

Index No.



FUHUA SECONDARY SCHOOL

Secondary Four Express

Preliminary Examination 2022

4E

[illegible]

PHYSICS

6091/01

Paper 1

30 Aug 2022
0800 – 0900
1 hour

Additional Material: Optical Mark Recognition (OMR)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class, index number on the OMR and this question booklet.

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 OMR.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done on this paper.

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

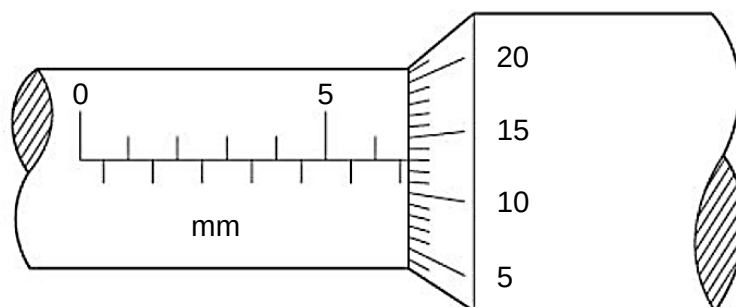
PARENT'S SIGNATURE	FOR EXAMINER'S USE	
		40

Setter: Mr Raymond Loh

Vetter: Mrs Wong Kexin

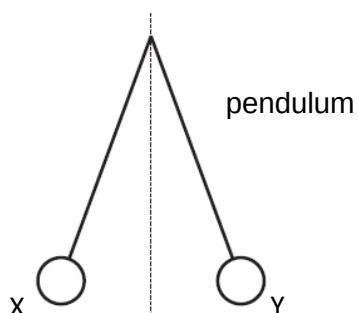
This question paper consists of 15 printed pages including this page.

- 1 The diagram shows a micrometer screw gauge.



What is the reading shown?

- A** 5.63 mm **B** 6.50 mm **C** 6.63 mm **D** 7.13 mm
- 2 The diagram shows a frictionless pendulum swinging between points X and Y at a frequency of 2.0 Hz.



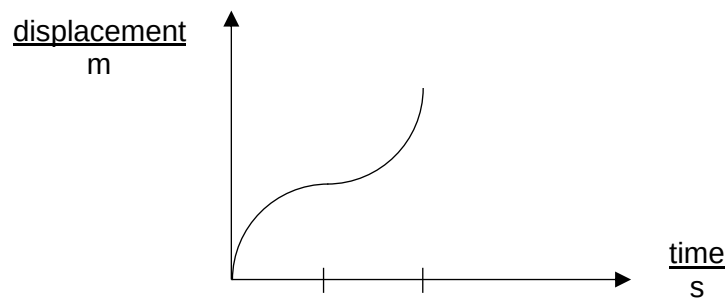
How long does it take for the bob to swing from X to Y?

- A** 0.25 s **B** 0.50 s **C** 1.0 s **D** 2.0 s
- 3 A parachutist falling at a steady speed opens his parachute.

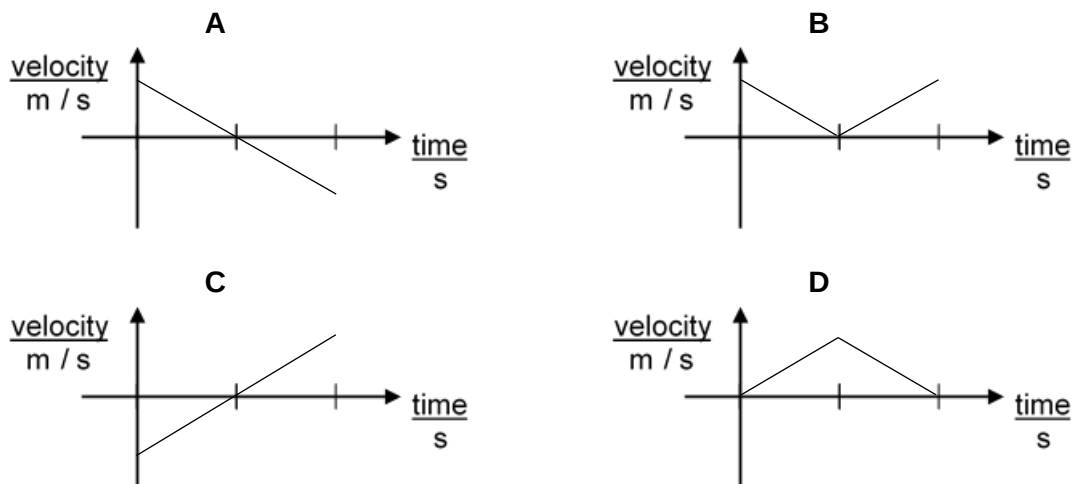
Which row gives the direction of the resultant force and the direction of the acceleration of the parachutist just after his parachute opens?

