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JURONGVILLE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024
Secondary 4 Express

STUDENT NAME			
CLASS		INDEX NUMBER	

PHYSICS 6091/01

Paper 1 Multiple Choice **13 August 2024**

Additional Materials: Multiple Choice Answer Sheet **1 hour**

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, index number and class in the spaces at the top of this page.

There are **forty** questions on this paper. Answer **ALL** questions. For each question, there are four possible answers, **A, B, C** or **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on 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.

Take acceleration due to gravity on Earth, g, to be 10 m/s^2 unless stated otherwise.

For Examiner's Use
40

Setter: Mr Lam Seng Tat

This document consists of **16** printed pages.

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1 Which is the unit for specific heat capacity in base units?

A kg m / s^2 K

B m^2 / s^2 kg K

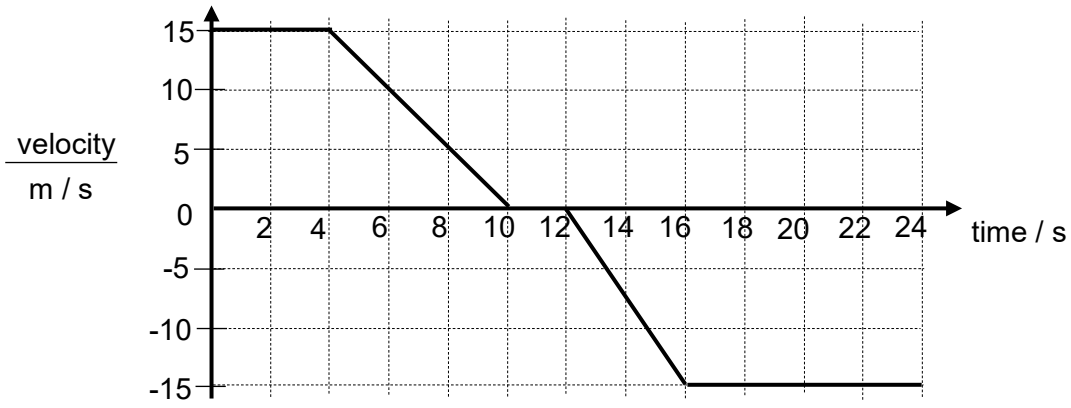
C m / s^2 K

D m^2 / s^2 K

2 Which row shows the correct order of magnitude for diameter of a typical atom and diameter of Earth?

	diameter of typical atom	diameter of Earth
A	0.01 nm	1 Mm
B	1 nm	1000 Mm
C	0.001 μm	0.1 Gm
D	0.000 1 μm	0.01 Gm

3 The diagram shows the velocity-time graph of an object.



Which statement is **incorrect**?

A The average speed of the object is 10.6 m/s.

B The displacement of the object is -45 m.

C The object decelerated at 2.5 m/s^2 to rest.

D The total distance travelled by the object is 250 m.

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4 The motion of an object is represented by the displacement-time and velocity-time graph.



Which statement describes the motion of the object?

A The object is moving from decreasing acceleration to constant acceleration.

B The object is moving from decreasing acceleration to constant velocity.

C The object is moving from increased acceleration to constant acceleration.

D The object is moving from increased acceleration to constant velocity.

5 The diagram shows the spacecraft OSIRIS-REx. It collected rock samples from the asteroid Bennu and returned the samples to Earth for analysis.



NAS

Spacecraft OSIRIS-REx



NAS

Asteroid Bennu

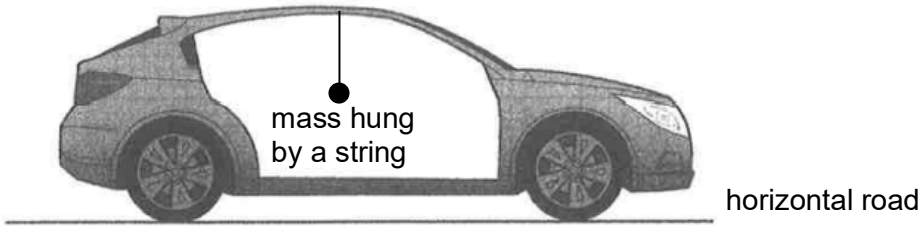
Bennu has a surface gravity of 6.27 x 10^{-6} times that of Earth. A mass of 121.6 g sample of rocks was returned to Earth.

