

Candidate Name**Candidate Number****Centre Name****Centre Number**

Paper 2 (2 hours)

It is necessary to respond on the answer sheets provided alongside this question paper. Additionally, you must have a soft pencil (preferably of type B or HB), a clean eraser, and a dark blue or black pen.

INSTRUCTIONS:

- You must write your name, candidate number, centre name, and centre number on the answer sheets in the designated spaces.
- The objective section consists of 25 questions, and you must attempt all of them.
- Each question has four options labelled A, B, C, and D. Select the option that you think is correct. Mark it on the multiple-choice answer sheet using a soft pencil.
- Attempt all the questions from the subjective section using a dark blue or black pen.
- It is important to follow the instructions provided on the answer sheets.
- Do not use correction fluid.
- Avoid writing on any bar codes.
- You are allowed to use a calculator if needed.

INFORMATION:

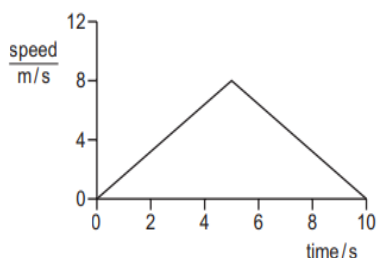
- This paper has a total of 100 marks.
- In the objective section, there are 25 questions, each carrying one mark.
There is no negative marking for incorrect responses.
- Subjective section comprises 75 marks
- The number of marks assigned for every question or its parts is indicated within brackets ().
- Rough work must be completed on this question paper.

OBJECTIVE SESSION**MARKS: 25**

1. A student measures the volume of a small irregularly shaped stone. Which apparatus must be used?

- A. a measuring cylinder containing water and a ruler only
- B. a measuring cylinder containing water only
- C. an empty measuring cylinder and a ruler only
- D. a ruler only

2. The graph shows how the speed of an object changes with time.



How far does the object travel in 10 seconds?

- A. 8 m
- B. 10 m
- C. 40 m
- D. 80 m

3. Which quantity is a force due to a gravitational field?

- A. density
- B. mass
- C. weight
- D. volume

4. Which statement gives a complete description of any object that is in equilibrium?

- A. no forces are acting.
- B. There is no resultant force.
- C. There is no resultant force and no resultant turning effect.
- D. There is no resultant turning effect.

5. Brakes are used to slow down a moving car. Into which form of energy is most of the kinetic energy converted as the car slows down?

- A. chemical
- B. elastic
- C. thermal
- D. sound

6. Which does not transfer useful energy?

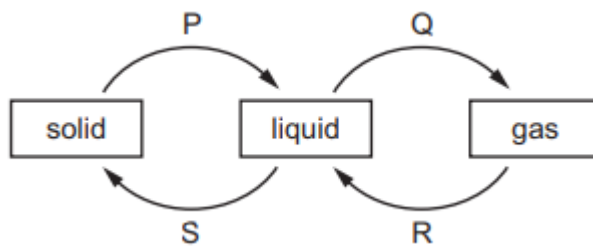
- A. emitting a sound wave
- B. measuring a temperature
- C. passing an electric current
- D. pushing a box along the floor

7. The table shows four forces. Each force acts on a different surface.

Which row shows the least pressure?

	size of the force / N	area of the surface / m ²
A	0.30	0.040
B	10	2.0
C	60	15
D	1200	40

8. The diagram shows four labelled changes of state between solid, liquid and gas.



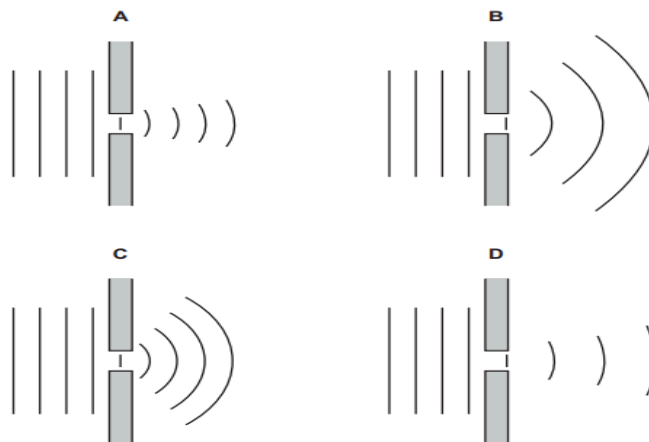
Which changes need an energy input?

