Revision Questions – 27 May 2026

1.

(a) Figure 18 shows identical filament lamps connected together to a 12V power supply.

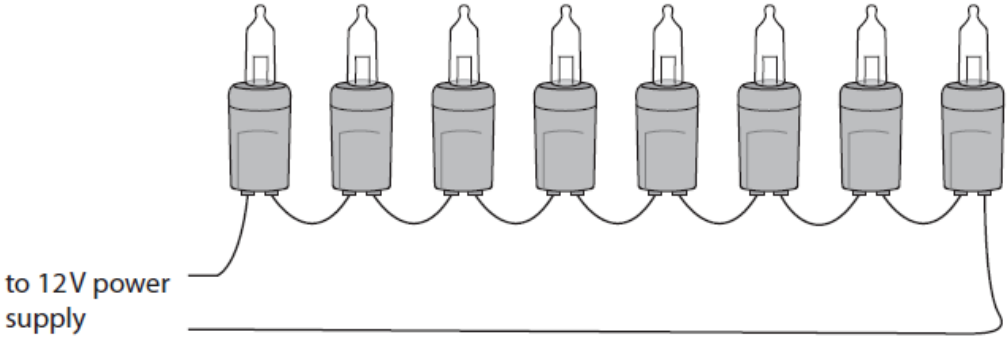


Figure 18

(i) Calculate the potential difference across each lamp.

(1)

potential difference = ... V

(ii) The power output of each lamp is 0.75W

Calculate the resistance of each lamp.

(4)

resistance = ... Ω

*(b) Explain, with the aid of a circuit diagram, the method a student could use to investigate how the resistance of a single lamp changes with the potential difference across the lamp.

(6)

2.

(a)

Complete the sentence. Choose answers from the box.

[2 marks]

charge	**potential difference**	**power**	**temperature**	**time**

The current through an ohmic conductor is directly proportional to the

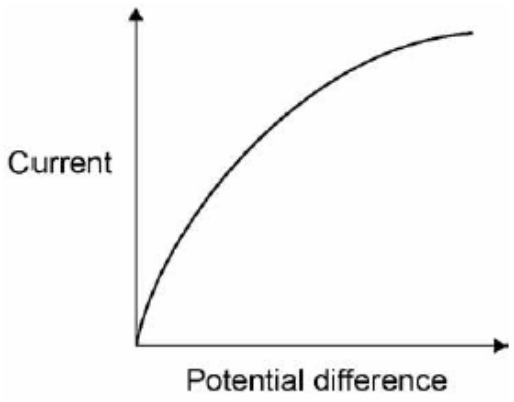
_____ across the component, provided

that the _____ remains constant.

(b)

Figure 7 shows a current – potential difference graph for a filament lamp.

Figure 7



Explain how the resistance of a filament lamp changes as the potential difference across it increases.

[3 marks]

_____

_____

_____

_____

_____

_____

(c)

Many householders are replacing their filament lamps with LED lamps which are more energy efficient.

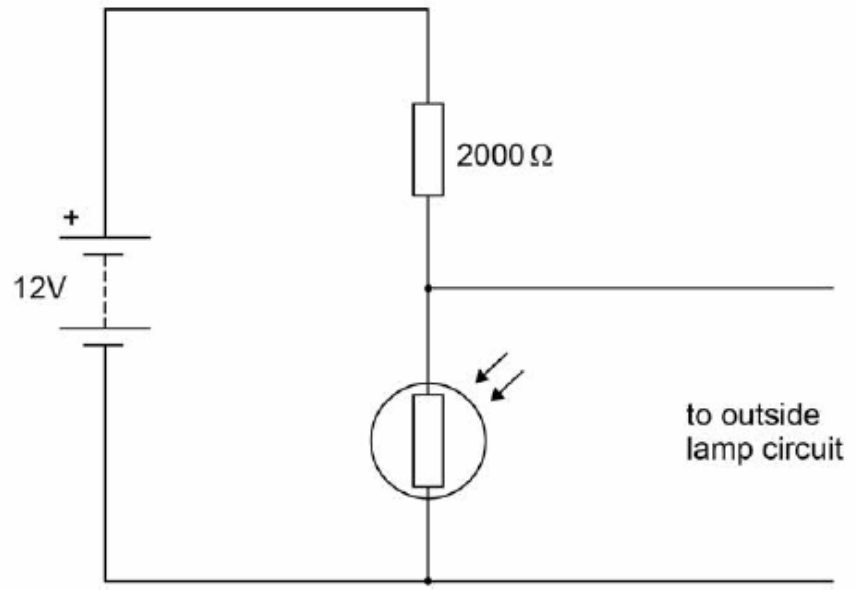
What does more energy efficient mean?

[1 mark]

A Light Dependent Resistor (LDR) is used to turn on an outside lamp when it gets dark.

Part of the circuit is shown in **Figure 8**.

Figure 8



(d)

The light intensity decreases.

What happens to the potential difference across the LDR and the current in the LDR?

[2 marks]

Potential difference _____

Current _____

(e)

What is the resistance of the LDR when the potential difference across it is 4 V?

Give a reason for your answer.

[2 marks]

Resistance = _____ Ω

Reason _____

_____

_____

(f)

Calculate the current through the LDR when the resistance of the LDR is 5000 Ω.

Give your answer to 2 significant figures.

[4 marks]

_____

_____

_____

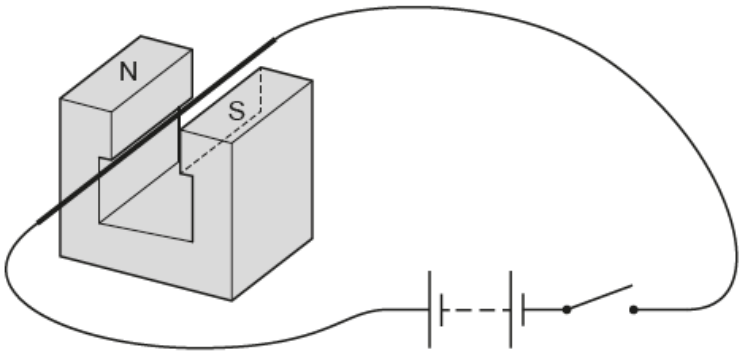
_____

Current = _____ A

3.

(a)

The diagram shows a current-carrying wire in the magnetic field between the North pole and the South pole of a magnet.



Describe and explain what happens to the wire when the switch is **closed**.

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.....

..... **[3]**

(b)

A current of 5.0A passes through a wire with a length of 0.75m.

The wire is in a field of magnetic flux density 0.30T.

Calculate the force acting on the wire.

Give your answer to **2** significant figures.

Use the Equation Sheet.

Force = ... N **[3]**

4.

(a) Figure 8 shows two magnets with their N poles facing each other.

Figure 8

On Figure 8, draw the shape and direction of the magnetic field between the two magnets.

(2)

(b) Figure 9 shows a toy that has a plastic cylinder, a plastic base and two similar magnets. Each of the two magnets is in the shape of a ring.

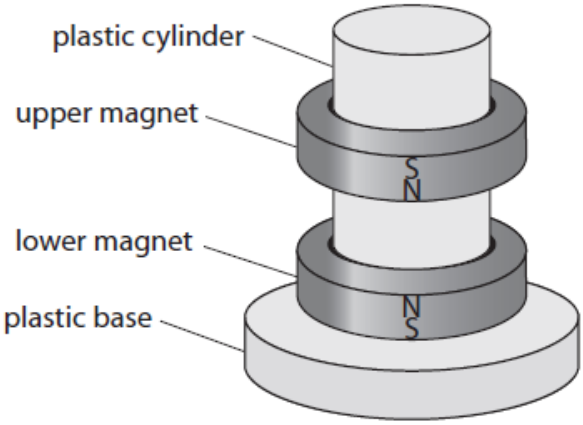

Figure 9

The upper magnet seems to float in the air above the lower magnet.

Describe the forces acting on the upper magnet.