What is the weight of the sample taken from Bennu given that the gravitational field strength on Earth is 9.81 N/kg?

	weight of sample on Bennu / N	weight of sample on Earth / N
A	7.48 x 10^{-6}	1.19
B	7.48 x 10^{-3}	1190
C	7.62 x 10^{-7}	1.19
D	7.62 x 10^{-4}	1190

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6 The diagram shows a mass hanging freely from a string suspended inside a car.



What would happen to the mass hung by a string in the car if the car was moving forward towards the right at constant speed and at constant acceleration?

	car moving forward at constant speed	car moving forward at constant acceleration
A	mass remain vertical	mass swing to left side of the vertical
B	mass remain vertical	mass swing to right side of the vertical
C	mass swing to left side of the vertical	mass swing to left side of the vertical
D	mass swing to right side of the vertical	mass swing to right side of the vertical

7 Two objects of the same size and shape, but one with greater mass, were dropped from rest in air.

Why does the object with the greater mass have higher terminal velocity?

A The object with the greater mass would take a longer time to reach terminal velocity since less air resistance is required to balance the heavier weight.

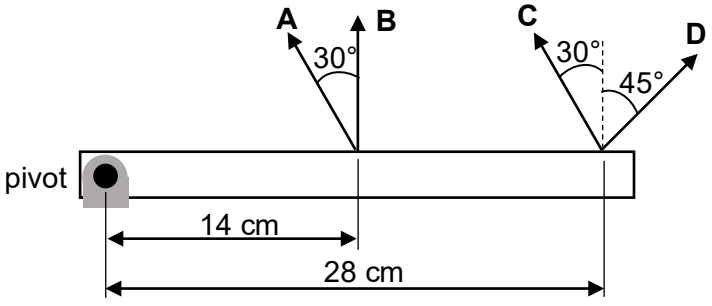
B The object with the greater mass would take a longer time to reach terminal velocity since more air resistance is required to balance the heavier weight.

C The object with the greater mass would take a shorter time to reach terminal velocity since less air resistance is required to balance the heavier weight.

D The object with the greater mass would take a shorter time to reach terminal velocity since more air resistance is required to balance the heavier weight.

8 The diagram shows a 30 cm long uniform steel bar pivot at its left end. The steel bar can rotate about freely about the pivot. Four pulling forces (**A**, **B**, **C** and **D**) are applied to rotate the steel bar about the pivot.

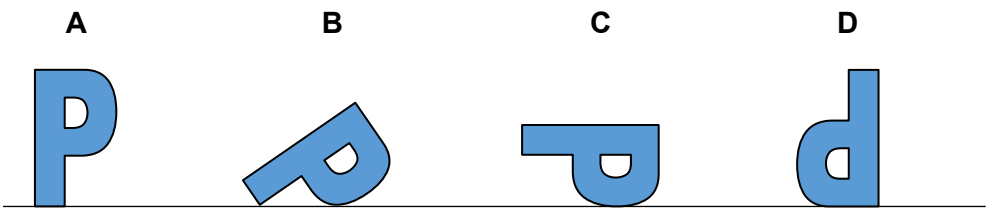
Which force will rotate the bar with the **least** amount of force?



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9 The diagram shows four positions of an object shape of letter 'P'.

Which position would object be the most stable?



10 A bottle contains 500 cm^3 of a liquid. The density of the liquid is 1500 kg/m^3.

What is the mass of the liquid?