- A. P and Q
- B. Q and R
- C. R and S
- D. S and P

9. In countries where it is usually hot, houses are often painted white. What is the reason for this?

- A. White surfaces are good reflectors of radiant energy.
- B. White surfaces are good transmitters of radiant energy.
- C. White surfaces are good absorbers of radiant energy.
- D. White surfaces are good emitters of radiant energy.

10. Plane water waves approach a narrow gap in a barrier. Which diagram shows the diffraction pattern that would occur?



11. Total internal reflection may occur when light reaches an air-glass boundary. Under which conditions is light internally reflected?

	medium in which light travels towards the boundary	angle of incidence
A	air	greater than the critical angle
B	air	less than the critical angle
C	glass	greater than the critical angle
D	glass	less than the critical angle

12. A student has a bar magnet. He brings the magnet close to an object. The magnet and the object repel each other. What must the object be?

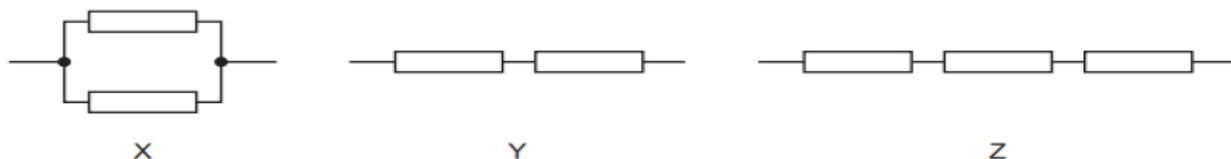
- A. another permanent magnet
- B. any magnetic material
- C. a block of wood
- D. a piece of copper

13. A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

- A.** It has gained electrons.
- B.** It has gained neutrons.
- C.** It has lost electrons.
- D.** It has lost neutrons.

14. Identical resistors are connected to form arrangements X, Y and Z.



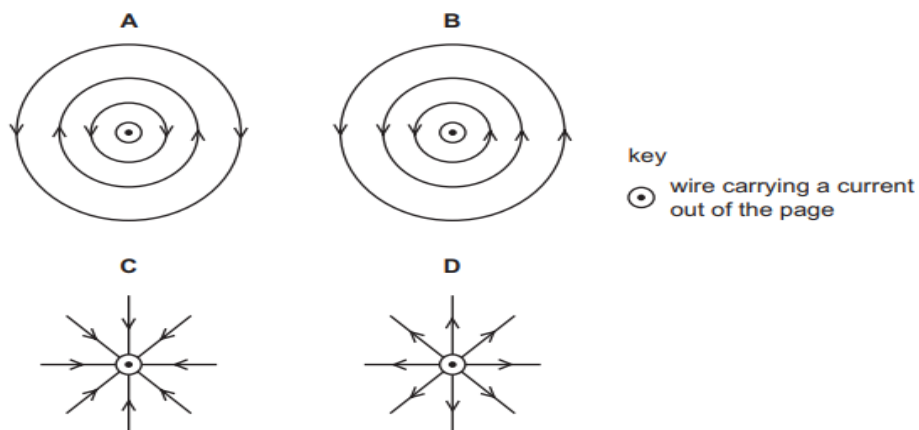
What is the correct order of the resistances of the arrangements from the largest to the smallest?

