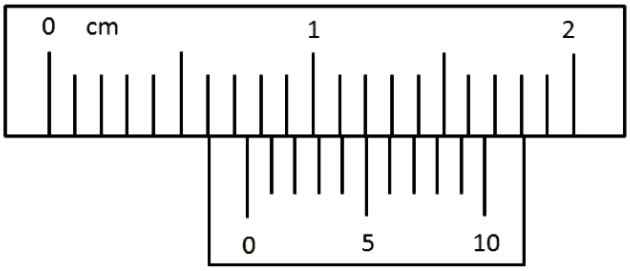
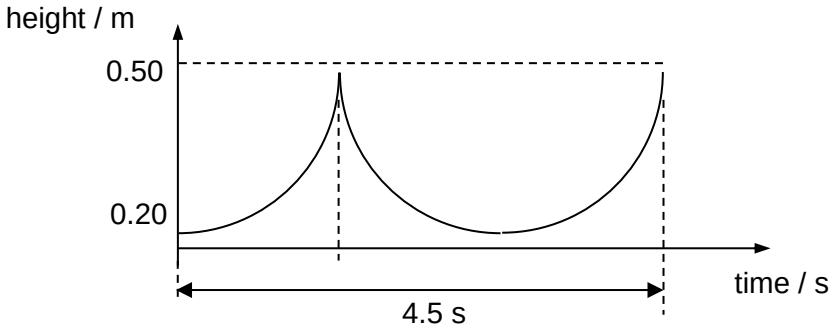
1 A pair of vernier calipers is used to measure the radius of a button battery.



What is the radius of the button battery?

A 0.62 cm **B** 0.65 cm **C** 0.72 cm **D** 0.75 cm

2 The graph below shows how the height of a swinging pendulum bob changes with time.



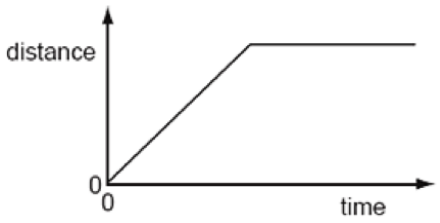
What is the period of the oscillation?

A 1.5 s **B** 3.0 s **C** 4.5 s **D** 6.0 s

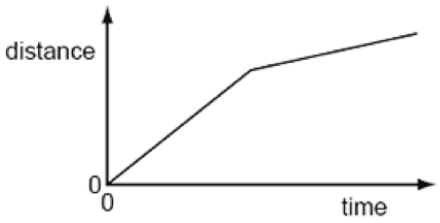
3 Alex is jogging at constant speed beside a road. He sees the traffic lights in front of him turn amber, so he begins to jog at a lower constant speed.

Which distance-time graph illustrates Alex's motion?

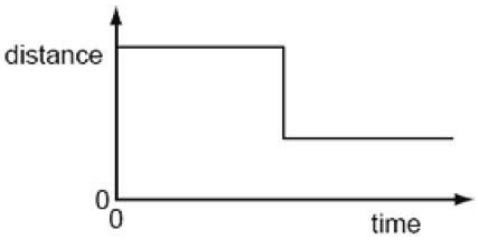
A



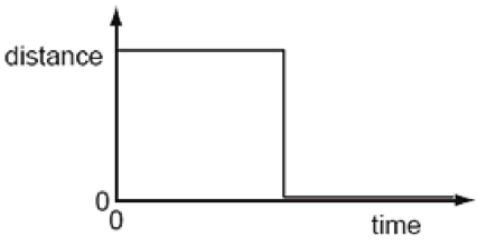
B



C



D



4 The acceleration of free fall on a particular planet is 8.0 m s^{-2}. An object was dropped from rest and hit the ground after 1.5 s. Air resistance is negligible.

From what height was the object dropped?

A 6.0 m **B** 9.0 m **C** 12 m **D** 18 m

5 A rubber ducky is released from the bottom of a pool of water. Almost immediately, it rises at a constant speed to reach the surface of the water.

Which of the following best describes the resultant force acting on the rubber ducky?

