



BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024
SECONDARY FOUR EXPRESS

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

PHYSICS

Paper 1

Multiple Choice

Setter:

Mr Teng JB

6091/01

23 August 2024

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and register number on the Multiple Choice Answer Sheet provided.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**.

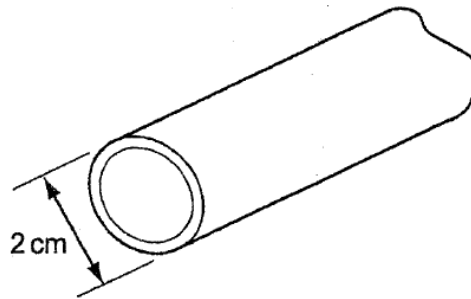
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

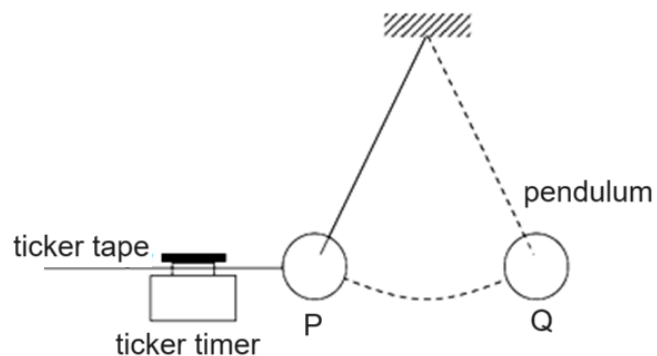
- 1 A length of copper pipe of uniform cross-section and several metres long carries water to a tap.



Which instruments are used to take measurements to calculate accurately the volume of copper used to make the pipe?

- A digital micrometer screw gauge and digital vernier calipers
 - B digital micrometer screw gauge and metre rule
 - C digital vernier calipers and measuring tape
 - D measuring tape and metre rule
- 2 A ticker tape timer is attached to a heavy pendulum as shown below.

The timer is switched on when the pendulum bob starts to move.

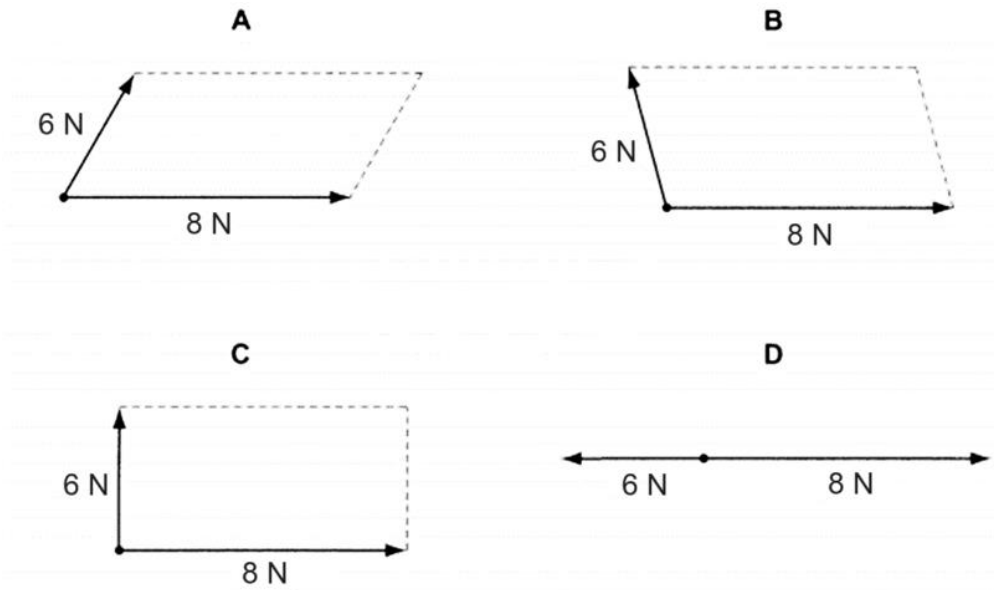


Which tape is most likely to be obtained in the first swing from P to Q?

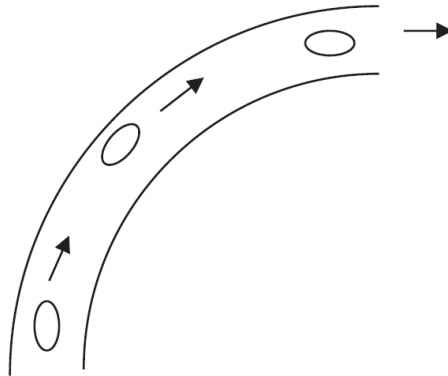
- A
- B
- C
- D

- 3 Forces of 8 N and 6 N act at a point.

Which scale diagram shows the forces that has a resultant of 12 N?



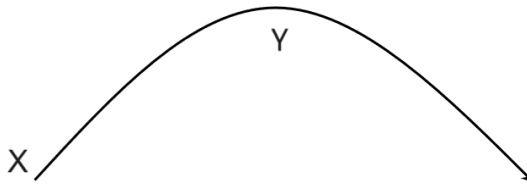
- 4 A car travels at constant speed round a bend.



Which statement about the motion of the car is **not** correct?

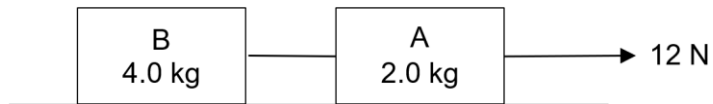
- A The acceleration of the car is zero.
- B The displacement of the car increases.
- C The distance covered per unit time by the car is constant.
- D The velocity of the car is not constant.

- 5 A stone is thrown upwards from X and follows a parabolic path. The highest point of the path is Y.



Which statement is true about gravitational acceleration, g ?