	direction of the resultant force	direction of the acceleration
A	downwards	upwards
B	downwards	downwards
C	upwards	upwards
D	upwards	downwards

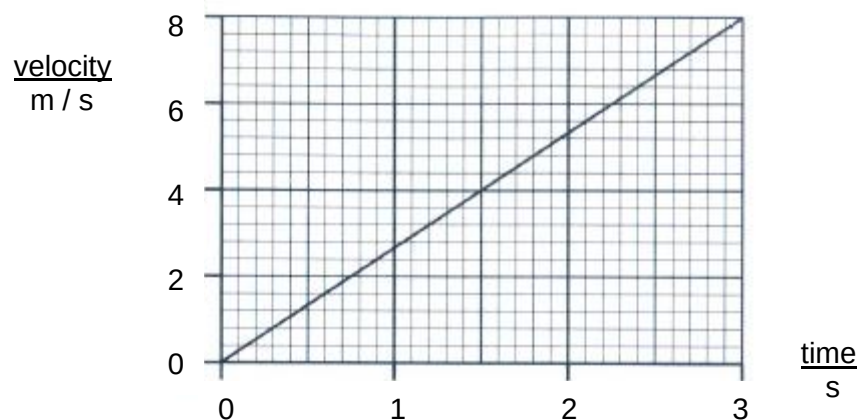
- 4 The graph shows how the displacement of an object changes with time.



Which graph represents the velocity-time graph of the object?



- 5 The graph shows how the velocity of a model car travelling on a flat surface varies with time.

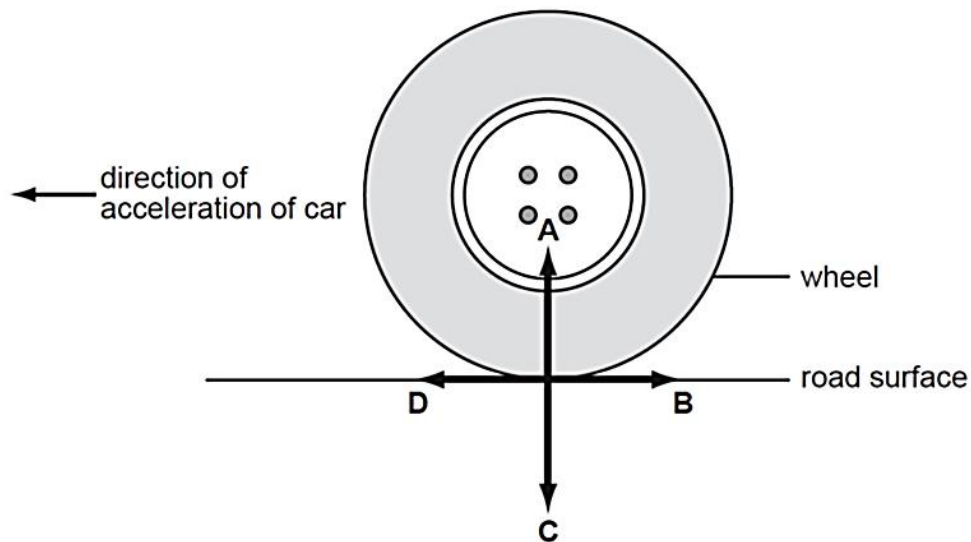


Which statement about the model car is **not** correct?

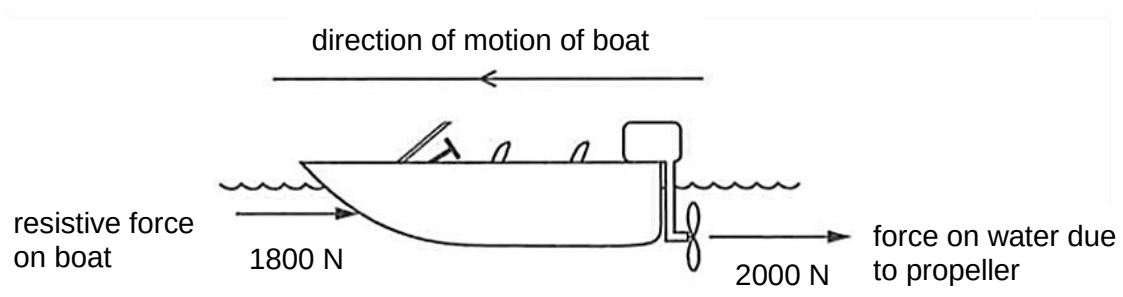
- A Its acceleration is 2.7 m/s^2 .
- B Its distance travelled is 12 m.
- C It is moving at a uniform velocity.
- D It is moving in the same direction throughout the 3 s.

