

EXP

PUNGGOL SECONDARY SCHOOL
SECONDARY 4
EXPRESS
2024 PRELIMINARY EXAMINATION
QUESTION BOOKLET



NAME

CLASS

INDEX
NUMBER

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Physics

6091/01

Paper 1

27 August 2024

1 hour

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on the Answer Sheet in the space provided.

Write in soft pencil.

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

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.

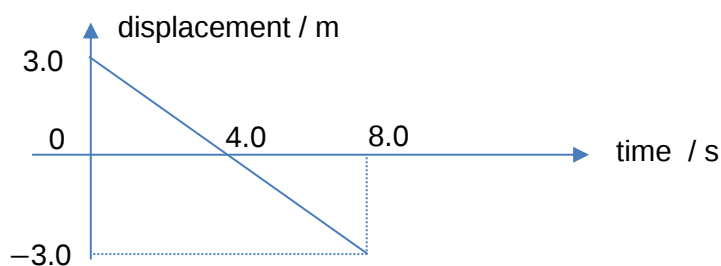
The use of an approved scientific calculator is expected, where appropriate.

For Examiner's use	
Paper 1	/40

Parent's Signature

This paper consists of **16** printed pages and **0** blank page.

- 1 Which quantity is a base quantity?
- A speed
B density
C potential difference
D current
- 2 Which of the following takes the longest time to occur?
- A time taken for earth to complete one revolution around the sun
B time taken for 22 mA of current to deliver 4.5 MC of charge
C time taken for 62 GJ of energy to be transferred by a 39 nW device
D time taken for an object to accelerate uniformly from rest to 4.0 km / s at a rate of $4.0 \mu\text{m} / \text{s}^2$
- 3 The displacement-time graph shows how the displacement of a particle from a reference point varies with time.



Which of the following gives the total distance travelled by the particle?

- A $(3.0 + 3.0) \text{ m}$
B $[3.0 + (-3.0)] \text{ m}$
C $[(\frac{1}{2} \times 4.0 \times 3.0) + (\frac{1}{2} \times 4.0 \times 3.0)] \text{ m}$
D $\{(\frac{1}{2} \times 4.0 \times 3.0) + [\frac{1}{2} \times 4.0 \times (-3.0)]\} \text{ m}$
- 4 Two objects, **X** and **Y**, have the same size and shape but **X** has a larger mass than **Y**. They are each dropped from a large altitude from rest in vacuum. The experiment is then repeated in air.

Which of the following is true?

	in vacuum	in air
A	X lands first	X lands first
B	X lands first	X and Y land together
C	X and Y land together	X lands first
D	X and Y land together	X and Y land together

- 5 A spacecraft was sent to the surface of the Moon. The gravitational field strength on the surface of the Moon is one-sixth that on the surface of the Earth.

How does the mass and weight of the spacecraft on the Moon compare with the mass and weight on Earth?

	mass on moon	weight on moon
A	same as on Earth	same as on Earth
B	same as on Earth	less than on Earth
C	less than on Earth	same as on Earth
D	less than on Earth	less than on Earth

- 6 A man pushes a heavy box with a weight of 50 N along a rough ground with a force of 30 N. The box moves at constant speed.



What is the resultant force acting on the box?

- A** 0 N **B** 30 N **C** 50 N **D** 80 N
- 7 In a game of softball, a player strikes a ball using a bat, exerting a force F on the ball.

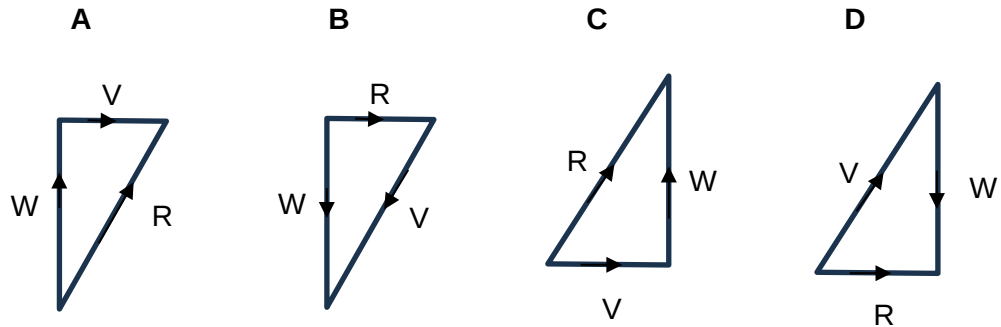
Which of the following, with F , forms an action-reaction pair?

