



Cambridge O Level

PHYSICS

5054/01

Paper 1 Multiple Choice

For examination from 2023

SPECIMEN PAPER

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

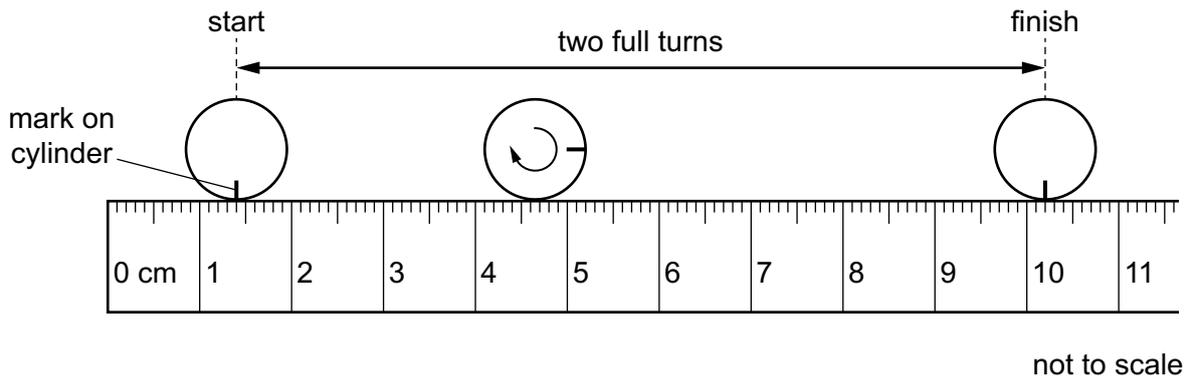
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **16** pages.

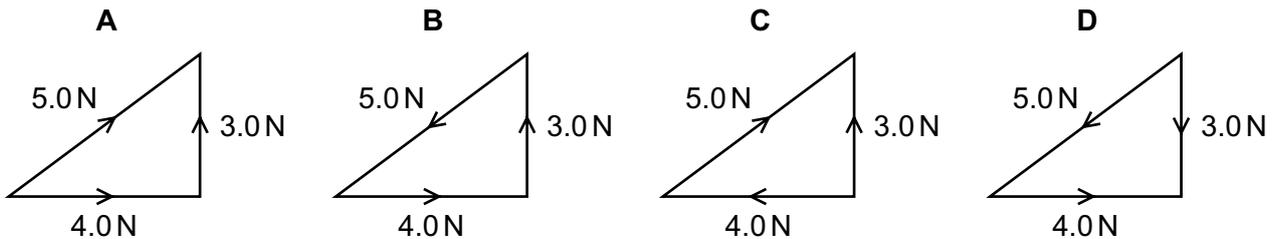


- 1 A small cylinder is rolled along a ruler and completes two full turns as shown in the diagram.

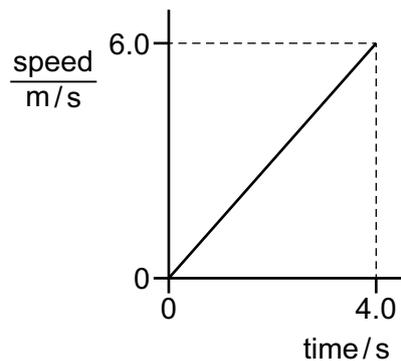


What is the circumference of the cylinder?

- A** 4.4 cm **B** 5.1 cm **C** 8.8 cm **D** 10.2 cm
- 2 Which diagram shows the vector addition of a 4.0 N force and a 3.0 N force?



- 3 The diagram shows the speed-time graph for an object moving with constant acceleration.



What is the distance travelled in the first 4.0 s?