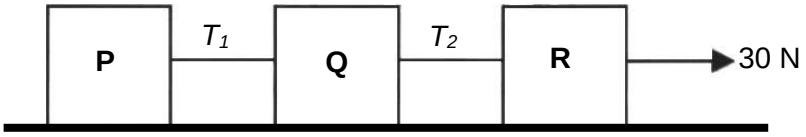
A zero

B upwards and equal to the rubber ducky's weight

C upwards and greater than the rubber ducky's weight

D upwards and less than the rubber ducky's weight

6 **P**, **Q** and **R** are three identical blocks resting on a smooth surface. The blocks are connected by inelastic strings and a force of 30 N is applied on the right side of block **R**.



What are the tensions T_1, between blocks **P** and **Q**, and T_2, between blocks **Q** and **R**, in the strings?

	T_1	T_2
A	15 N	15 N
B	30 N	30 N
C	10 N	20 N
D	7.5 N	15 N

7 When a balloon is released, it rises in the air. It will eventually stop rising once it reaches a certain height *H* from the ground.

Why is this so?

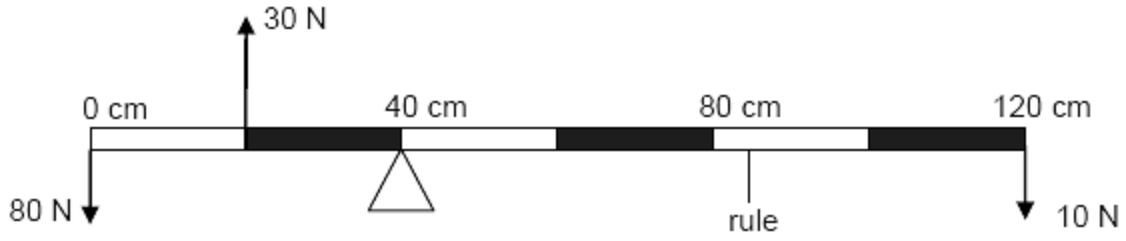
A The density of the air in the balloon is the same as the density of the atmosphere at *H*.

B The gravitational force acting on the balloon is stronger at *H* than at sea level.

C The normal contact force on the balloon becomes zero.

D The size of the balloon decreases due to a decrease in its weight.

8 Rachael pivots a 120 cm rod of negligible mass at the 40 cm mark. She then applies two weights and a spring at three positions of the rod.



What is the resultant moment acting on the rod?

A 8 Nm anti-clockwise

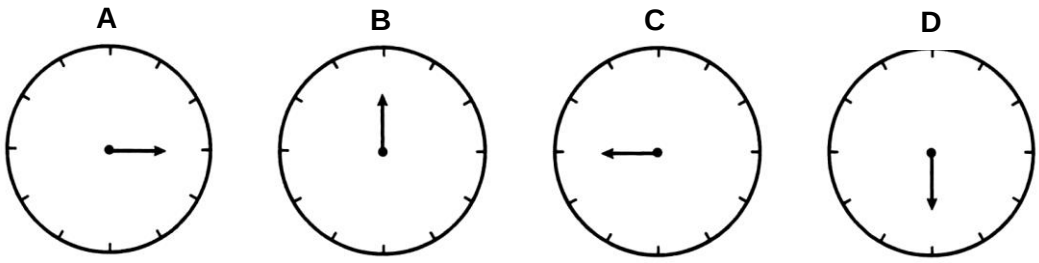
B 14 Nm clockwise

C 18 Nm anti-clockwise

D 32 Nm clockwise

9 The diagrams below show four pointers attached freely to the centre of a circular board at different orientations.

Which board has its pointer in stable equilibrium?



10 When a force of 5.0 N is exerted on an object, the object moves at a constant speed of 0.20 m s^{-1} for 50 m.

What is the power exerted on the object?