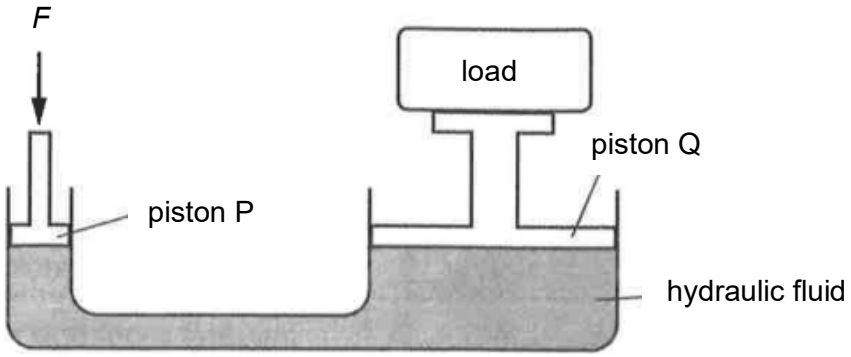
A 300 g

B 750 g

C 3 kg

D 750 kg

11 A hydraulic jack is used to lift a load of 2000 N by applying a force *F* to piston P.



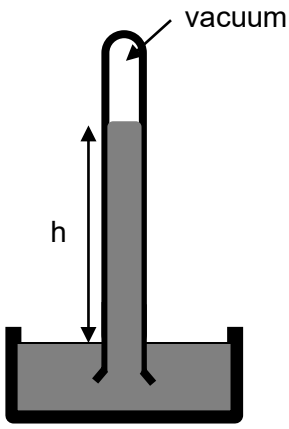
The cross-sectional area of piston P is 300 cm^2.

Which row shows the correct applied force *F* and cross-sectional area of piston Q?

	applied force *F* / N	cross-sectional area of piston Q / cm^2
A	300	1200
B	300	1500
C	500	1200
D	500	1500

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12 The diagram shows a barometer. A scientist used it to measure the atmospheric pressure as he climbed a tall mountain.



Which statement is correct?

A The mercury column height h decreases as atmospheric pressure decreases at higher height of the mountain.

B The mercury column height h decreases as atmospheric pressure increases at higher height of the mountain.

C The mercury column height h increases as atmospheric pressure decreases at higher height of the mountain.

D The mercury column height h increases as atmospheric pressure increases at higher height of the mountain.

13 A car is travelling at a constant speed of 90 km/h with a forward force of 4000 N.

What is the work done by the forward force for each kilometre travelled?

A 100 kJ

B 360 kJ

C 800 kJ

D 4000 kJ

14 A 70 kg man walks at a speed of 2 m/s. He then started running at 5 m/s.

What is his increase in kinetic energy?

A 105 J

B 315 J

C 735 J

D 1015 J

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15 A gas in a fixed volume container is heated.

Which statement explaining why pressure of the gas increases is **incorrect**?

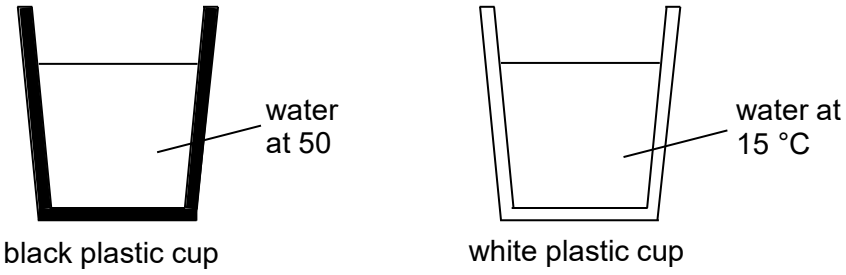
A Pressure of the gas increases as the force acting on the container walls increases.

B Pressure of the gas increases as the space between the gas particles decreases.

C Pressure of the gas increases as the speed of gas particles increases.

D Pressure of the gas increases as there are more collisions of the gas particles on the walls of the container.

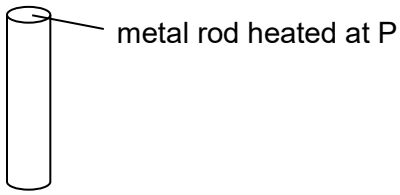
16 The diagram shows a black plastic cup containing water at 50 °C and a white plastic cup containing water at 15 °C.