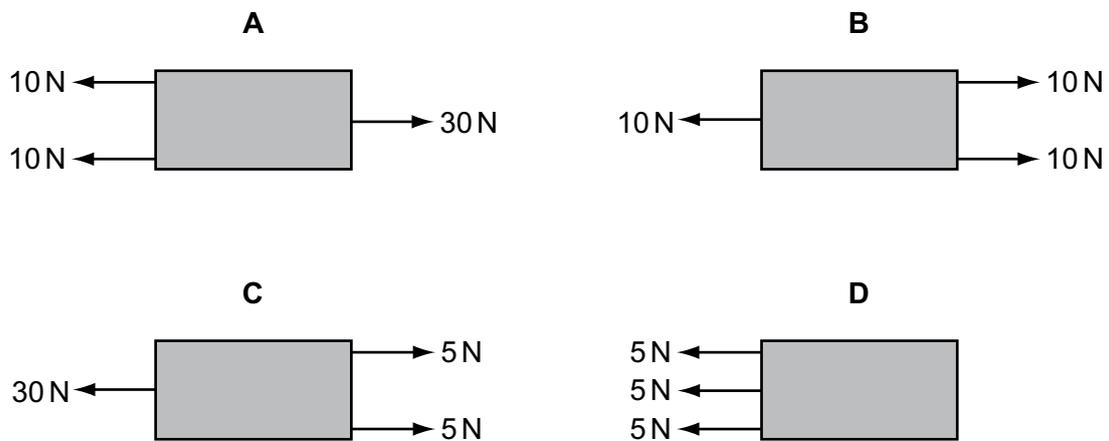
- A** 0.67 m **B** 1.5 m **C** 12 m **D** 24 m

- 4 An astronaut travels to Mars.

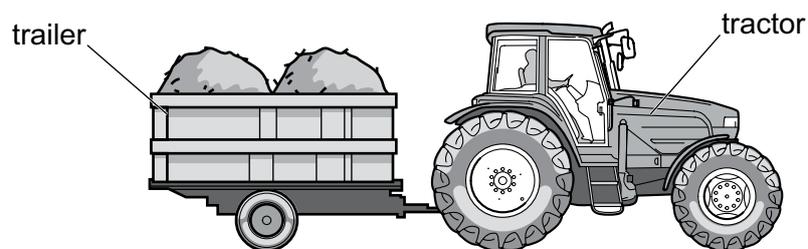
Which row describes how his mass and his weight compare with their sizes on Earth?

| | mass | weight |
|----------|-----------|-----------|
| A | different | different |
| B | different | the same |
| C | the same | different |
| D | the same | the same |

- 5 Which object has the largest resultant force acting on it?



- 6 A tractor pulls a trailer at a constant speed.



The tractor exerts a force of 1600 N forwards on the trailer.

What force is exerted by the trailer on the tractor?

- A** 0 N
- B** 1600 N backwards
- C** 1600 N forwards
- D** 3200 N forwards

- 7 A skydiver is falling at terminal velocity.



Which row describes the acceleration of the skydiver and the velocity of the skydiver?