A 1.0 W **B** 50 W **C** 250 W **D** 1250 W

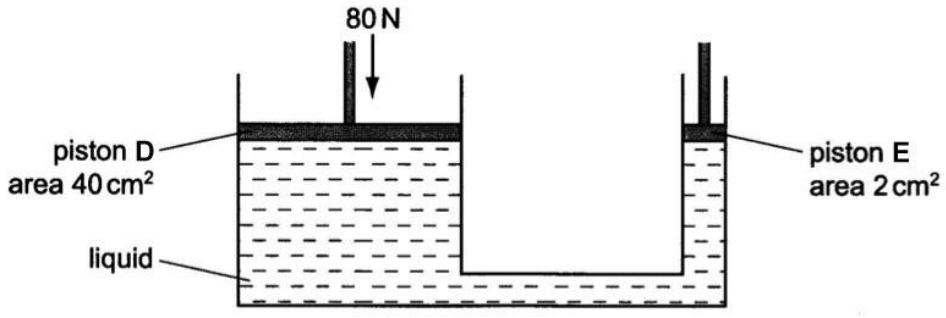
11 A ball of mass 2 kg is dropped from rest and falls freely from a height of 40 m.
At a particular instant, the speed of the ball is 10 m s^{-1}.
Take gravitational field strength as 10 N kg^{-1}.

What is the height of the ball from the ground at this instant?

A 5 m **B** 20 m **C** 30 m **D** 35 m

12 A forklift is used in a supermarket to move heavy groceries. There is a hydraulic system in the forklift, in which the hydraulic liquid is *incompressible*.

A mover needs to apply a downward force at piston E (foot pedal) to lift groceries on piston D (fork).



What is the downward force needed at piston E to lift a 80 N sack of potatoes on piston D?

A 1 N **B** 4 N **C** 80 N **D** 1600 N

13 **Fig. 13.1** shows a closed J-tube trapping 5.0 cm^3 of air with some mercury.
Fig. 13.2 shows the J-tube after more mercury is poured in until the mercury levels differ by 76 cm.

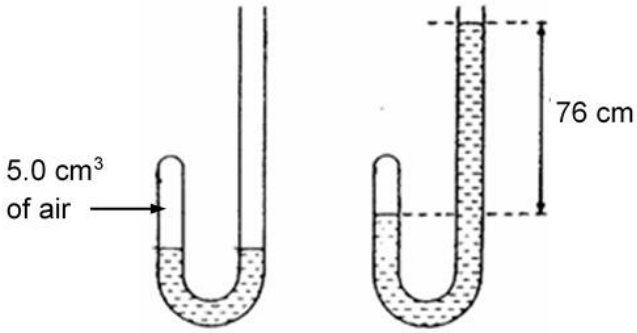


Fig. 13.1 **Fig. 13.2**

What is the volume of trapped air in **Fig. 13.2** if the atmospheric pressure is 76 cm Hg?

A 0.4 cm^3 **B** 2.5 cm^3 **C** 5.0 cm^3 **D** 10.0 cm^3

14 The Brownian motion of smoke particles is caused by

A collisions between air molecules.

B collisions between smoke particles.

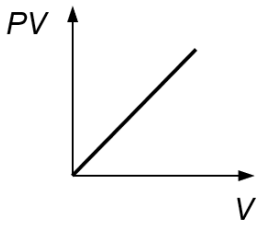
C collisions between smoke particles and air molecules.

D convection currents in the air.

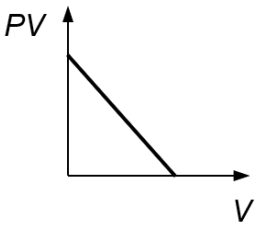
15 An experiment is conducted to determine the relationship between the volume *V* of a fixed mass of gas and the gas pressure *P* in a closed container. Temperature of the gas is kept constant.

Which *PV* against *V* graph is correct?

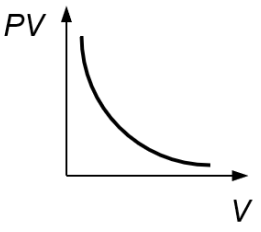
A



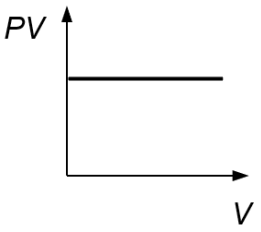
B



C



D



16 A man stands beside a campfire and feels warm immediately.

How does thermal energy from the campfire reach the man?

A by convection

B by conduction and convection

C by radiation

D by conduction and radiation

17 Which statement is **not** true about boiling and evaporation?

A Boiling is a fast process while evaporation is a slow process.