What is the direction of energy transfer to the surrounding air if both cups are placed in a room at 30 °C?

	black plastic cup with water at 50 °C	white plastic cup with water at 15 °C
A	air to cup	air to cup
B	air to cup	cup to air
C	cup to air	air to cup
D	cup to air	cup to air

17 The diagram shows a metal rod. It is heated at P.



Which statement is correct?

A Metal rod at P becomes denser and heat is conducted downwards.

B Metal rod at P becomes denser and heat remains at P.

C Metal rod at P expands and heat is conducted downwards.

D Metal rod at P expands and heat remains at P.

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18 Two bottles contains the same type of oil at 50 °C. Bottle X contains more oil than Bottle Y.

Which statement explains why oil in Bottle Y cools faster than Bottle X?

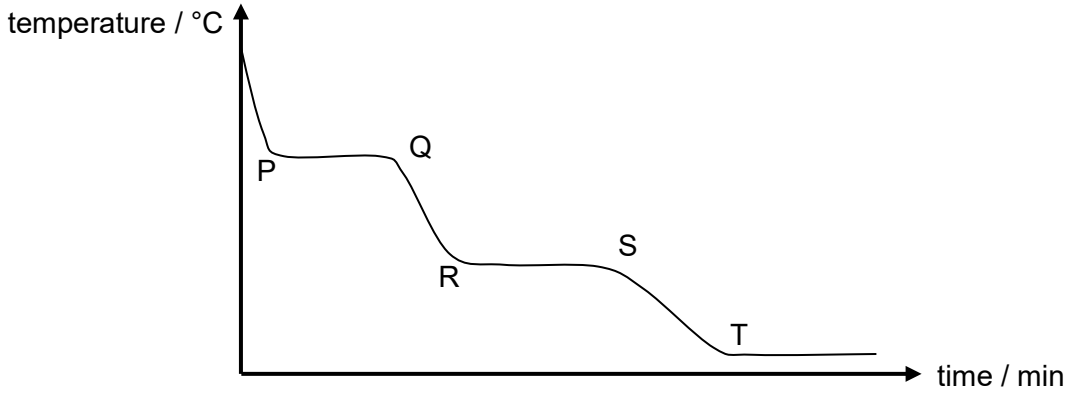
A Bottle Y has a higher heat capacity than Bottle X.

B Bottle Y has a higher specific heat capacity than Bottle Y.

C Bottle Y has a lower heat capacity than Bottle X.

D Bottle Y has a lower specific heat capacity than Bottle X.

19 The graph shows a cooling curve of a tank of a substance in its gaseous state cooled into its solid state.



Between which two points on the graph does the tank contain the substance in liquid state?