- A It is greatest at X.
 - B It is greatest at Y.
 - C It is the same at X and Y.
 - D It is zero at Y.
- 6 A force of 12 N acts on blocks A and B of masses 2.0 kg and 4.0 kg respectively as shown in the diagram.

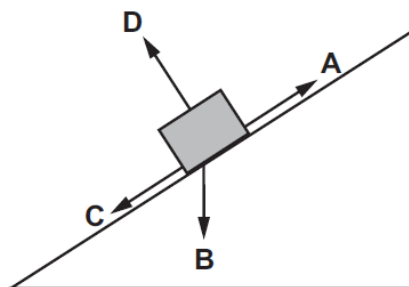


Given that the floor is smooth, what is the tension of the string which is between block A and B?

- A 2.0 N
 - B 4.0 N
 - C 8.0 N
 - D 12.0 N
- 7 A force moves a box up a rough slope.

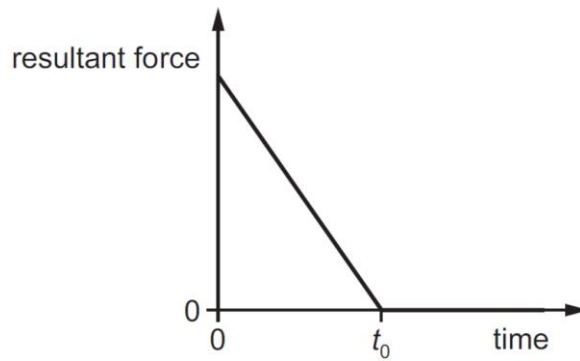
The diagram shows four forces acting on the box.

Which is the force due to friction on the box?

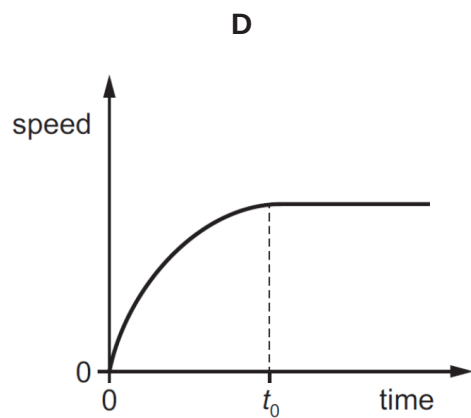
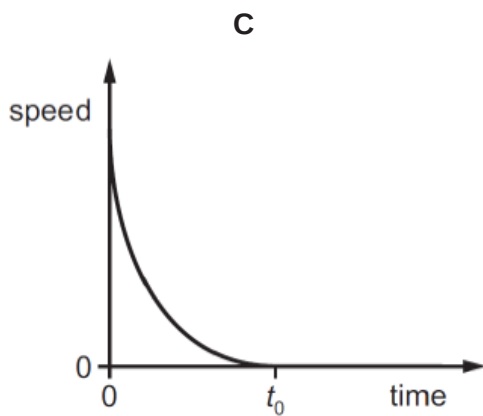
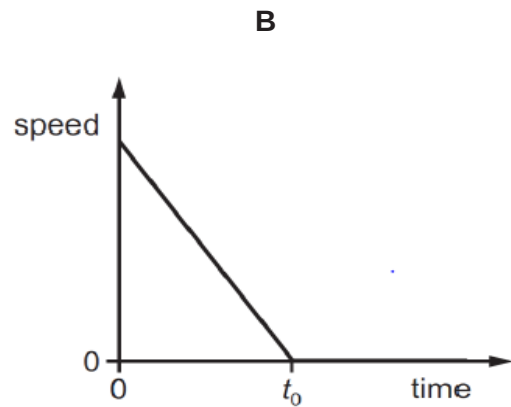
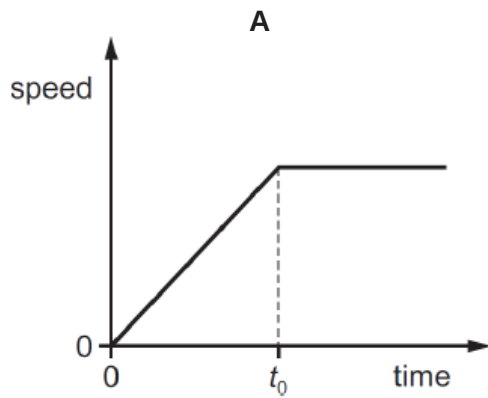


- 8 A resultant force acts on an object and causes it to move in a straight line.

The graph shows how the resultant force varies with time.



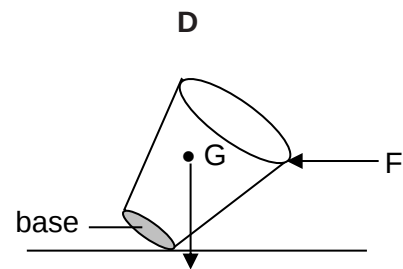
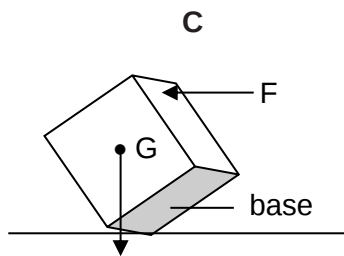
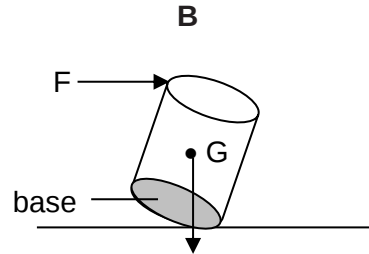
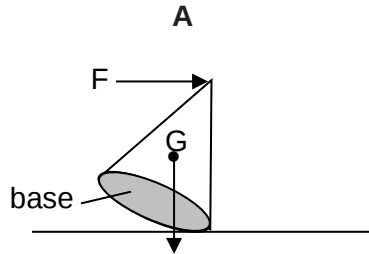
Which graph shows the correct speed-time graph for the object?



