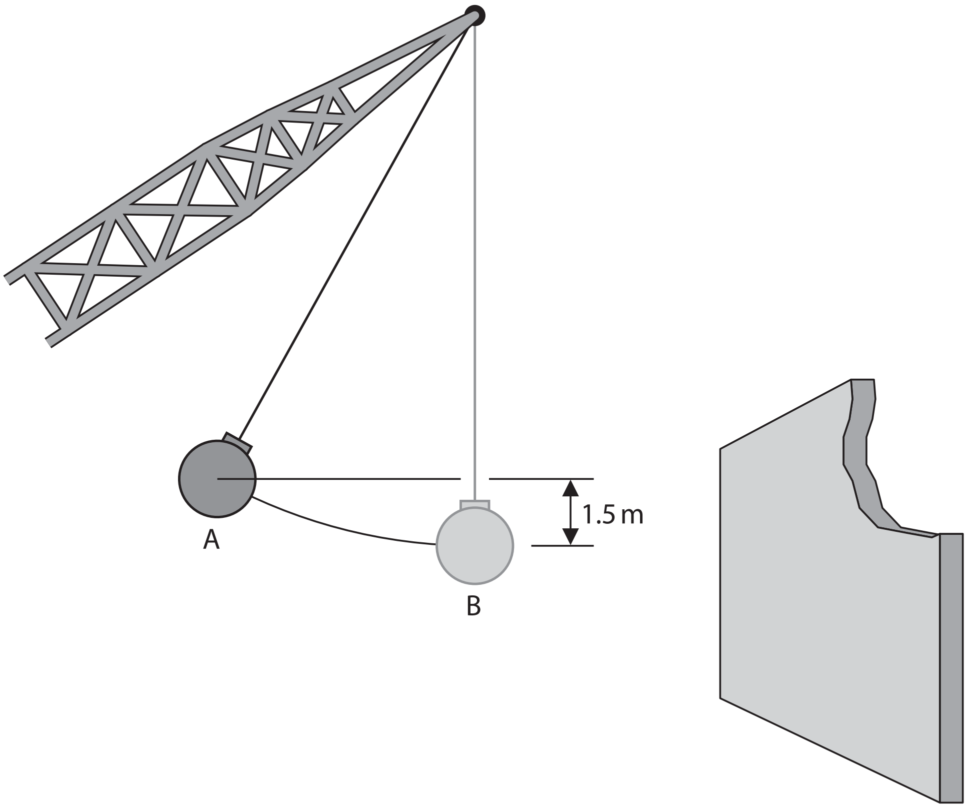


Figure 14

As the ball swings from A to B, it moves through a vertical height of 1.5 m.

(i) Calculate the change in gravitational potential energy.

Take gravitational field strength, g, to be 10 N/kg.

(3)

DO NOT WRITE IN THIS AREA

S 5 9 2 9 7 A 0 2 2 2 8

(ii) The heavy ball comes to rest soon after smashing into the wall. In doing this, the temperatures of the ball, wall and surroundings all increase slightly. Explain this observation.

(2)

....

....

....

....

(iii) Which of these quantities of the ball changes in **both** magnitude and direction while the ball is swinging?

Put a cross (☒) in the box next to your answer.

(1)

☐ **A** gravitational potential energy

☐ **B** velocity

☐ **C** the gravitational force acting

☐ **D** kinetic energy

*(b) After knocking down the wall, the ball will swing **freely**.

The graph in Figure 15 shows how the height of the ball above ground varies with time during three swings.

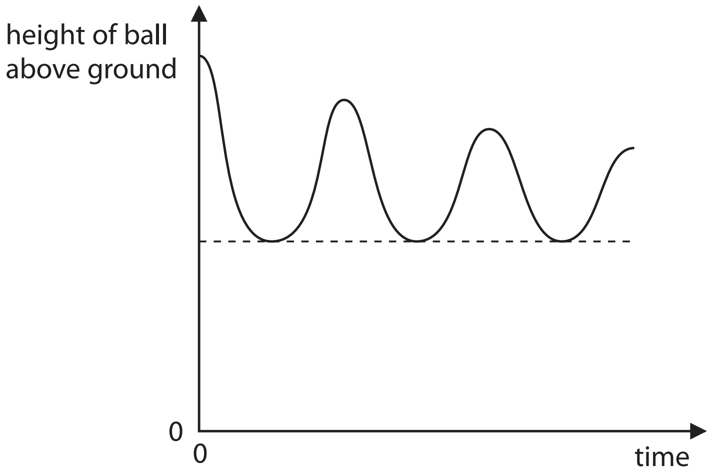


Figure 15

Explain how the energy within the system changes during this time.