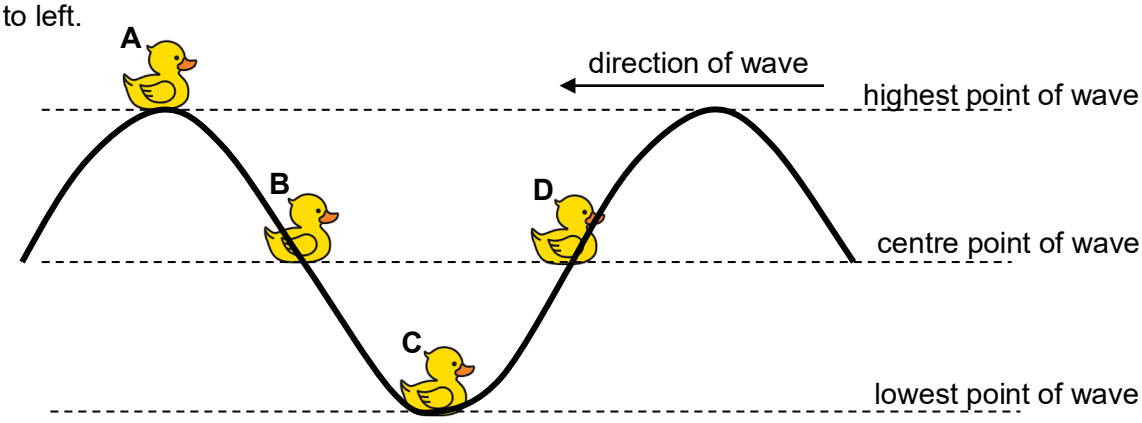
A P and Q

B Q and R

C R and S

D S and T

20 The diagram shows four toy ducks sitting on a pond. A wave moves across the pond from right to left.



Which toy duck would move upwards and then downwards during the next half cycle of the wave?

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21 A ship sending ultrasound signals to detect fish found a large school of fish 200 m below the ship. The speed of sound in seawater is 1500 m/s.

How long did the ultrasound signal take to return to the ship after being transmitted?

A 0.067 s

B 0.13 s

C 0.20 s

D 0.27 s

22 Which statement about electromagnetic waves used in television communication and electromagnetic waves used to disinfect medical equipment is **correct**?

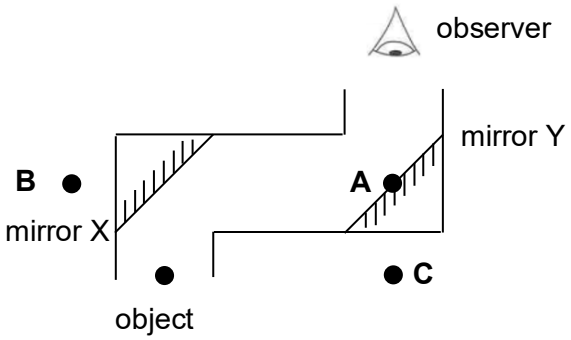
A Electromagnetic waves used in television communication has higher frequency than electromagnetic waves used to disinfect medical equipment.

B Electromagnetic waves used in television communication has higher wavelength than electromagnetic waves used to disinfect medical equipment.

C Electromagnetic waves used in television communication has higher energy than electromagnetic waves used to disinfect medical equipment.

D Electromagnetic waves used in television communication has lower speed than electromagnetic waves used to disinfect medical equipment.

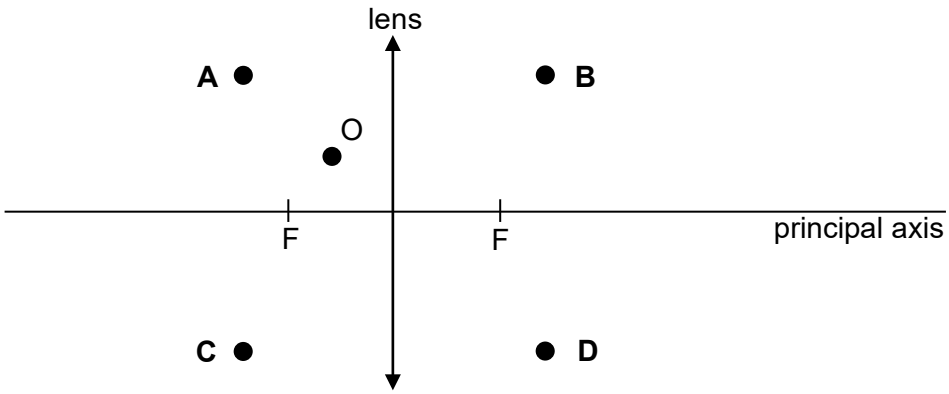
23 The diagram (drawn to scale) shows an object viewed using two mirrors.



An observer looks into the mirrors as shown.
At which position is the image of the object seen?

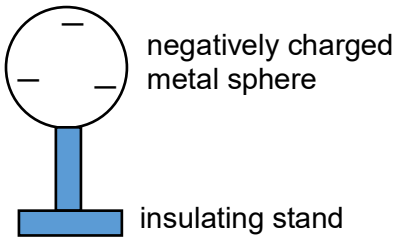
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24 The diagram (drawn to scale) shows an object O placed in front of a converging lens with its focal points F indicated.