- 6 The diagram shows the wheel of a moving car. The wheel is connected to the engine. The car is accelerating along a road in the direction shown.

What is the direction of the frictional force exerted by the road surface on the wheel?



- 7 The propeller of a boat pushes water backwards with a force of 2000 N. The boat moves through the water against a total resistive force of 1800 N.

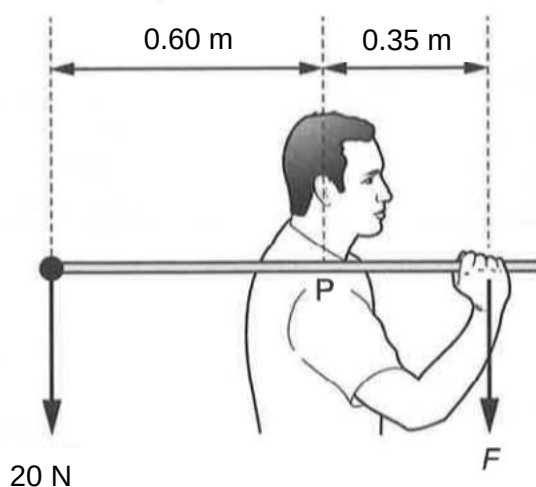


What is the magnitude of the resultant force on the boat?

- A** 200 N **B** 1800 N **C** 2000 N **D** 3800 N
- 8 Which property of an object causes the object to resist a change in the state of rest or motion of the object?

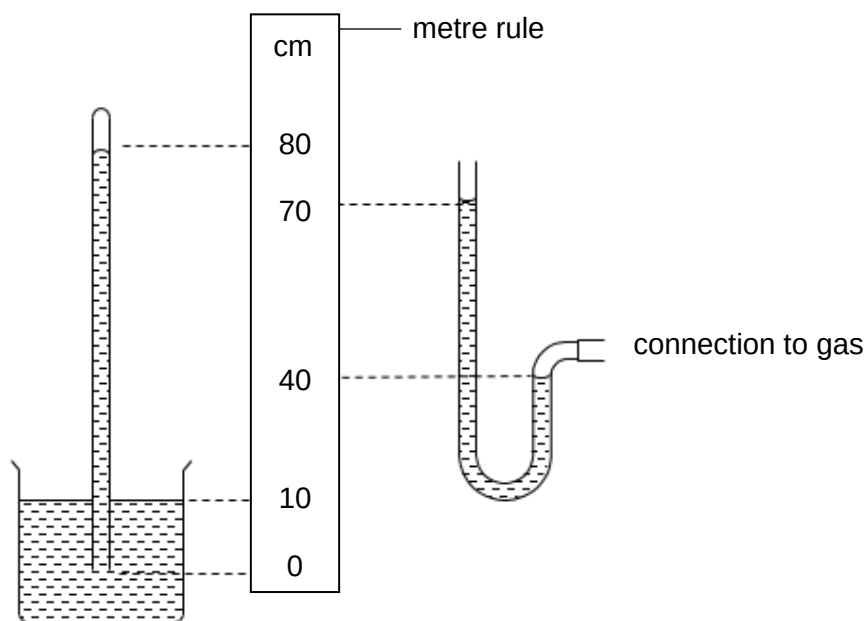
- A** density **B** mass **C** velocity **D** volume

- 9 A man is carrying a load on the end of a uniform pole of length 1.0 m and weight 5 N. He rests the pole on his shoulder at point P which acts as a pivot. He keeps the pole in balance with a downward force F with his hand, as shown.



What is the force F applied by the man to balance the pole?

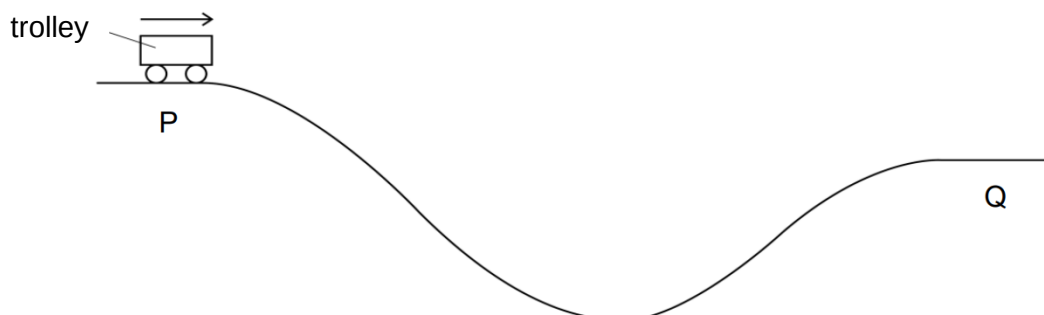
- A 12.0 N B 17.0 N C 34.3 N D 35.7 N
- 10 The diagram shows a mercury barometer and a mercury manometer placed beside each other. One end of the manometer is connected to a container filled with an unknown gas.