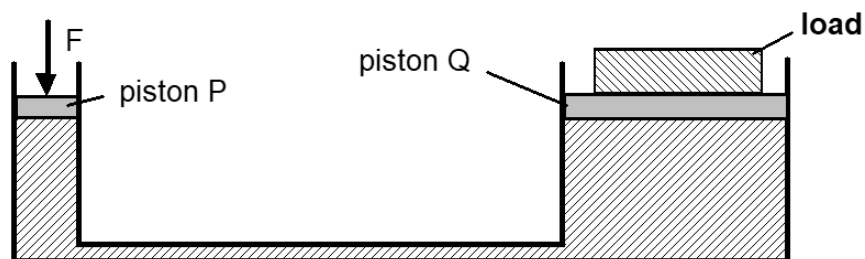
- 9 The four objects are held stationary by an applied force F .

G is the centre of gravity of the object.

Which object will topple when force F is removed?



- 10 The diagram shows a hydraulic pump.



Which statement is true?

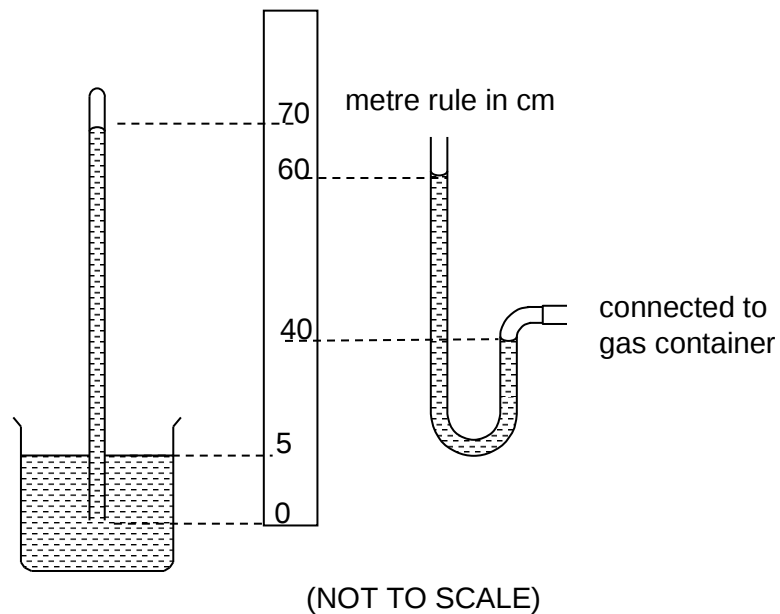
- A** The distance moved by piston P is smaller than the distance moved by piston Q.
 - B** The force F is greater than the weight of the load.
 - C** The pressure on piston P is greater than the pressure on piston Q.
 - D** The work done by force F is equal to the work done against the weight of the load.
- 11 A full bottle of water has a mass of 150 g. When the bottle is filled up with an unknown liquid, its mass is 50 g. The mass of the empty bottle is 20 g. The density of water is 1.0 g/cm^3 .

What is the density of the unknown liquid?

- A** 0.23 g/cm^3
- B** 0.33 g/cm^3
- C** 3.00 g/cm^3
- D** 4.33 g/cm^3

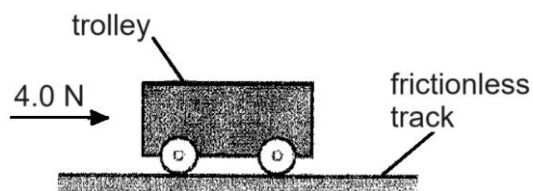
- 12** A mercury barometer and a mercury manometer are placed in the same room which is on a hilltop. The manometer is connected to a gas container.

The density of mercury is 13600 kg/m^3 . The gravitational field strength g is 10 N/kg .

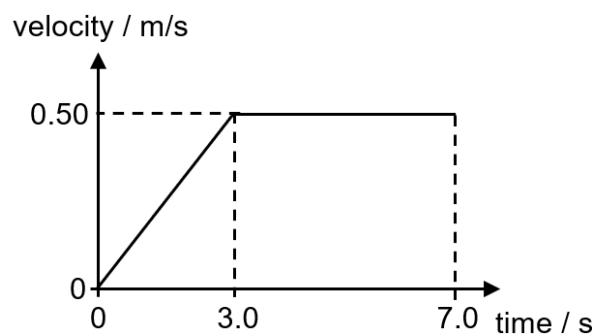


What is the pressure of the gas in the gas container?

- A** 27200 Pa **B** 61200 Pa **C** 88400 Pa **D** 116000 Pa
- 13** A trolley is pushed with a force of 4.0 N for 3.0 s along a frictionless track.



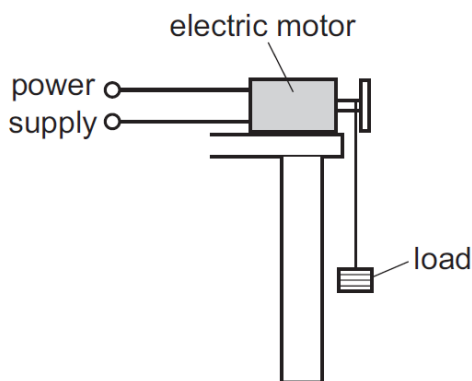
The graph shows the velocity of the trolley against time.



What is the work done by the force on the trolley?

- A** 0.75 J **B** 3.0 J **C** 8.0 J **D** 11.0 J

- 14 An electric motor is used to lift a load at a constant speed.



The gravitational potential energy store (GPE) in the load increases.