Which is the position of the image of the object?

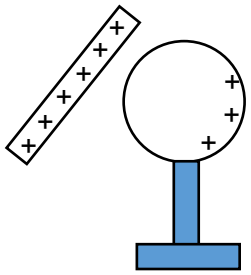
25 The diagram shows a negatively charged metal sphere placed on an insulating stand.



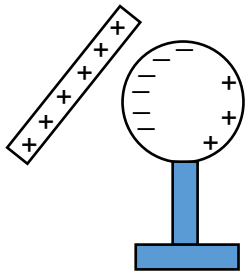
A positively charged rod is brought near to the metal sphere.

What diagram shows the charge distribution on the sphere?

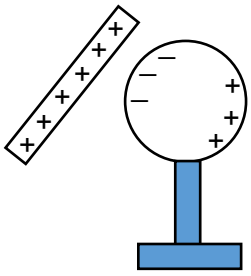
A



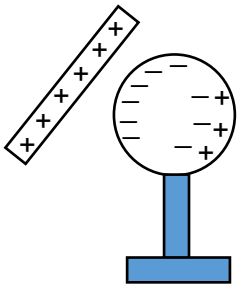
B



C



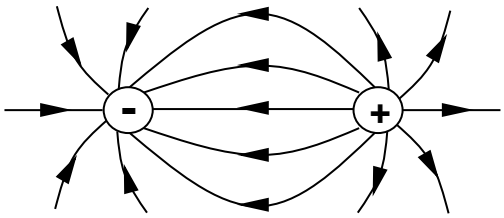
D



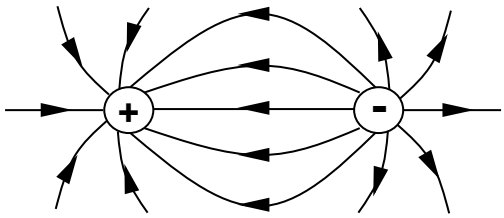
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26 Which shows the correct electric field?

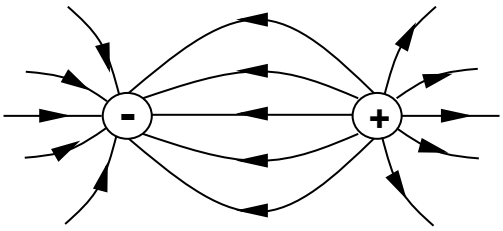
A



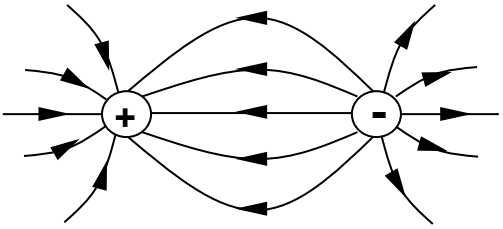
B



C



D



27 A heating element has a potential difference of 15 V when 120 C flows through it.

What is the electrical energy dissipated by the heater?

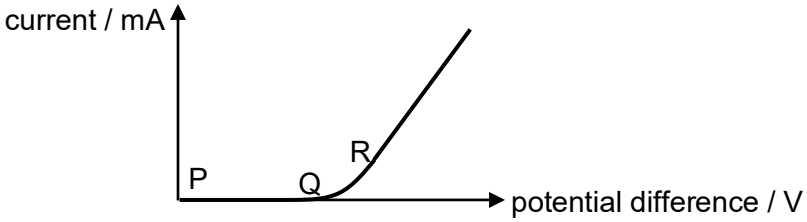
A 0.13 J

B 7.5 J

C 8.0 J

D 1800 J

28 The graph shows the relationship between current and potential difference across a diode.

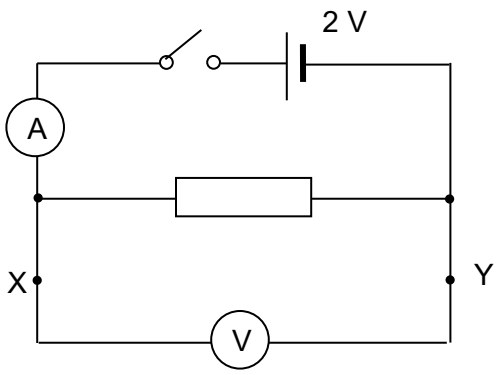


Which row describes the resistance of the diode?