B Boiling happens throughout the liquid while evaporation happens at the surface.

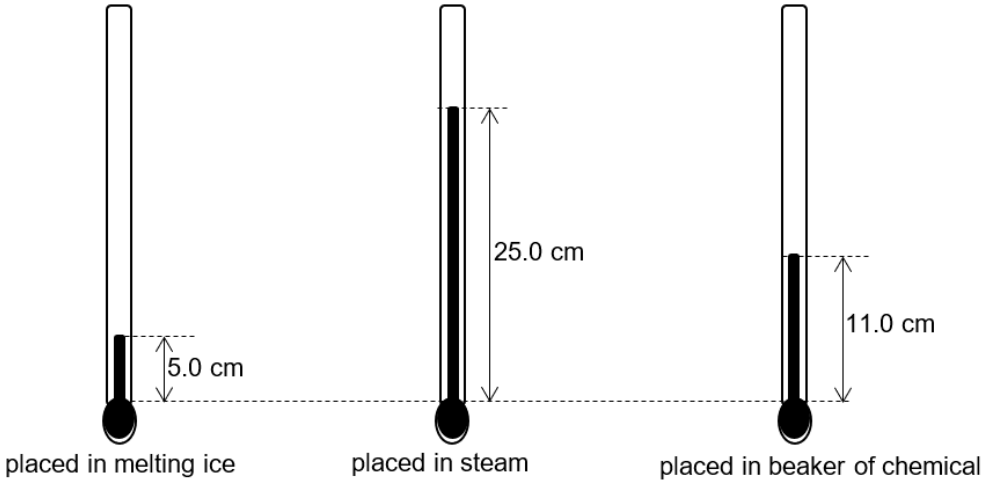
C Boiling occurs at 100 °C while evaporation happens at any temperature between 0 °C to 100 °C.

D In boiling, the average internal energy of the liquid increases while in evaporation, the average internal energy of the liquid decreases.

18 What is the temperature difference between the melting point of ice and boiling point of water?

A 100 K **B** 173 K **C** 273 K **D** 373 K

19 Ben found an old thermometer where the markings for the reading have faded. He placed it in melting ice and found the length of the mercury thread to be 5.0 cm. He then placed it in steam and the length of the mercury thread was 25.0 cm. Lastly, he placed it in a beaker of chemical and the length of the mercury thread was 11.0 cm.



What is the temperature of the chemical?

A 24 °C **B** 30 °C **C** 44 °C **D** 55 °C

20 In general, coastal areas experience smaller changes in temperature as compared to inland areas.

This is because of the

A high heat capacity of water.

B high specific latent heat of fusion of water.

C low specific latent heat of vaporisation of water.

D low thermal conductivity of water.

21 A lump of ice is put inside a glass of water.
The ice has mass 100 g and temperature -10 ^{o}C.
The water has mass 240 g and temperature 60 ^{o}C.

specific heat capacity of ice = 2100 J / kg.^{o}C

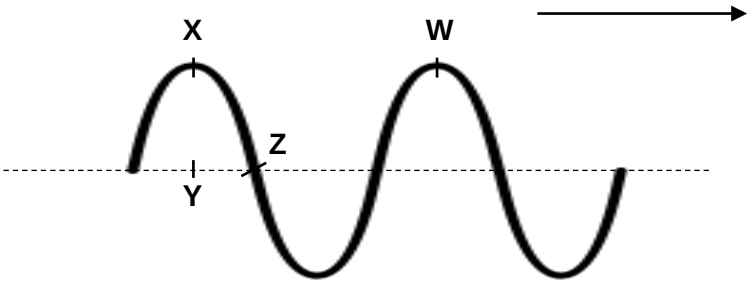
specific heat capacity of water = 4200 J / kg.^{o}C

specific latent heat of fusion of ice = 0.336 MJ / kg

What is the lowest possible temperature of the remaining water?

A 17.3 ^{o}C **B** 18.8 ^{o}C **C** 24.6 ^{o}C **D** 59.0 ^{o}C

22 A water wave is travelling towards the right.



Which of the following is/are correct?