Use the idea of magnetic fields in your answer.

(3)

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(c) Figure 10 shows a current-carrying wire between the poles of a magnet.

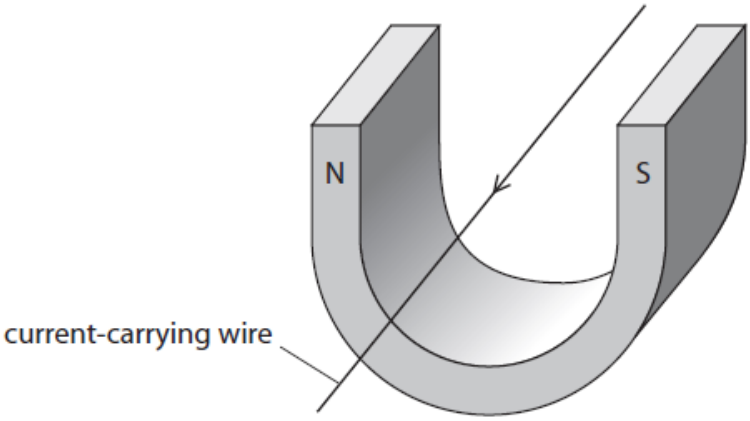


Figure 10

(i) The magnet and the wire each experience a force when there is a current in the wire.

(2)

1 State the direction of the force on the wire.

.....

2 State the direction of the force on the magnet.

.....

(ii) The force on the wire is 0.15 N.

The current in the wire is 2.7 A.

The magnet produces a field with a magnetic flux density of 0.50 T.

Calculate the length of the wire in the magnetic field.

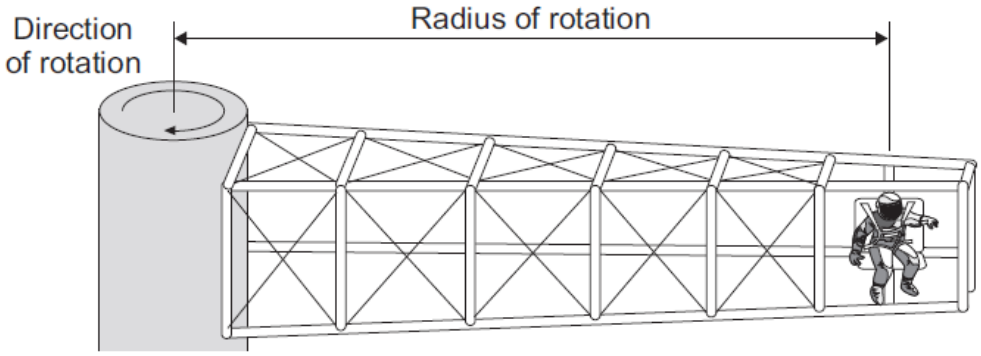
Use an equation selected from the list of equations given at the end of the question paper.

(2)

length of the wire in the magnetic field = ... m

5.

The diagram shows a 'G-machine'. The G-machine is used in astronaut training.



The G-machine moves the astronaut in a horizontal circle.

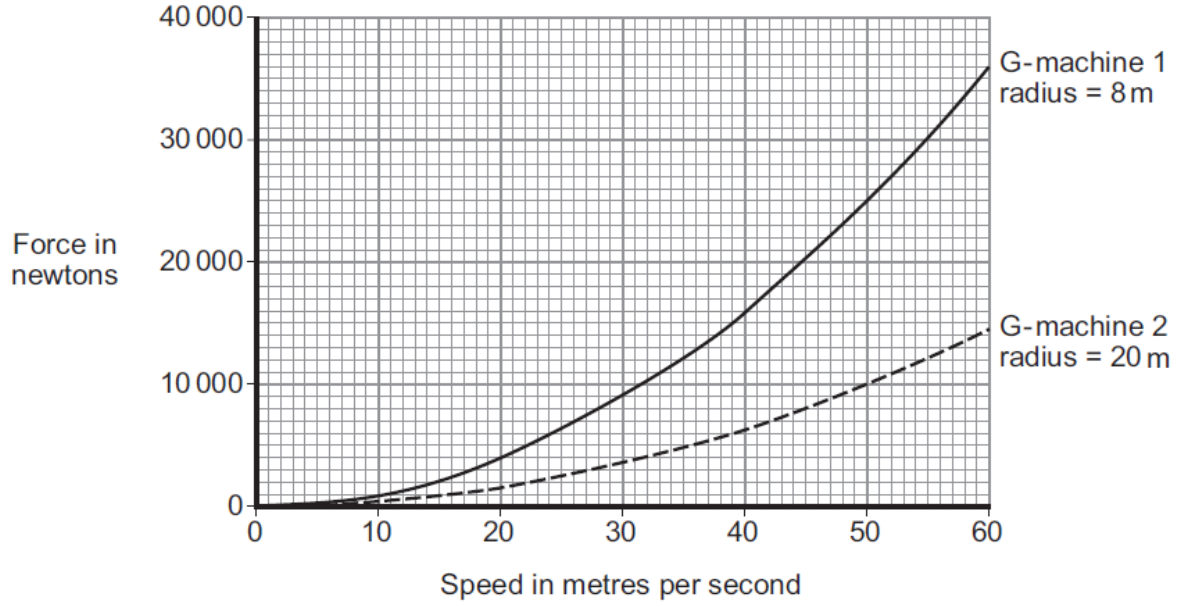
(a) When the G-machine is rotating at constant speed, the astronaut is accelerating.

Explain, how is it possible for an object to accelerate while moving at a constant speed.

(b) The force causing the astronaut to move in a circle is measured.

The graph shows how the speed of the astronaut affects the force causing the astronaut to move in a circle for two different G-machines.

The radius of rotation of the astronaut is different for each G-machine.



(b) (i) State **three** conclusions that can be made from the graph.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

(b) (ii) The speed of rotation of G-machine 1 is increased from 20 m/s to 40 m/s.

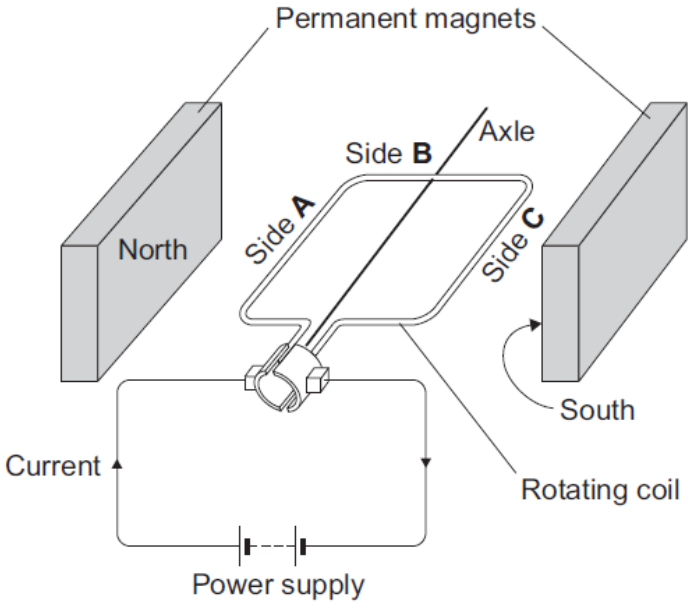
Determine the change in force on the astronaut.

.....

Change in force = ... N

(1 mark)

(c) Each G-machine is rotated by an electric motor. The diagram shows a simple electric motor.



(c) (i) A current flows through the coil of the motor.

Explain why side **A** of the coil experiences a force.

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.....

(2 marks)

(c) (ii) Draw arrows on the diagram to show the direction of the forces acting on side **A** of the coil and side **C** of the coil.

(1 mark)

(c) (iii) When horizontal, side **B** experiences no force.

Give the reason why.

.....

.....

(1 mark)

(d) While a G-machine is rotating, the operators want to increase its speed.

What can the operators do to make the G-machine rotate faster?

.....