What is the pressure of the gas?

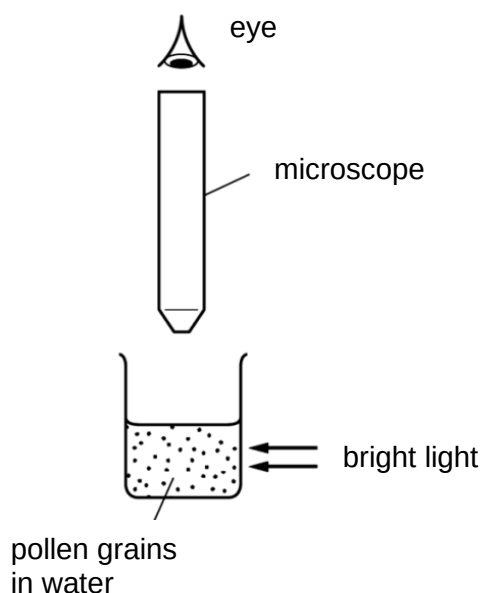
- A 30 cm Hg B 60 cm Hg C 70 cm Hg D 100 cm Hg

- 11** A trolley of mass 20 kg moves from position P to Q along a rough track. At point Q, its gravitational potential energy is 100 J less than that at point P. Its speed at point P is 2.0 m / s. The work done against friction from point P to Q is 60 J.



What is the speed of the trolley at point Q?

- A** 2.8 m / s **B** 3.2 m / s **C** 4.4 m / s **D** 5.8 m / s
- 12** A 1500 kg car accelerates from 10 m / s to 30 m / s in 10 s.
- What is the average power output developed by the engine of the truck?
- A** 15 kW **B** 30 kW **C** 60 kW **D** 600 kW
- 13** Very small pollen grains are suspended in water. A bright light shines from the side. Through a microscope, small specks of light are seen to be moving in a random, jerky manner.



What are the moving specks of light?

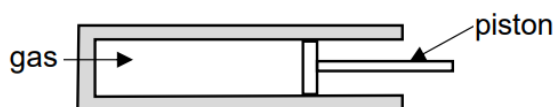
- A** Pollen grains being hit by other pollen grains.
B Pollen grains being hit by water molecules.
C Water molecules being hit by other water molecules.
D Water molecules being hit by pollen grains.

- 14 A sealed container contains nitrogen gas.

What will happen to the gas molecules when the container is heated?

- A They will become denser.
- B They will expand.
- C They will move further apart.
- D They will move more quickly.

- 15 The diagram shows a cylinder made of insulating material with a movable piston at one end. The piston can be pushed or pulled without the gas leaking out.



Which statement about the gas when the piston is moving is **not** correct?

- A The density of the gas decreases as the piston is pulled outwards.
- B The mass of the gas in the piston remains unchanged.
- C The pressure of the gas decreases as the piston is pulled outwards.
- D The temperature increases as the piston is pushed gently inwards.

- 16 When a hand is placed on a metal surface and a wooden surface at room temperature, it feels colder on the metal surface than on the wooden surface.

Which statement is the correct explanation?

- A The metal surface is a better absorber of infra-red than wooden surface.
- B The metal surface is a better thermal conductor than wooden surface.
- C The metal surface is a better emitter of infra-red than wooden surface.
- D The metal surface is at a much lower temperature than the wooden surface.

- 17 Which statement is true about the particles that remain in a liquid during evaporation?

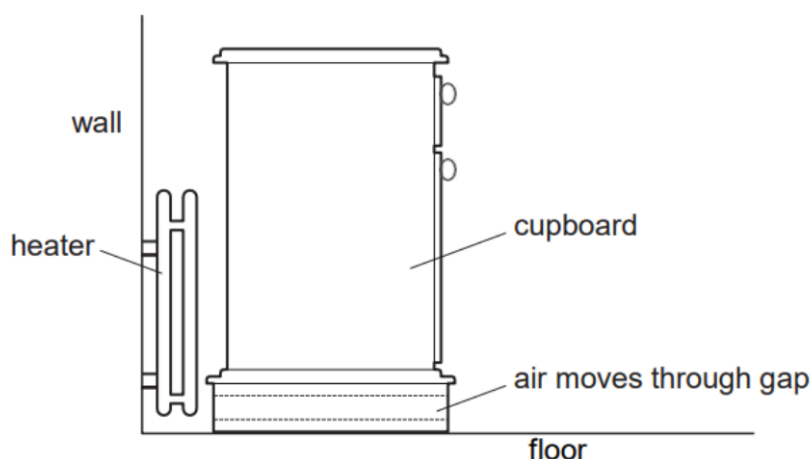
- A The average size of the particles is decreasing.
- B The average size of the particles is increasing.
- C The average speed of the particles is decreasing.
- D The average speed of the particles is increasing.

