

- 1 What is the most accurate method to determine the period of an oscillating pendulum?
- A Use a digital timer to measure the time for 1 period. Repeat this 10 times and calculate the average.
  - B Count the number of complete oscillations in 10 seconds. Divide by 10.
  - C Use a digital timer to measure the time for 1 period.  $\times$
  - D Use a digital timer to measure the time for 10 complete oscillations. Divide by 10.
- 2 Which feature of a graph represents total distance travelled?
- A the area under a distance-time graph  $\times$
  - B the area under a speed-time graph  $\sim$
  - C the gradient of a distance-time graph  $\times$
  - D the gradient of a speed-time graph  $\times$
- 3 Which statement about mass is correct?
- A Mass is density divided by volume.  $\times$
  - B Mass is the volume of space occupied by a body.  $\times$
  - C Mass is weight multiplied by the gravitational field strength.
  - D Mass resists a change in motion.
- 4 Which unit is a unit of weight?
- A kg
  - B kg/m
  - C N
  - D Nm

$$\rho = \frac{m}{V}$$

$$m = \rho \times V$$

$$W = mg$$

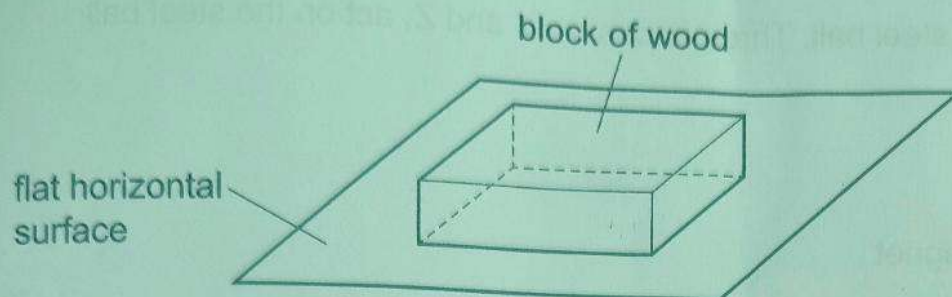
$$mg = W$$

$$g = \frac{1}{m}$$

$$m = \frac{W}{g}$$

$$m = \frac{W}{g}$$

- 5 The diagram shows a block of wood at rest on a flat horizontal surface.



Which equation is used to calculate the density of the wood?

$$\rho = \frac{m}{V}$$

- A density = mass of block  $\times$  area of bottom surface of block
- B density =  $\frac{\text{mass of block}}{\text{area of bottom surface of block}}$   $\times$
- C density = mass of block  $\times$  volume of block  $\times$
- D density =  $\frac{\text{mass of block}}{\text{volume of block}}$
- 6 A stone of mass 400 g is lowered into a measuring cylinder containing water.  $m = 400$
- The water level rises from 300 cm<sup>3</sup> to 500 cm<sup>3</sup>.  $V \text{ of stone}$

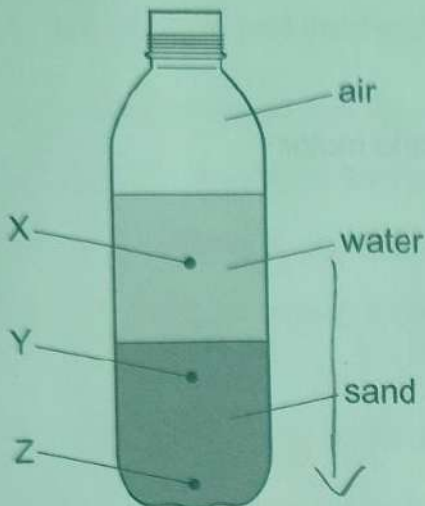
What is the density of the stone?

- A 0.50 g/cm<sup>3</sup>    B 0.80 g/cm<sup>3</sup>    C 1.33 g/cm<sup>3</sup>    D 2.0 g/cm<sup>3</sup>

$$\rho = \frac{400}{200}$$

$$\rho = \frac{m}{V}$$

- 9 The diagram shows a bottle containing air, water and sand.