- A** the force of the ball on air
B the force of the ball on the bat
C the force of the air on the ball
D the force of the Earth on the ball

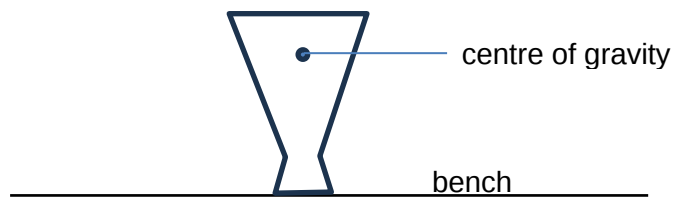
- 8 A drone moves eastwards and arrives at a point due east of its starting point.

The drone has a speed of V in still air. A wind is blowing from north to south causing the drone to move with a speed of W in the same direction.

Which diagram correctly represents the resultant velocity, R , of the drone?



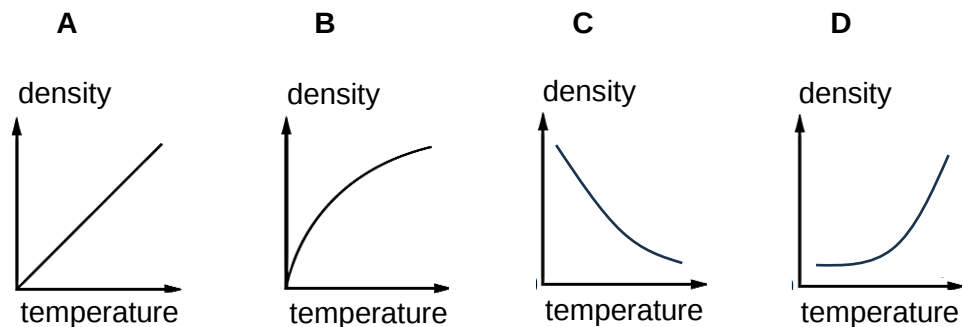
- 9 The diagram shows the shape of a solid object with its centre of gravity marked.



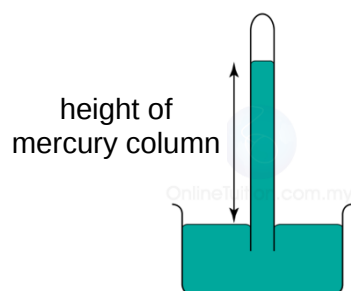
Which of the following makes the object more stable?

- A Turn the object upside down.
 - B Make the object using a material of lower density.
 - C Make the object using a material of higher density.
 - D Move the object to a region with a lower gravitational field strength.
- 10 A piece of metal is heated, and its mass and volume are measured to determine how its density changes with temperature.

Which of the following graph shows the relationship between the density of the substance and temperature?



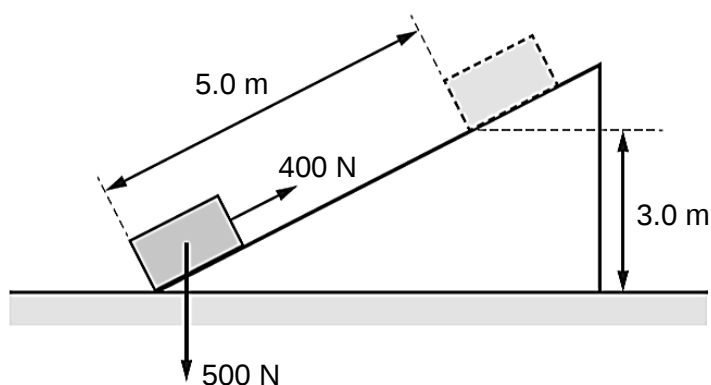
- 11** The diagram shows a mercury barometer used to measure atmospheric pressure.