The moving load also has energy in the kinetic store (KE).

Which expression is used to calculate the efficiency of the motor when the load is being lifted at a constant rate?

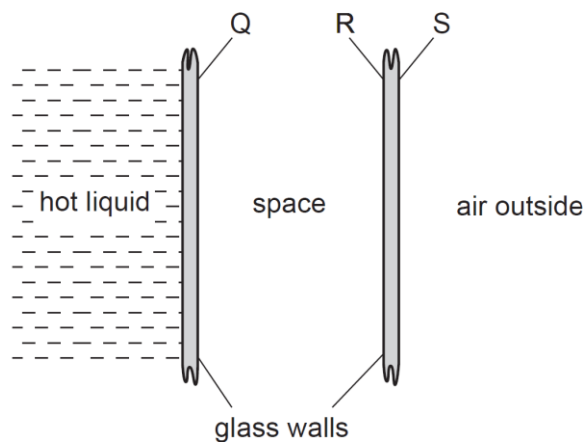
- A $\text{efficiency} = \frac{\text{GPE gained per second}}{\text{KE gained per second}}$
- B $\text{efficiency} = \frac{\text{GPE gained per second}}{\text{power supplied}}$
- C $\text{efficiency} = \frac{\text{power supplied}}{\text{GPE gained per second}}$
- D $\text{efficiency} = \frac{\text{power supplied}}{\text{KE gained per second}}$

- 15 Brownian motion is often demonstrated by viewing illuminated smoke particles contained in a sealed transparent cell through a low power microscope.

Which statement is **not** correct?

- A Air molecules are too tiny to be observed through the microscope.
- B Small specks of light are seen moving about in a random motion.
- C The observed motion is caused by random motion of the smoke particles.
- D The speed of the observed motion would decrease if the temperature drops.

- 16 Which statement describes the mechanism that allows a metallic conductor to conduct heat quickly?
- A The atoms near the hot end are vibrating more vigorously about their fixed positions and transferring their energy to neighbouring atoms located in cooler regions by knocking against them.
 - B The diffusion of atoms in the conductor from the hot end to the cold end.
 - C The diffusion of free electrons from the hotter end to the cooler end of the conductor, carrying their energy along with them.
 - D The free electrons near the hotter end emit energy to the atoms near the cold end.
- 17 A student uses a double-walled glass vessel to contain a hot liquid.



What reduces the heat loss by radiation?

- A a vacuum in the space between the walls
- B painting surface Q black
- C painting surface R black
- D painting surface S silver

- 18 Pot X and pot Y are both in a cool room.

Pot X contains hot water below its boiling point.

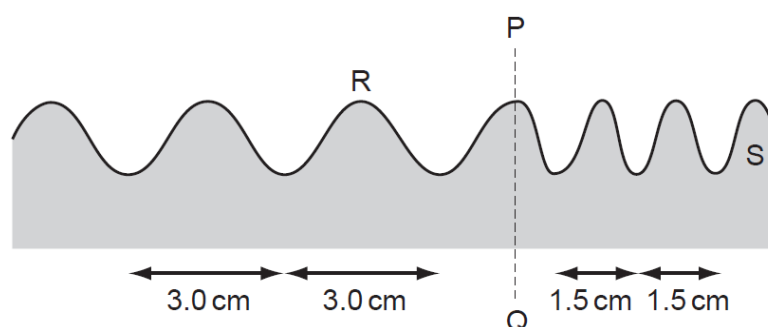
Pot Y is identical to pot X but contains water that is kept boiling by a hotplate underneath it.



What happens to the average kinetic energy of the particles in the liquid water in pot X and to the average kinetic energy of the particles in the liquid water in pot Y?

	kinetic energy of liquid particles in X	kinetic energy of liquid particles in Y
A	decreases	does not change
B	decreases	increases
C	stays the same	does not change
D	stays the same	increases

- 19 The diagram shows a water wave in a ripple tank.

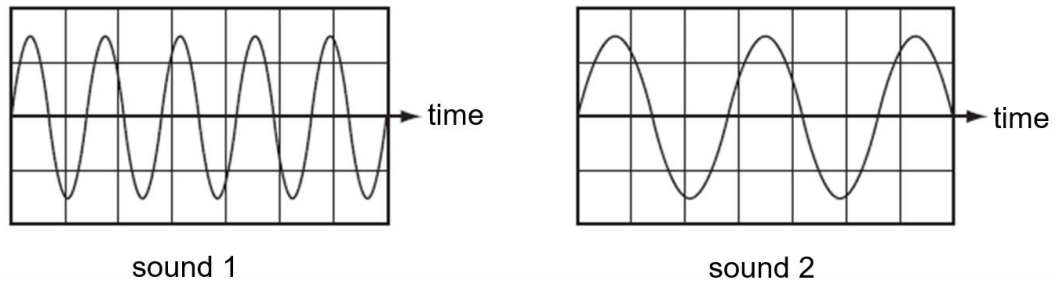


The wave has a speed of 12 cm/s at R. The wave crosses a boundary PQ where the distance between crests changes from 3.0 cm to 1.5 cm.

What is the velocity of the wave at point S?