More sand is added to the bottle. This affects the position of the centre of gravity of the bottle and its contents.

How might the centre of gravity move?

- A from X towards Y
- B from Y towards X
- ☒ C from Y towards Z
- D from Z towards Y

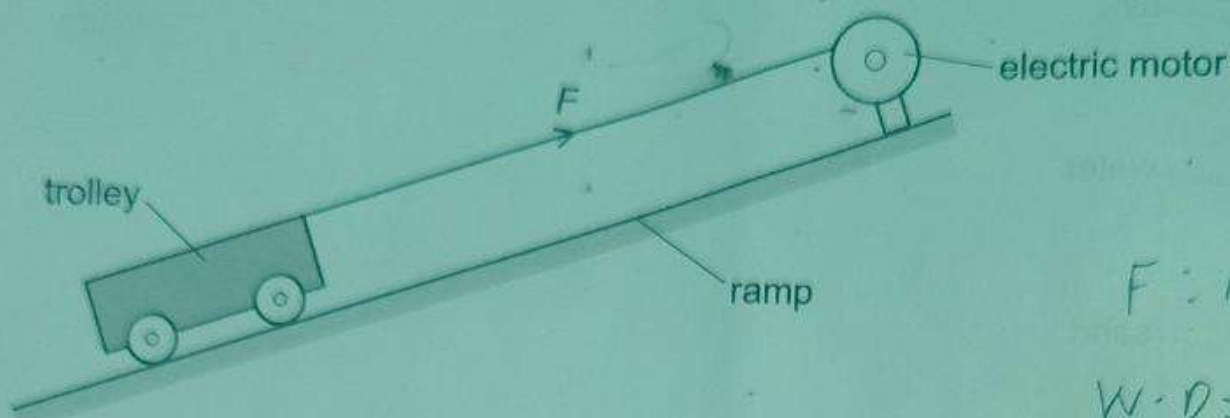
- 10 What is the unit of impulse?

- A kg
- B  $\text{kg m/s}^2$
- ☒ C N/s
- ☒ D Ns

$$= N \times s$$

- 11 An electric motor produces a force  $F$  to pull a trolley up a ramp.

There is no friction or air resistance acting.



Which quantity is equal to the work done by the force  $F$ ?

- A the acceleration of the trolley
- B the energy given to the trolley
- C the power of the motor
- D the weight of the trolley

$$F = m$$

$$W \cdot D =$$

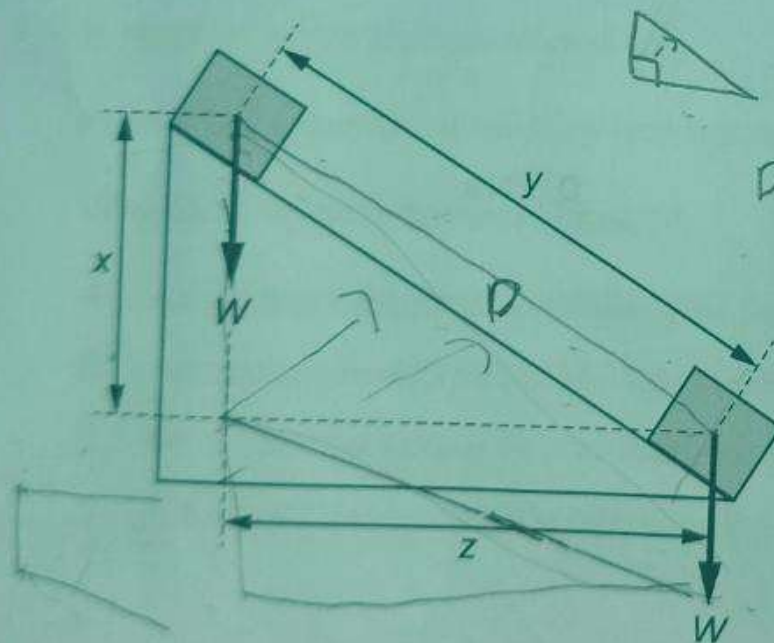
$$W \cdot D =$$

$$F \cdot D = W \cdot$$

$$F = \frac{W \cdot D}{D}$$

$$W \cdot D =$$

- 12 A heavy box of weight  $W$  slides down a frictionless slope.