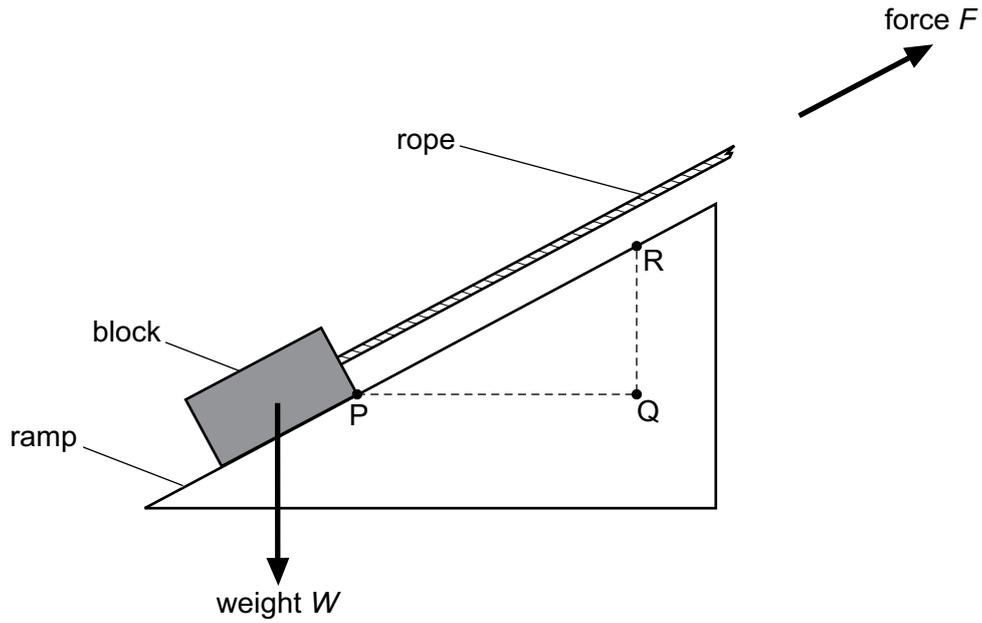
| | acceleration of the skydiver | velocity of the skydiver |
|----------|------------------------------|--------------------------|
| A | downwards | constant |
| B | downwards | zero |
| C | zero | constant |
| D | zero | zero |

- 8 Which car experiences a resultant force that is **not** zero?
- A** a car moving along a straight horizontal road at constant speed
- B** a car moving around a bend at constant speed
- C** a car moving up a hill at constant velocity
- D** a car that is at rest
- 9 A car is designed to be stable.

Where **must** the centre of gravity of the car be?

- A** above the front wheels
- B** above the rear wheels
- C** as high in the car as possible
- D** as low in the car as possible

- 10 The diagram shows a block being pulled up a ramp by a rope.



The block has weight W and the rope is pulled with force F .

The block moves distance PR and is raised through height QR .

What is the equation for the work done on the block by the rope?

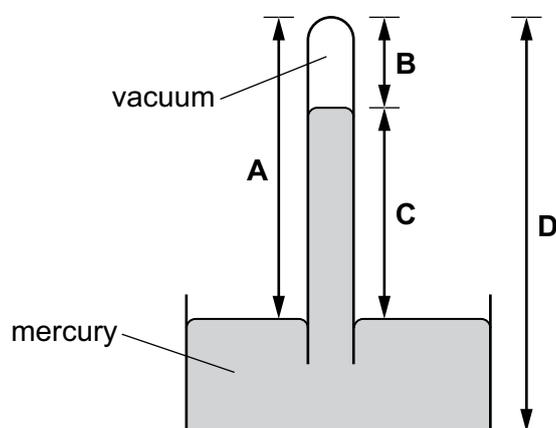
- A force $F \times$ distance PR
 - B force $F \times$ height QR
 - C weight $W \times$ distance PQ
 - D weight $W \times$ distance PR
- 11 Which uses a non-renewable energy source?
- A a geothermal heating system
 - B a nuclear power station
 - C a solar panel
 - D a wind turbine

12 Which expression gives the efficiency of an a.c. generator?

- A $\frac{\text{electrical energy output}}{\text{total energy input}}$
- B $\frac{\text{electrical energy output}}{\text{thermal energy output}}$
- C $\frac{\text{total energy output}}{\text{electrical energy input}}$
- D $\frac{\text{thermal energy output}}{\text{total energy input}}$

13 Mercury is a liquid. The diagram shows a simple mercury barometer.

Which height is a measure of the atmospheric pressure?



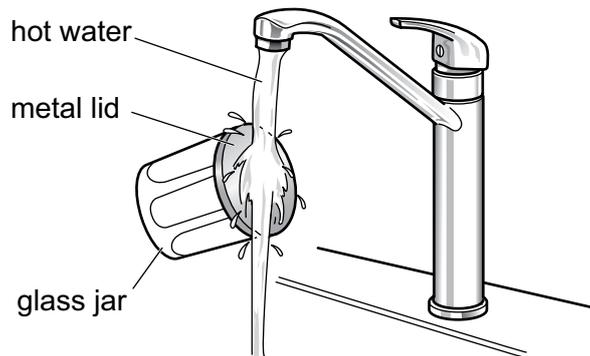
14 A gas is in a sealed container of constant volume. The gas is heated and the pressure of the gas on the walls of the container increases.