- 18 Two different liquids, X and Y, with the same mass and initial temperature, are heated by the same heat source. Liquid X reaches a temperature of 60°C slower than liquid Y.

Which statement is the correct explanation?

- A Liquid X has a higher specific heat capacity than liquid Y.
- B Liquid X has a higher specific latent heat of fusion than liquid Y.
- C Liquid X has a lower specific heat capacity than liquid Y.
- D Liquid X has a lower specific latent heat of fusion than liquid Y.

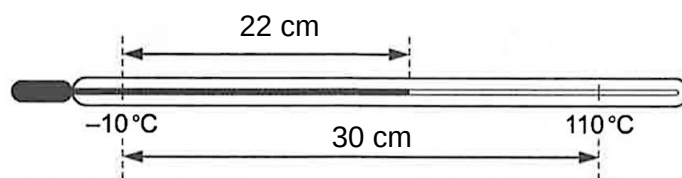
- 19 A cupboard is placed in front of a heater. Air can move through a gap under the cupboard.



Which of the following describes the temperature and the direction of motion of the air in the gap?

	temperature of air	direction of air
A	cool	towards the heater
B	cool	away from the heater
C	warm	towards the heater
D	warm	away from the heater

- 20 The diagram shows a mercury-in-glass thermometer. The distance between the -10°C and the 110°C markings is 30 cm.



What is the temperature when the end of the mercury thread is at a distance of 22 cm from the -10°C mark?

- A** 60.0 $^{\circ}\text{C}$ **B** 65.0 $^{\circ}\text{C}$ **C** 78.0 $^{\circ}\text{C}$ **D** 88.0 $^{\circ}\text{C}$

- 21 Which row shows an example of a transverse wave and a longitudinal wave?

	transverse wave	longitudinal wave
A	infra-red radiation	X-ray
B	visible light	radio wave
C	ultrasound wave	ultra-violet radiation
D	gamma ray	ultrasound wave

- 22** A longitudinal wave travels along a spring.
The diagram represents the position of the coils of the spring at one particular instant.

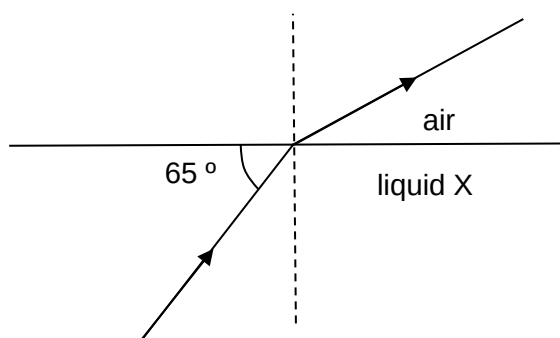


The coils vibrate from side to side. Each coil completes 4.0 oscillations in 2.0 s.

Which row shows the correct frequency and wavelength of the wave?

	frequency / Hz	wavelength / m
A	0.5	XY
B	2.0	XY
C	0.5	YZ
D	2.0	YZ

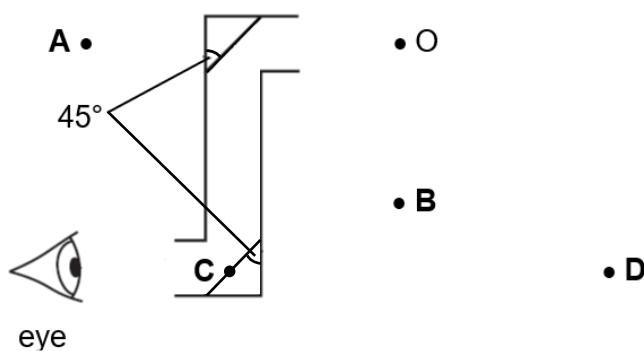
- 23** A ray of light is incident from below the surface of liquid X as shown in the diagram. The refractive index of liquid X is 1.2.



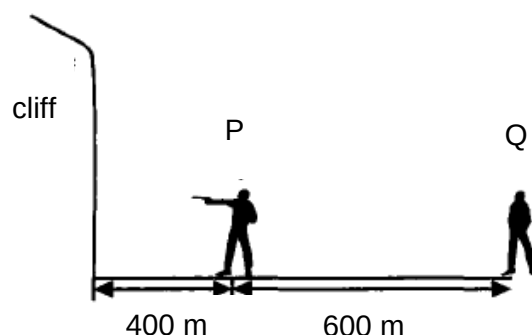
What is the angle of refraction in air?