$$D = \sqrt{x^2 + z^2}$$

$$= y + z$$

$$= x + z = y$$

$$= W \cdot y$$

$$W \cdot D$$

What is the work done by the weight  $W$  in moving from top to bottom?

- A  $Wx$
- B  $Wy$
- C  $W(y - z)$
- D  $W(x + z)$

- 13 In a fossil fuel power station, chemical energy stored in the fossil fuel is used to generate electricity.

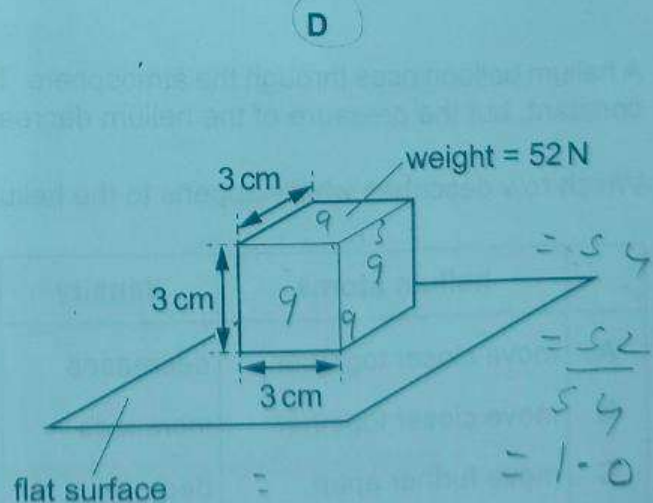
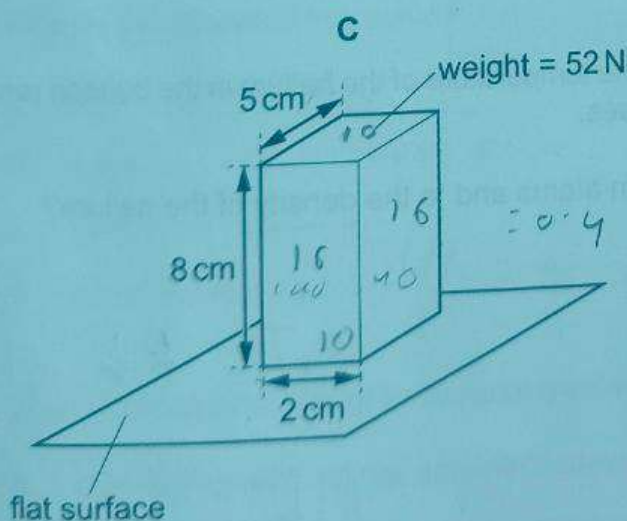
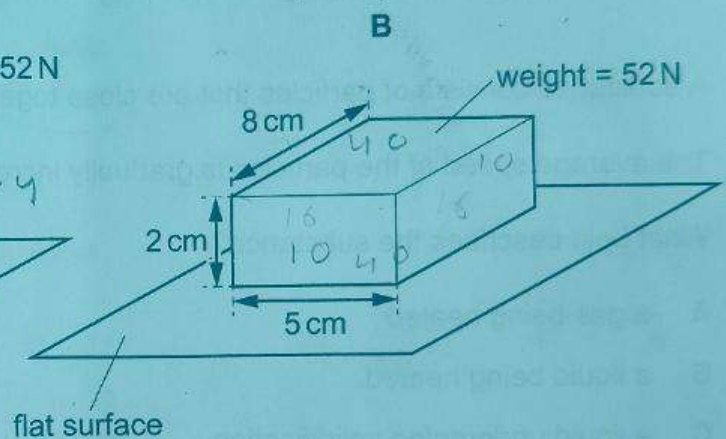
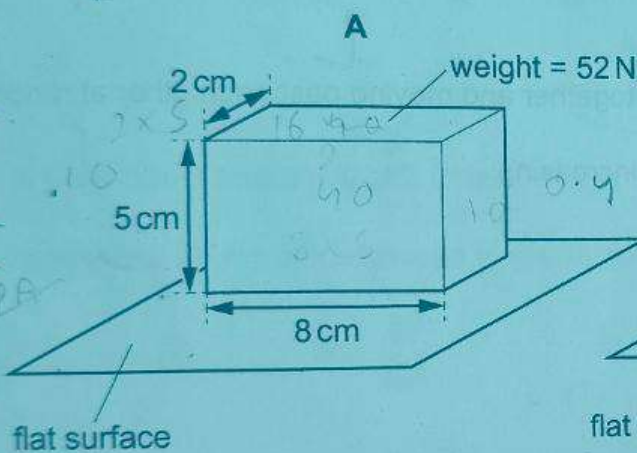
Which stage is **not** involved in the generation of electricity in a nuclear power station?