How does the atmospheric pressure and the height of the column of mercury in the barometer change when the barometer is brought from ground level to the top of a mountain?

	atmospheric pressure	height of mercury
A	increases	increases
B	increases	remains the same
C	decreases	decreases
D	decreases	remains the same

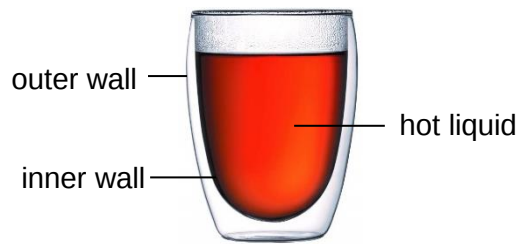
- 12** A force of 400 N is applied on a crate of weight 500 N along a ramp as shown in the diagram. The crate moves a distance of 5.0 m at constant speed.



Which of the following correctly shows the amount of work done by the force, and amount of energy transferred to the various stores?

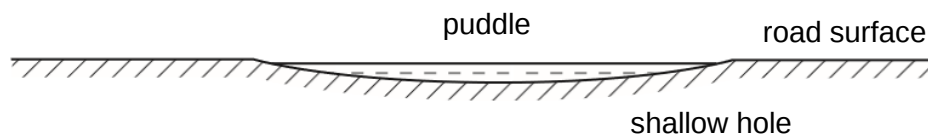
	work done by force / J	amount of energy transferred to kinetic store / J	amount of energy transferred to internal store of surroundings / J
A	1500	1500	0
B	1500	0	1500
C	2000	1500	500
D	2000	0	500

- 13** The diagram below shows a double-walled glass.



Which of the following best explains why this design allows a user to hold the cup more safely?

- A** The transparent glass increases the rate of heat loss by convection.
 - B** The glass is a good conductor of heat and increases the rate of heat loss by conduction.
 - C** The hot liquid is not in contact with any surface so the rate of heat loss via conduction is reduced.
 - D** The space between the inner wall and outer wall traps air, which reduces the rate of heat transfer from the liquid to the outer wall.
- 14** The diagram shows the cross-sectional area of a shallow puddle of water on a road after rain.

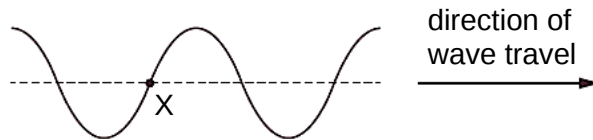


The surrounding temperature and the wind speed remain constant.

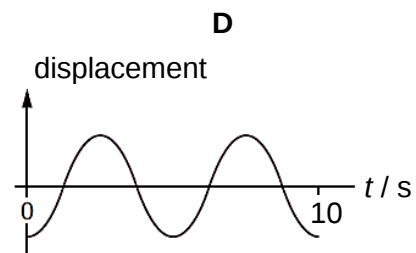
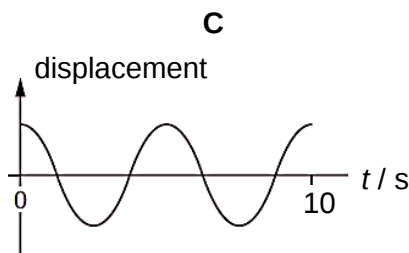
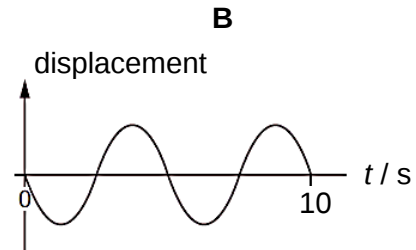
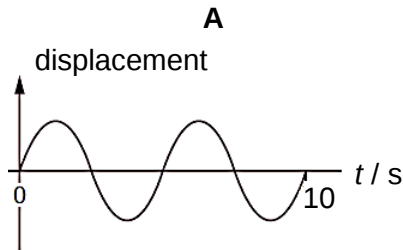
Which of the following best explains how the rate of evaporation of the water from the puddle changes?

