

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**PHYSICS**

**5054/01**

Paper 1 Multiple Choice

October/November 2006

**1 hour**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

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

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

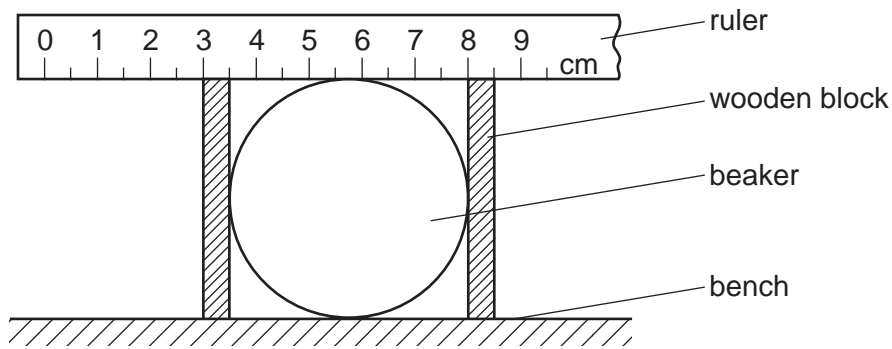
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**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.

- 1 The diagram shows one method of measuring the diameter of a beaker.



What is the diameter of the beaker?

- A** 4.5 cm      **B** 5.0 cm      **C** 5.5 cm      **D** 8.0 cm
- 2 A student studies some equations.

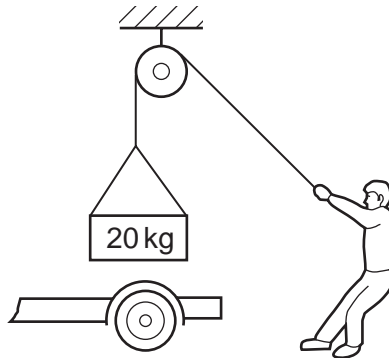
$$\text{power} = \text{work} / \text{time}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{velocity} = \text{displacement} / \text{time}$$

How many vector quantities are contained in the equations?

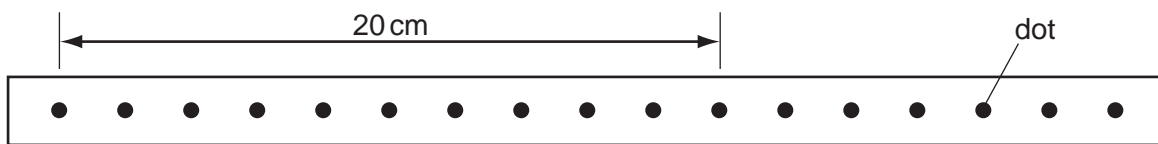
- A** 1      **B** 2      **C** 3      **D** 4
- 3 A person just supports a mass of 20 kg suspended from a rope.



What is the resultant force acting on the mass?

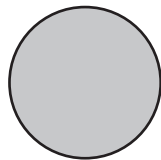
- A** 0 N      **B** 10 N      **C** 20 N      **D** 200 N

- 4 When a block of wood of mass 2 kg is pushed along the horizontal flat surface of a bench with a friction force of 4 N.
- When the block is pushed along the bench with a force of 10 N, it moves with a constant
- A** speed of 3 m/s.  
**B** speed of 5 m/s.  
**C** acceleration of 3 m/s<sup>2</sup>.  
**D** acceleration of 5 m/s<sup>2</sup>.
- 5 The diagram shows a strip of paper tape that has been pulled under a vibrating arm by an object moving at constant speed. The arm was vibrating regularly, making 50 dots per second.



What was the speed of the object?