- A Fuel is burned in a furnace. ✓
- B Steam is used to turn a turbine. (POWVPT)
- C The turbine is used to turn a generator. ✓
- D Water is heated in a boiler to make steam. ✓

- 14 The diagrams show rectangular blocks. Each block rests on a flat surface.

The weights and the dimensions of the blocks are shown.

Which diagram shows the block that exerts the greatest pressure on the flat surface?



- 15 It is dangerous for divers rising to the surface in a lake when the pressure decreases by more than  $180\,000\text{ Pa}$  in  $1.0\text{ minute}$ .  $\approx 60$

The density of water is  $1000\text{ kg/m}^3$ . The gravitational field strength  $g$  is  $9.8\text{ N/kg}$ .

What is the greatest speed at which divers may rise to the surface safely?

- A  $0.31\text{ m/s}$       B  $3.0\text{ m/s}$       C  $18\text{ m/s}$       D  $29\text{ m/s}$

$$P = h\rho g$$

$$180\,000 = 1000 \times 100 \times 9.8$$

$$180\,000 = 9800x$$

$$x = 18.36$$

- 16 Which terms describe the changes in state between a gas and a liquid?

- A boiling and condensing  
B boiling and freezing  $\times$   
C condensing and freezing  $\times$   
D evaporating and solidifying

gas  $\xrightarrow{C}$  liquid  
 $\xleftarrow{E}$   
 $b \propto E$

- 17 A substance consists of particles that are close together and moving past each other at random.

The average speed of the particles is gradually increasing.

What best describes the substance?

- A a gas being heated  
B a liquid being heated  
C a liquid undergoing solidification  
D a solid being heated  $\times$

L  $\rightarrow$  S

- 18 A helium balloon rises through the atmosphere. The temperature of the helium in the balloon remains constant, but the pressure of the helium decreases.

Which row describes what happens to the helium atoms and to the density of the helium?

|   | helium atoms         | density   |
|---|----------------------|-----------|
| A | move closer together | decreases |
| B | move closer together | increases |
| C | move further apart - | decreases |
| D | move further apart - | increases |