- A** 30° **B** 35° **C** 42° **D** 49°
- 24** The diagram shows a child using a periscope to look at an object O on the other side of the wall. The periscope has two plane mirrors.

At which position is the image of O seen?



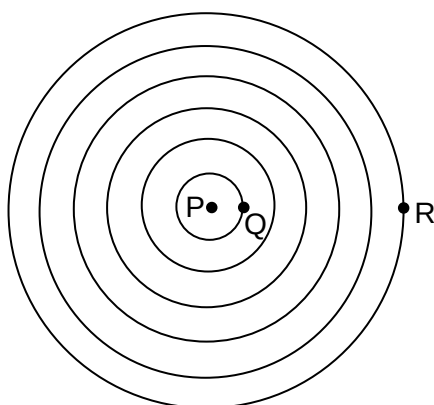
- 25 Two people, P and Q, stand in front of a vertical cliff as shown.



P fires one shot using a pistol and Q hears two shots.
The speed of sound in air is 340 m/s .

What is the time interval between the two shots that Q hears?

- A 2.4 s B 2.9 s C 4.1 s D 5.0 s
- 26 The diagram shows the top view of some water waves produced from point P.



The waves have a speed of 0.40 m/s and take 2.0 s to travel from point Q to R.

What is the wavelength of the wave?

- A 0.16 m B 0.20 m C 0.40 m D 0.80 m
- 27 Below are four statements about the uses of electromagnetic radiation.

Gamma rays are used in cancer treatment.
Infra-red waves are used in thermal imaging cameras.
Microwaves are used in satellite TV.
X-rays are used to check bone fractures.

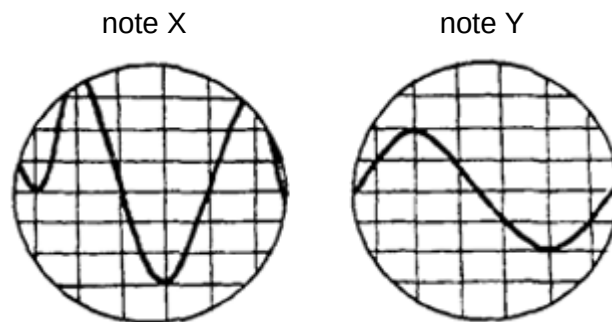
How many of these statements is/are correct?

- A 1 B 2 C 3 D 4

28 Which electromagnetic wave will **not** cause damage to living cells?

- A gamma rays
- B microwaves
- C ultra-violet radiation
- D X-rays

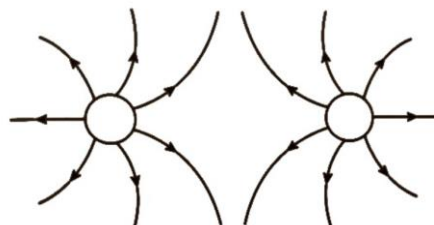
29 The waveforms of two notes X and Y are shown in the datalogger screens with the same scale.



Which row is true about note X as compared with note Y?

	loudness	pitch
A	louder than Y	higher than Y
B	louder than Y	lower than Y
C	not as loud as Y	lower than Y
D	not as loud as Y	higher than Y

30 The diagram shows the electric field pattern between two isolated point charges.



Which two point charges produce this pattern?

- A**

Two circles, each containing a '+' sign, representing two positive point charges.

B

Two circles, each containing a '-' sign, representing two negative point charges.
- C**

Two circles, the left one containing a '+' sign and the right one containing a '-' sign, representing a positive and a negative point charge.

D

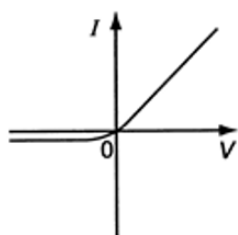
Two circles, the left one containing a '-' sign and the right one containing a '+' sign, representing a negative and a positive point charge.

- 31** An electron is placed at a point where an electric field is acting vertically downwards. There is a force exerted on the electron due to the field.

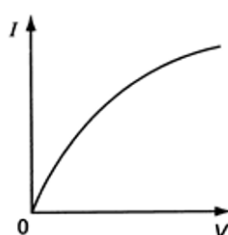
In which direction does this force act on the electron?