How do the particles of the gas cause this increase in pressure?

- A They expand.
- B They hit each other more frequently.
- C They hit the container walls more frequently.
- D They vibrate faster.

15 A person cannot open a glass jar which has a metal lid.

After the lid is held under hot water for a few seconds, the jar opens easily.



What is the explanation for this?

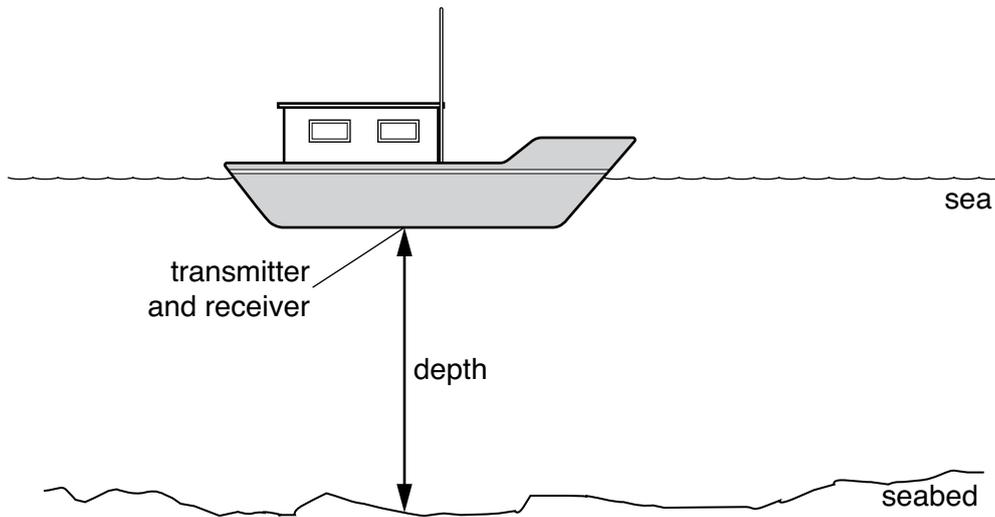
- A** The glass jar contracts.
 - B** The glass jar expands.
 - C** The metal lid contracts.
 - D** The metal lid expands.
- 16** The more energetic particles escape from the surface of a liquid.

Which term describes this process?

- A** condensation
- B** evaporation
- C** melting
- D** radiation

- 17 The depth of the sea under a ship is determined by sending a pulse of sound with a frequency of 3000 Hz from a transmitter on the bottom of the ship to the seabed. The sound reflects from the seabed and returns to a receiver on the bottom of the ship.

The time between sending the pulse and receiving the reflected pulse is measured.

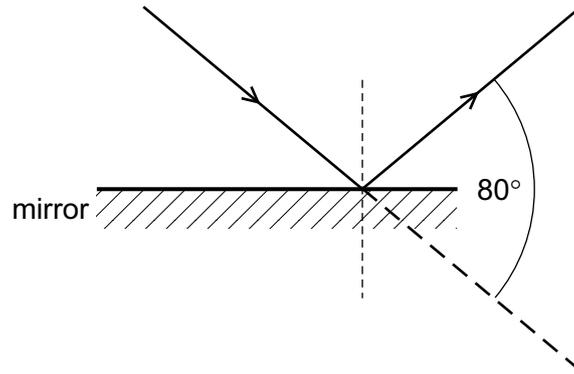


The depth of the sea beneath the ship is 600 m and the time measured is 0.80 s.

What is the wavelength of this sound in the sea?