$T \uparrow$   $P \downarrow$   $\uparrow$

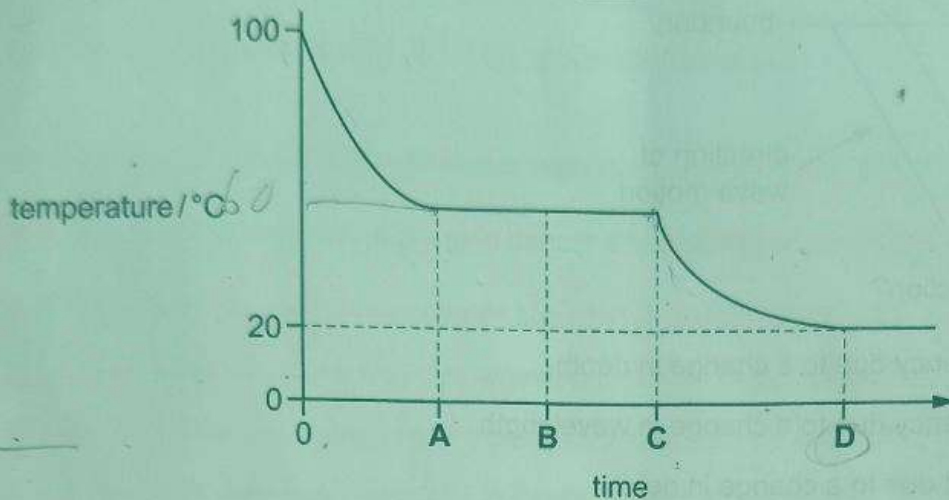
$V \uparrow$   $P \downarrow$

$$\downarrow \rho = \frac{m}{V}$$

- 19 A sample of liquid at  $100^\circ\text{C}$  is allowed to cool to a room temperature of  $20^\circ\text{C}$ .

The diagram shows how the temperature changes with time during the cooling process.

At which time does the sample become completely solid?



$P = \dots$

$$2P = 1$$

$$2 \times \frac{1}{2} = 1$$

$$2 \times 60 = 1$$

- 20 A wave has a frequency of  $2.0\text{ Hz}$ .  
How many waves are produced in one minute?

A  $2.0 \times 60$

B  $\frac{60}{2.0}$

C  $2.0$

D  $\frac{2.0}{60}$

$$\frac{1}{P} = F$$

$$\frac{1}{P} = 2$$

$$\frac{1}{60}$$

$$F = \frac{1}{P}$$

$$\frac{1}{F} = \frac{1}{2}$$

$$F = 2.0$$

- 21 The frequency of a wave is  $0.60\text{ MHz}$  and the wavelength of the wave is  $0.50\text{ km}$ .

What is the speed of this wave?

A  $0.30\text{ m/s}$

B  $1.2\text{ m/s}$

C  $1200\text{ m/s}$

D  $300\,000\,000\text{ m/s}$

$$1\text{ MHz} \rightarrow 1\,000\,000\text{ MHz}$$

$$0.5\text{ km} \rightarrow 0.5 \times 1000 = 500\text{ m}$$

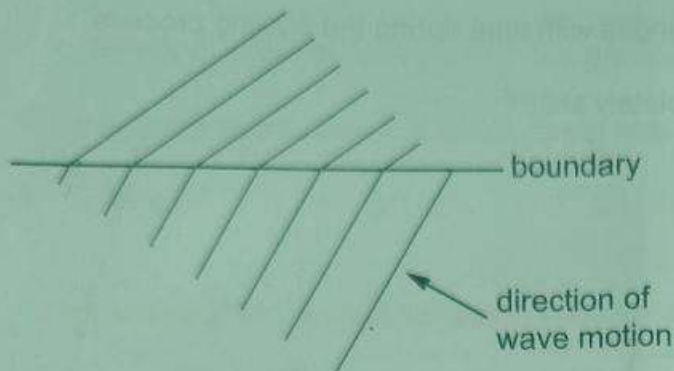
$$v = f\lambda$$

$$v = 0.60 \times 500 = 300\text{ m/s}$$

- 22 Which list consists only of transverse waves?