.....

(1 mark)

6.

(a) A student has a bar magnet, a piece of iron the same size as the magnet, and some paper clips.

Describe how the student could use these items to demonstrate temporary induced magnetism.

(3)

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(b) A student sets up the apparatus shown in Figure 9.

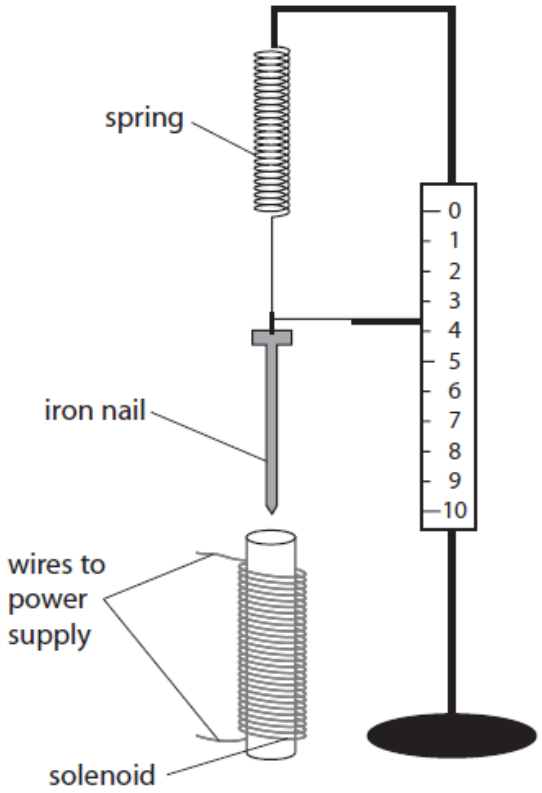


Figure 9

(i) When the current in the solenoid is switched on, the solenoid attracts the iron nail.

Describe how the student could use this apparatus to investigate how the size of the current in the solenoid affects the force of attraction between the solenoid and the iron nail.

(4)

(ii) The spring constant of a different spring is 24 N/m.

The spring is extended from its unstretched length by 12 cm.

Calculate the energy transferred in extending the spring by 12 cm.

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

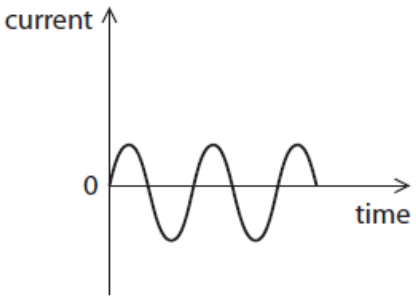
(2)

energy transferred = ... J

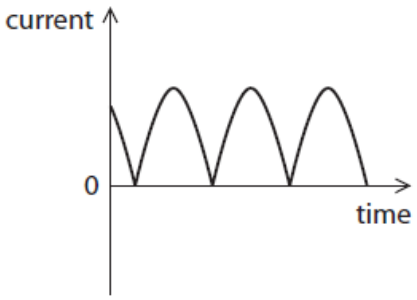
7.

(a) Which of these could be the output for a dynamo?

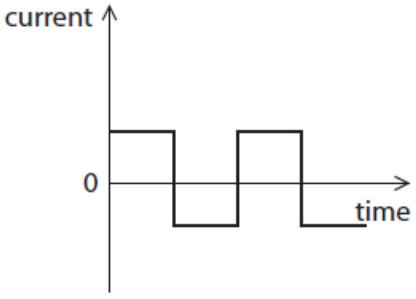
(1)



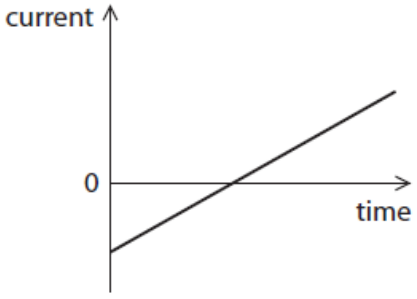
☒ **A**



☐ **B**



☒ **C**



☐ **D**

(b) (i) Figure 17 shows the output from a battery.

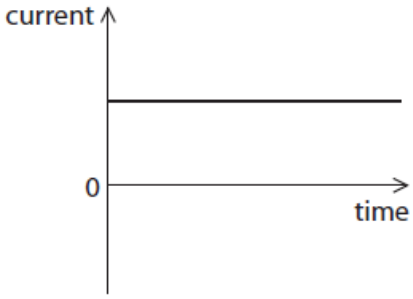


Figure 17

Explain why a transformer will not work with the input current as shown in Figure 17.

(2)

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.....

(ii) A transformer has 30 turns on the primary coil and 150 turns on the secondary coil.

A potential difference of 25 V is applied across the primary coil.

Calculate the potential difference across the secondary coil.

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

(3)

potential difference = ... V

(c) High voltage transmission cables and transformers are used in the national grid.

Explain how using high voltage transmission cables and transformers allows the distribution of electrical power around the United Kingdom to be as efficient as possible.

Refer to the following equations in your answer.

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

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

(6)

8.

(a) An electric car is travelling at a speed of 16.0 m/s.

The total mass of the car is 1200 kg.

(i) Calculate the kinetic energy, in kJ, of the car.

(2)

kinetic energy = ... kJ

(ii) On a journey, the car transfers energy from the battery at an average rate of 17.5 kW.

The battery in the car transfers a total of 126 MJ of energy before it becomes discharged.

Calculate the time taken for the battery to become discharged on this journey.

Give your answer in hours.

(2)

time taken = ... hours

(iii) Figure 20 shows an electrical device connected to the wheels of an electric car.

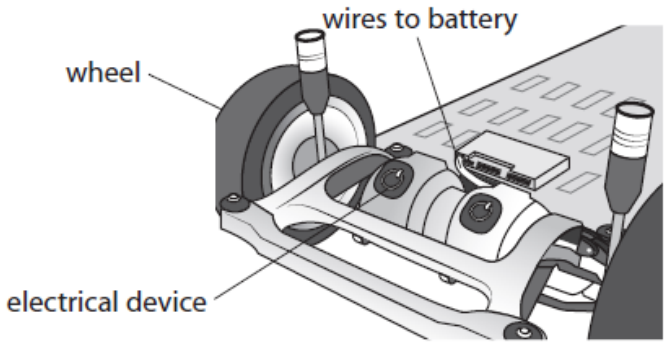


Figure 20

The electrical device is used as a motor when the car accelerates and as a dynamo when the car decelerates.

Explain how using the device can help to increase the time that the car can be driven before the battery becomes discharged.

(2)

(b) The battery can be recharged at a charging point.

The charging point provides an average current of 15.0 A to the battery, at a potential difference (voltage) of 400 V.

It is claimed that 126 MJ of energy can be transferred to the battery in less than 6 hours.

(i) Comment on this claim.

Use this equation to support your answer

$$t = \frac{E}{I \times V}$$

(3)

.....

.....

(ii) Calculate the total charge that moves into the battery while it is being recharged.