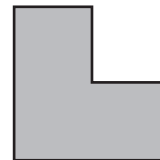
- A** 2.0 cm/s      **B** 5.0 cm/s      **C** 100 cm/s      **D** 200 cm/s
- 6 Three objects are cut from the same sheet of steel. They are different shapes but they all have the same mass.



disc



square

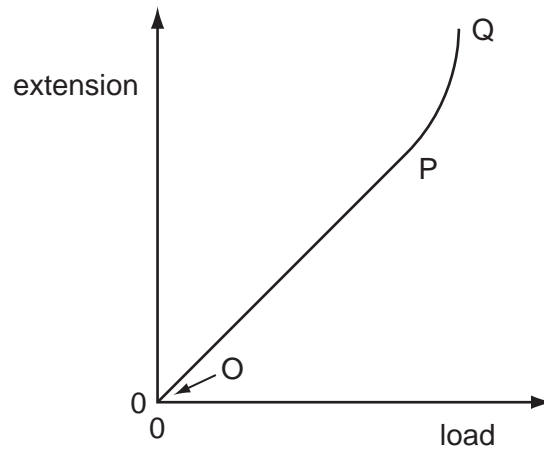


L-shape

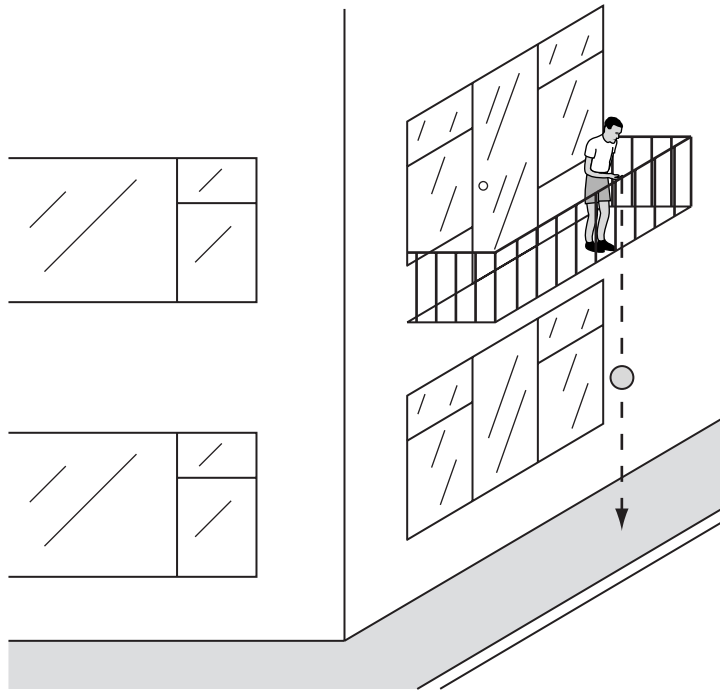
Which object has the greatest density?

- A** the disc  
**B** the L-shape  
**C** the square  
**D** they all have the same density

- 7 Which part of the graph shows the limit of proportionality for an elastic solid?



- A O                      B OP                      C P                      D PQ
- 8 A young child holds a ball over the edge of a balcony. The ball has gravitational potential energy. The ball is then released. It falls onto a concrete path below, and bounces back up.



Which sequence represents, in the correct order, the transformations of the gravitational potential energy after the ball is released?