- A electromagnetic waves, seismic S-waves, waves on the surface of water ✓
- B seismic S-waves, sound waves, electromagnetic waves X
- C sound waves, waves on the surface of water, seismic P-waves X
- D waves on the surface of water, seismic P-waves, electromagnetic waves

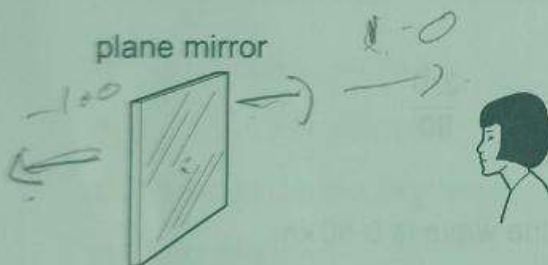
- 23 The diagram shows the refraction of water waves as they cross a boundary in a ripple tank.



$$\downarrow v = f \lambda$$

What causes this refraction?

- A a change in frequency due to a change in depth
  - B a change in frequency due to a change in wavelength
  - C a change in speed due to a change in depth
  - D a change in speed due to a change in frequency
- 24 A woman stands in front of a plane mirror. She sees an image of herself in the mirror.



The woman moves 1.0 m further away from the mirror.

What happens to the distance between the woman and her image?

- A It decreases by 1.0 m.
  - B It decreases by 2.0 m.
  - C It increases by 1.0 m.
  - D It increases by 2.0 m.
- 25 The refractive index of Perspex is 1.5.

What is the critical angle for light incident on the boundary between Perspex and air?

- A  $0.73^\circ$
- B  $26^\circ$
- C  $38^\circ$
- D  $42^\circ$

$$1.5 = \frac{1}{\sin c}$$

26 Which statement is correct?

- A Infrared radiation **cannot** travel in a vacuum. ~~X~~
- B Infrared radiation **cannot** travel in solids or in gases. ~~X~~
- C Infrared radiation can only travel in a vacuum. ~~X~~
- D Infrared radiation can travel in a vacuum and in gases.

LW  
r

HF  
U

27 Ultraviolet waves and radio waves are both components of the electromagnetic spectrum.

Why do ultraviolet waves cause skin cancer and cataracts while radio waves do **not**?

- A Ultraviolet waves have a greater speed in air than radio waves.
- B Ultraviolet waves have longer wavelengths than radio waves. ~~X~~
- C Ultraviolet waves have lower frequencies than radio waves. ~~X~~
- D Ultraviolet waves are ionising, but radio waves are **not** ionising.

28 A fishing boat emits a pulse of ultrasound. The pulse is reflected from some fish underneath the boat.

The reflected pulse reaches the boat 0.32 s after it is emitted.

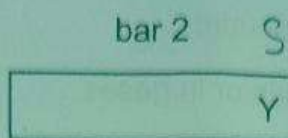
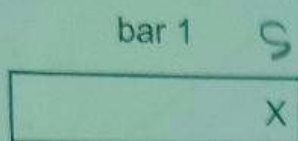
The speed of ultrasound in water is 1500 m/s.

What is the distance between the boat and the fish?

- A 240 m
- B 480 m
- C 4700 m
- D 9400 m

$\frac{L}{1} \quad \frac{L}{1}$

- 29 Two bars are each marked at one end with an X or a Y, as shown.



End X of bar 1 is brought close to the N pole and then to the S pole of a magnet.

End Y of bar 2 is brought close to the N pole and then to the S pole of the magnet.

The table shows what happens.

|                  | end X of bar 1 | end Y of bar 2 |
|------------------|----------------|----------------|
| N pole of magnet | attracted      | attracted      |
| S pole of magnet | attracted      | repelled       |

*magnet* *magnet*

Which materials are bar 1 and bar 2 made from?

|   | bar 1  | bar 2  |
|---|--------|--------|
| A | copper | iron   |
| B | iron   | steel  |
| C | steel  | copper |
| D | steel  | iron   |

- 30 The field outside a bar magnet is represented by magnetic field lines.

Which row gives the direction of the arrows and the spacing of the field lines?