	rate of evaporation	explanation
A	decreases	depth of puddle decreases
B	decreases	surface area decreases
C	increases	volume of water decreases
D	remains constant	temperature and wind speed does not change

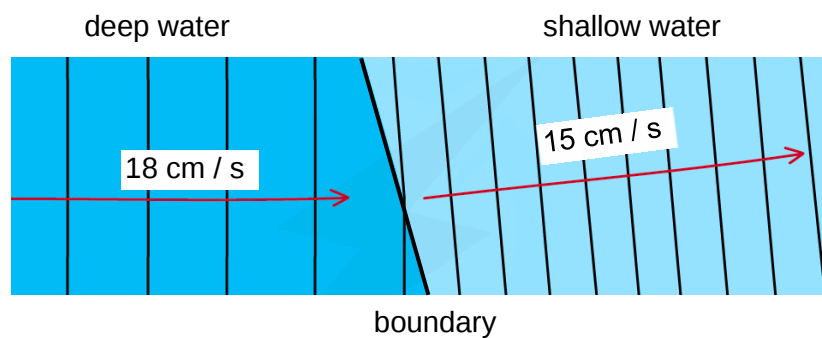
- 15** The diagram shows a transverse wave travelling along a rope at the time $t = 0$ s. A point on the rope is labelled X. The period of the wave is 5.0 s.



Taking upwards as positive, which graph shows the variation with time of the displacement of particle X between $t = 0$ s and $t = 10.0$ s?



- 16** A water wave travels from deep water to shallow water in a ripple tank as shown in the diagram.

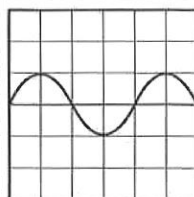


Waves in the deep water have a wavelength of 3.6 cm and a speed of 18 cm / s. The speed of the waves in shallow water is 15 cm / s.

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

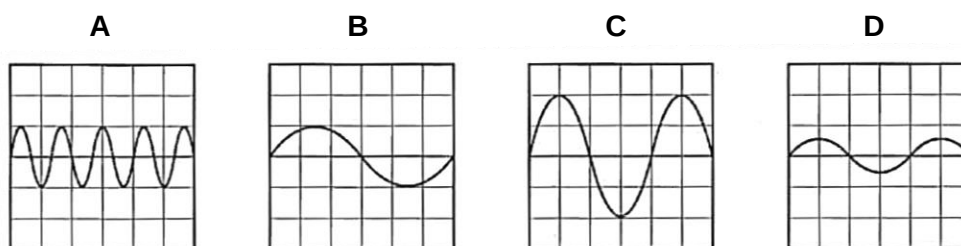
- A** 3.0 cm **B** 3.6 cm **C** 4.3 cm **D** 5.0 cm

- 17** The diagram shows the waveform obtained when a sound was played.



The sound was changed so that it is equally loud and of a lower pitch.

Which diagram represents the waveform of the new sound?



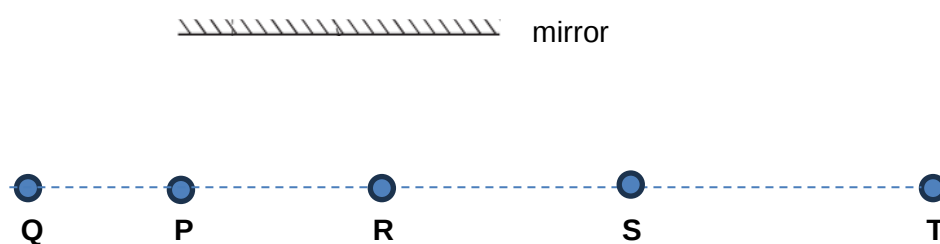
- 18** A pulse of sound is transmitted vertically downward from the bottom of a stationary ship, and the time taken for its echo to be detected back at the ship is recorded.

