



# BEDOK SOUTH SECONDARY SCHOOL PRELIMINARY EXAMINATION 2024

# 4EXP

CANDIDATE  
NAME

CLASS

REGISTER  
NUMBER

## PHYSICS

Paper 1 Multiple Choice

**6091/01**  
27 August 2024

**1 hour**

Additional Materials: Multiple Choice Answer Sheet

### READ THESE INSTRUCTIONS FIRST

Write in soft pencil,  
Do not use staples, paper clips, highlighters, glue or correction fluid.  
Write your name, class, register number on the Answer Sheet in the spaces provided.

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.

Setter: Ms Toh QM

| For Examiner's Use |    |
|--------------------|----|
| Marks              | 40 |

This document consists of **21** printed pages.

**[Turn over**

**1** What is the unit of force expressed in base units?

- A**  $(\text{kg m}^2) / \text{s}^2$     **B**  $(\text{kg m}) / \text{s}^2$     **C**  $(\text{kg s}^2) / \text{m}$     **D**  $\text{kg m s}^2$

**2** Two identical objects begin to fall from rest. One object falls from 200 m above the Earth's surface and the other falls from 200 m above the Moon's surface. There is no atmosphere on the Moon and the weight of each object is constant.

Which row describes the motion of both objects one second after they started falling?

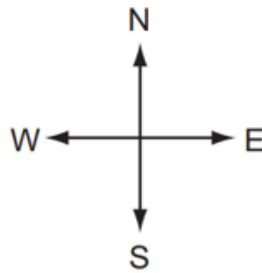
|          | acceleration of object falling<br>above the Earth's surface | acceleration of object falling<br>above the Moon's surface |
|----------|-------------------------------------------------------------|------------------------------------------------------------|
| <b>A</b> | decreasing                                                  | constant                                                   |
| <b>B</b> | constant                                                    | constant                                                   |
| <b>C</b> | increasing                                                  | decreasing                                                 |
| <b>D</b> | increasing                                                  | increasing                                                 |

**3** At a lift off, the mass of a rocket is  $2.5 \times 10^6 \text{ kg}$ . The rocket engines produce a thrust of  $2.9 \times 10^7 \text{ N}$ . The gravitational field strength  $g$  is  $10 \text{ N / kg}$ .

What is the initial acceleration of the rocket?

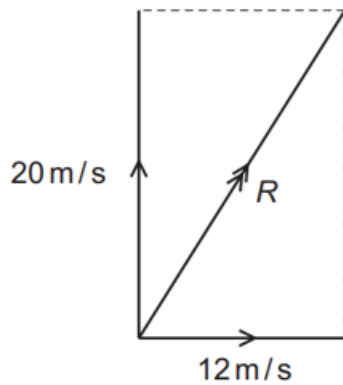
- A**  $0.086 \text{ m / s}^2$     **B**  $1.6 \text{ m / s}^2$     **C**  $12 \text{ m / s}^2$     **D**  $21 \text{ m / s}^2$

- 4 When there is no wind, the engines of an airship push it due north at  $20 \text{ m/s}$ . The wind is blowing from the west at  $12 \text{ m/s}$ .

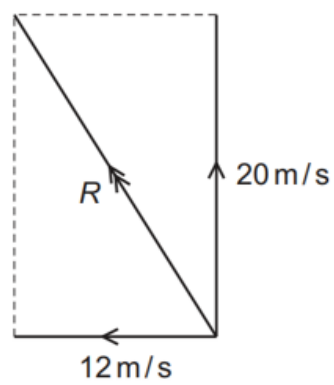


Which vector diagram correctly shows how the resultant velocity  $R$  of the airship is obtained?