- A.** $X \rightarrow Y \rightarrow Z$
- B.** $Y \rightarrow X \rightarrow Z$
- C.** $Z \rightarrow X \rightarrow Y$
- D.** $Z \rightarrow Y \rightarrow X$

15. Where must a fuse be connected in a mains electric circuit?

- A.** the earth wire only
- B.** the live wire only
- C.** the neutral wire only
- D.** the live wire and the earth wire

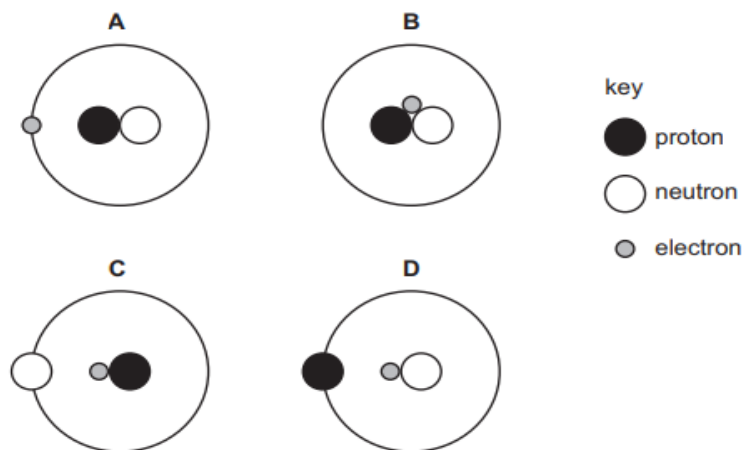
16. There is a current in a wire. The direction of the current is out of the page. Which diagram shows the magnetic field pattern produced?



17. A student investigates the output voltage induced across a coil of wire by a bar magnet. When will the induced voltage have the greatest value?

- A. The student slowly moves the bar magnet into the coil of wire.
- B. The student leaves the bar magnet stationary in the coil of wire.
- C. The student quickly removes the bar magnet from the coil of wire.
- D. The student places the bar magnet at rest outside the coil of wire.

18. Which diagram shows a possible structure of a neutral atom?



19. A nuclide of cobalt contains 27 protons and 32 neutrons. Which symbol represents this nuclide?

- A ${}^{27}_{59}\text{Co}$ B ${}^{32}_{27}\text{Co}$ C ${}^{59}_{27}\text{Co}$ D ${}^{59}_{32}\text{Co}$

20. An isotope of radon is radioactive. It decays by emitting an α -particle. What happens to the nucleus of a radon atom during the emission of the α -particle?

- A. It becomes the nucleus of a different isotope of radon with fewer neutrons.

B. It becomes the nucleus of a different isotope of radon with more neutrons.

C. It becomes the nucleus of an element with a higher proton number.

D. It becomes the nucleus of an element with a lower proton number.

21. Why are some radioactive sources stored in boxes made from lead?

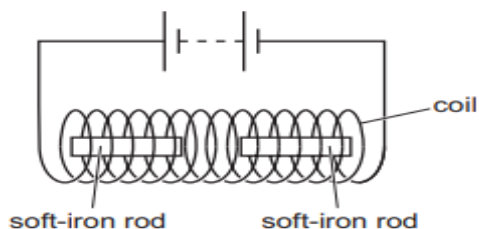
A. Lead absorbs emissions from radioactive sources.

B. Lead decreases the half-life of radioactive sources.

C. Lead increases the half-life of radioactive sources.

D. Lead repels emissions from the radioactive sources.

22. Two soft-iron rods are placed end-to-end inside a coil. The coil is connected to a battery.



The connections from the battery to the coil are now reversed. What happens to the soft-iron rods in each case?

	battery connections as shown	battery connections reversed
A	rods attract	rods attract
B	rods attract	rods repel
C	rods repel	rods attract
D	rods repel	rods repel