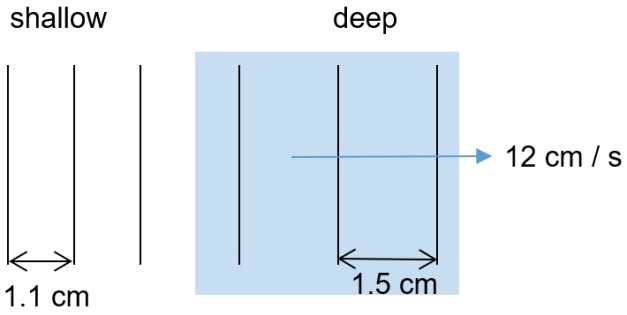
1 Amplitude of the wave is represented by the distance **XY**.

2 Particle at **X** will move to **Z** after a quarter of a period.

3 Wavelength of the wave is represented by the distance **XW**.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 3 only

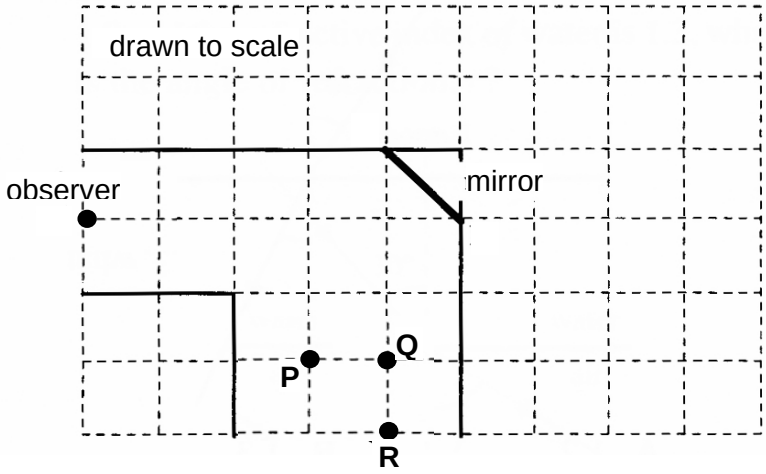
23 A ripple tank is used to demonstrate refraction of plane water waves.
Waves in shallow water have a wavelength of 1.1 cm.
Waves in deeper water have a wavelength of 1.5 cm and a speed of 12 cm s^{-1}.



What is the speed of the waves in the shallow water?

A 7.3 cm s^{-1} **B** 8.8 cm s^{-1} **C** 16 cm s^{-1} **D** 20 cm s^{-1}

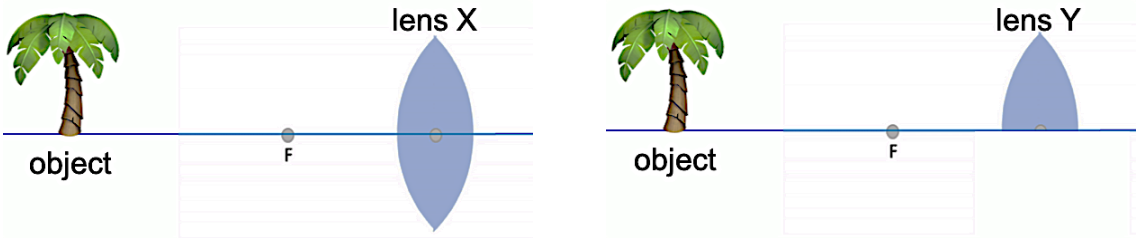
24 A plane mirror is placed at a tight and sharp turn leading to a lift lobby.



Who can the observer see in the plane mirror?

A **P** only **B** **P** and **Q** only **C** **Q** and **R** only **D** **P**, **Q** and **R**

25 Two different lenses are used to capture the image of an object.



Which row describes the characteristics of these images?

	image from **lens X**	image from **lens Y**
A	brighter	dimmer
B	magnified	diminished
C	upright	inverted
D	further from lens	nearer to lens

26 Four components of the electromagnetic spectrum are listed in order.

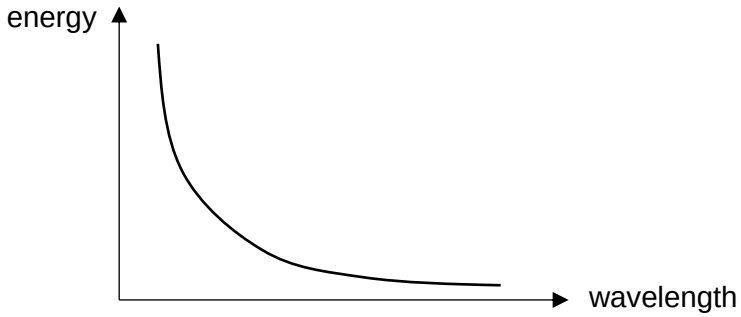
X-ray	visible light	**Z**	radio wave

Which is a possible application of **Z**?