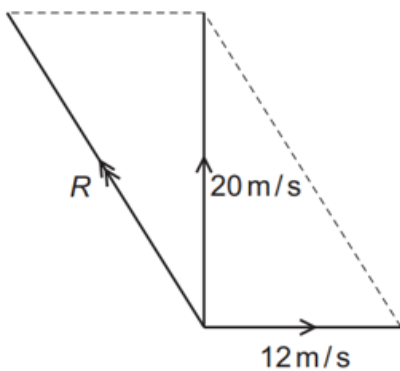
**A**



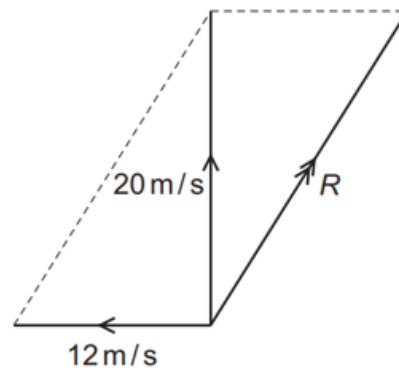
**B**



**C**



**D**



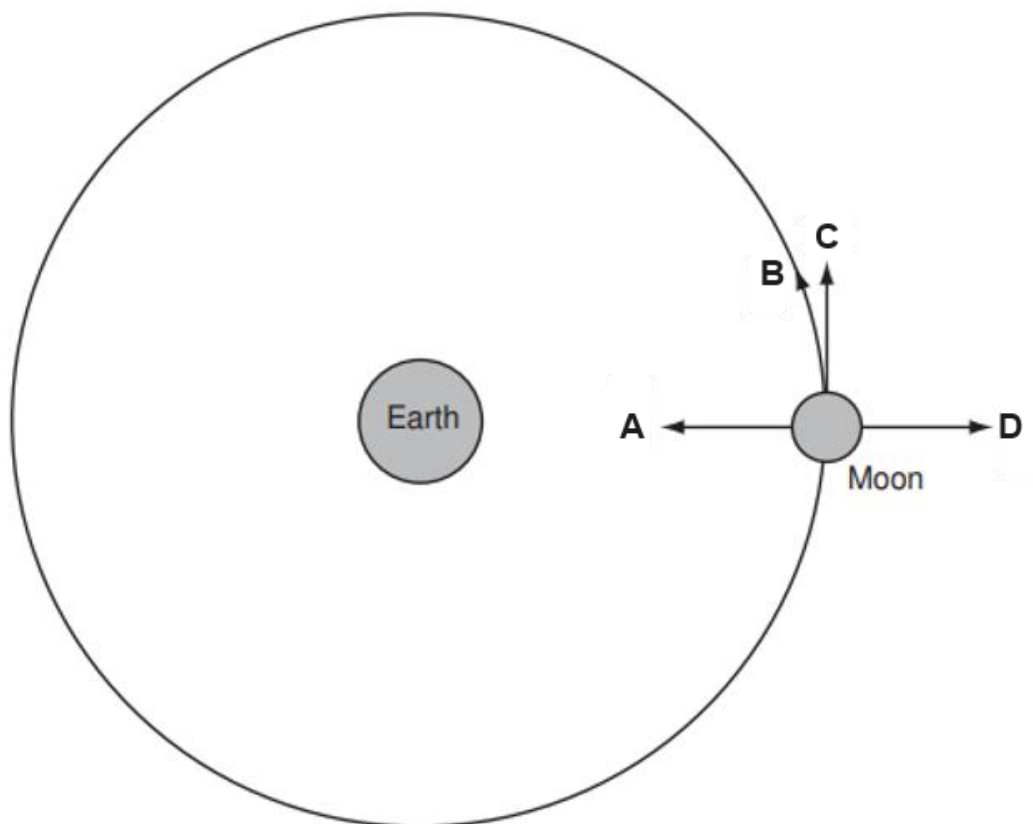
- 5** A student kicks a ball horizontally along the ground. As he does so, his foot applies a force to the ball.

At the same time, the ball applies a force to his foot.

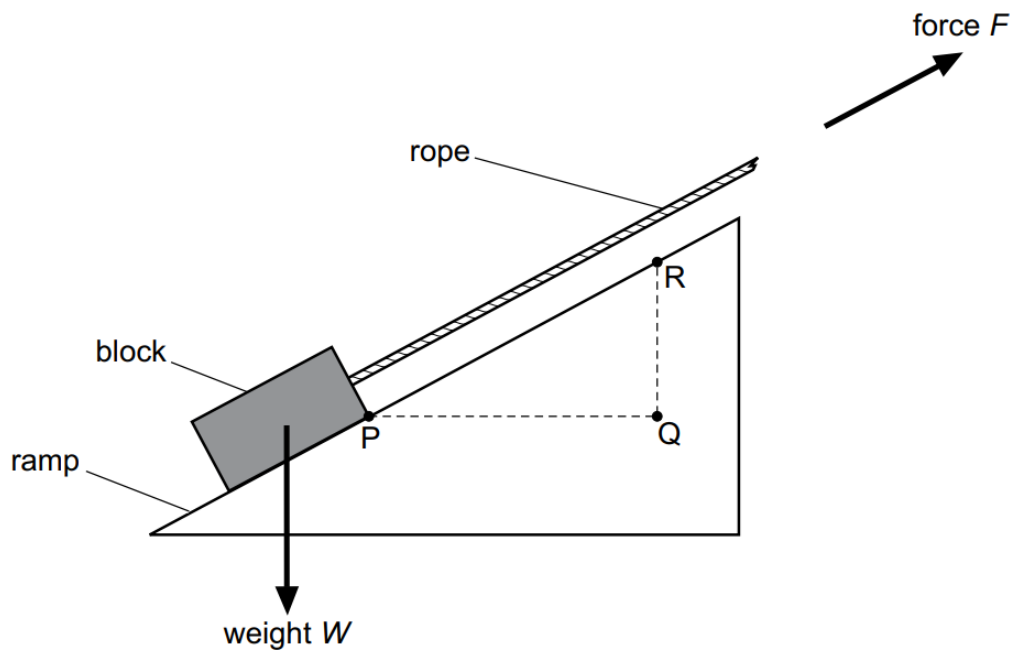
How do these forces compare?

- A** The force on the foot is equal to the force on the ball but in the opposite direction.
  - B** The force on the foot is equal to the force on the ball and in the same direction.
  - C** The force on the foot is smaller than the force on the ball and in the opposite direction.
  - D** The force on the foot is smaller than the force on the ball but in the same direction.
- 6** The diagram represents the Moon in its orbit round the Earth.

Which arrow represents the direction of the resultant force acting on the Moon at the instant shown?



- 7 The diagram shows a block being pulled up a ramp by a rope.

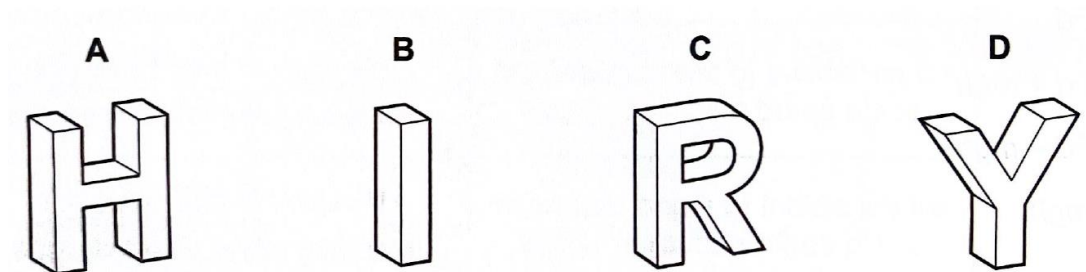


The block has weight  $W$  and the rope is pulled with force  $F$ .  
The block moves distance  $PR$  and is raised through height  $QR$ .