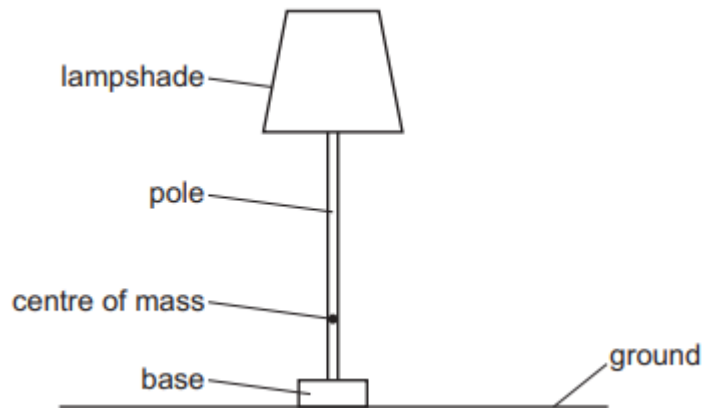
23. The diagram shows the image of a clock in a plane mirror.



What is the actual time?

- A. 04:15
- B. 04:45
- C. 07:15
- D. 07:45

24. The diagram shows a lamp.



Changing which feature increases the stability of the lamp?

- A. a larger lampshade
- B. a longer pole
- C. a heavier base
- D. a higher centre of mass

25. A car travels at an average speed of 60 km / h for 15 minutes. How far does the car travel in 15 minutes?

- A. 4.0 km
- B. 15 km
- C. 240 km
- D. 900 km

THEORETICAL PORTION

MARKS: 45

1. i) What is the relationship between Curie and Rutherford? [2]

ii) Define the term Half-life. [2]

iii) State Pauli's exclusion principle. [3]

iv) What is the Faraday's law of Electromagnetic Induction? [3]

v) Why is the electromagnetic field so important? [3]

2. i) What is this a current-voltage graph for? [2]

ii) Define Resistivity, the unit of resistivity and write its formula. [3]

iii) What are permanent magnets? What materials are used to make permanent magnets? [4]

iv) How is Heat Transferred? Write Conduction Equation. [4]

v) A piece of iron 135 g has a specific heat of $0.43 \text{ J/g}^\circ\text{C}$. Also, it is heated from 100°C to 350°C . So, calculate how much heat energy is required. [2]

3. i) Write some characteristics of solids. [2]

ii) A string is tied to an eraser, a person holds the string and applies a tension force to the string as it is made to move in a circle at a constant speed. Is this scenario an example of work being done? [3]

iii) Define Radiant Energy.

[2]

iv) Write out step-by-step instructions for an experiment to find the position of the centre of mass of a plane lamina.

[2]

v) The teacher increases the frequency of the water waves. Describe what happens to the speed and the wavelength of the water waves.

[2]

3. i) The size of force P is 30 N. The distance from the pivot to force P is 6.0 cm. Calculate the moment of the force.

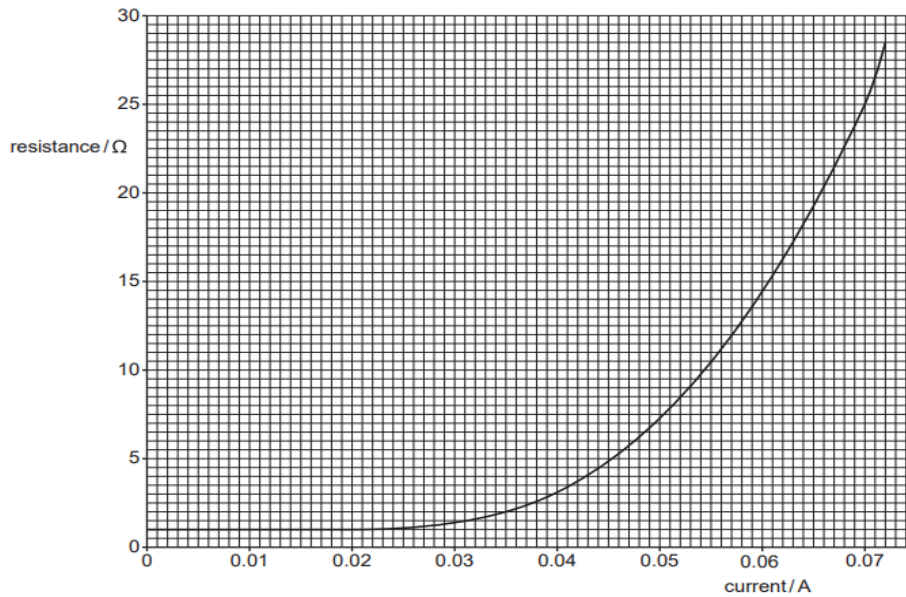
[3]