The ship repeats this process at another location. The new time recorded is 1.5 times as long as the time taken at the first location.

Which of the following is correct?

- A** The speed of sound at the original location is 0.75 times as fast as at the new location.
- B** The speed of sound at the original location is 1.5 times as fast as at the new location.
- C** The depth at the new location is 0.75 times as deep as the original location.
- D** The depth at the new location is 1.5 times as deep as the original location.

- 19 The diagram shows an observer **P** looking at the mirror images of students **Q**, **R**, **S** and **T**. All of them are standing equally far from the mirror.

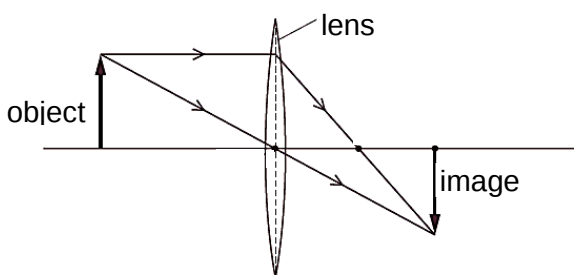


Which student(s) can observer **P** see as a mirror image?

- A **R** only
 - B **R** and **S** only
 - C **Q**, **R** and **S** only
 - D **Q**, **R**, **S** and **T**
- 20 Light in a vacuum strikes a glass surface at an angle of incidence of 42° . In the glass, the angle of refraction is 29° .

What is the speed of light in glass?

- A $2.1 \times 10^8 \text{ m/s}$
 - B $3.0 \times 10^8 \text{ m/s}$
 - C $2.2 \times 10^8 \text{ m/s}$
 - D $4.1 \times 10^8 \text{ m/s}$
- 21 The diagram shows a thin converging lens forming a real image of an object.



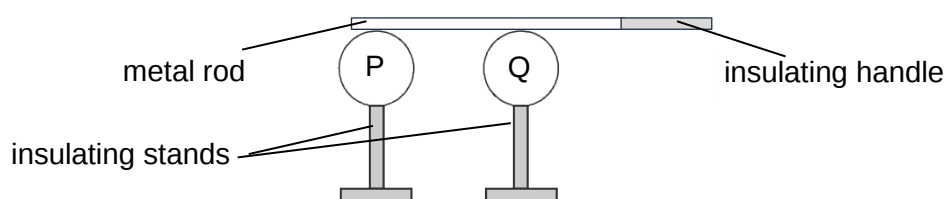
What happens as the object is moved further away from the lens?

	how image moves	how size of image changes
A	further away from lens	increases in size
B	further away from lens	decreases in size
C	towards the lens	increases in size
D	towards the lens	decreases in size

- 22** A thin converging lens has a focal length of 5.0 cm. An object is placed on the principal axis, 2.0 cm away from the lens.

What type of image is formed by the lens?

- A** real and inverted
 - B** real and upright
 - C** virtual and inverted
 - D** virtual and upright
- 23** Two metal spheres are mounted on insulating stands. Sphere P is initially positively charged, and sphere Q is initially uncharged. A neutral metal rod held by an insulating handle is then placed in contact with P and Q as shown in the diagram.



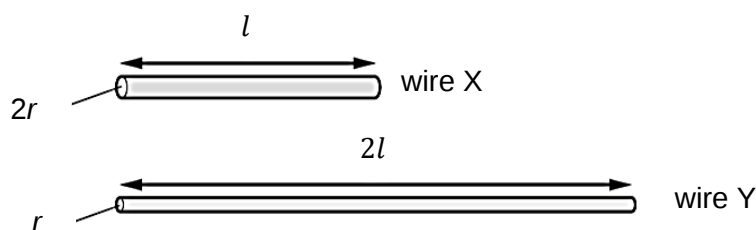
What are the charges on P and Q after the rod is placed in contact with them?

	charge on P	charge on Q
A	positive	positive
B	positive	uncharged
C	uncharged	positive
D	uncharged	uncharged

- 24** Which of the following best describes the conventional current and its unit?