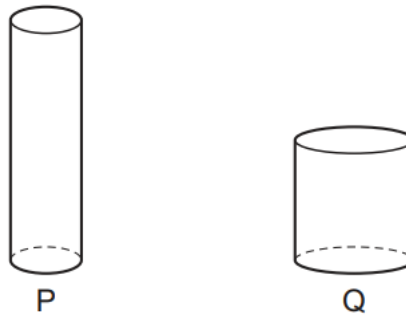
What is the equation for the work done on the block by the rope?

- A weight  $W \times$  distance  $PQ$
  - B weight  $W \times$  distance  $PR$
  - C force  $F \times$  distance  $PR$
  - D force  $F \times$  height  $QR$
- 8 A child has a set of wooden 3-dimensional capital letters.

Which letter, H, I, R or Y, is the most stable when standing upright on a table?



- 9 Two cylinders P and Q are made of copper.

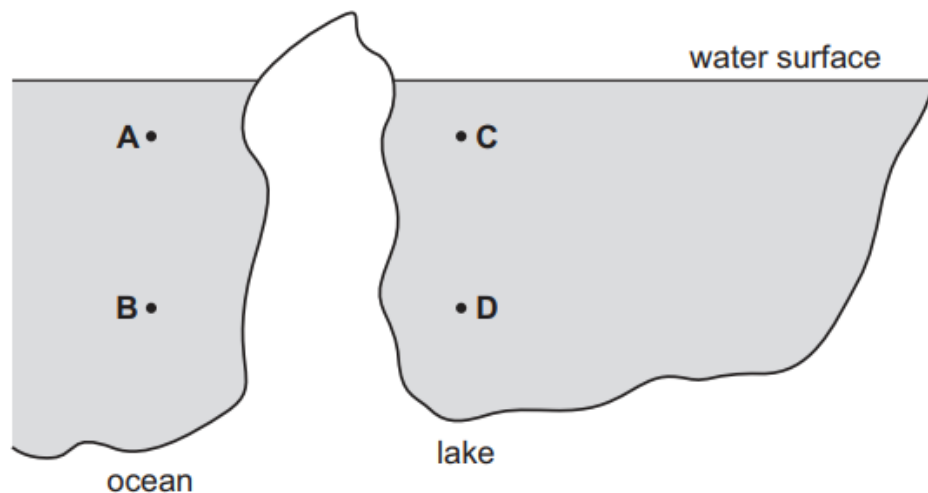


The height of P is twice the height of Q. The diameter of P is half the diameter of Q.

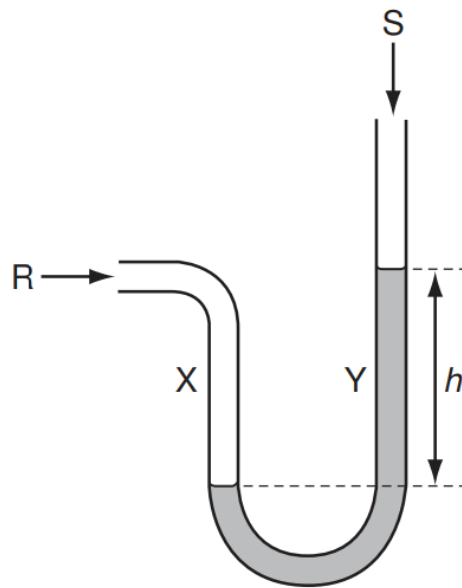
Which statement is correct?

- A The density of cylinder P is four times that of cylinder Q.
  - B The density of cylinder P is twice that of cylinder Q.
  - C The density of cylinder P is equal to that of cylinder Q.
  - D The density of cylinder P is half that of cylinder Q.
- 10 An underwater diver moves from the ocean to a freshwater lake. The density of water in the lake is less than the density of water in the ocean.

In which position does the diver experience the smallest pressure due to the water?



- 11 The diagram shows a simple manometer.

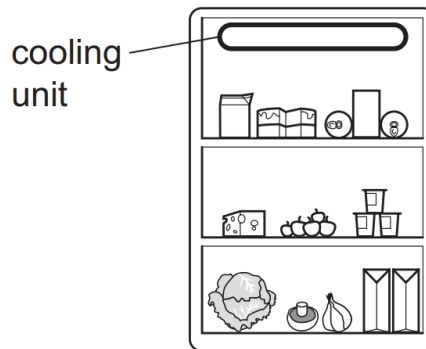


Arm X is connected to a gas supply. Arm Y is open to the atmosphere.

What pressure is the length  $h$  used to measure?

- A the atmospheric pressure  $S$
  - B the gas pressure  $R$
  - C the sum of the gas pressure  $R$  and the atmospheric pressure  $S$
  - D the difference between the gas pressure  $R$  and the atmospheric pressure
- 12 Which uses a non-renewable energy source?
- A a wind turbine
  - B a solar panel
  - C a nuclear power station
  - D a geothermal heating system

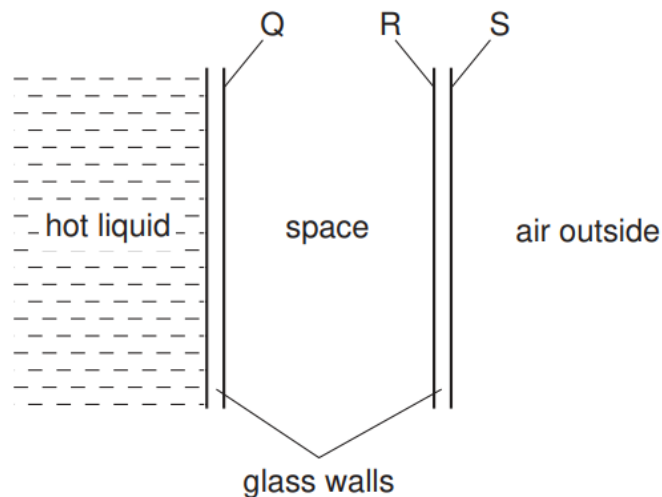
- 13 The diagram shows the inside of a refrigerator.