Use the equation

$$E = Q \times V$$

(2)

charge = ... C

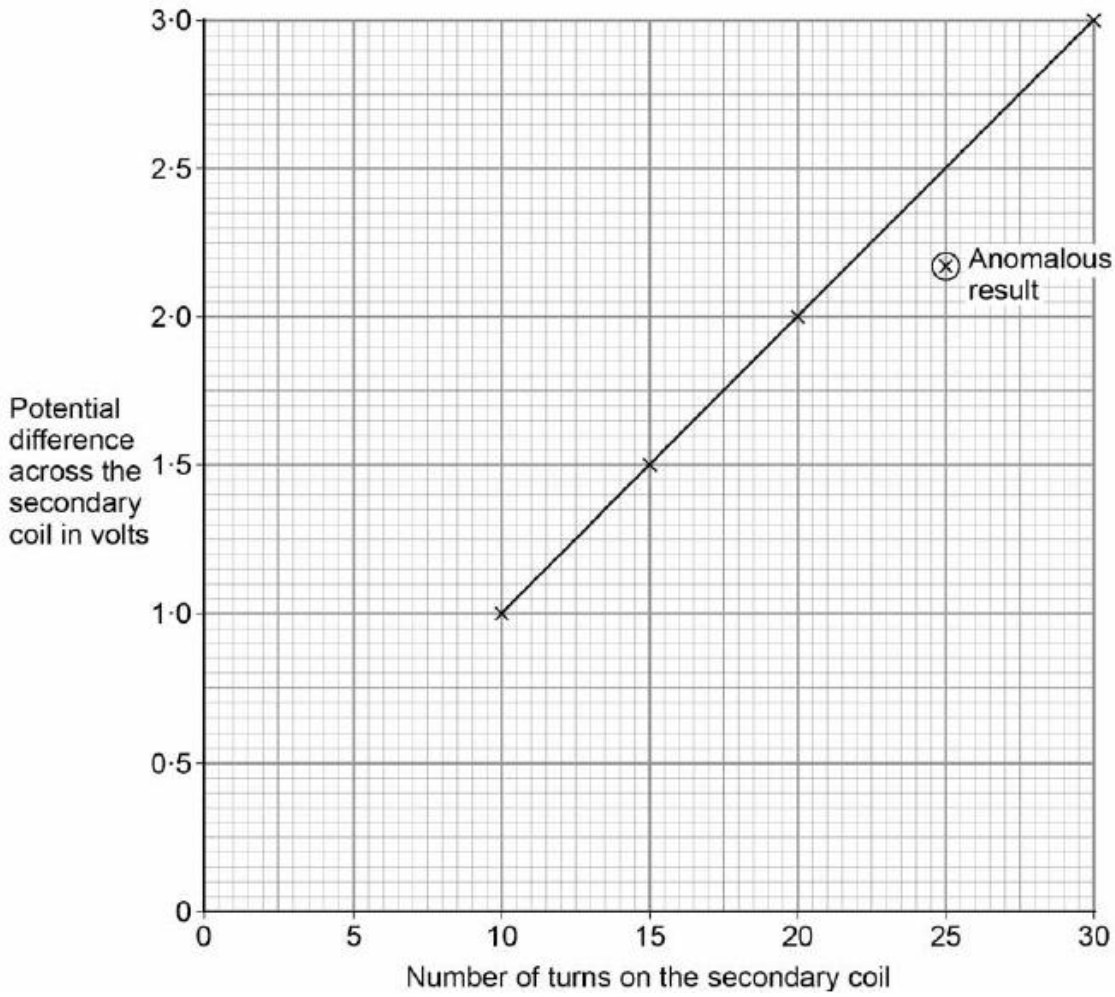
9.

A student used a simple transformer to investigate how the number of turns on the secondary coil affects the potential difference (p.d.) across the secondary coil.

The student kept the p.d. across the primary coil fixed at 2V.

Figure 12 shows the results collected by the student.

Figure 12



(a)

Figure 12 contains one anomalous result.

Suggest **one** possible reason why this anomalous result occurred.

[1 mark]

_____

_____

(b)

The transformer changes from being a step-down to a step-up transformer.

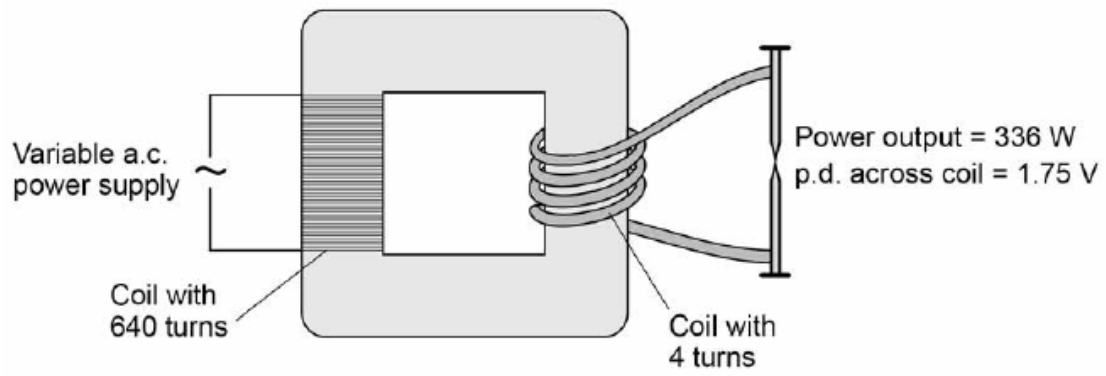
How can you tell from **Figure 12** that this happens?

[1 mark]

A spot-welder is a device that uses a transformer to produce a large current to join sheets of metal together.

Figure 13 shows a transformer demonstrating how a large current can heat and join two nails together.

Figure 13



(c)

How does the amount of infrared radiation emitted by the nails change when the power supply is switched on?

[1 mark]

(d)

Calculate the current from the power supply needed to provide a power output of 336 W.

Use the data in **Figure 13**.

The transformer is 100% efficient.

[5 marks]

Current = _____ A

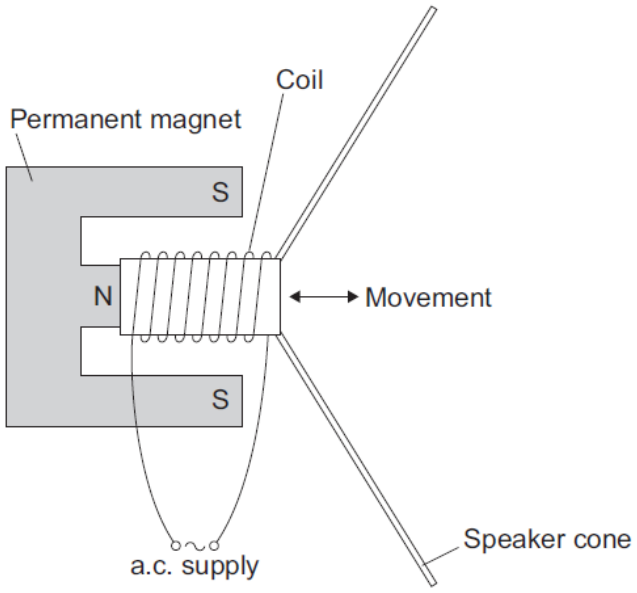
10.

(a)

Musicians often use loudspeakers.

Figure 14 shows how a loudspeaker is constructed.

Figure 14



The loudspeaker cone vibrates when an alternating current flows through the coil.

Explain why.

[4 marks]

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(b) Explain how the same speaker can theoretically be used as a microphone.

11.

(a) Observation of the spectra from distant galaxies provides evidence to support the 'Big Bang' theory.

(a) (i) Complete the following sentence.

Many scientists think that the 'Big Bang' theory describes the .....

..... .

(1 mark)

(a) (ii) Tick (✓) **one** box to complete the sentence.

The discovery of cosmic microwave background radiation was important

because it …

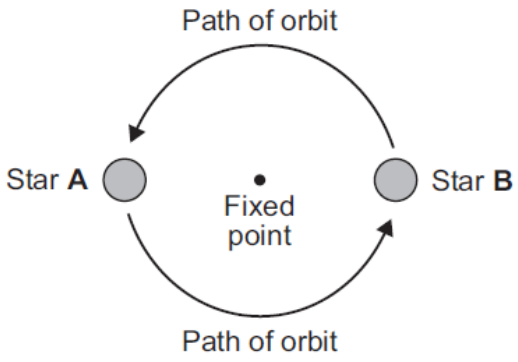
proved the 'Big Bang' theory to be correct. ☐

provided more evidence to support the 'Big Bang' theory. ☐

proved the Universe will continue to expand forever. ☐

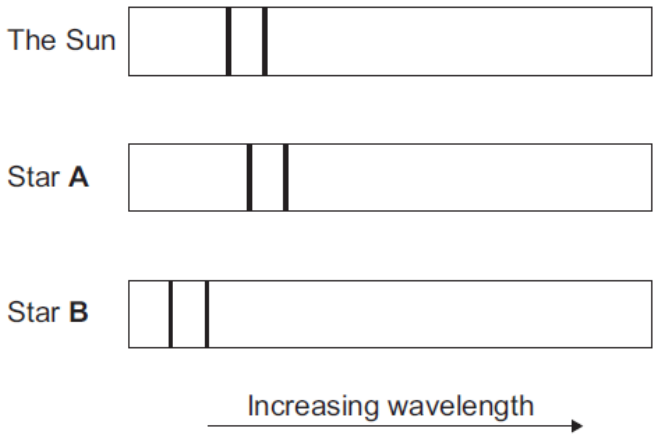
(1 mark)

(b) Many stars are part of a binary star system. Binary star systems have two stars.