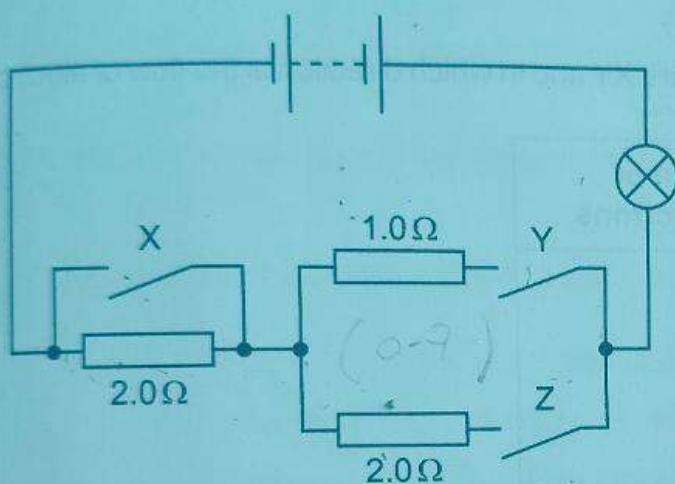
|   | direction of arrows        | spacing of lines               |
|---|----------------------------|--------------------------------|
| A | north pole to south pole ✓ | closer where field is stronger |
| B | south pole to north pole ✗ | closer where field is stronger |
| C | north pole to south pole ✓ | closer where field is weaker   |
| D | south pole to north pole ✗ | closer where field is weaker   |

*mt*

31 Why are metals good electrical conductors?

- A Metals have electrons that are free to move. ✓
- B Metals have isotopes that are radioactive. ✗
- C Metals have nuclei that have a positive charge. ✗
- D Metals have protons that are fixed in their nuclei.

32 The diagram shows a lamp, three resistors and three switches, X, Y and Z, connected to a battery.



For which combination of switch settings does the lamp shine the brightest?

$R \uparrow$

$V = IR$

|   | X      | Y      | Z      |
|---|--------|--------|--------|
| A | closed | closed | closed |
| B | closed | closed | open   |
| C | open   | closed | closed |
| D | open   | open   | closed |

(2.7)

(3.0)

(0.7)

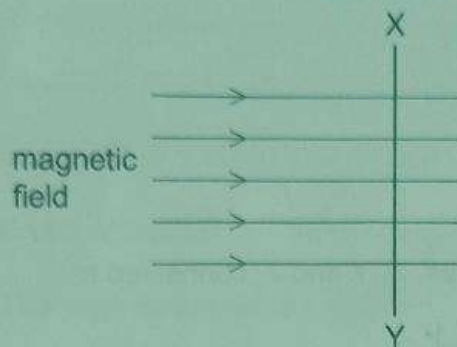
C

33 Which quantities are multiplied together to determine the power input to an electrical appliance?

- A potential difference, current and time ✗
- B potential difference and current only ✓
- C potential difference, resistance and time
- D potential difference and resistance only

$P = IV$

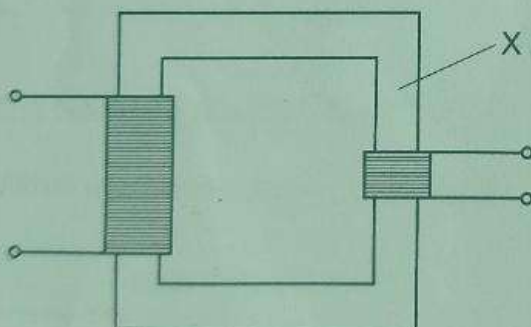
- 34 A current-carrying wire XY moves out of the page when placed perpendicular to the magnetic field shown.



In which direction is the conventional current in wire XY and in which direction is the flow of electrons?

|   | direction of conventional current | direction of flow of electrons |
|---|-----------------------------------|--------------------------------|
| A | from X to Y                       | from X to Y                    |
| B | from X to Y                       | from Y to X                    |
| C | from Y to X                       | from X to Y                    |
| D | from Y to X                       | from Y to X                    |

- 35 A simple transformer is shown.