When the refrigerator is first switched on, what happens to the molecules and density of the air near the cooling unit?

|   | molecules of the air | density of the air |
|---|----------------------|--------------------|
| A | become smaller       | decreases          |
| B | become smaller       | increases          |
| C | move closer together | decreases          |
| D | move closer together | increases          |

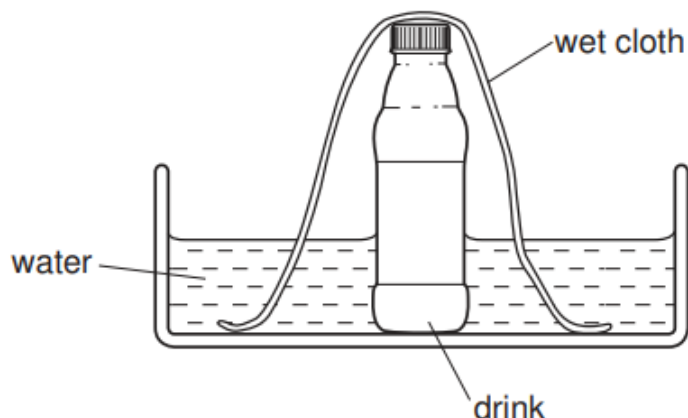
- 14 A student needs a double-walled glass vessel to contain a hot liquid.



What reduces heat losses by radiation?

- A a vacuum in the space between the walls
- B painting surface Q black
- C painting surface R black
- D painting surface S silver

- 15** On a hot day, a drink in a bottle can be kept cool by standing it in a bowl of water and placing a wet cloth over it.



Why is the drink kept cool?

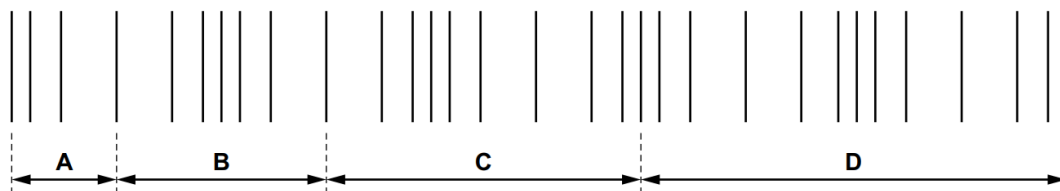
- A** Hot air cannot escape from the bottle.
  - B** The cloth conducts heat from the bottle into the water.
  - C** The drink cannot evaporate from the bottle.
  - D** Water evaporating from the cloth cools the drink.
- 16** What is the definition of the amplitude of a wave?
- A** the distance between the extreme points of a particle's motion
  - B** the maximum distance a particle moves from its equilibrium position
  - C** the maximum energy carried by the wave
  - D** the maximum power of the vibrations carrying the wave
- 17** An echo sounder produces ultrasound of frequency 24 kHz. The ultrasound travels in water at a speed of 1.5 km / s.

What is the wavelength of this ultrasound in water?

- A** 0.063 m      **B** 16 m      **C** 36 m      **D** 63 m

- 18** A sound wave travels through air. The lines in the diagram show the positions of particles of air at one particular time.

Which distance is the wavelength of the wave?



- 19** A student stands a distance  $x$  in front of a large wall.

He claps his hands at a regular rate so that each clap coincides with the echo from the previous clap. In a time  $t$ , he claps his hands  $N$  times.

Which expression is used to calculate the speed of sound in air?

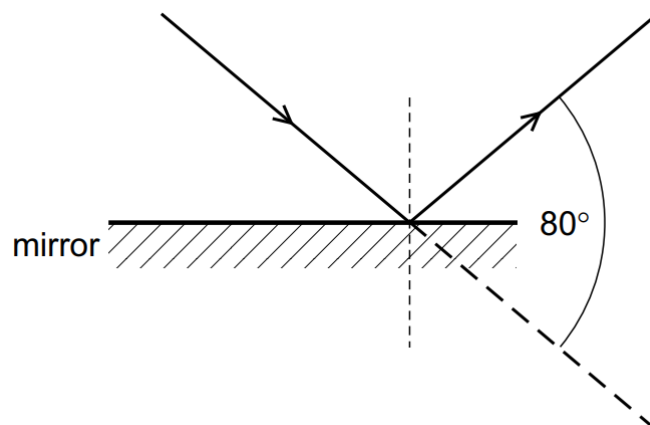
**A**  $\frac{x}{Nt}$

**B**  $\frac{2x}{Nt}$

**C**  $\frac{Nx}{t}$

**D**  $\frac{2Nx}{t}$

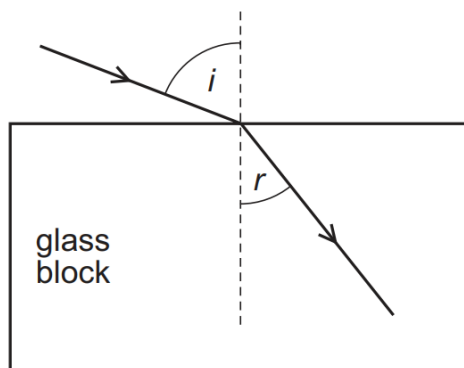
- 20** Light is incident on a mirror and is reflected as shown.



What is the angle of incidence and angle of reflection?