- A 0.25 m
- B 0.32 m
- C 0.50 m
- D 2.0 m

18 Light is incident on a mirror and is reflected as shown.

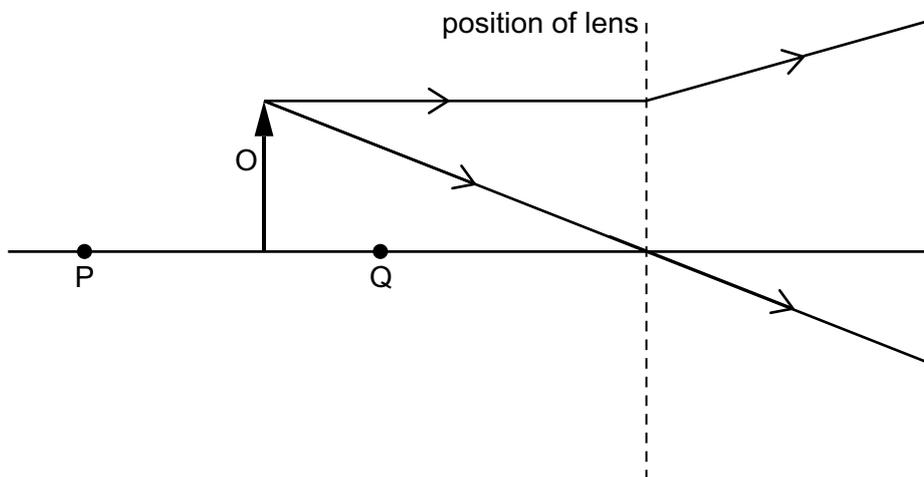


What is the angle of incidence and what is the angle of reflection?

| | angle of incidence | angle of reflection |
|----------|--------------------|---------------------|
| A | 40° | 40° |
| B | 40° | 50° |
| C | 50° | 40° |
| D | 50° | 50° |

19 An object O is placed in front of a lens.

The ray diagram shows the paths of two light rays that start at the tip of the object.

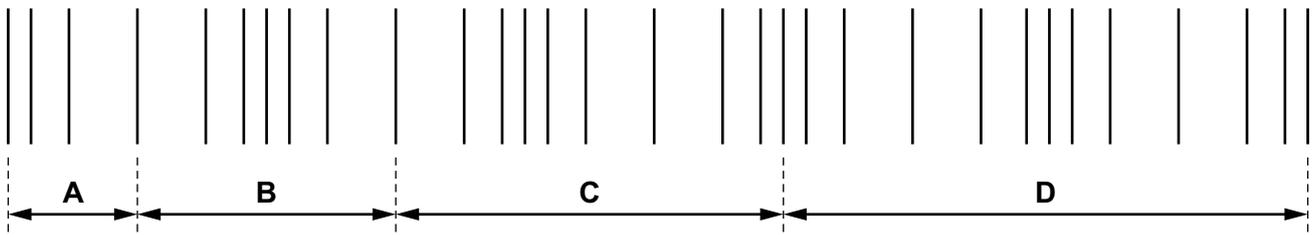


Which point P or Q is a principal focus and what type of image is formed?

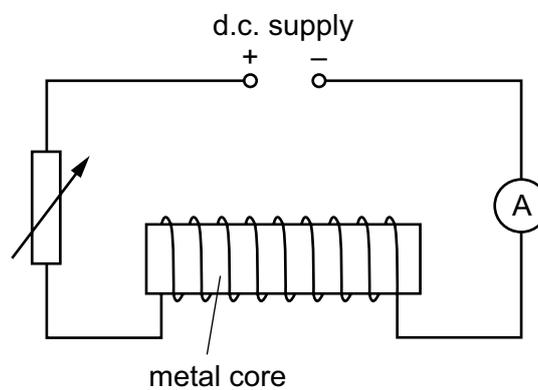
| | principal focus | type of image formed |
|----------|-----------------|----------------------|
| A | point P | real |
| B | point P | virtual |
| C | point Q | real |
| D | point Q | virtual |

- 20 A sound wave travels through air. The lines in the diagram show the positions of particles of air at one particular time.