A bone and dental inspection **B** cancer treatment

C forgery detection of currency notes **D** intruder alarm

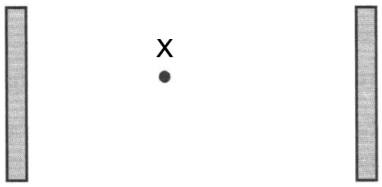
27 The diagram shows the relationship between the energy and the wavelength of the electromagnetic waves.



Which electromagnetic wave has the highest energy?

A infra-red **B** microwave **C** ultraviolet **D** visible light

28 A man who is standing at a point **X** between two parallel walls fires a starting pistol. He hears the first echo after 0.6 s and second echo after 0.8 s.



How long after firing the pistol will he hear the third echo?

A 1.2 s **B** 1.4 s **C** 1.6 s **D** 2.4 s

29 A ringing alarm bell is placed inside a bell jar and air is slowly pumped out of the jar.

Which statement explains what happens next?

A The volume of the ringing increases as there is more space for the sound to travel out from.

B The volume of the ringing decreases as there is lesser medium for the sound to travel through.

C The pitch of the ringing increases as the air molecules can move further before colliding with another air molecule.

D The pitch of the ringing decreases as the air molecules are further apart.

30 In which order should the steps be carried out to charge an uncharged metal ball by using a charged glass rod?

1 bring the charged glass rod towards the uncharged metal ball

2 earth the metal ball

3 remove the earthing

4 remove the glass rod

A 1 → 2 → 3 → 4 **B** 1 → 2 → 4 → 3

C 1 → 4 → 2 → 3 **D** 2 → 1 → 4 → 3

31 A battery from a mobile phone is rated at “3200 mAh”.

Which physical quantity is “mAh” related to and which is an equivalent representation of “3200 mAh”?

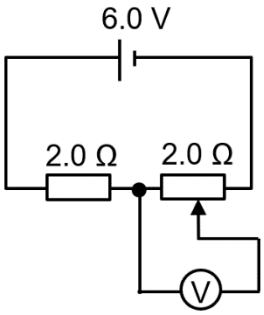
	physical quantity	equivalent representation
A	charge	3.2 C
B	charge	11520 C
C	energy	3.2 J
D	energy	11520 J

32 A resistor with resistance R is made from a length L of resistance wire, with a cross-sectional area A.
A second resistor with resistance 3R is made from the same material, with a cross-sectional area of 4A.

What is the length of the resistance wire for the second resistor?

A 0.75 L **B** 1.3 L **C** 7 L **D** 12 L

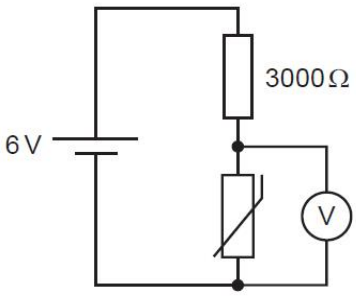
33 The diagram below shows a circuit with a potential divider.