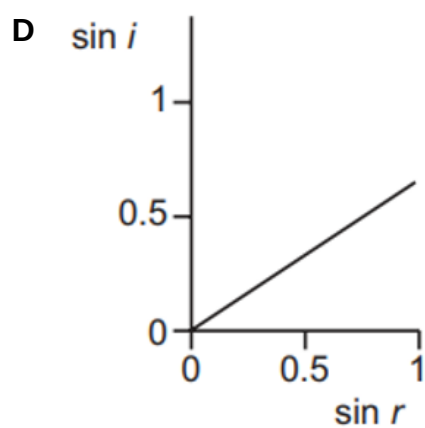
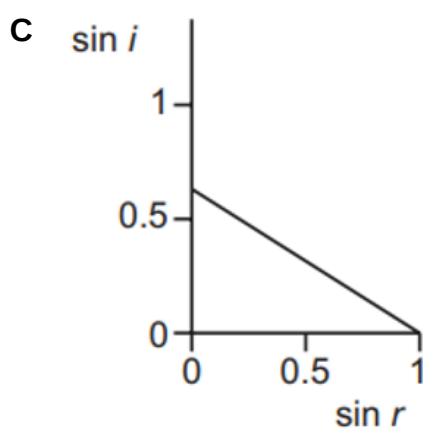
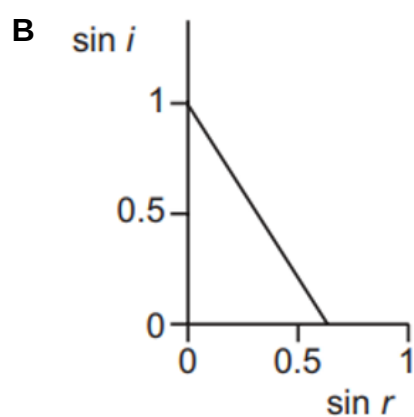
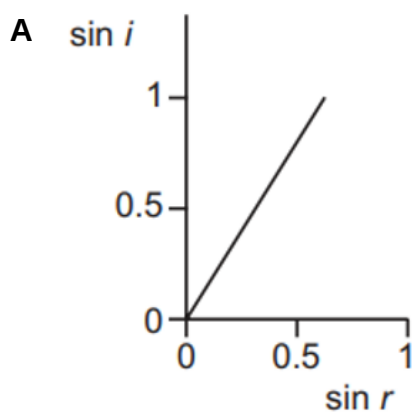
|          | angle of incidence | angle of reflection |
|----------|--------------------|---------------------|
| <b>A</b> | $40^\circ$         | $40^\circ$          |
| <b>B</b> | $40^\circ$         | $50^\circ$          |
| <b>C</b> | $50^\circ$         | $40^\circ$          |
| <b>D</b> | $50^\circ$         | $50^\circ$          |

- 21 A ray of light enters a glass block at an angle of incidence  $i$ , producing an angle of refraction  $r$  in the glass.



Several different values of  $i$  and  $r$  are measured, and a graph is drawn of  $\sin i$  against  $\sin r$ .

Which graph is correct?



- 22** The diagram shows the main regions of the electromagnetic spectrum. Some of the sections are labelled.

|             |  |   |       |  |  |            |
|-------------|--|---|-------|--|--|------------|
| radio waves |  | R | light |  |  | gamma-rays |
|-------------|--|---|-------|--|--|------------|

Which makes use of the waves in region R?

- A** killing cancerous cells  
**B** satellite television  
**C** television remote controller  
**D** sunbed
- 23** A piece of polythene is rubbed with a cloth duster. The polythene becomes negatively charged and the cloth becomes positively charged.

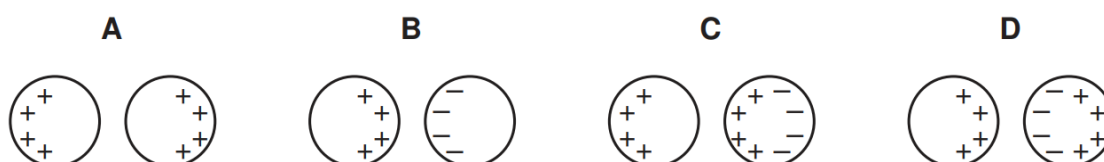
What happens to the polythene and to the cloth to cause this?

|          | polythene       | cloth           |
|----------|-----------------|-----------------|
| <b>A</b> | gains electrons | gains protons   |
| <b>B</b> | gains electrons | loses electrons |
| <b>C</b> | loses protons   | gains protons   |
| <b>D</b> | loses protons   | loses electrons |

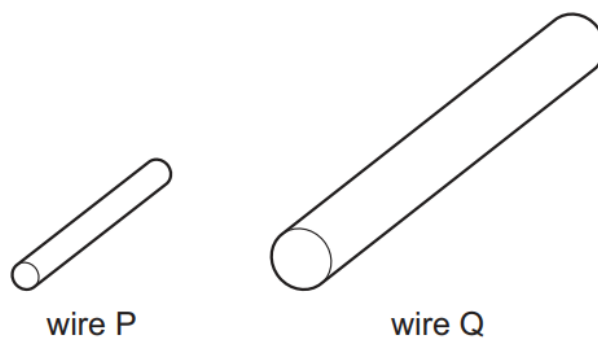
- 24** A positively charged insulated metal sphere is brought close to, but not touching, a similar uncharged metal sphere.



Which diagram shows the charge distribution on the spheres?

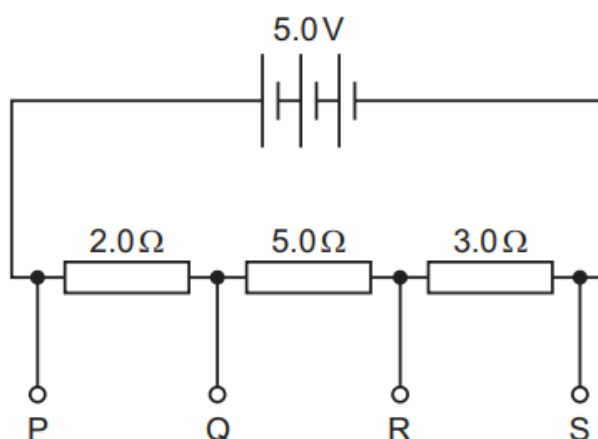


- 25 The resistance of a cylindrical wire P is  $80\ \Omega$ . A second wire Q is made from the same material. The cross-sectional area of Q is four times that of P. The length of Q is twice the length of P.