- A** horizontally to the left
- B** horizontally to the right
- C** vertically downwards
- D** vertically upwards

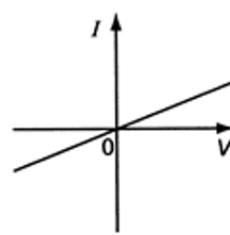
- 32** Graphs X, Y and Z show how the current varies with potential difference for three electrical components.



graph X



graph Y



graph Z

Which electrical component does each graph represent?

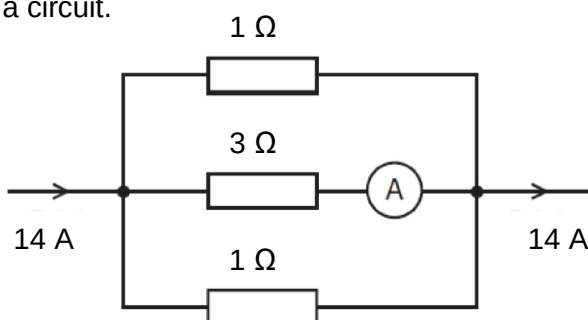
	graph X	graph Y	graph Z
A	filament lamp	semiconductor diode	metallic conductor
B	semiconductor diode	filament lamp	metallic conductor
C	metallic conductor	semiconductor diode	filament lamp
D	semiconductor diode	metallic conductor	filament lamp

- 33** A current of 10 A flows through an electrical component.

What is the amount of charge flowing through the electrical component in an hour?

- A** 0.0028 C
- B** 10 C
- C** 360 C
- D** 36000 C

- 34** The diagram shows a circuit.



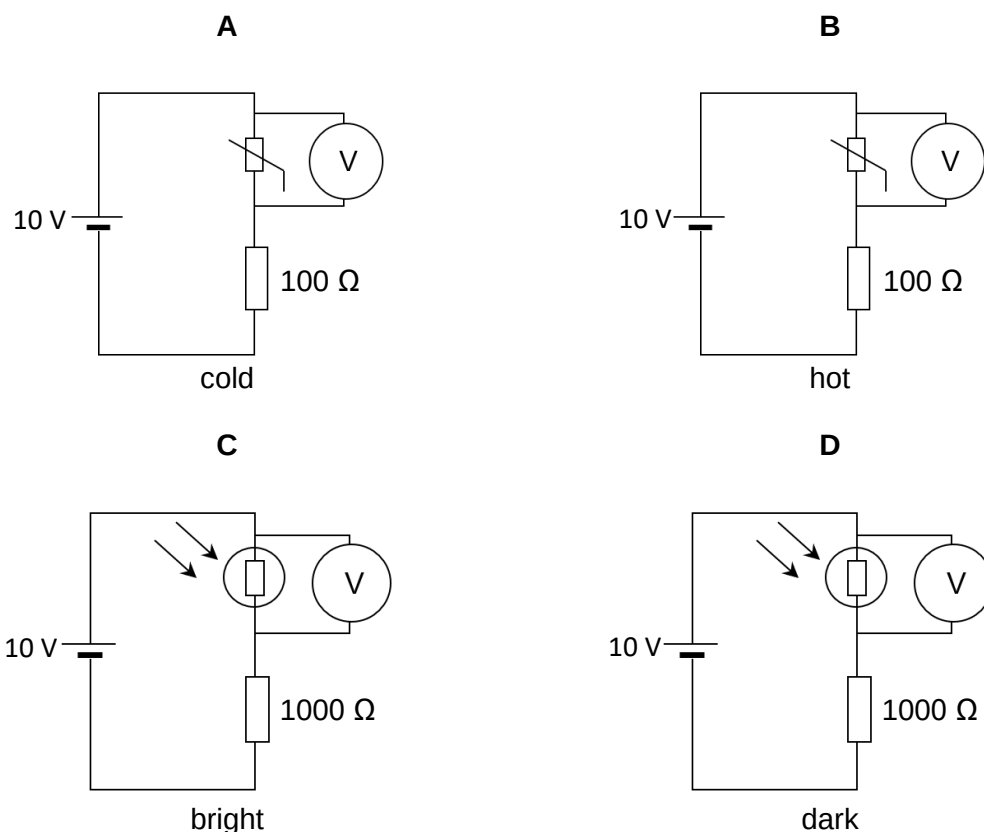
What is the reading of the ammeter?

- A** 1 A
- B** 2 A
- C** 3 A
- D** 4 A

- 35 The table shows the resistance of a light dependent resistor (LDR) and a thermistor under different conditions.

LDR	thermistor
dark: 10 k Ω	cold: 1 k Ω
bright: 100 Ω	hot: 100 Ω

Which circuit will show the smallest voltmeter reading?