The visible spectrum from stars includes dark lines. These lines are at specific wavelengths.

The diagram shows the position of two dark lines in the spectrum from the Sun. It also shows the same lines in the spectra from two stars **A** and **B** in a binary star system at the same point in time.



(b) (i) What name is given to the effect shown in the spectrum from star **A**?

.....

(1 mark)

(b) (ii) Scientists have concluded that the two stars in a binary star system orbit around a fixed point between the two stars.

A comparison of the spectra from the two stars in a binary star system provides evidence to support this conclusion.

Explain how.

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(3 marks)

12.

(a) Which row of the table is correct for both force and velocity?

(1)

	force	velocity
☒ A	scalar	scalar
☒ B	scalar	vector
☒ C	vector	scalar
☒ D	vector	vector

(b) Figure 6 shows a satellite orbiting the Earth.

Figure 6

(i) State the name of the force that keeps the satellite in orbit around the Earth.

(1)

.....

(ii) Draw an arrow on Figure 6 to show the direction of the force acting on the satellite, that keeps the satellite in orbit around the Earth.

Label this arrow 'F'.

(1)

(c) Satellites are used to gather data about the origin of the Universe.

The Big Bang theory is a theory about the origin of the Universe.

Evidence for the Big Bang theory is provided by red-shift and CMB radiation.

(i) Describe what is meant by red-shift.

(2)

(ii) Explain how red-shift provides evidence for the Big Bang theory.

(2)

(iii) The Cosmic Background Explorer (COBE) satellite observed CMB radiation from 1989 to 1993.

State what the 'M' in CMB radiation stands for.

(1)

(iv) State what is meant by 'cosmic background radiation'.

(1)

(v) Explain how the presence of CMB radiation provides evidence for the Big Bang theory.

(2)

13.

During the evolution of a star, the nebula collapses and becomes a main sequence star.

(i) State what causes the nebula to collapse.

(1)

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(ii) Explain why the nebula stops collapsing as it becomes a main sequence star.

(3)

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14.

Nuclear fission is used in nuclear reactors in some power stations.

In the reactor, a fission chain reaction is maintained and controlled to produce a supply of energy to generate electricity.

Figure 14 is a diagram of a nuclear reactor.

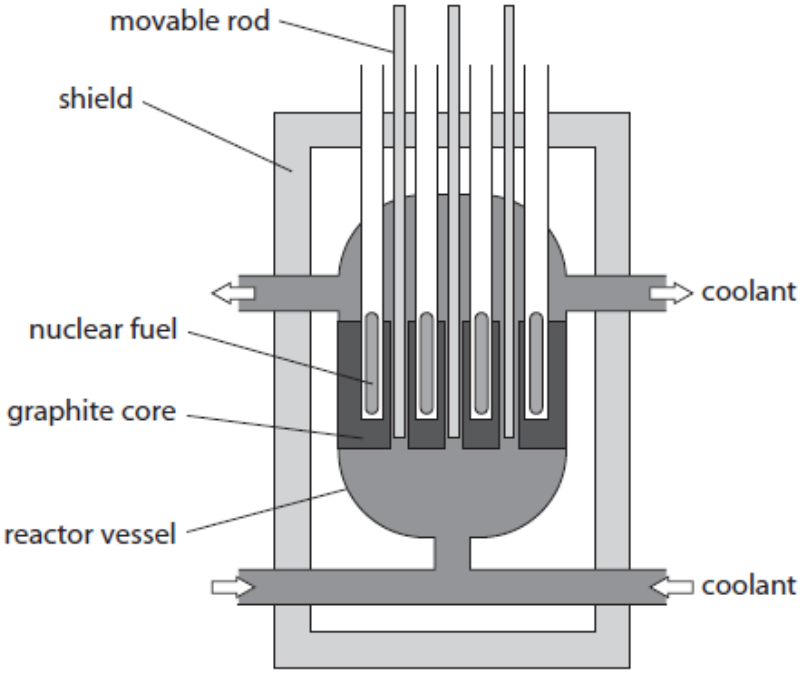


Figure 14

Explain how the graphite core and the movable rods are used to maintain and control the chain reaction.

(6)

15.

Figure 18 shows a ball before and after it collides with a wall.

The arrows show the direction of movement of the ball.

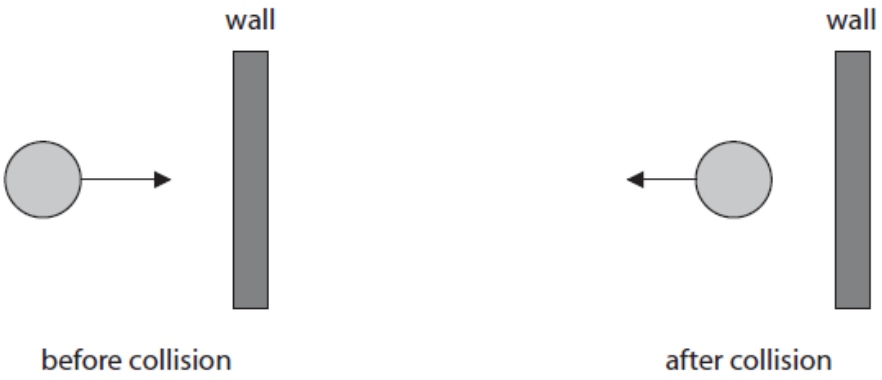


Figure 18

Before the collision, the momentum of the ball is 0.80 kg m / s.

After the collision, the momentum of the ball is 0.60 kg m / s in the opposite direction.

The ball is in contact with the wall for a time of 70 ms during the collision.

Calculate the force exerted on the ball by the wall.

(3)

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

force = ... N

16.

Figure 13 shows two objects, Q and R, before and after they collide.

Figure 13

The arrows show the direction of movement of the objects.
The arrows are not to scale.

Explain how momentum is conserved in the collision.

Use Newton's third law and Newton's second law in your answer.

Newton's second law can be written as

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

(6)

17.

Figure 12 shows three toy animals hanging from a rod.

The rod hangs from the ceiling by a string tied to the centre of the rod.

The system is in equilibrium.

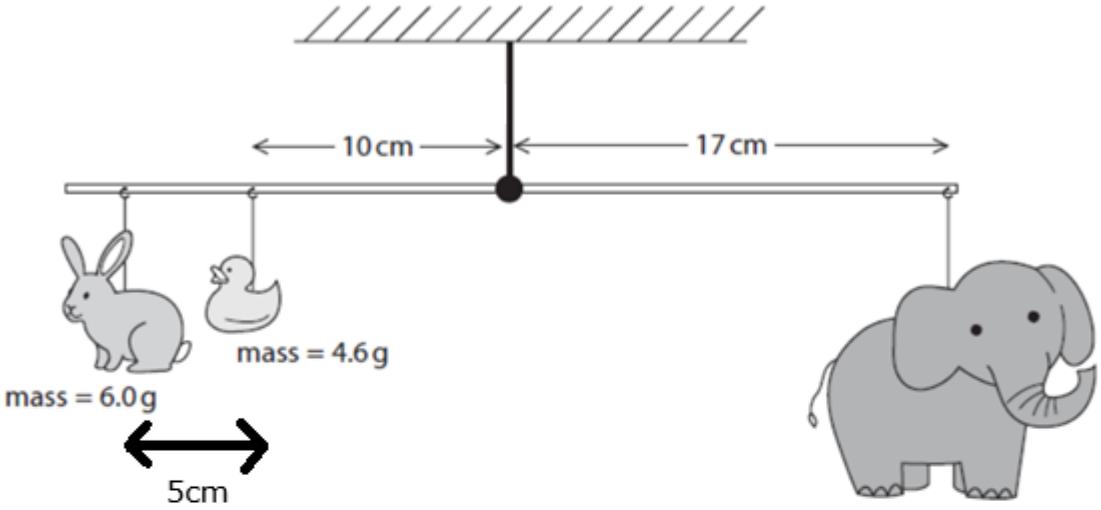


Figure 12

Use the principle of moments to calculate the mass of the toy elephant.