What is the resistance of Q?

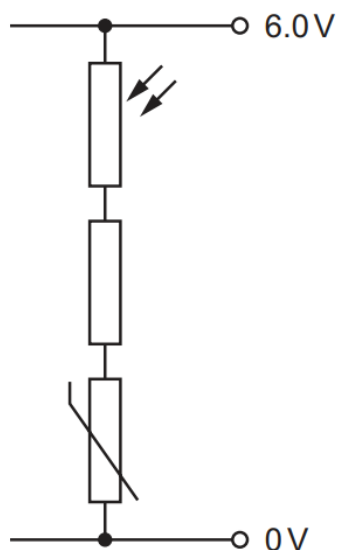
- A  $10\ \Omega$       B  $40\ \Omega$       C  $160\ \Omega$       D  $640\ \Omega$
- 26 The diagram shows a circuit with a  $5.0\text{ V}$  power supply, three resistors and four output terminals P, Q, R and S.



Between which pair of terminals is there a potential difference of  $1.5\text{ V}$ ?

- A PQ      B PR      C QS      D RS

- 27** A student connects two components with variable resistances and a fixed resistor across a 6.0 V supply.

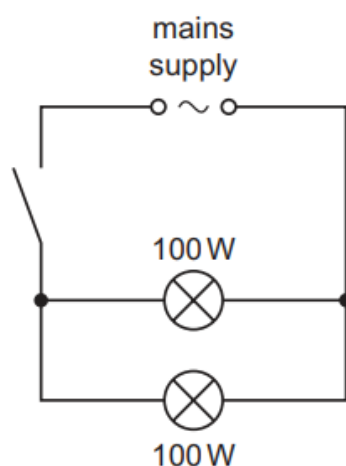


Under which conditions is the voltage across the fixed resistor the greatest?

- A** cold and dark
  - B** cold and bright
  - C** warm and dark
  - D** warm and bright
- 28** Which appliance used on a 240 V supply is most likely to burn out its fuse?

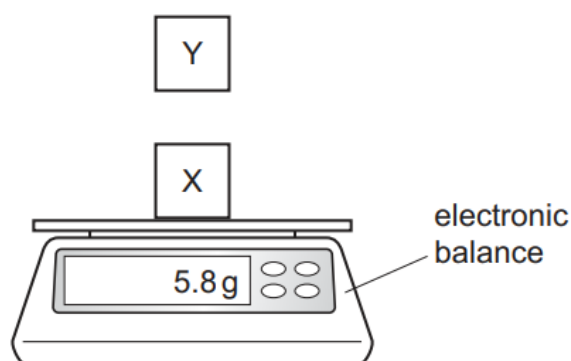
|          | appliance           | fuse |
|----------|---------------------|------|
| <b>A</b> | 100 W lamp          | 1 A  |
| <b>B</b> | 1 kW vacuum cleaner | 5 A  |
| <b>C</b> | 2 kW fan heater     | 3 A  |
| <b>D</b> | 3 kW electric fire  | 13 A |

- 29 Two 100 W lamps are connected in parallel to the mains supply, as shown.



How much electrical energy is supplied by the mains when the switch is closed for 36 minutes?

- A 0.030 kWh    B 0.060 kWh    C 0.12 kWh    D 7.2 kWh
- 30 The cost of electricity is 30.0 cents / kWh.  
It takes 0.060 hours and costs 4.0 cents to boil the water in a kettle.
- What is the power rating of the kettle?
- A 0.45 kW    B 0.65 kW    C 2.2 kW    D 130 kW
- 31 Object X is on an electronic balance. Object Y is held above object X as shown.

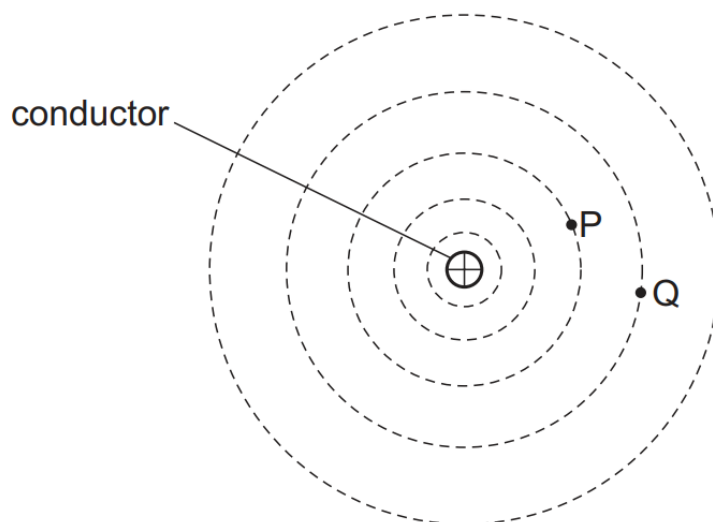


The reading on the balance increases when Y moved closer to X without any contact.

Why does this happen?

- A X and Y are both made of iron.  
B X and Y are both magnets.  
C Y is a magnet and X is made of iron.  
D Y is made of iron and X is a magnet.

- 32 The diagram shows the shape of the magnetic field lines near a current-carrying conductor.