	between P and Q	between Q and R
A	infinity	decreasing
B	infinity	increasing
C	zero	decreasing
D	zero	increasing

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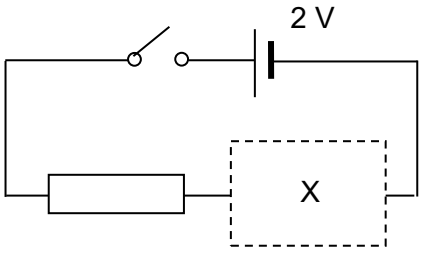
29 The diagram shows a fixed resistor connected to a 2 V cell and a switch. An ammeter and a voltmeter is connected to measure the current flow and potential difference across the resistor.



Which row describes the changes, if any, to the ammeter and voltmeter reading when a conducting wire is added between X and Y?

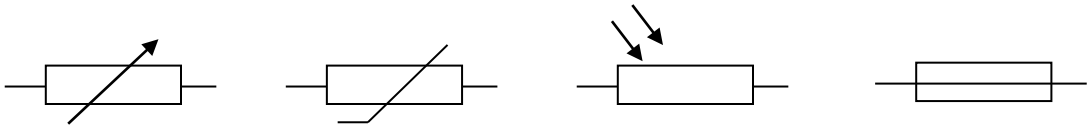
	ammeter	voltmeter
A	decrease	no change
B	decrease	zero
C	increase	no change
D	increase	zero

30 The diagram below shows a fixed resistor connected to a 2 V cell and a switch.



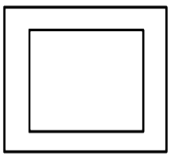
What component should be connected in series at X to the fixed resistor to vary the resistance of the circuit at varying lighting conditions?

A **B** **C** **D**



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31 Which statement is **incorrect** for an appliance with the symbol shown?



A All appliances with the symbol do not require a fuse.

B All appliances with the symbol do not require an earth wire.

C All appliances with the symbol has an outer casing that is insulated.

D All appliances with the symbol has internal components insulated from the external casing.

32 An electrical heater requires 240 V supply and a 10 A fuse.

What would be a suitable resistance of the heater?

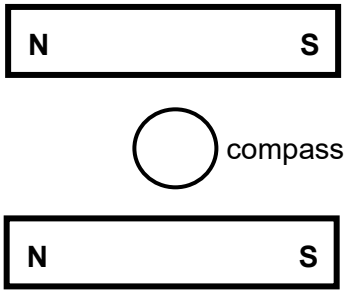
A 20 Ω

B 24 Ω

C 32 Ω

D 64 Ω

33 The diagram shows two identical magnets arranged in parallel to each other. A compass is placed between the two magnets.



What should be the direction of the needle of the compass?

A 

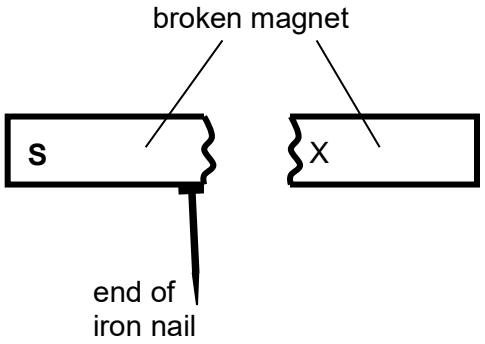
B 

C 

D 

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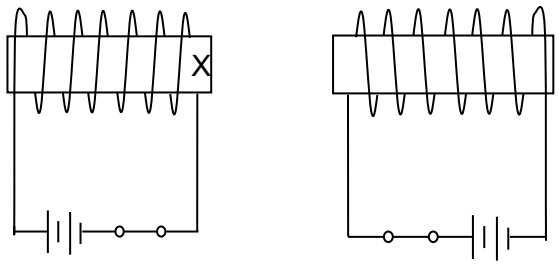
34 The diagram shows a bar magnet broken at its centre. An iron nail is placed at one end of the broken magnet.