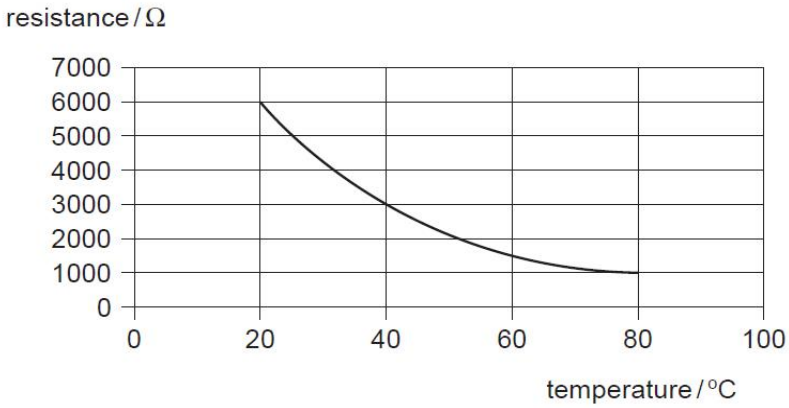


What are the minimum and maximum readings of the voltmeter when the potential divider is adjusted?

	minimum reading / V	maximum reading / V
A	0.0	3.0
B	0.0	6.0
C	2.0	4.0
D	3.0	6.0

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

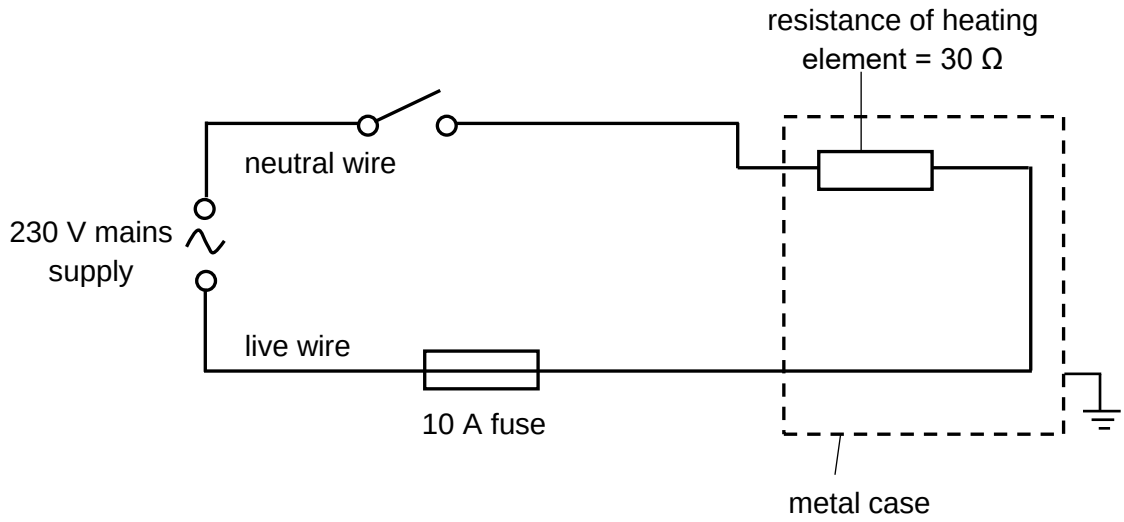




What is the temperature of the thermistor when the voltmeter reads 1.5 V?

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

35 The diagram shows the circuit formed when a rice-cooker is plugged into a mains socket.



What is the fault in this circuit arrangement?

A The earth wire is connected wrongly.

B The fuse is connected to the wrong wire.

C The fuse rating is too low.

D The switch is connected to the wrong wire.

36 **Fig. 36.1** shows the deflection of a compass needle when placed at end **X** of bar **P**.

Fig. 36.2 shows the deflection of the compass needle when magnet **Q** is placed at end **Y** of bar **P**.

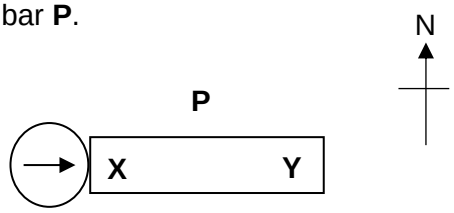


Fig. 36.1

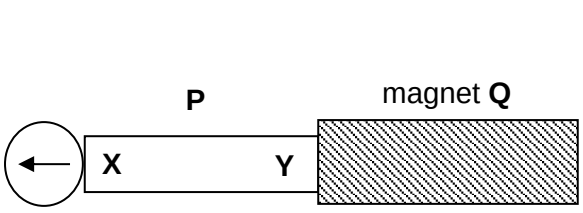


Fig. 36.2

What can be deduced about the bar **P**?