- A** 3.0 cm/s **B** 6.0 cm/s **C** 12 cm/s **D** 24 cm/s

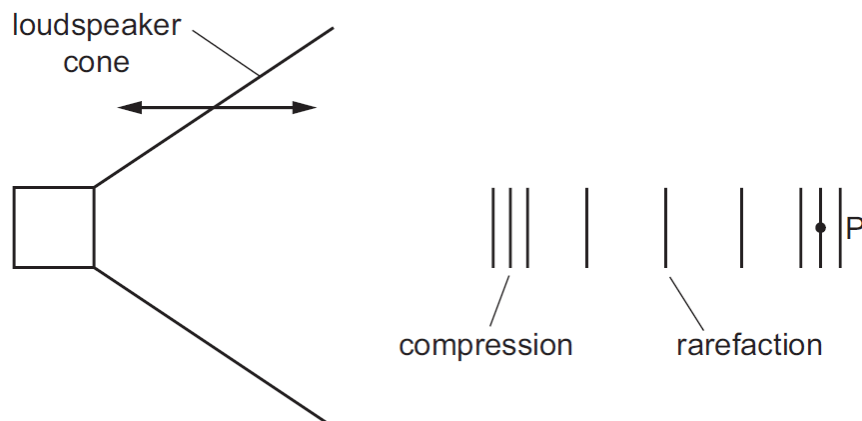
- 20 The diagrams show the waveforms of two different sounds. The scales are the same in each diagram.



How does sound 2 compare with sound 1, in terms of loudness and pitch?

	loudness	pitch
A	equal	equal
B	equal	lower
C	equal	higher
D	lower	higher

- 21 A loudspeaker cone vibrates backward and forward at a frequency of 50 Hz to produce compressions and rarefactions in the air.

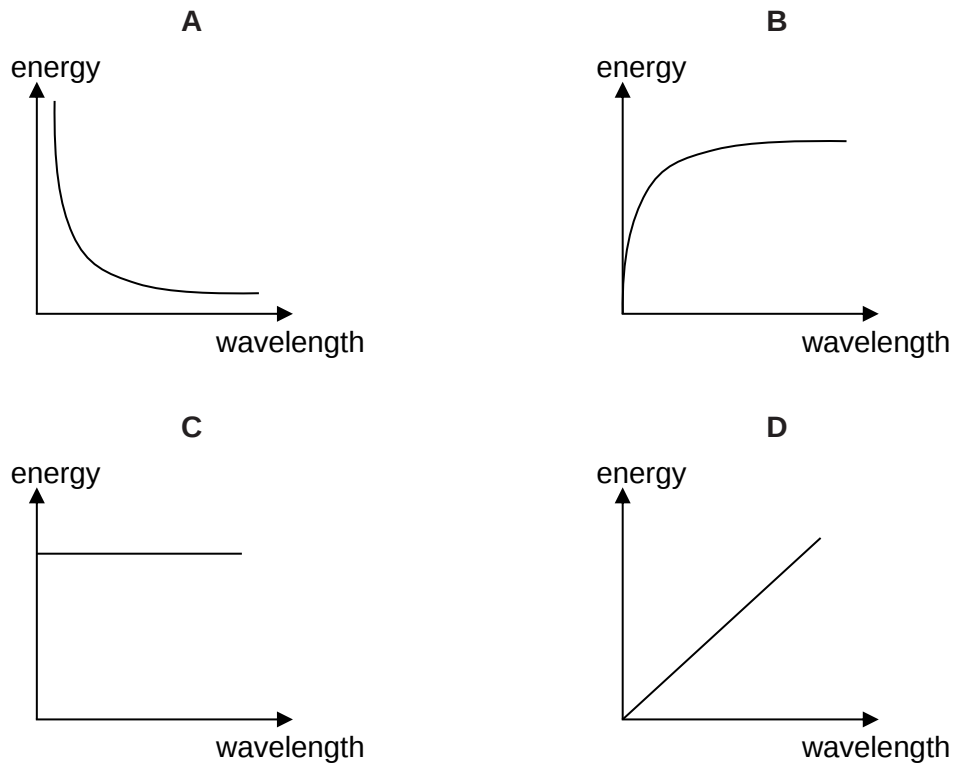


After some time, a compression reaches point P.

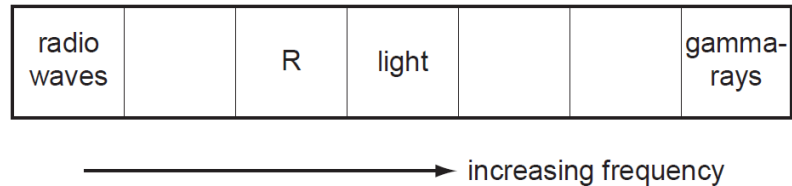
How long does it take for the next rarefaction to arrive at P?

- A** 0.010 s **B** 0.020 s **C** 25 s **D** 50 s

- 22 Which graph shows the relationship between the energy and the wavelength of the electromagnetic waves?



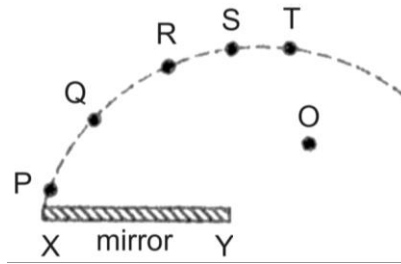
- 23 The diagram shows the main sections of the electromagnetic spectrum in order of increasing frequency. Some of the sections are labelled.



Which application uses the section R?

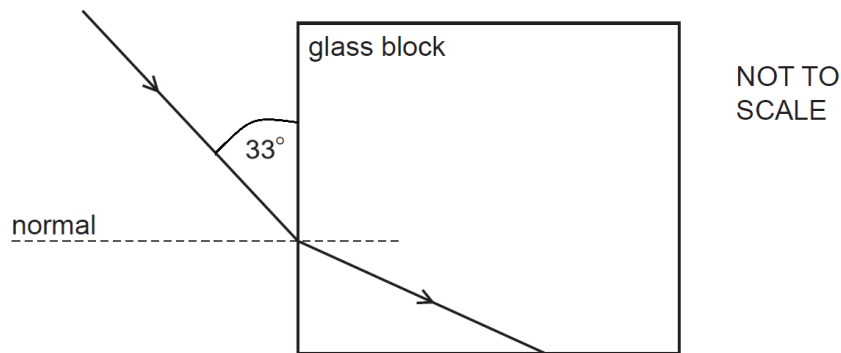
- A** artificial tanning in sunbeds
- B** satellite television
- C** sterilisation
- D** television remote controller

- 24 The diagram shows an object O placed in front of a mirror XY.