Part X is labelled.

Which material is used to make part X?

- A iron
- B plastic
- C copper
- D steel

- 36 The table shows the number of protons, neutrons and electrons in four particles.  
Which row shows the overall charge on the particle?

|   | number of protons | number of neutrons | number of electrons | overall charge |
|---|-------------------|--------------------|---------------------|----------------|
| A | 2                 | 2                  | 3                   | neutral        |
| B | 4                 | 3                  | 3                   | neutral        |
| C | 6                 | 5                  | 5                   | positive       |
| D | 6                 | 7                  | 6                   | negative       |

- 37 In the alpha-particle scattering experiment, a beam of alpha-particles is aimed at a thin sheet of gold in a vacuum.

A student writes three conclusions about this experiment.

- 1 The atom has a very small nucleus surrounded by mostly empty space. ✓
- 2 The atom has a nucleus which contains most of the atomic mass. ✓
- 3 The atom has a nucleus that is negatively charged. ✗

Which conclusions are correct?

- A 1, 2 and 3 ✗      B 1 and 2 only      C 1 and 3 only ✗      D 2 and 3 only ✗

- 38 The Earth, the Moon and the Sun are objects in the Solar System.

Which statement about the Earth, the Moon and the Sun is correct?

- A The Earth orbits the Moon once every 24 hours. ✗  
 B The Earth orbits the Sun once every 365 days. ✓  
 C The Moon orbits the Sun once every month. ✗  
 D The Moon orbits the Earth once every 24 hours. ✗

- 39 In which three regions of the electromagnetic spectrum does the Sun radiate most of its energy?

- A infrared, radio, visible ✗  
 B infrared, ultraviolet, visible ✓  
 C gamma, radio, visible ✗  
 D ultraviolet, visible, X-rays ✓

40 The Big Bang theory describes the expansion of the Universe.

Three statements that relate to the Big Bang theory are listed.

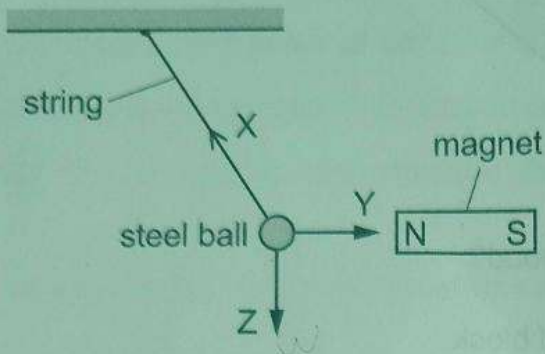
- 1 Distant galaxies are receding faster than closer galaxies.
- 2 Redshift is an increase in the observed frequency of light from distant galaxies.
- 3 Redshift is evidence for the Big Bang.

Which statements are correct?

- A 1, 2 and 3      B 1 and 2 only      C 1 and 3 only      D 2 and 3 only

- 7 A steel ball is suspended from the end of a length of string.

A magnet is brought near to the steel ball. Three forces, X, Y and Z, act on the steel ball.



What are the names of forces X, Y and Z?

|   | X             | Y                   | Z        |
|---|---------------|---------------------|----------|
| A | contact force | magnetic force      | friction |
| B | contact force | electrostatic force | weight   |
| C | tension       | magnetic force      | weight   |
| D | tension       | electrostatic force | friction |

- 8 A skydiver jumps from an aeroplane.

After a few seconds, he reaches terminal velocity without opening his parachute.

Why does he reach terminal velocity?

- A Air resistance becomes greater than his weight and slows him down.
- B Air resistance decreases and he speeds up.
- C Air resistance increases and balances his weight so that his acceleration is zero.
- D His weight decreases and balances the air resistance.