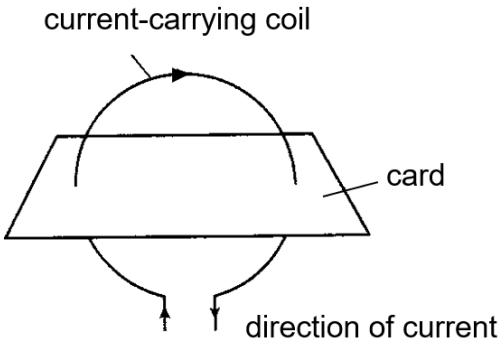
A It is a bar of aluminium.

B It is a bar of iron.

C It is a magnet with end **X** as its North pole.

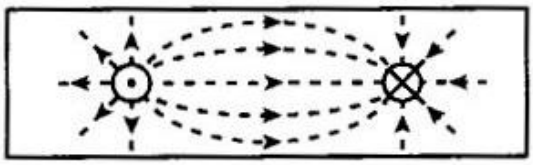
D It is a magnet with end **X** as its South pole.

37 The diagram shows a coil which carries a current. Iron filings are sprinkled onto the card to trace the pattern of the induced magnetic field.

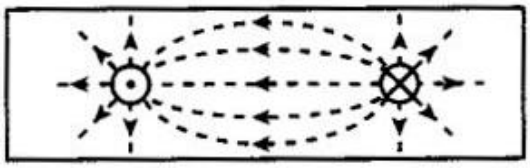


Which is the pattern of the induced magnetic field as viewed from the top of the card?

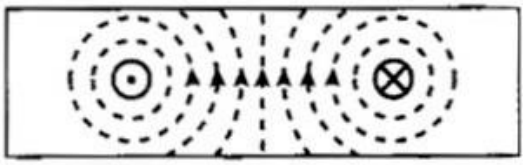
A



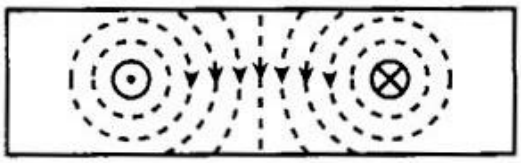
B



C



D



38 Which change does **not** affect the magnitude of induced e.m.f in a simple a.c. generator?

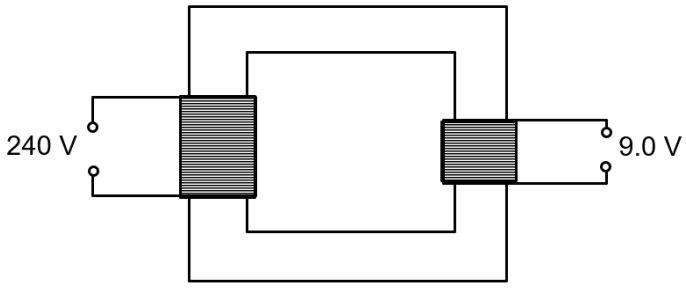
A distance between magnet and rectangular coil

B number of turns of coil per unit length of the rectangular coil

C resistance of the rectangular coil

D speed of rotation of the rectangular coil

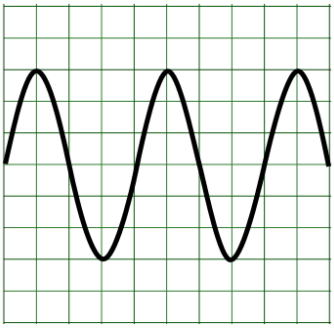
39 An ideal transformer is connected between a mains supply of 240 V and a computer speaker. The speaker has a resistance of 6.0 Ω and receives an output voltage of 9.0 V from the transformer.



What current is drawn from the mains supply?

A 0.025 A **B** 0.056 A **C** 1.5 A **D** 16 A

40 The diagram below shows the display screen of cathode-ray oscilloscope (c.r.o.). It is connected to a 24 V alternating supply with a frequency of 50 Hz.



What is the Y-gain and time-base setting of the c.r.o.?

	Y-gain	time-base setting
A	4 V / div	2 ms / div
B	4 V / div	5 ms / div
C	8 V / div	2 ms / div
D	8 V / div	5 ms / div

*************End of Paper************