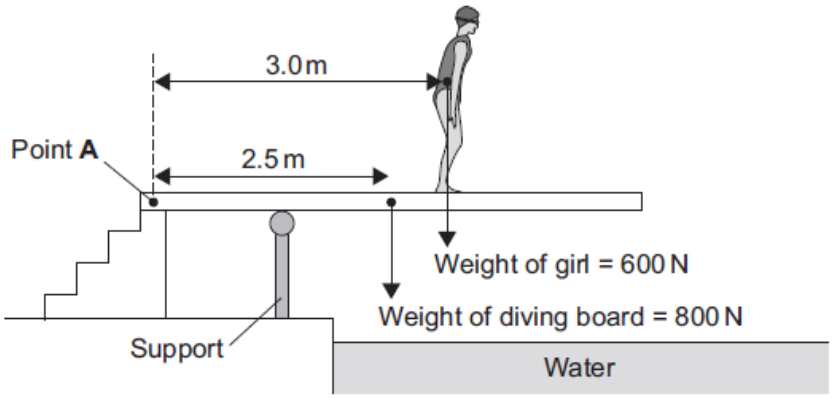
(4)

mass = ... g

18.

(a) **Figure 5** shows a girl standing on a diving board.

Figure 5



Calculate the total clockwise moment of the weight of the diving board and the weight of the girl about Point **A**. Give the unit.

Use the correct equation from the Physics Equations Sheet.

[4 marks]

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Total clockwise moment about Point **A** = ...

(b) **Figure 6** shows the girl standing at a different place on the diving board.

The support provides an upward force **F** to keep the diving board balanced.

Figure 6

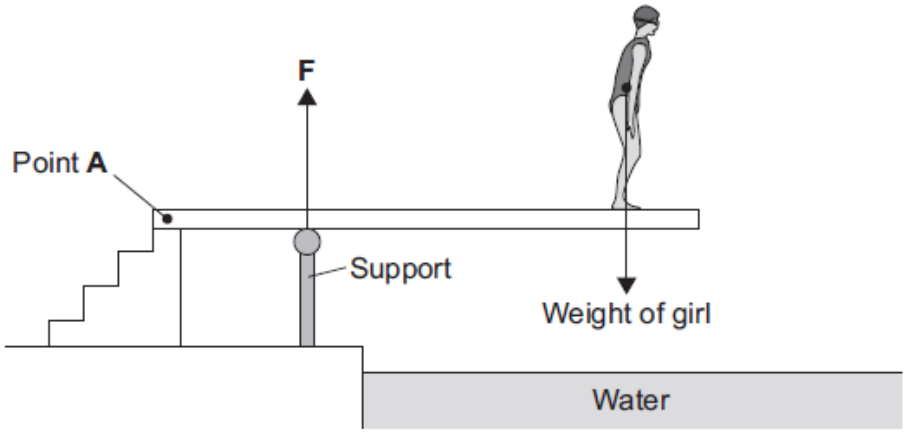
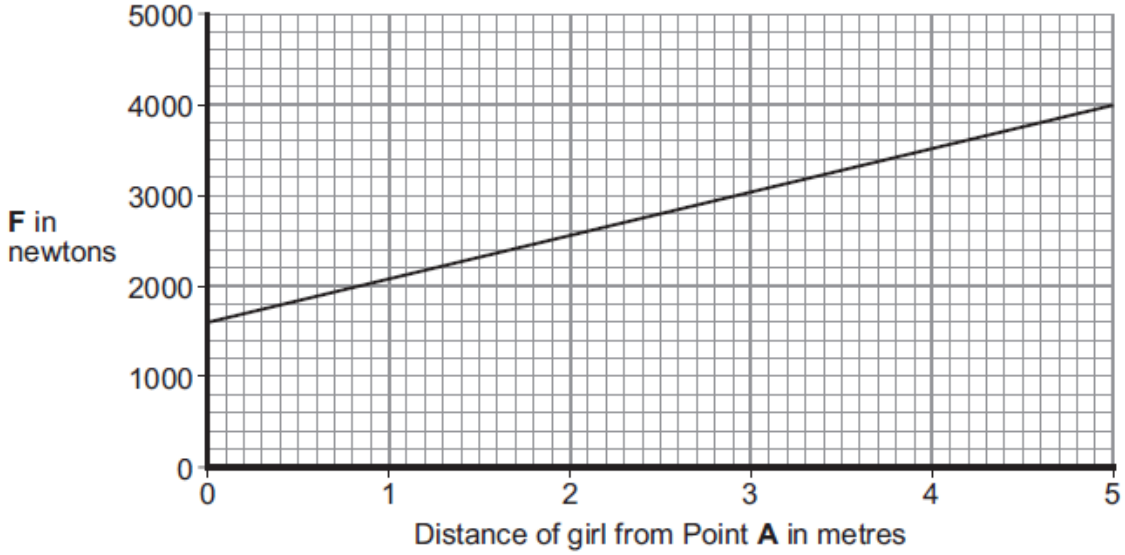


Figure 7 shows how the upward force **F** varies with the distance of the girl from Point **A**.

Figure 7



Explain, in terms of clockwise and anticlockwise moments, why the upward force **F** increases as shown in **Figure 7**.

[3 marks]

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19.

Figure 13 shows a diagram of a device for lifting heavy loads.

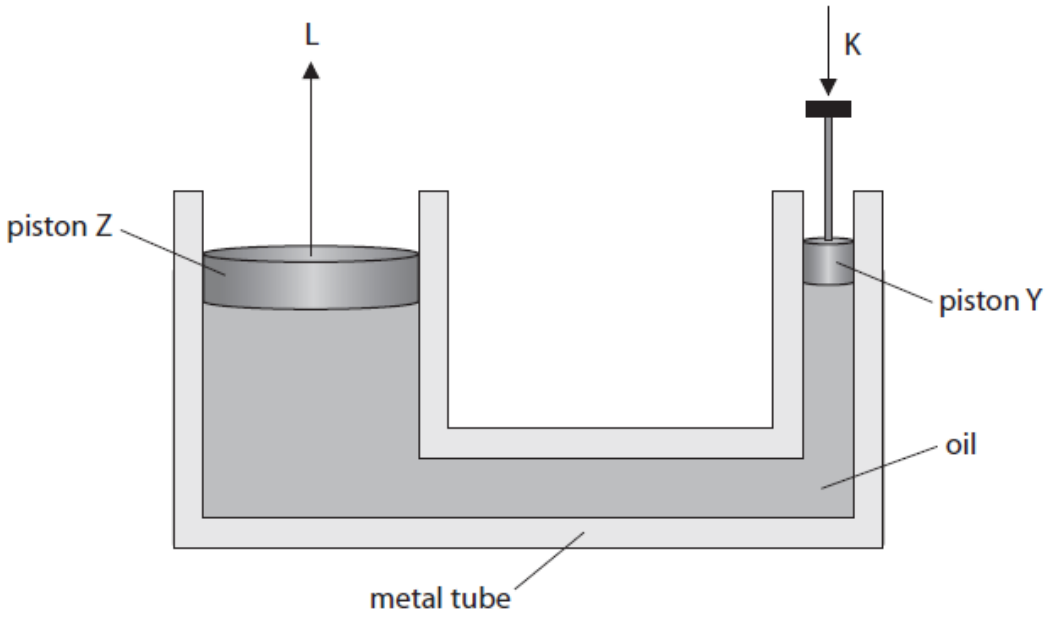


Figure 13

The metal tube is filled with oil.