ii) Explain why the axles become warm when the wheels turn.

[3]

PRACTICAL PORTION**MARKS: 30**

1. Fig shows how the resistance of the filament of a lamp changes as the current through the lamp changes.



(a) Describe how the resistance of the lamp changes. [2]

(b) For a current of 0.070 A, find:

(i) The resistance of the lamp. [2]

(ii) The potential difference across the lamp. [2]

(iii) The power being dissipated by the lamp.

[2]

(c) Two of these lamps are connected in parallel to a cell. The current in each lamp is 0.070 A.

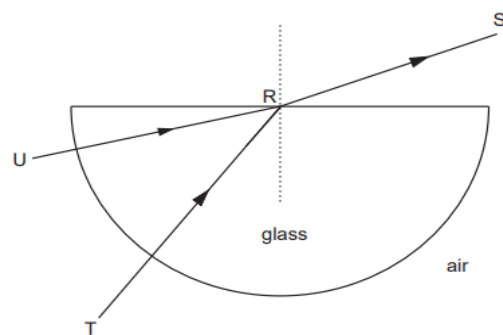
(i) State the value of the EMF of the cell.

[2]

(ii) Calculate the resistance of the circuit, assuming the cell has no resistance.

[2]

2. In Fig a ray of light TRS is shown entering, passing through and leaving a semicircular glass Block.



(a) As the light enters the block, its frequency remains constant.

State what happens to

(i) the speed of the light as it enters the block.

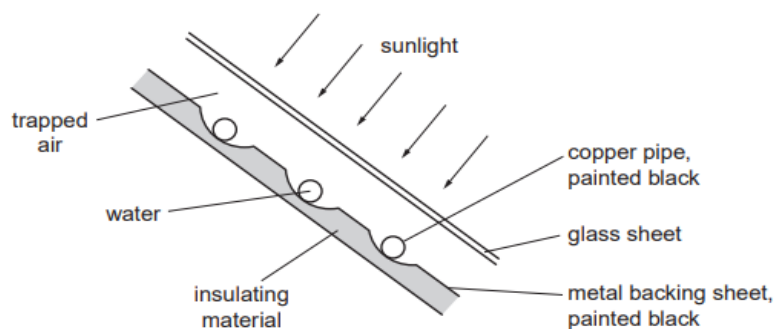
[2]

(ii) the wavelength of the light as it enters the block. [2]

(b) The refractive index of the glass is 1.48. The speed of light in air is 3.00×10^8 m / s. Calculate the speed of the light in the glass. State the equation you use. [2]

(c) Another ray of light enters the block along UR. In Fig, draw a line to show what happens to this ray after it has reached R. [2]

3. A solar panel is mounted on the roof of a house. Fig. 4.1 shows a section through part of the solar panel.



A pump makes water circulate through the copper pipes. The water is heated by passing through the solar panel.

(a) Suggest why

(i) The pipes are made of copper. [2]

(ii) The pipes and the metal backing sheet are painted black. [2]

(iii) An insulating material is attached to the metal backing sheet. [2]

(iv) The presence of the glass sheet increases the energy collected by the water. [2]

(b) During one day, 250 kg of water is pumped through the solar panel. The temperature of this water rises from 16 °C to 38 °C. The water absorbs 25% of the energy falling on the solar panel, and the specific heat capacity of water is 4200 J / (kg °C).

Calculate the energy falling on the solar panel during that day. [2]