Between which positions will the observer see the image of the object?

- A P and Q B Q and R C R and S D S and T
- 25 Light passes from air into a glass block of refractive index 1.5, as shown.

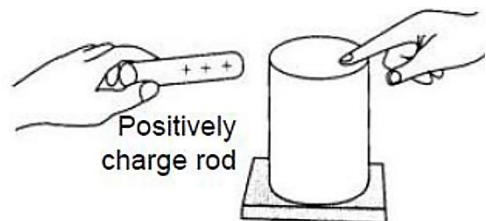


What is the angle of refraction in the glass and what is the critical angle?

	angle of refraction	critical angle
A	34°	42°
B	34°	60°
C	38°	42°
D	38°	60°

- 26 A student tries to charge a metal cylinder by following the sequence below:

- I. Bring a positively charge rod near the cylinder.
- II. Touch the cylinder with a finger.
- III. Remove the rod.
- IV. Remove the finger.



What is the effect on the cylinder after this process?

- A It becomes negatively charged.
 B It becomes negatively charged on one side and positively charged on the other side.
 C It becomes positively charged.
 D It becomes uncharged.

- 27** The potential difference across a $10\ \Omega$ resistor is $5.0\ \text{V}$.

How much charge passes through the $10\ \Omega$ resistor in 0.50 minute?

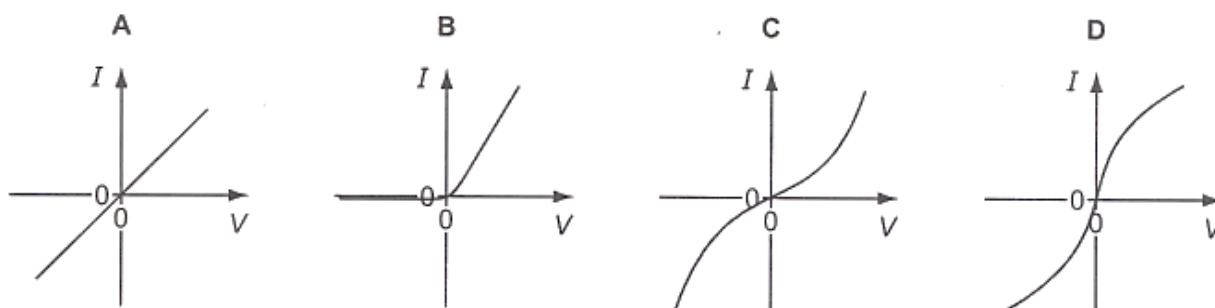
- A** 0.25 C **B** 1.0 C **C** 15 C **D** 60 C

- 28** A 1.0 m long wire has a cross-sectional diameter of 1.0 mm and a resistance of $16\ \Omega$.

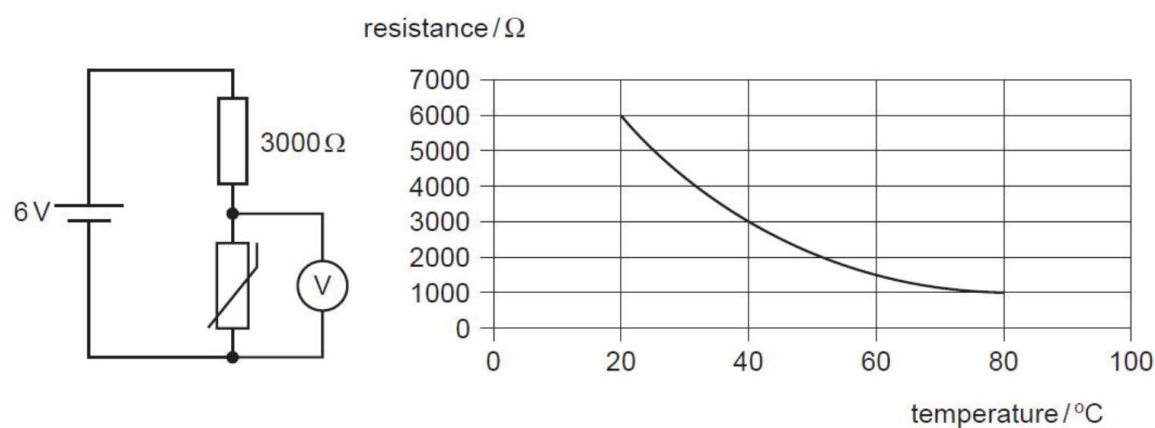
What is the resistance of another wire of the same material which is 4.0 m long and has a cross-sectional diameter of 2.0 mm?

- A** $4.0\ \Omega$ **B** $8.0\ \Omega$ **C** $16\ \Omega$ **D** $32\ \Omega$

- 29** Which graph shows the I - V characteristic for a filament lamp?



- 30** A thermistor is connected in a circuit with a 6 V cell, a 3000 Ω resistor and a voltmeter, as shown. The graph shows how the resistance of the thermistor varies with temperature.