Which distance is the wavelength of the wave?



- 21 The diagram shows an electromagnet.

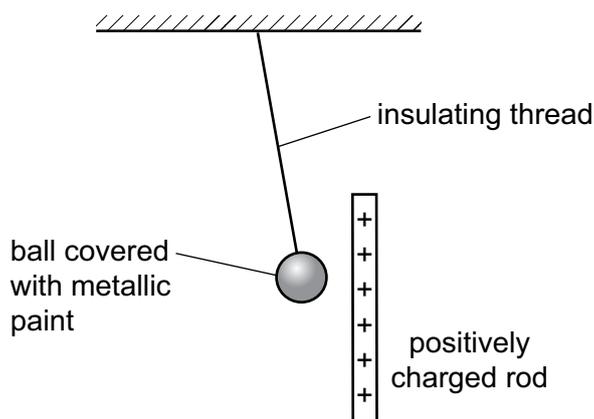


How can the strength of the magnetic field around the electromagnet be increased?

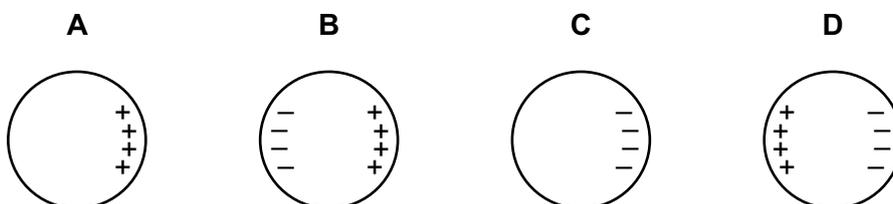
- A Remove the metal core and decrease the current in the circuit
 - B Remove the metal core and keep the current in the circuit constant
 - C Reverse the d.c. supply and decrease the current in the circuit
 - D Reverse the d.c. supply and increase the current in the circuit
- 22 What material can a temporary magnet be made from?

- A plastic
- B soft iron
- C steel
- D wood

- 23 The diagram shows an uncharged ball covered with metallic paint. The ball is suspended from an insulating thread. It is placed near a positively charged rod.



Which diagram shows the charge distribution on the ball?



- 24 A charge of 45C flows through an electric appliance in 3.0 minutes.

What is the average current in the appliance?

- A 0.25A B 4.0A C 15A D 135A

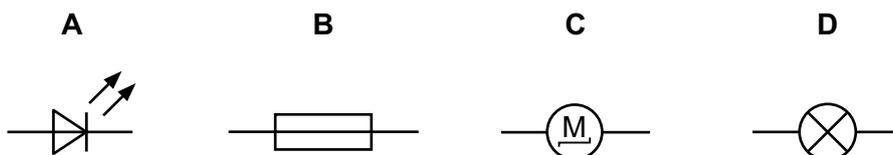
- 25 A wire of length 0.50m and cross-sectional area $1.0 \times 10^{-6} \text{m}^2$ has a resistance of 0.75Ω .

Another wire of the same material has a length of 2.0 m and a cross-sectional area of $0.50 \times 10^{-6} \text{m}^2$.

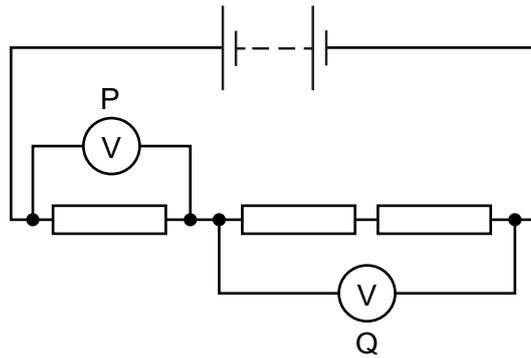
What is the resistance of the longer wire?

- A 0.094Ω B 0.38Ω C 1.5Ω D 6.0Ω

- 26 Which electrical symbol represents a fuse?