- A** It is the rate of flow of negative charges and its unit is the ampere.
- B** It is the rate of flow of negative charges and its unit is the coulomb.
- C** It is the rate of flow of positive charges and its unit is the ampere.
- D** It is the rate of flow of positive charges and its unit is the coulomb.

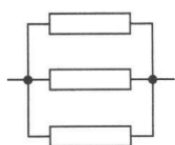
- 25 The diagram shows two wires, X and Y, made of the same material.



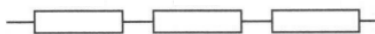
Wire X has resistance R and length l . Wire Y is twice as long as wire X, and its radius, r , is half of that of wire X.

What is the resistance of wire Y?

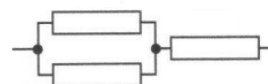
- A $R/2$ B $2R$ C $4R$ D $8R$
- 26 3 identical resistors are connected differently to form three different networks.



network L



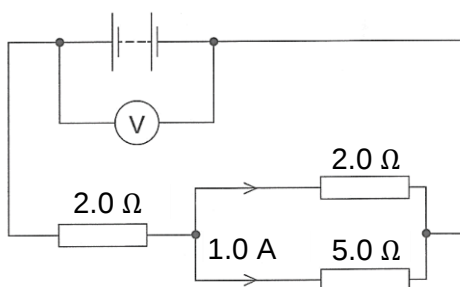
network M



network N

Which of the following lists the networks in increasing order of effective resistance?

- A $L \rightarrow M \rightarrow N$
 B $L \rightarrow N \rightarrow M$
 C $M \rightarrow L \rightarrow N$
 D $N \rightarrow M \rightarrow N$
- 27 The circuit diagram shows a $2.0\ \Omega$ resistor connected in series with a parallel arrangement of a $2.0\ \Omega$ resistor and a $5.0\ \Omega$ resistor.

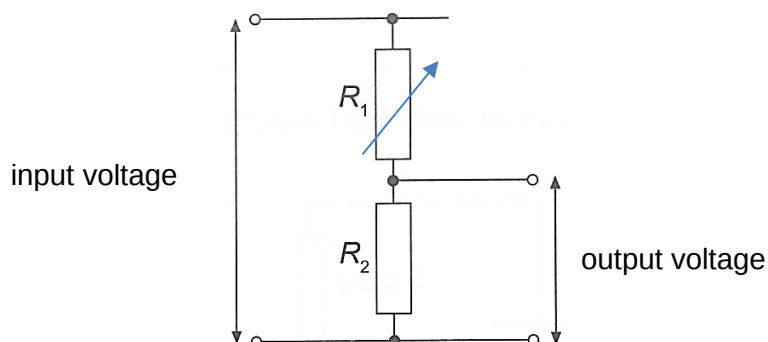


The current flowing through the $5.0\ \Omega$ resistor is $1.0\ \text{A}$.

What is the reading on the voltmeter?

- A $7.0\ \text{V}$ B $10\ \text{V}$ C $12\ \text{V}$ D $17\ \text{V}$

- 28** The diagram shows a variable resistor R_1 and a fixed resistor R_2 used in a potential divider.



The input voltage is kept at a constant value.

Which of the following best describes how and why the output voltage varies as R_1 increases?

	how output voltage varies	reason
A	increases	current through fixed resistor decreases
B	increases	current through fixed resistor increases
C	decreases	current through fixed resistor decreases
D	decreases	current through fixed resistor increases

- 29** A current of 4.5 A flows through the electrical components of a refrigerator when connected to a source of 240 V.

It costs \$0.35 for 1 kW h of electrical energy.

How much will it cost to keep the refrigerator running for 1 week?