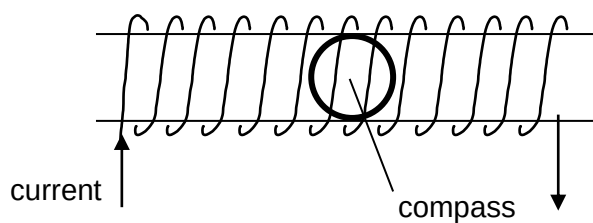
- 36 The diagram below shows the label on an electric iron. The iron is used for 12 hours every month. The cost of 1 kWh of electrical energy is 25 cents.

ELECTRIC IRON	
Operating Voltage	240 V
Power	2800 W
Fuse Rating	13 A

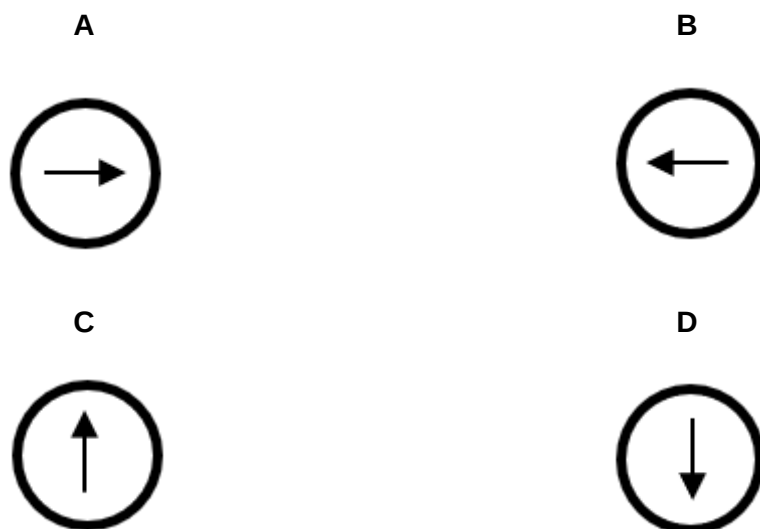
Which statement is **not** true about the electric iron?

- A The energy dissipated in the iron every month is 121 MJ.
- B The fuse will blow when the current flowing through the iron is above 13 A.
- C The iron should use a fuse with a fuse rating of 10 A instead of 13 A.
- D The user pays \$8.40 every month to use the iron.

- 37** A compass is placed in the centre of a solenoid as shown in the diagram below.



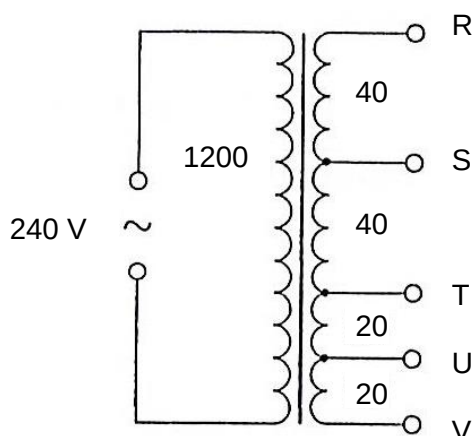
In which direction will the compass needle point?



- 38** What is the main function of the split ring commutator in a d.c. motor?

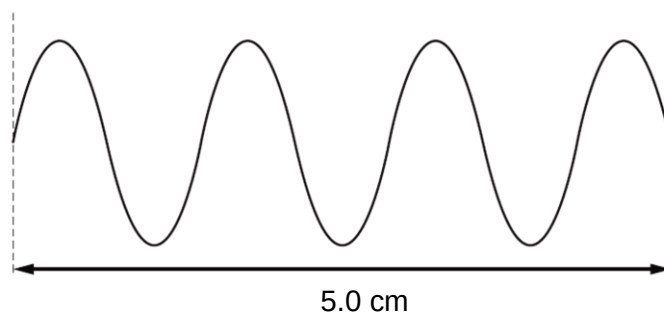
- A** It allows electrical contact between the coil of wire and the battery.
- B** It increases the turning effect of the coil of wire.
- C** It reverses the direction of the current in the coil every half a revolution.
- D** It reverses the direction of the force on the coil every full revolution.

- 39** A transformer consists of one coil with 1200 turns and a second coil with a total of 120 turns, which can be tapped at various places.



Which pair of terminals should be connected to a 12 V, 24 W lamp for it to light up normally?

- A** RS **B** RT **C** ST **D** SU
- 40** A student uses a cathode-ray oscilloscope (c.r.o.) to measure the period of a signal. She sets the time-base of the c.r.o. to 20 ms / cm and observes the trace illustrated below. The trace has a length of 5.0 cm.



What is the period of the signal?

- A** 0.004 s **B** 0.029 s **C** 1.14 s **D** 28.6 s

End of Paper