The piston Y is pushed down with a force K.

This produces a force L on piston Z.

The pressure exerted on the oil by piston Y is the same as the pressure exerted by the oil on piston Z.

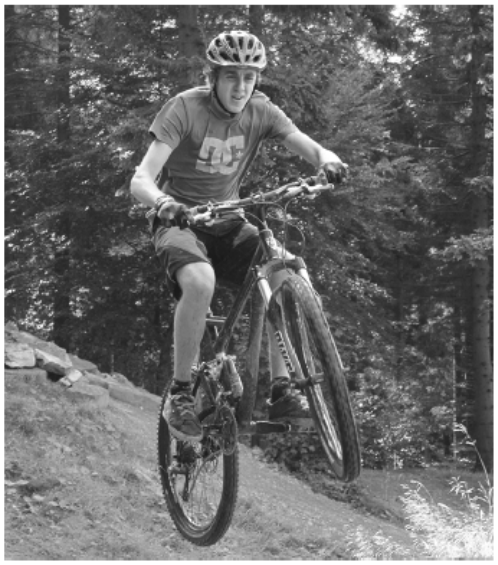
Explain the difference between the size of force K and the size of force L.

(3)

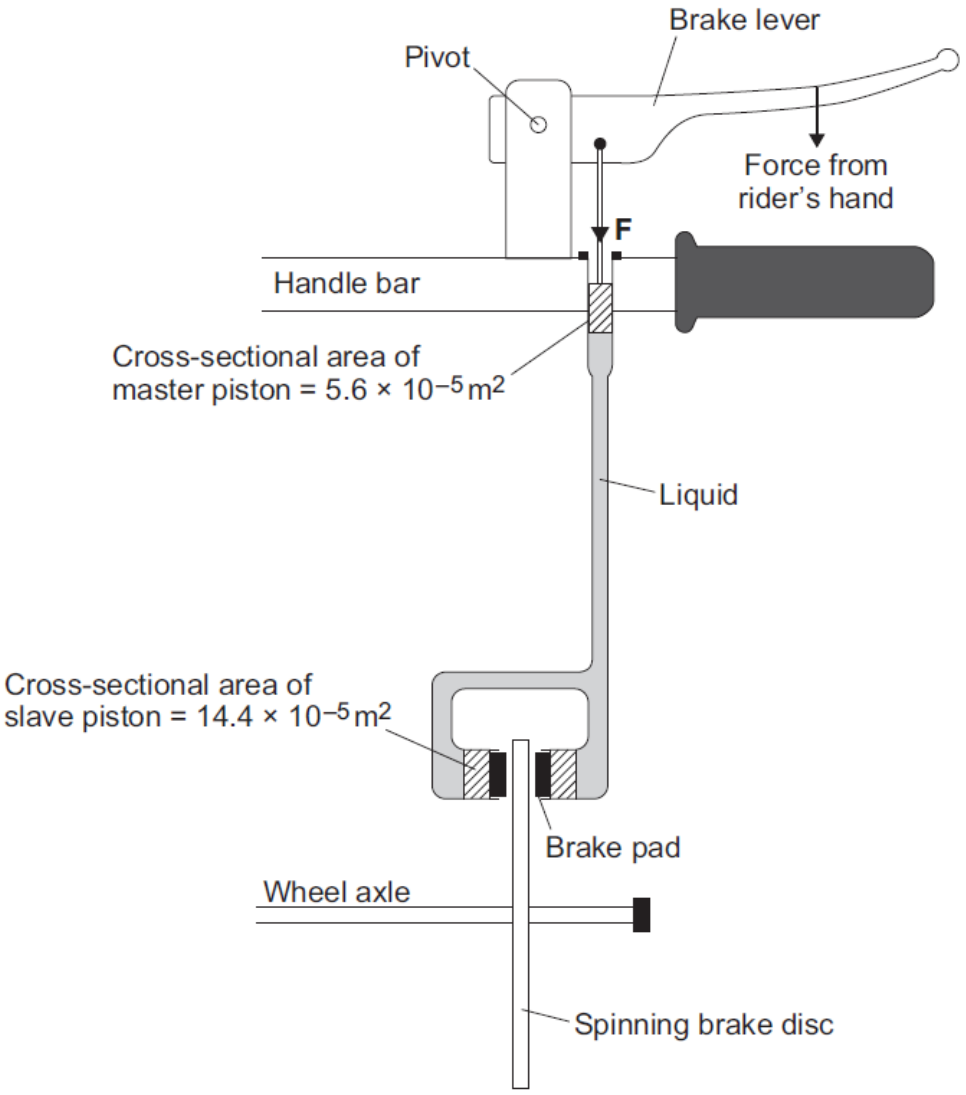
Question 20 is on the next page.

20.

Mountain bike riders use brakes to slow down.



Some mountain bikes have hydraulic brakes.



(a) What property of a liquid enables a hydraulic brake system to work?

.....

(1 mark)

(b) When the rider's hand pulls on the brake lever, the master piston applies a pressure of 1.5×10^6 pascals to the liquid.

Using information from the diagram, calculate the force **F** exerted on the liquid by the master piston.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

.....

Force **F** = ... N

(2 marks)

(c) The pressure in the liquid applies a force to move each slave piston.

How does the size of this force compare to the force **F** applied by the master piston?

.....

.....

Give a reason for your answer.

.....

.....

(2 marks)

21.

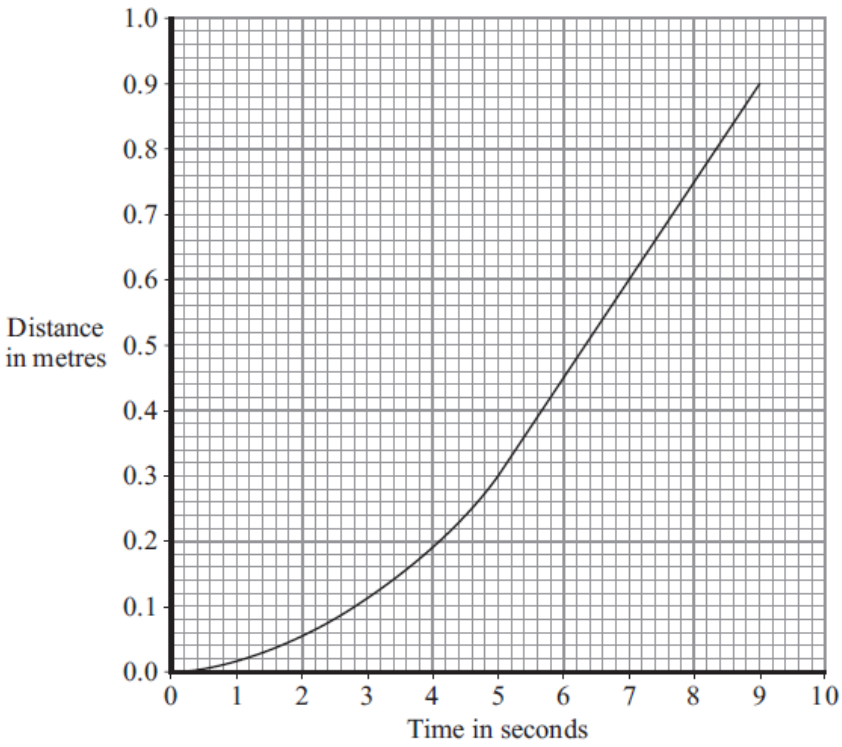
(a) The diagram shows a steel ball-bearing falling through a tube of oil.
The forces, **L** and **M**, act on the ball-bearing.