The system consists of the swinging ball and its surroundings.

(6)

(Total for Question 9 = 12 marks)

10 (a) Figure 16 shows a beaker containing 150 g of water.

Figure 16

The cross-sectional area of the bottom of the beaker is $3.3 \times 10^{-3}\,\text{m}^{-2}$.

Calculate the pressure at the bottom of the beaker due to the water.

Take gravitational field strength, g, to be 10 N/kg.

(2)

pressure = ... Pa

(b) Figure 17 shows information about the pressures in the ocean and in the atmosphere of a distant planet.

Graph A shows the variation of pressure as the depth in the ocean increases.

Graph B shows the variation of pressure as the height in the atmosphere increases.

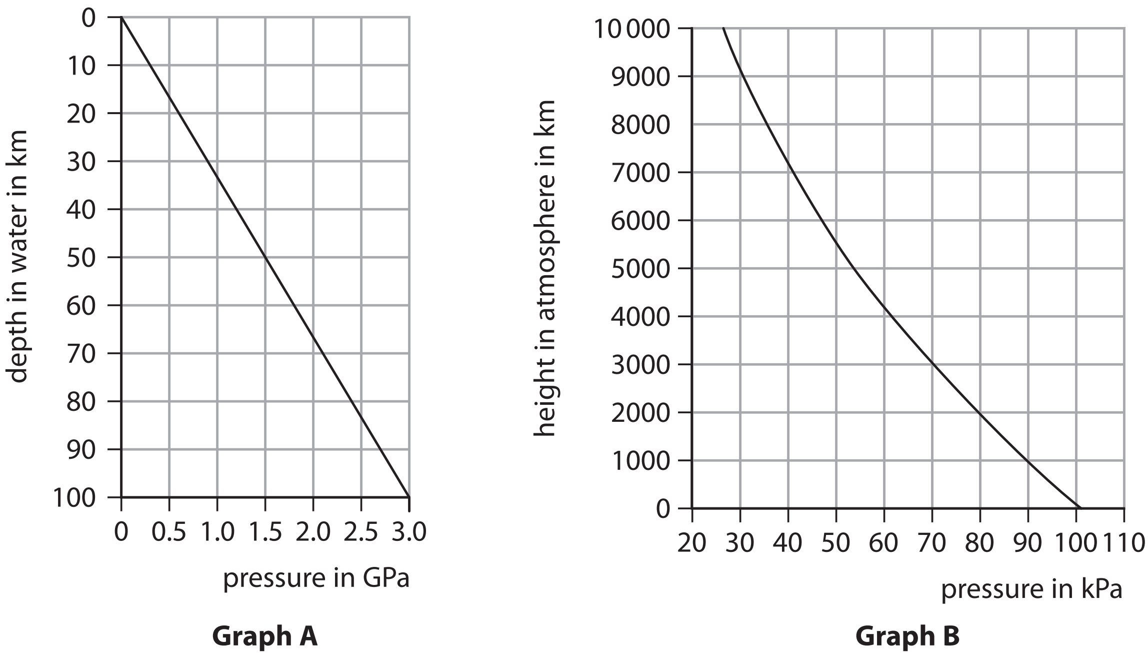


Figure 17

(i) Use information from Graph A to obtain a value for the density of the ocean water.

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

(4)

density = ... kg/m^3

S 5 9 2 9 7 A 0 2 6 2 8

*(ii) Explain the similarities and differences in the pressure variations shown in graphs A and B.

Your answer should refer to both the particle model (kinetic theory) and to density.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

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 $F = B \times I \times l$
$\frac{\textit{voltage across primary coil}}{\textit{voltage across secondary coil}} = \frac{\textit{number of turns in primary coil}}{\textit{number of turns in secondary coil}}$ $\frac{V_p}{V_s} = \frac{N_p}{N_s}$
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 $E = ½ \times k \times x^2$
pressure due to a column of liquid = height of column × density of liquid × gravitational field strength $P = h \times \rho \times g$