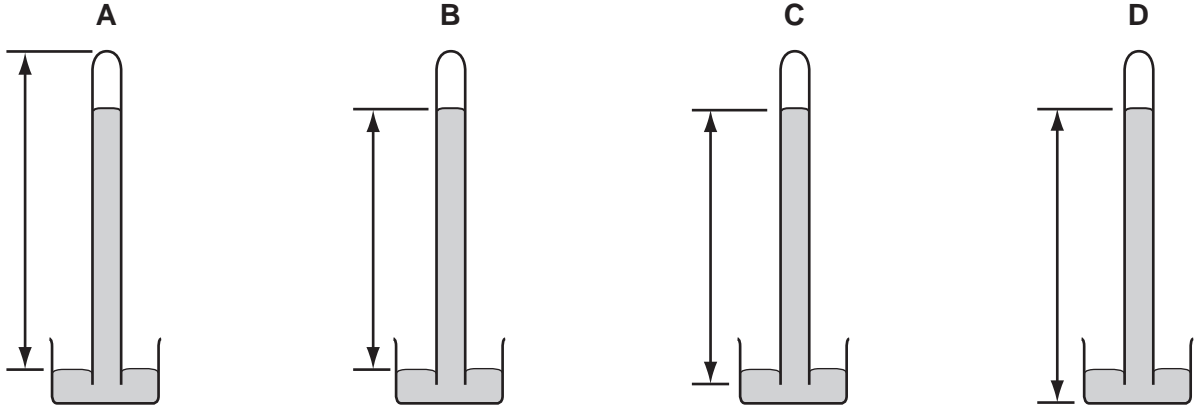
- A → elastic potential energy → kinetic energy → chemical potential energy  
 B → elastic potential energy → kinetic energy → gravitational potential energy  
 C → kinetic energy → elastic potential energy → kinetic energy  
 D → kinetic energy → gravitational potential energy → kinetic energy

- 9 How much energy would be released if  $1 \times 10^{-20}$  kg of matter was entirely converted to energy? (The speed of light is  $3 \times 10^8$  m/s.)

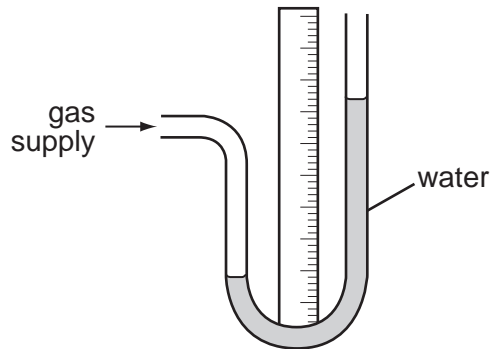
A  $3 \times 10^{-12}$  J    B  $9 \times 10^{-7}$  J    C  $4.5 \times 10^{-4}$  J    D  $9 \times 10^{-4}$  J

- 10 The diagrams show a simple mercury barometer.

Which diagram shows the distance to be measured to find atmospheric pressure?

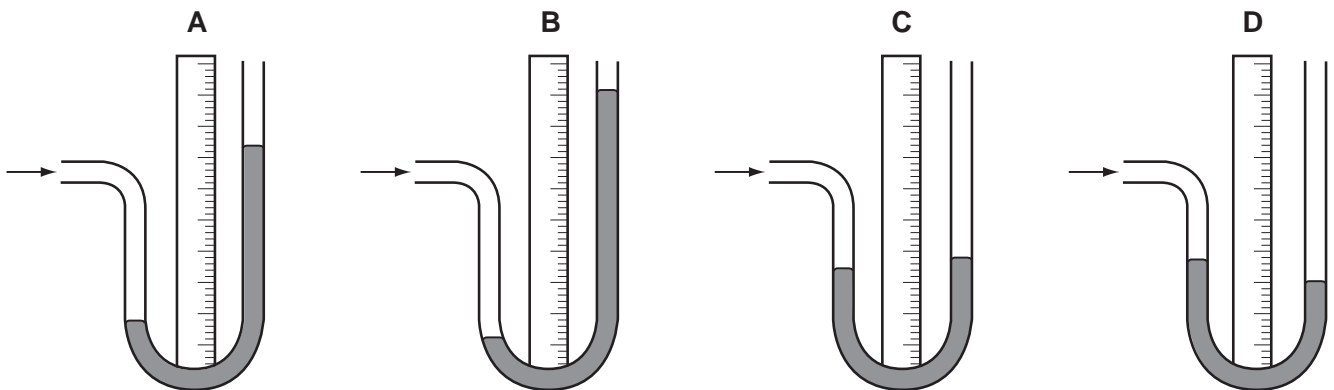


- 11 A water manometer is connected to a gas supply. The diagram shows the water levels.