- A** \$0.05 **B** \$2.25 **C** \$63.50 **D** \$378

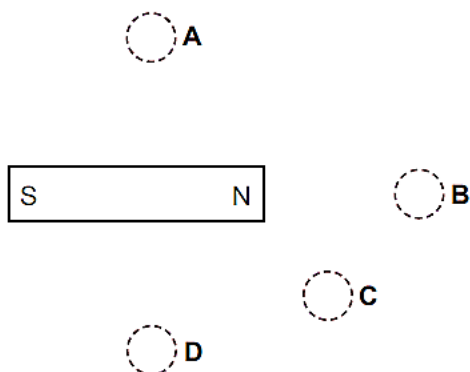
- 30** Which of the following shows the outcome of installing the fuse in the neutral wire?

- A** The filament in the fuse will melt when excessive current flows, and the device will be disconnected from high electric potential.
- B** The filament in the fuse will melt when excessive current flows, and the device will still be connected to high electric potential.
- C** The filament in the fuse will not melt when excessive current flows, and the device will be disconnected from high electric potential.
- D** The filament in the fuse will not melt when excessive current flows, and the device will still be connected to high electric potential.

31 What is the function of the earth wire?

- A** It closes the circuit so current may flow to operate a device.
- B** It is a high resistance wire to reduce the amount of current to a safe level.
- C** It provides an alternative path for current to flow if a wiring fault occurs.
- D** It allows excessive charges to be stored to conserve energy.

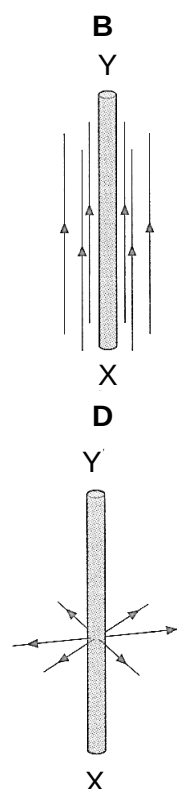
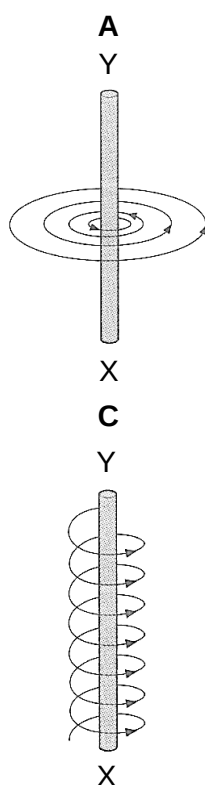
32 A plotting compass is used to trace the magnetic field lines around a bar magnet.



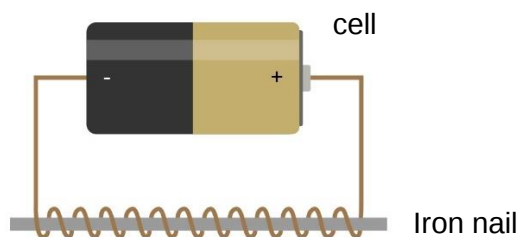
Which is a possible position where the plotting compass shows  ?

33 A magnetic field is produced when a current flows through a straight wire XY.

Which of the following correctly shows the magnetic field pattern produced by wire XY?



- 34** A simple electromagnet can be made by winding a wire round an iron nail and supplying a current through a cell as shown in the diagram below.

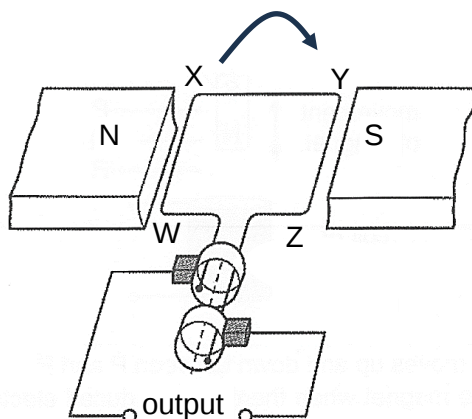


A student suggested the following modifications to the set up.