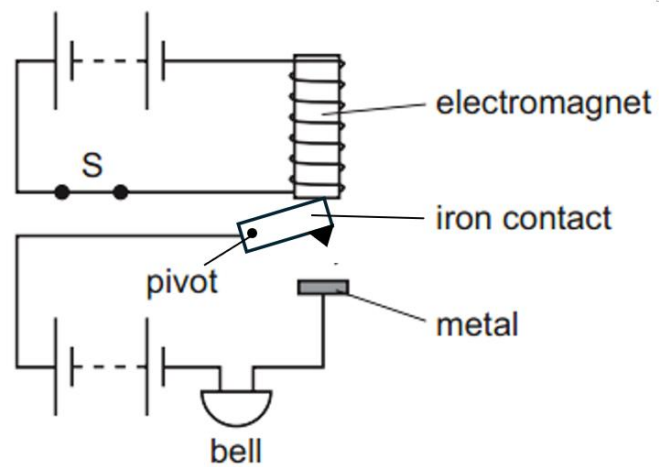


The current in the conductor enters into the plane of the diagram.

Which row correctly states the direction of the field lines and compares the strengths of the field at points P and Q?

|          | direction of field lines | field is stronger at |
|----------|--------------------------|----------------------|
| <b>A</b> | clockwise                | P                    |
| <b>B</b> | clockwise                | Q                    |
| <b>C</b> | anticlockwise            | P                    |
| <b>D</b> | anticlockwise            | Q                    |

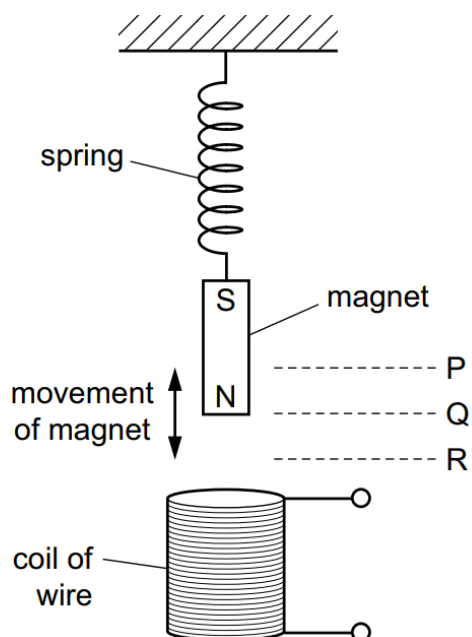
- 33** The diagram shows an alarm system in which the switch S is shown closed. The top circuit is arranged so that the electromagnet is positioned over the soft iron contact.



What happens when switch S is opened?

|          | iron contact          | bell         |
|----------|-----------------------|--------------|
| <b>A</b> | rotate clockwise      | rings        |
| <b>B</b> | rotate clockwise      | stop ringing |
| <b>C</b> | rotate anti-clockwise | rings        |
| <b>D</b> | rotate anti-clockwise | stop ringing |

- 34** A magnet oscillates vertically above a coil of wire.

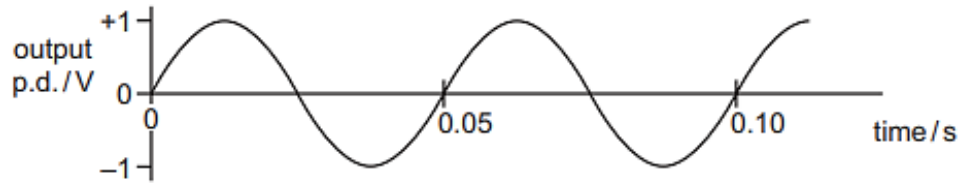


As the lower end of the magnet oscillates between P and R, a varying e.m.f. is induced across the coil.

When this e.m.f. is 0 V, where could the lower end of the magnet be?

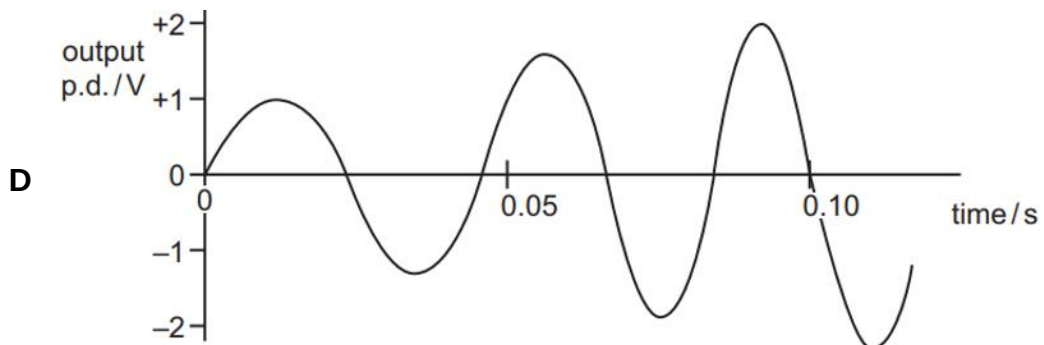
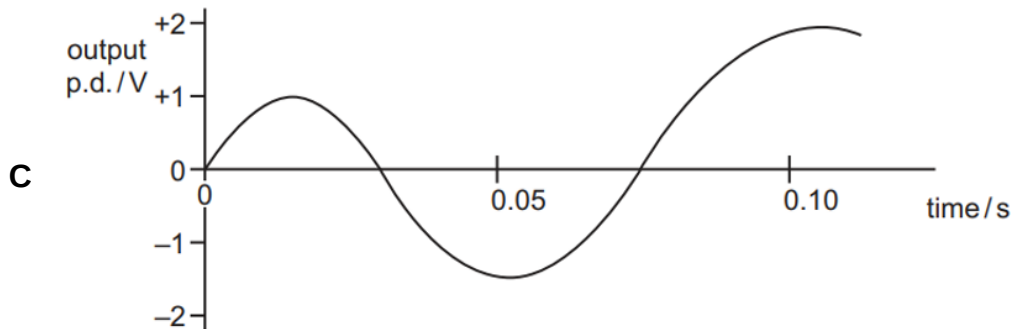
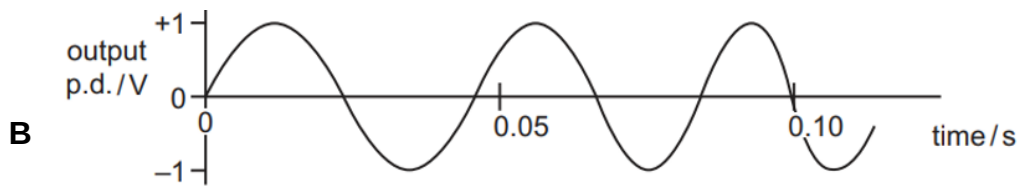
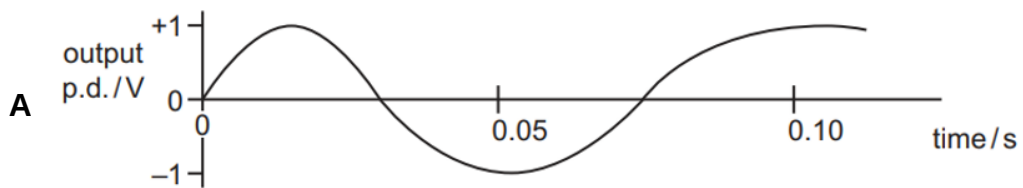
- A** at R only
- B** at Q only
- C** at P or at R
- D** at P or at Q