Which row is correct?

	pole at end of iron nail	movement of end of iron nail
A	north	attracted to X
B	north	repelled from X
C	south	attracted to X
D	south	repelled from X

35 The diagram shows two iron bars magnetized by solenoids when current is switched on.

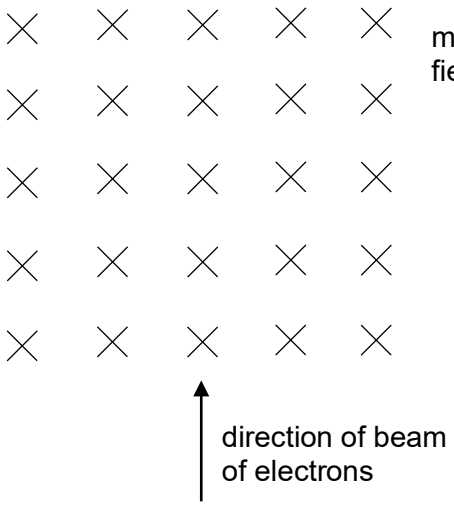


What is the magnetic pole at X and the movement of the two iron bars?

	pole at X	movement of iron bars
A	north	attract to each other
B	north	repel from each other
C	south	attract to each other
D	south	repel from each other

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36 The diagram shows a beam of electrons entering a magnetic field.



Which statement describes the movement of the electrons as they enter the magnetic field?

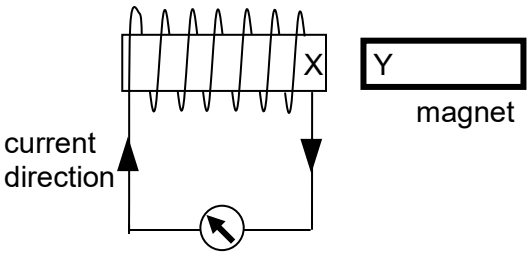
A The electrons are deflected into the paper.

B The electrons are deflected out of the paper.

C The electrons are deflected to the left.

D The electrons are deflected to the right.

37 The diagram shows an iron bar in a solenoid connected to a galvanometer. A permanent magnet is at the right of the solenoid.



Which direction of magnet movement and pole at end X and Y will cause current to flow and deflect the galvanometer needle as shown?

	movement of magnet	pole at X	pole at Y
A	away from the solenoid	south	south
B	towards the solenoid	south	south
C	away from the solenoid	north	north
D	towards the solenoid	north	north

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38 What happens when a simple a.c. generator doubles the number of turns in its coil?

A The amplitude of induced e.m.f. is doubled and frequency does not change.

B The amplitude of induced e.m.f. is doubled and frequency is halved.

C The amplitude of induced e.m.f. is doubled and frequency is doubled.

D The amplitude of induced e.m.f. is halved and frequency does not change.

39 $^{35}_{17}Cl$ is a common isotope of chlorine.

What is the correct description of this isotope?

A The isotope has atomic number of 35.

B The isotope has 35 electrons.

C The isotope has 18 neutrons.

D The isotope has 18 protons.

40 Uranium (U) nucleus decays into Thorium (Th) nucleus with an alpha particle emitted.

Which is the correct nuclide equation for this decay?

A $^{238}_{92}U \longrightarrow {}^{234}_{94}Th + {}^{4}_{2}He$

B $^{238}_{92}U \longrightarrow {}^{234}_{90}Th + {}^{4}_{2}He$

C $^{238}_{92}U \longrightarrow {}^{237}_{93}Th + {}^{0}_{-1}e$

D $^{238}_{92}U \longrightarrow {}^{237}_{92}Th + {}^{0}_{-1}e$

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