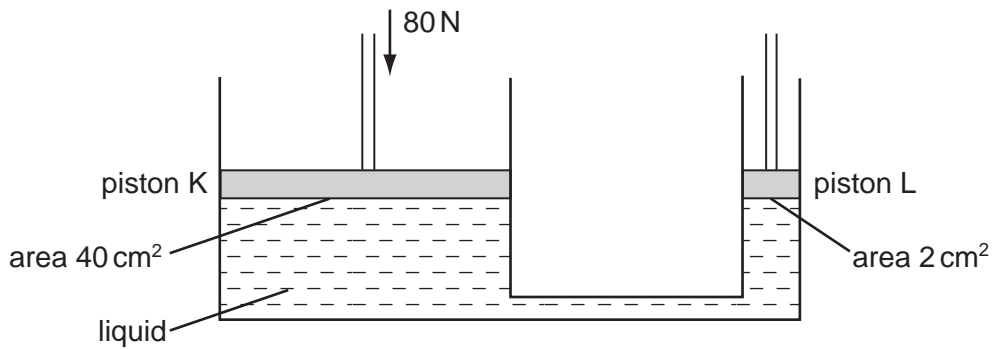


The water is replaced by mercury, which is more dense than water.

Which diagram shows the mercury levels when the manometer is connected to the same gas supply?



- 12 The system shown in the diagram contains a liquid.



A downward force of 80 N is exerted on piston K.

What will be the upward force exerted by the liquid on piston L?

- A** 1 N  
**B** 4 N  
**C** 80 N  
**D** 1600 N
- 13 What is a property of both liquids and gases?
- A** They always fill their containers.  
**B** They are incompressible.  
**C** They can flow.  
**D** They have molecules in fixed positions.
- 14 What conditions of temperature and surface area would produce the most rapid evaporation from a pool of water on a road surface?

	temperature	surface area
<b>A</b>	high	large
<b>B</b>	high	small
<b>C</b>	low	large
<b>D</b>	low	small

- 15 The sensitivity of a liquid-in-glass thermometer depends on the volume of liquid used and the diameter of the bore of the thermometer.

Which changes will produce the greatest increase in sensitivity?

	volume of liquid	bore diameter
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

- 16 The energy required to change liquid water into water vapour at the same temperature is called latent heat of vaporisation.

What does this energy do?

- A** increases the average separation of the water molecules
  - B** increases the average speed of the water molecules
  - C** raises the temperature of the air near the water
  - D** splits the water molecules into their separate atoms
- 17 A 2 kW kettle containing boiling water is placed on a balance. It is left there and continues to boil for 5 minutes. The balance reading changes by 0.2 kg.

What does this information give as a value for the specific latent heat of vaporisation of water?

- A** 2000 J/kg
- B** 3000 J/kg
- C** 50 000 J/kg
- D** 3 000 000 J/kg

- 18 The heat from the hot water in a metal radiator passes through the metal and then spreads around the room.

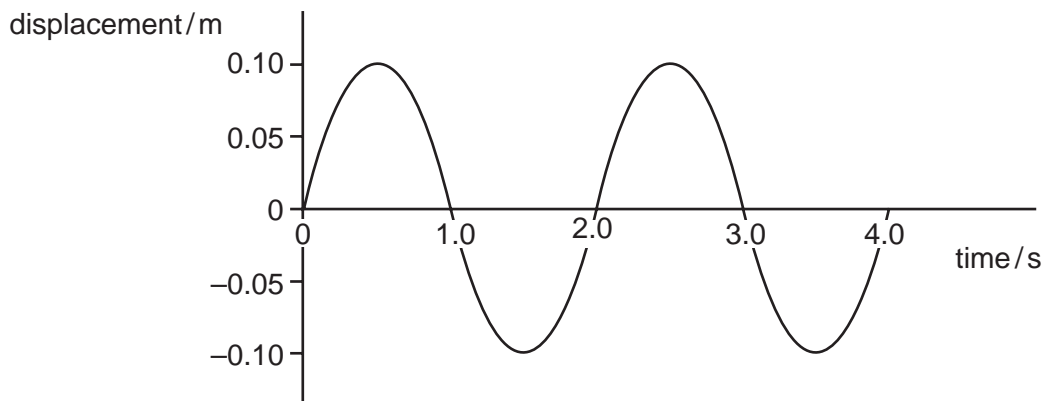
What are the main processes by which the heat is transferred through the radiator and spread around the room?