- 27 Three identical resistors are joined in series to a battery.



Voltmeter Q reads 8.0V.

What is the reading on voltmeter P and what is the e.m.f. of the battery?

| | reading on P/V | e.m.f. of battery/V |
|----------|----------------|---------------------|
| A | 4.0 | 8.0 |
| B | 4.0 | 12 |
| C | 8.0 | 8.0 |
| D | 8.0 | 12 |

- 28 The e.m.f. of the battery in a radio is 3.0V.

The resistance of the circuit in the radio is 6.0Ω .

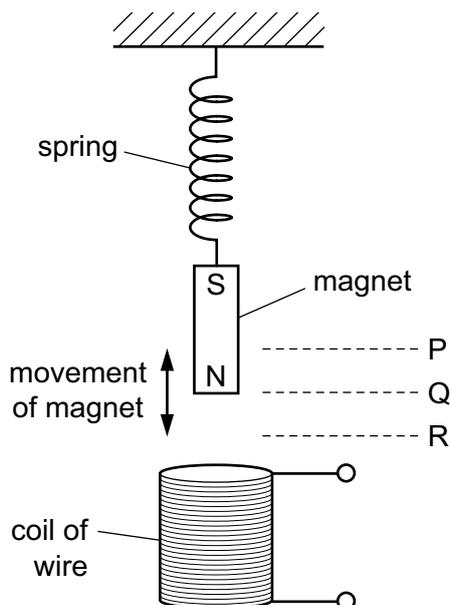
The radio is switched on.

How much energy is transferred from the battery in 30 minutes?

- A** 45 J
B 900 J
C 2700 J
D 32400 J
- 29 What is the unit for the energy used by an electrical appliance?

- A** ampere
B kilowatt-hour
C volt
D watt

30 A magnet oscillates vertically above a coil of wire.

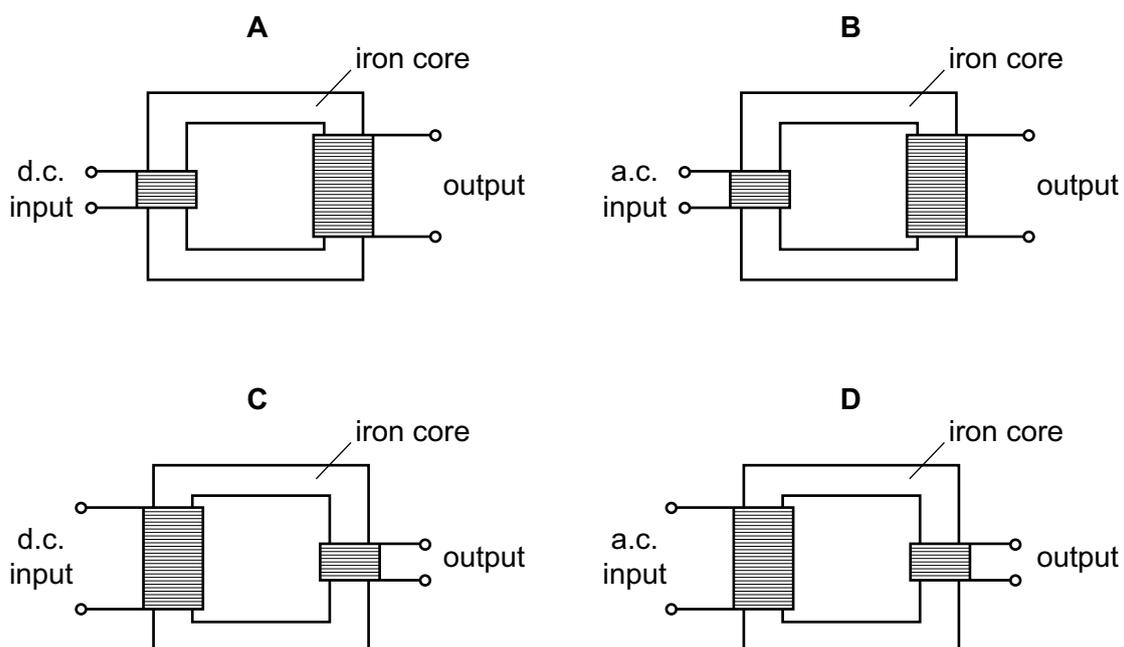


As the lower end of the magnet oscillates between P and R, a varying e.m.f. is induced across the coil.