- 35 The graph shows the output of an a.c. generator. The coil in the generator rotates 20 times in one second.



The speed of rotation of the coil steadily increases.

Which graph best shows how the output changes?

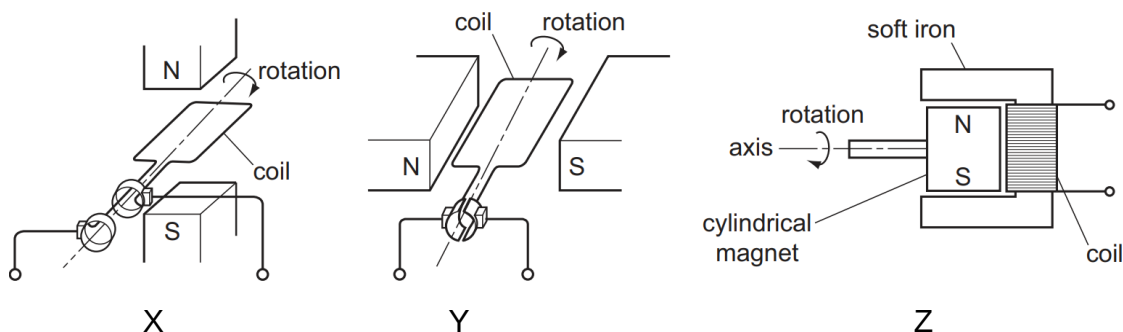


- 36** Electric power cables transmit electrical energy over large distances using high voltage, alternating current.

What are the advantages of using a high voltage and of using an alternating current?

|          | advantage of using a high voltage     | advantage of using an alternating current      |
|----------|---------------------------------------|------------------------------------------------|
| <b>A</b> | high current is produced in the cable | the resistance of the cable is reduced         |
| <b>B</b> | high current is produced in the cable | the voltage can be changed using a transformer |
| <b>C</b> | less energy is wasted in the cable    | the resistance of the cable is reduced         |
| <b>D</b> | less energy is wasted in the cable    | the voltage can be changed using a transformer |

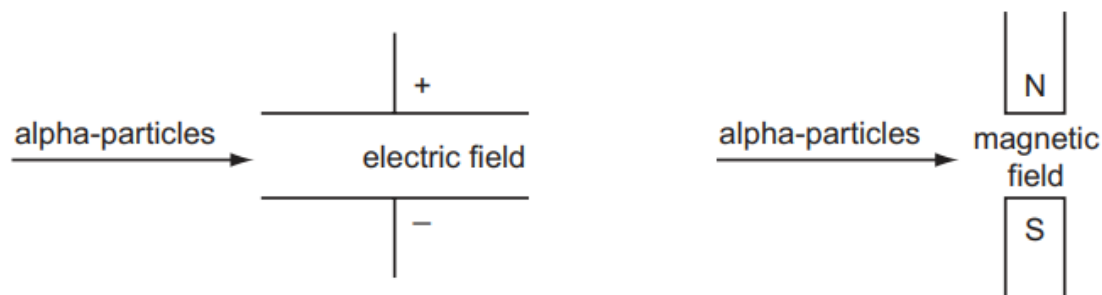
- 37** The diagrams show three electrical devices, X, Y and Z.



Which devices provide an alternating current (a.c.) output?

- A** X only      **B** Y only      **C** X and Y      **D** X and Z

- 38** Alpha-particles pass through an electric field or a magnetic field as shown in the diagrams.



How is the path of the particles affected by these fields?

|          | electric field | magnetic field |
|----------|----------------|----------------|
| <b>A</b> | deflected      | deflected      |
| <b>B</b> | deflected      | undeflected    |
| <b>C</b> | undeflected    | deflected      |
| <b>D</b> | undeflected    | undeflected    |

- 39** Which row is correct for nuclear fission and for nuclear fusion?

|          | fission                 | fusion                             |
|----------|-------------------------|------------------------------------|
| <b>A</b> | produces larger nuclei  | is the energy source of a star     |
| <b>B</b> | produces larger nuclei  | releases energy in a power station |
| <b>C</b> | produces smaller nuclei | is the energy source of a star     |
| <b>D</b> | produces smaller nuclei | releases energy in a power station |

- 40** The half-life of a radioisotope is 2400 years. The activity of a sample is 720 counts / s.

How long will it take for the activity to fall to 90 counts / s?

- A** 300 years      **B** 2400 years      **C** 7200 years      **D** 19 200 years

**END OF PAPER**

**[Turn over**