	through the metal radiator	around the room
<b>A</b>	conduction	conduction
<b>B</b>	conduction	convection
<b>C</b>	radiation	conduction
<b>D</b>	radiation	convection

- 19 What is meant by the term *wavefront*?

- A** the distance between successive peaks of a wave
- B** the distance between the trough and the peak of a wave
- C** a line joining points along the peak of a wave
- D** a line joining the trough and the peak of a wave

- 20 The diagram shows how displacement varies with time as a wave passes a fixed point.

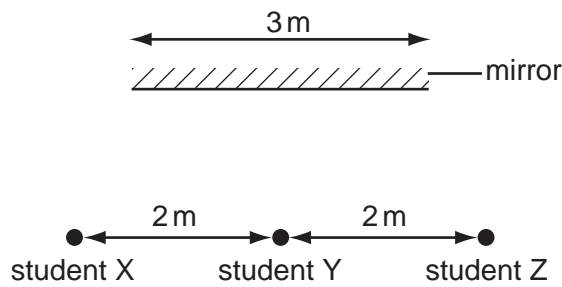


What is the frequency of this wave?

- A** 0.25 Hz
- B** 0.50 Hz
- C** 1.0 Hz
- D** 2.0 Hz



- 21 Three students stand 2 m apart in front of a plane mirror which is 3 m long.

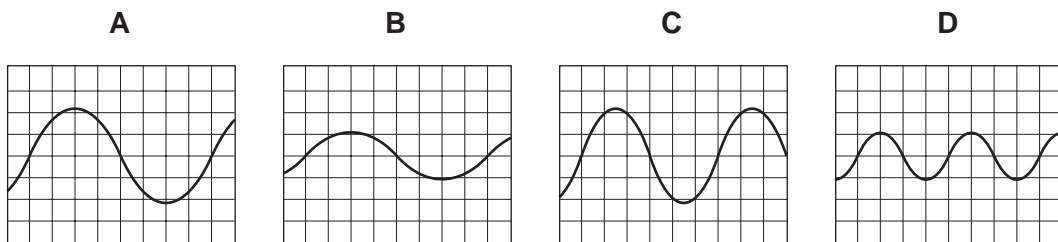


Student Y is standing opposite the mid-point of the mirror.

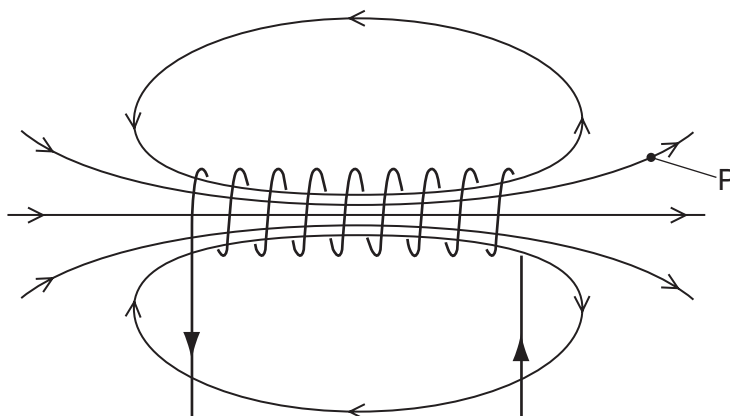
How many students can see the images of the other two?