- I** increasing the number of cells
- II** increasing the thickness of the wires used
- III** winding more rounds around the nail
- IV** using a nail made of steel

Which of the above modifications can produce a stronger electromagnet?

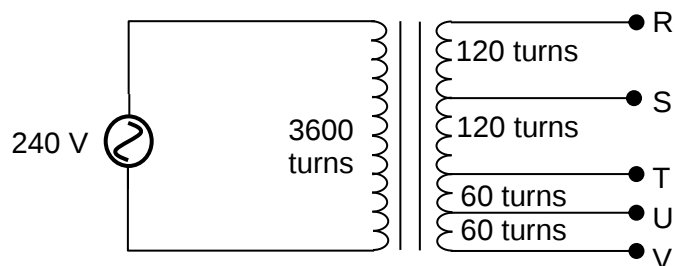
- A** I only
 - B** II and III only
 - C** I, II and III only
 - D** I, II, III and IV
- 35** The diagram shows a simple A.C generator, consisting of a coil of wire WXYZ placed in between two magnets.



The coil is rotated in the direction as shown in the diagram. Which of the following correctly describes the direction of the current flowing in the coil and the rule used to predict its direction?

	direction of current in the coil	rule used
A	X to W	Fleming's Left-Hand Rule
B	W to X	Fleming's Left-Hand Rule
C	Y to Z	Fleming's Right-Hand Rule
D	Z to Y	Fleming's Right-Hand Rule

- 36** A transformer consists of a primary coil of 3600 turns and a secondary coil with a total of 360 turns which can be tapped at various places.



A 12 V, 24 W lamp is connected to two terminals of the secondary coil, and the lamp lights at normal brightness.

Between which terminals is the lamp connected?

- A** R and S **B** R and T **C** S and U **D** S and V
- 37** Electricity is transmitted over large distances through high-voltage power cables running alternating current.

What are the advantages of using high-voltage cables and alternating current?

	advantage of using high voltage cables	advantage of using alternating current
A	lower heat loss in cables	voltage can be stepped up or down
B	lower heat loss in cables	lower average current
C	higher current in cable	voltage can be stepped up or down
D	higher current in cable	lower average current

- 38** Smoke detectors may make use of radioactive emissions to function.

Which of the following best explains why alpha-particles are used in smoke detectors?

	ionising ability	penetrating power
A	high, allow a current to flow	high, so alpha particles can penetrate through the smoke
B	high, allow a current to flow	low, so alpha particles cannot penetrate through the smoke
C	low, to keep the device safe for use	high, so alpha particles can penetrate through the smoke
D	low, to keep the device safe for use	low, so alpha particles cannot penetrate through the smoke

- 39** In a nuclear power station, energy released from nuclear reactions are harnessed to produce electricity.

Which statement about the reactors in a nuclear power plant is correct?

- A** The reactions are easily controlled and no harmful substances are produced in a nuclear reaction.
 - B** Nuclear reactors make use of reactions where heavy nuclei decay into smaller nuclei.
 - C** A nuclear reaction may be initiated when a proton bombards a heavy nucleus, causing more protons to be released in a chain reaction.
 - D** Large amount of radioactive substances are required to produce a small amount of electricity.
- 40** Which of the following best explains why nuclear fusion does not take place easily?
- A** Energy is required to overcome the repulsion between electrons of the atoms involved in nuclear fusion.
 - B** Energy is required to overcome the repulsion between the neutrons of the atoms involved in nuclear fusion.
 - C** Energy is required to overcome the repulsion between the protons of the atoms involved in nuclear fusion.
 - D** Energy is required to overcome the repulsion between the neutrons and the protons of the atoms involved in nuclear fusion.

Solutions for P1

1	2	3	4	5	6	7	8	9	10
D	C	A	C	B	A	B	D	A	C
11	12	13	14	15	16	17	18	19	20
C	D	D	B	B	A	B	D	B	C
21	22	23	24	25	26	27	28	29	30
D	D	A	C	D	B	C	C	C	B
31	32	33	34	35	36	37	38	39	40
C	C	A	C	C	C	A	B	B	C