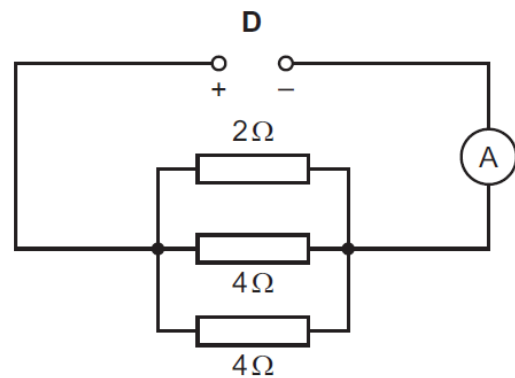
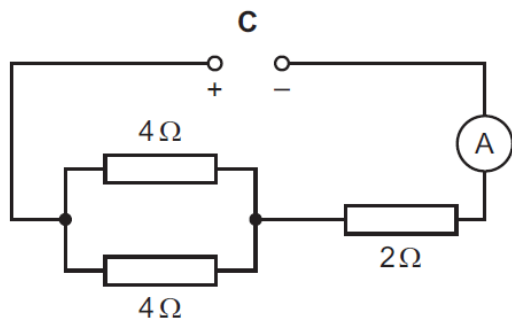
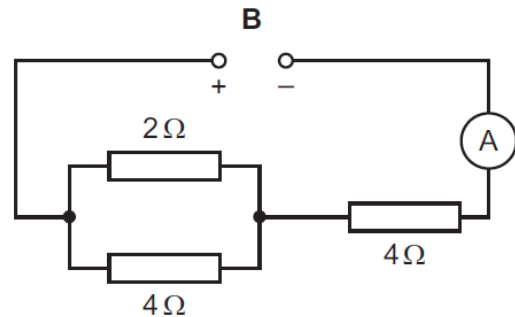
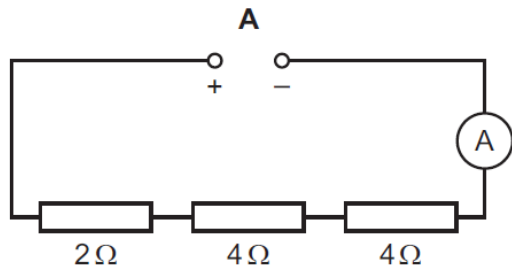


What is the temperature of the thermistor when the voltmeter reads 2 V?

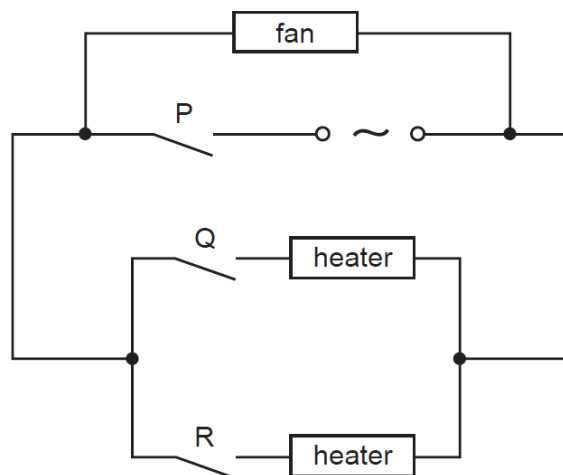
- A** 20 °C **B** 40 °C **C** 60 °C **D** 80 °C

- 31 An ammeter is connected to three resistors and a power supply.

Which arrangement of resistors gives the greatest ammeter reading?



- 32 The diagram shows the circuit for a hair-dryer.



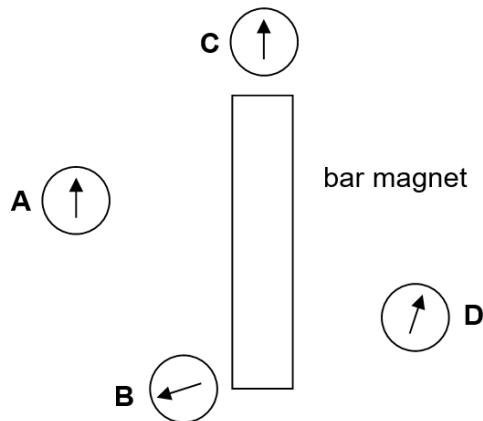
The fan has a power rating of 0.10 kW and the heaters each have a rating of 0.40 kW. The cost of electricity is 8.0 cents/kWh.

What is the cost of running the dryer for two hours with switches P and Q closed and switch R open?

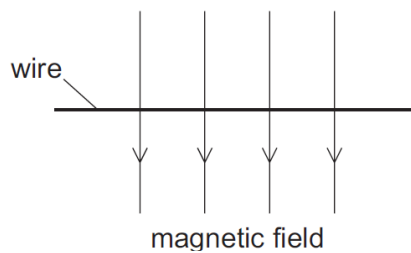
- A** 1.6 cents **B** 3.2 cents **C** 6.4 cents **D** 8.0 cents

- 33 Four magnetic compasses are placed near a bar magnet as shown in the diagram below.

Which compass is faulty?



- 34 A wire is placed at right angles to a uniform magnetic field.



There is a current in the wire and it experiences a force.

Beams of alpha-particles, beta-particles and neutrons are fired into the magnetic field in the same direction as the conventional current in the wire.

Which beams experience a force that is initially in the same direction as the force experienced by the current-carrying wire?

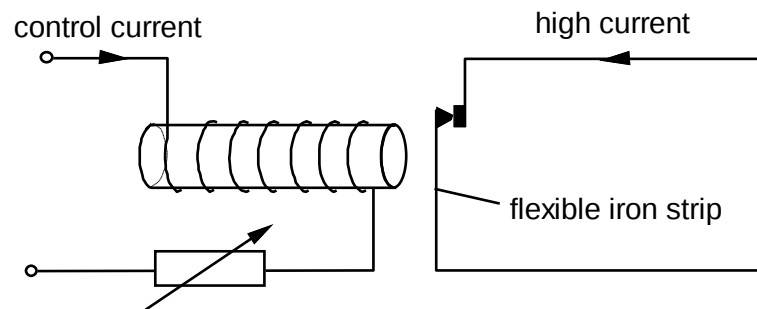
key:

✓ = beam experiences a force in the same direction

✗ = beam does not experience a force in the same direction

	alpha-particles	beta-particles	neutrons
A	✓	✗	✓
B	✓	✗	✗
C	✗	✓	✓
D	✗	✓	✗

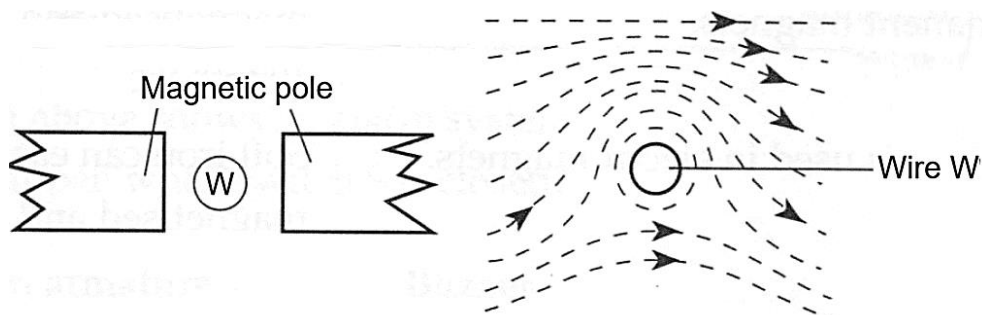
- 35 An iron-core electromagnet is to be used in a simple relay to switch off a high current by attracting a flexible iron strip as shown in the diagram below.



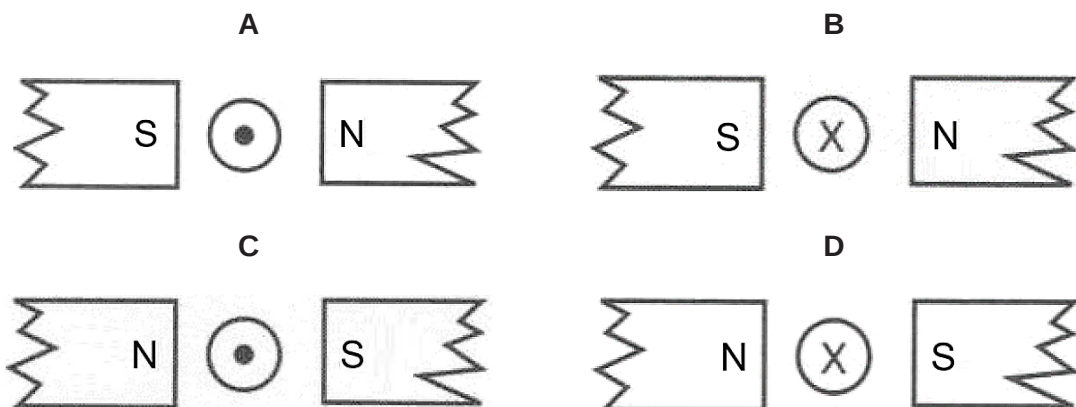
During a trial, it is found that the relay does not operate when the control current is switched on.

Which change might make it work?

- A decreasing the number of coils on the electromagnet
 - B lowering the resistance in the variable resistor
 - C replacing the iron-core with a steel-core
 - D reversing the direction of the control current
- 36 A long straight wire W is placed between the poles of two magnets. The pattern of the magnetic field produced is as shown below.



Which arrangement will give rise to the pattern of magnetic field observed?



- 37** The output of an a.c. generator is connected to a lamp.

The coil of the generator is rotated at a constant rate which makes the lamp flash twice every second.

The coil is then rotated at twice the rate of rotation.

What happens to the maximum brightness of the lamp and how many times does the lamp flash every second?

	brightness	number of flashes every second
A	does not change	1
B	does not change	4
C	increases	1
D	increases	4

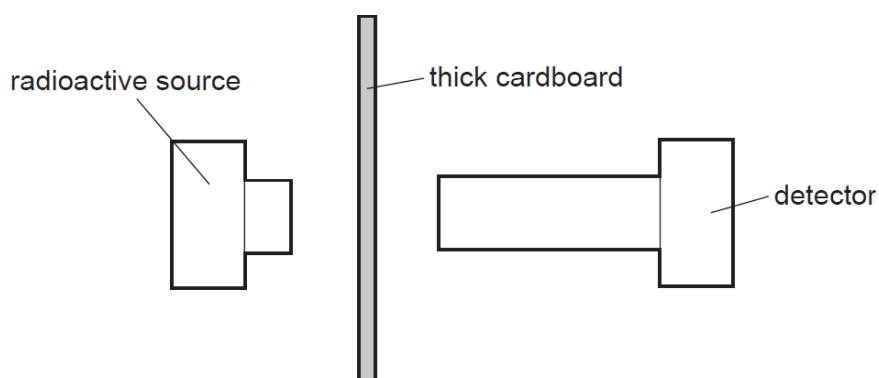
- 38** For every 10 kW of power transmission, 4.0 kW is dissipated as heat along the transmission wire.

Given that the total resistance of the transmission wire is 10 M Ω , what is the potential difference across the live and neutral wires?

- A** 400 kV **B** 500 kV **C** 600 kV **D** 1000 kV

- 39** A student investigates a radioactive source that emits only alpha-particles. Without any source nearby, the detector shows a low reading.

The source and thick cardboard are placed near the detector, as shown.



What is the reading on the detector now, and why?

	detector reading	reason
A	high	some alpha-particles pass through cardboard
B	low	background radiation is detected
C	zero	all the radiation is absorbed by the cardboard
D	zero	alpha-particles are all absorbed by the cardboard

40 Which row is correct for nuclear fission and for nuclear fusion?

	fission	fusion
A	produces larger nuclei	is the energy source of a star
B	produces larger nuclei	releases energy in a power station
C	produces smaller nuclei	is the energy source of a star
D	produces smaller nuclei	releases energy in a power station