- A** 0                      **B** 1                      **C** 2                      **D** 3
- 22 The human eye has a converging lens system that produces an image at the back of the eye.  
An eye views a distant object. What type of image is produced?
- A** real, erect, same size  
**B** real, inverted, diminished  
**C** virtual, erect, diminished  
**D** virtual, inverted, magnified
- 23 The diagrams show oscilloscope traces of sounds picked up by microphones. The oscilloscope controls are set in the same position for all the traces.

Which trace shows the sound that is both loud and low-pitched?



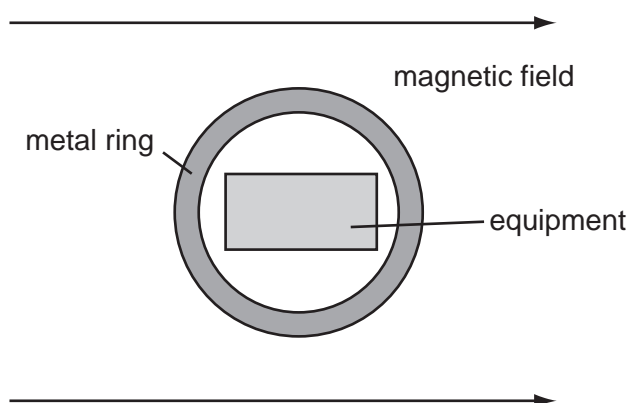
- 24 A current in a solenoid creates a magnetic field.



What is the effect on the magnetic field at the point P of using a larger current in the opposite direction?

	field strength	field direction
<b>A</b>	decreases	reverses
<b>B</b>	decreases	unchanged
<b>C</b>	increases	reverses
<b>D</b>	increases	unchanged

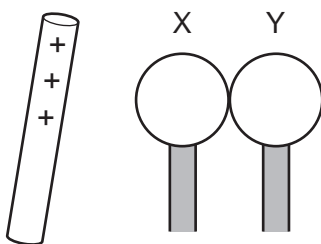
- 25 A metal ring screens a piece of equipment from a magnetic field.



Which metal should be used for the ring, and why?

	metal	reason
<b>A</b>	copper	the metal carries the field lines around the equipment
<b>B</b>	copper	the metal is non-magnetic
<b>C</b>	iron	the metal carries the field lines around the equipment
<b>D</b>	iron	the metal is non-magnetic

- 26 Two insulated and uncharged metal spheres X and Y are touching. While a positively charged rod is near X, the spheres are moved apart. After this action, X has a negative charge.

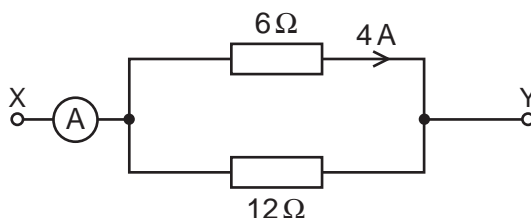


What will be the charge on Y?

- A negative and smaller than that on X  
 B negative and the same size as that on X  
 C positive and smaller than that on X  
 D positive and the same size as that on X
- 27 A wire has a resistance of  $8\ \Omega$ . A second wire, made of the same material, has half the length and twice the cross-sectional area.

What is the resistance of the second wire?

- A  $1\ \Omega$                       B  $2\ \Omega$                       C  $8\ \Omega$                       D  $16\ \Omega$
- 28 Two resistors of  $6\ \Omega$  and  $12\ \Omega$  are arranged in parallel. A p.d. is connected across the terminals X and Y. The current through the  $6\ \Omega$  resistor is  $4\ \text{A}$ .



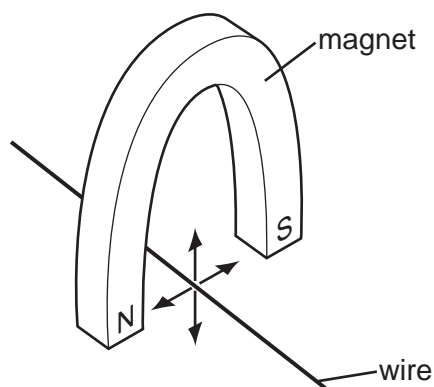
What is the current in the ammeter?