When this e.m.f. is 0V, where could the lower end of the magnet be?

- A at R only
- B at Q only
- C at P or at R
- D at P or at Q

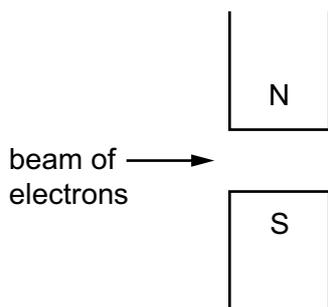
31 Which transformer arrangement produces an output e.m.f. that is larger than the input p.d.?



32 Why is a relay used in a switching circuit?

- A to switch on a small current using a small current
- B to switch on a small current using a large current
- C to switch on a large current using a small current
- D to switch on a large current using a large current

33 A horizontal beam of electrons passes between the two poles of a magnet in a vacuum.



In which direction is the beam deflected?

- A into the page
- B out of the page
- C towards the north pole
- D towards the south pole

34 How many neutrons are in one neutral atom of the krypton isotope ${}^{84}_{36}\text{Kr}$?

- A 36
- B 48
- C 84
- D 120

35 ${}^{14}_6\text{C}$ represents a nuclide of the element carbon and ${}^{14}_7\text{N}$ represents a nuclide of the element nitrogen.

How is a neutral atom of ${}^{14}_7\text{N}$ different to a neutral atom of ${}^{14}_6\text{C}$?

- A The nitrogen atom has one electron fewer than the carbon atom.
- B The nitrogen atom has one neutron more than the carbon atom.
- C The nitrogen atom has one proton fewer than the carbon atom.
- D The nitrogen atom has one proton more than the carbon atom.

36 Radioactive isotopes emit three types of radiation.

Which list gives the types of radiation in order of their ionising effect from greatest to least?

- A alpha-particles, beta-particles, gamma rays
- B alpha-particles, gamma rays, beta-particles
- C beta-particles, gamma rays, alpha-particles
- D gamma rays, beta-particles, alpha-particles

37 Which statement about the half-life of a radioactive isotope is correct?

- A Half-life is half the time it takes for the mass of the isotope to decrease to zero.
- B Half-life is half the time it takes for the number of nuclei of the isotope to decrease to zero.
- C Half-life is the time taken for the nucleon number of the isotope to halve.
- D Half-life is the time taken for the number of nuclei of the isotope to halve.

38 Light from the Sun travels to the Earth at a speed of 3.0×10^8 m/s.

The time for the complete journey is 500 s.

What is the average orbital speed of the Earth in its orbit around the Sun?

- A 60 m/s
- B 4.8×10^3 m/s
- C 3.0×10^4 m/s
- D 1.8×10^6 m/s

39 In the Sun, energy is transferred from an energy store.

Which energy is being released and what is the name of the reaction that releases this energy inside the Sun?

| | energy | reaction |
|---|----------|-----------|
| A | chemical | burning |
| B | chemical | radiation |
| C | nuclear | fission |
| D | nuclear | fusion |

40 The light emitted from a galaxy is redshifted when detected on Earth.

How does the frequency of the light when detected on Earth compare with its frequency when emitted and in what direction is the galaxy moving?

| | frequency of light when detected on Earth | direction of movement of galaxy |
|----------|---|---------------------------------|
| A | less than frequency of emission | away from Earth |
| B | less than frequency of emission | towards Earth |
| C | greater than frequency of emission | away from Earth |
| D | greater than frequency of emission | towards Earth |

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