What causes force **L**?

.....

(1 mark)

(b) The distance–time graph represents the motion of the ball-bearing as it falls through the oil.



(b) (i) Explain, in terms of the forces, **L** and **M**, why the ball-bearing accelerates at first but then falls at constant speed.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) (ii) What name is given to the constant speed reached by the falling ball-bearing?

.....

(1 mark)

(b) (iii) Calculate the constant speed reached by the ball-bearing.

Show clearly how you use the graph to work out your answer.

.....

.....

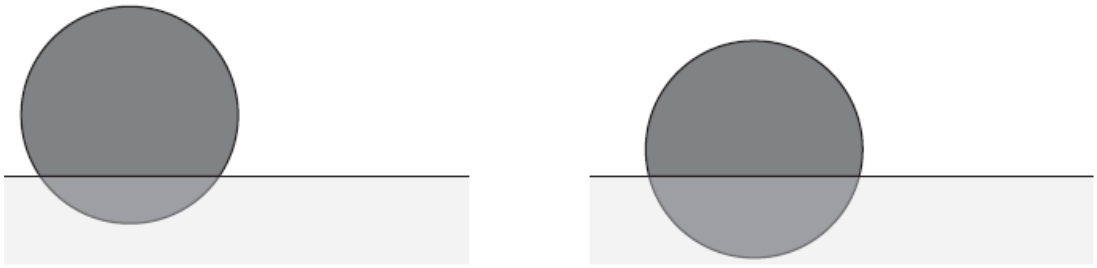
.....

Speed = ... m/s

(2 marks)

22.

Figure 15 shows a ball floating in seawater and the same ball floating in fresh water.



seawater fresh water

Figure 15

(i) Compare the upthrust on the ball in seawater with the upthrust on the same ball in fresh water.

(1)

.....

.....

(ii) Explain why there is less of the ball below the surface of the seawater than below the surface of the fresh water.

(3)

.....

.....

.....

.....

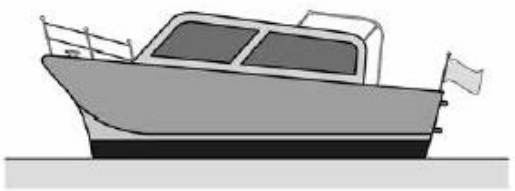
.....

.....

23.

Figure 8 shows a boat floating on the sea. The boat is stationary.

Figure 8



(a)

Figure 9 shows part of the free body diagram for the boat.

Complete the free body diagram for the boat.

[2 marks]

Figure 9

(b)

Calculate the mass of the boat.

Use the information given in **Figure 9**.

gravitational field strength = 9.8 N/kg

Give your answer to **two** significant figures.

[4 marks]

Mass = _____ kg

(c)

When the boat propeller pushes water backwards, the boat moves forwards.
The force on the water causes an equal and opposite force to act on the boat.

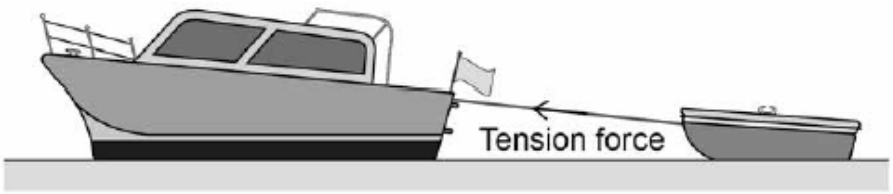
Which law is this an example of?

[1 mark]

(d)

Figure 10 shows the boat towing a small dinghy.

Figure 10



The tension force in the tow rope causes a horizontal force forwards and a vertical force upwards on the dinghy.

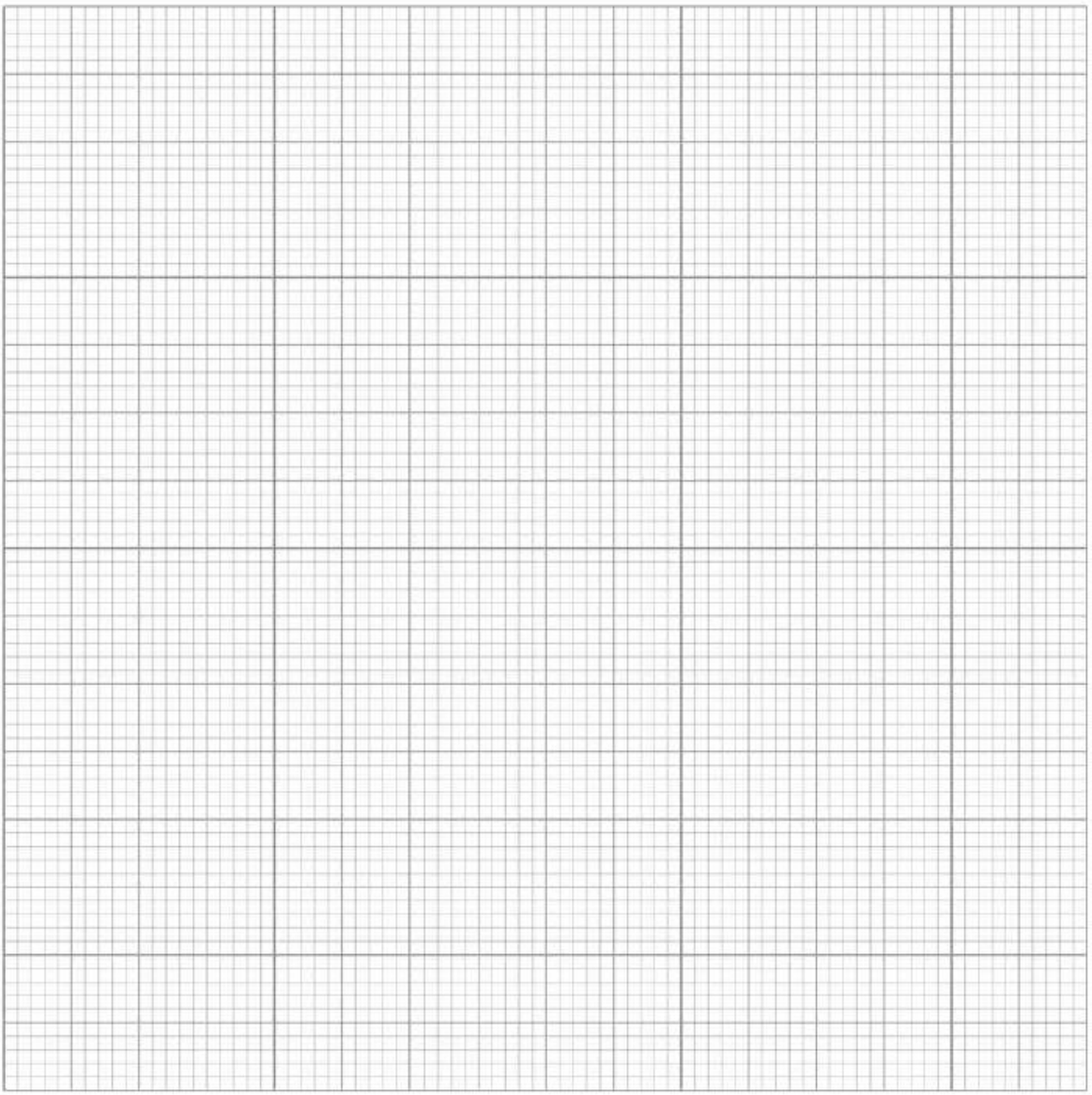
horizontal force forwards = 150 N
vertical force upwards = 50 N

Figure 11 shows a grid.

Draw a vector diagram to determine the magnitude of the tension force in the tow rope and the direction of the force this causes on the dinghy.

[4 marks]

Figure 11



Magnitude of the tension force in the tow rope = _____ N

Direction of the force on the dinghy caused by the tension force in the tow rope = _____