- A  $4\ \text{A}$                       B  $6\ \text{A}$                       C  $8\ \text{A}$                       D  $12\ \text{A}$
- 29 Which of the following would cost the **least** if operated from the same voltage supply?
- A a  $5000\ \text{W}$  electric cooker used for 1 minute  
 B a  $1000\ \text{W}$  electric fire used for 10 minutes  
 C a  $500\ \text{W}$  electric iron used for 1 hour  
 D a  $100\ \text{W}$  lamp used for 1 day

- 30 A house-owner replaces a failed fuse for the lights of the house. When the lights are switched on, the second fuse also fails. The house-owner then uses a third fuse with a higher rating than the previous two.

Why is this **not** a sensible thing to do?

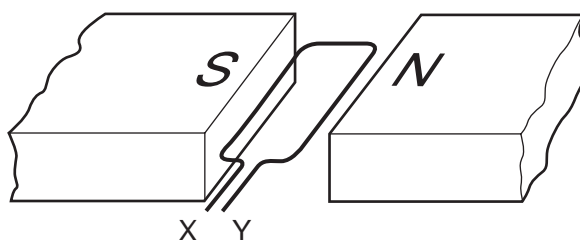
- A** Fuses only allow the circuit to work if the rating is exactly right.  
**B** The third fuse will melt because the rating is too high.  
**C** Using a fuse with too high a rating causes electric shocks.  
**D** The circuit may work, but the fault is not corrected.
- 31 A copper wire is held between the poles of a magnet.



The current in the wire can be reversed. The poles of the magnet can also be changed over.

In how many of the four directions shown can the force act on the wire?

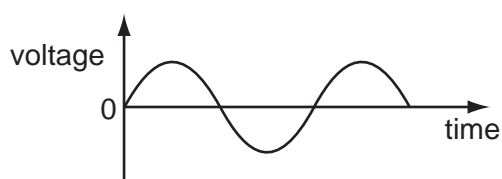
- A** 1                      **B** 2                      **C** 3                      **D** 4
- 32 The diagram shows a coil in a magnetic field.



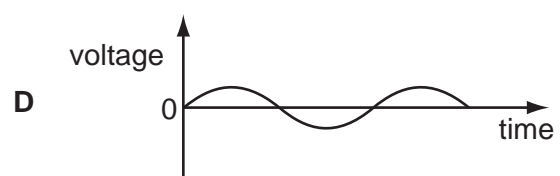
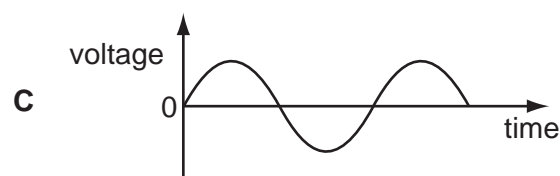
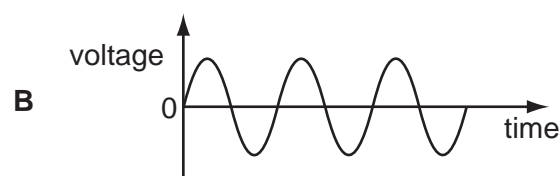
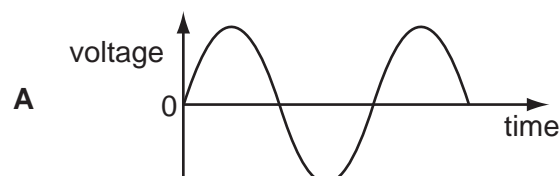
When the coil is part of a d.c. motor, what must be connected directly to X and Y?

- A** d.c. supply  
**B** slip rings  
**C** soft-iron core  
**D** split-ring commutator

- 33 A transformer has more turns on the secondary coil than on the primary. The graph shows how the input voltage varies with time.

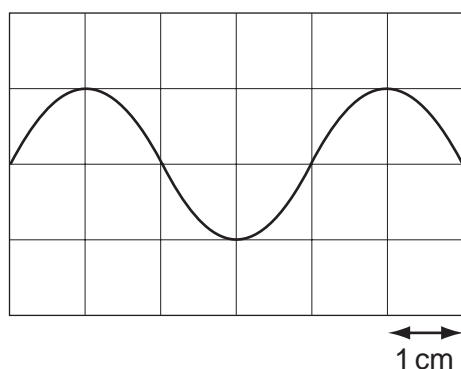


Which graph, drawn to the same scale as the input graph, shows how the output voltage varies with time?



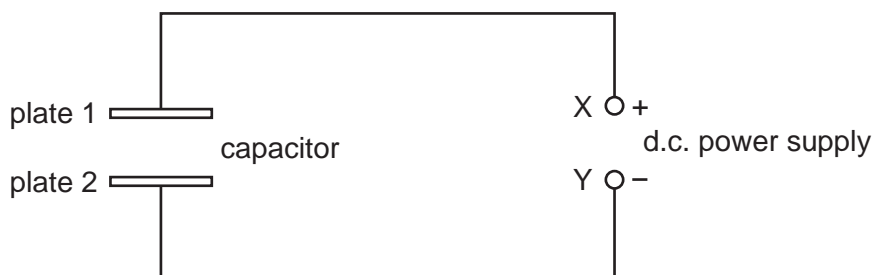
- 34 Why is electrical energy usually transmitted at high voltage?
- A** As little energy as possible is wasted in the transmission cables.
  - B** The current in the transmission cables is as large as possible.
  - C** The resistance of the transmission cables is as small as possible.
  - D** The transmission system does not require transformers.

- 35 The diagram shows the output waveform of an a.c. generator as displayed on an oscilloscope. The horizontal scale is 5 ms/cm.



What is the time for one complete rotation of the coil of the generator?

- A 5 ms                      B 10 ms                      C 20 ms                      D 30 ms
- 36 A capacitor can be made to store energy by connecting it to a d.c. power supply.



Along which paths do electrons flow as the capacitor starts to charge?

- A from X to plate 1 only  
 B from X to plate 1 and from plate 2 to Y  
 C from Y to plate 2 and from plate 1 to X  
 D from Y to plate 2 only
- 37 A nucleus of sodium, Na, has 11 protons and 12 neutrons.

Which symbol represents this nucleus?

- A  ${}_{12}^{11}\text{Na}$                       B  ${}_{11}^{12}\text{Na}$                       C  ${}_{11}^{23}\text{Na}$                       D  ${}_{12}^{23}\text{Na}$

- 38 The half-life of a radioactive material is 24 years.

The activity of a sample falls to a fraction of its initial value after 72 years.

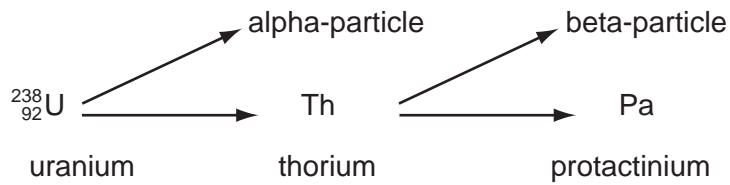
What is the fraction?

- A 1/3                      B 1/4                      C 1/6                      D 1/8

- 39 Which is the correct comparison of the penetrating power and ionising power of alpha and gamma radiation?

	greater penetrating power	greater ionising power
<b>A</b>	alpha	alpha
<b>B</b>	alpha	gamma
<b>C</b>	gamma	alpha
<b>D</b>	gamma	gamma

- 40 The uranium nucleus  ${}_{92}^{238}\text{U}$  emits an alpha-particle to become thorium, which then emits a beta-particle to become protactinium.



What is the proton number (atomic number) of protactinium?

- A** 95            **B** 91            **C** 90            **D** 89

