



Time: 1 hour

### Instructions to candidates

Look at the left hand side of your answer sheet. Ensure that your name, the school/centre name and subject paper are **printed**. Also ensure that the subject code, paper number, centre code, your examination number and the year are **printed** and **shaded**. Do not change the already printed information.

Write your **name**, **centre number** and **candidate number** on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty (40)** questions in 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 Answer Card provided.

### Information for candidates

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough work should be done in this question paper.

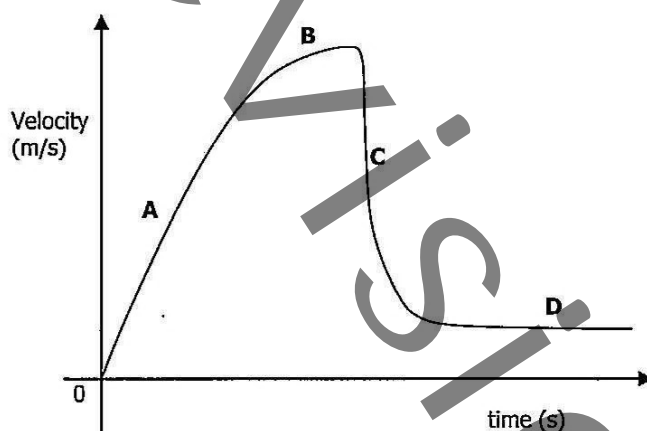
**Cell phones are not allowed in the examination room.**

- 1 A Grade 10 pupil has been asked to measure the volume of a piece of wire accurately. The wire is about 1m long and 2mm in diameter.

Which measuring instruments should the pupil use?

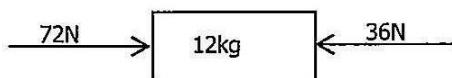
	Length	Diameter
A	Meter rule	Micrometer
B	Meter rule	Vernier Calipers
C	Micrometer	Vernier Calipers
D	Vernier Calipers	Micrometer

- 2 The velocity-time graph for a falling sky diver is shown below. As he falls, the sky diver spreads out his arms and legs and then opens his parachute.



Which part **A**, **B**, **C** or **D** of the graph shows the sky diver falling with terminal velocity?

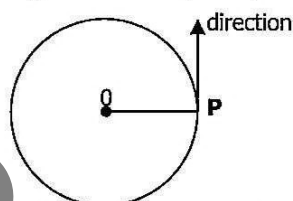
- 3 The diagram shows the forces acting on a packing case of mass 12kg.



What is the resultant force and acceleration produced?

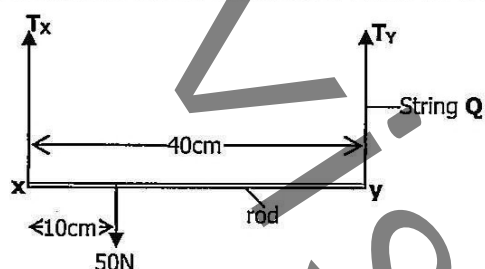
	Resultant Force	Acceleration
A	36N	$0.3\text{m/s}^2$
B	36N	$3.0\text{m/s}^2$
C	108N	$9.0\text{m/s}^2$
D	108N	$30.0\text{m/s}^2$

- 4 The diagram shows particle **P** moving in a circular path at a constant speed.



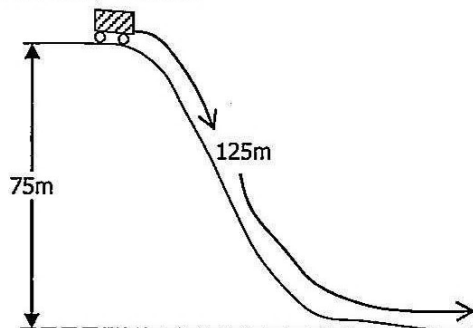
Which statement about **P** is correct?

- A A force of constant size acts on **P** in the direction of motion.
  - B A force of constant size acts on **P** towards **O**.
  - C The force of **P** varies in size as it moves around the circle.
  - D There is no resultant force acting on **P**.
- 5 A light rigid rod 40cm long is supported horizontally at its end by two vertical strings. A weight of 50N is attached to the rod a distance of 10cm from end **x** as shown.



What is the tension in string **Q**?

- A 12.5N
  - B 25.5N
  - C 50.0N
  - D 400.5N
- 6 The diagram shows an object of total mass 2500kg descending from rest at the top of a steep incline.



What is the loss of potential energy as a result of descending the incline?

Assume  $g = 10\text{m/s}^2$ .

- A  $1.875 \times 10^6\text{J}$
- B  $2.750 \times 10^6\text{J}$
- C  $7.500 \times 10^6\text{J}$
- D  $8.750 \times 10^6\text{J}$

- 7 A simple machine of velocity ratio 5 is used to lift a load of 600N through a vertical distance of 20m. If the machine is 80% efficient, what is the effort applied?

A 150N  
B 200N  
C 300N  
D 400N

- 8 An Eskimo stands on snow wearing snow shoes. The mass of the Eskimo is 40kg and the snow shoes have a total area of  $5\text{m}^2$  in contact with the snow (gravitational field strength is  $10\text{N/kg}$ ).

What pressure does the Eskimo exert on the snow?

A  $8.0\text{N/m}^2$   
B  $40.0\text{N/m}^2$   
C  $50.0\text{N/m}^2$   
D  $80.0\text{N/m}^2$

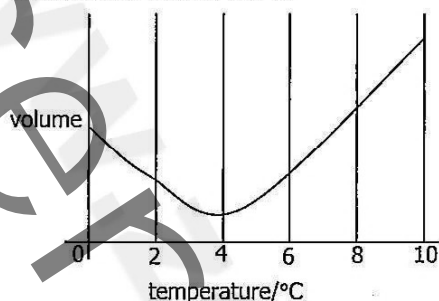
- 9 Which row best describes how the molecules move in solids, liquids and gases?

	Solids	Liquids	Gases
A	Fixed positions	Only vibrate	Move about freely
B	Slowly in all directions	Quickly in all directions	Very quickly in all directions
C	Vibrate about mean position	Move about	Move about freely
D	Vibrate in one direction only	Vibrate in two directions	Vibrate in all directions

- 10 The temperature at which the particles which make up substances have their lowest possible energy is ...

A  $0^\circ\text{C}$ .  
B  $0\text{K}$ .  
C  $-100^\circ\text{C}$ .  
D  $-273\text{K}$ .

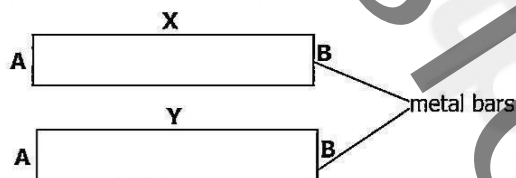
- 11** The diagram shows how the volume of 1kg of water varies with temperature between 0°C and 10°C.



What happens to the volume and density of the water as the temperature rises from 0°C to 4°C?

	<b>Volume</b>	<b>Density</b>
<b>A</b>	Increases	Decreases
<b>B</b>	Increases	Increases
<b>C</b>	Decreases	Decreases
<b>D</b>	Decreases	Increases

- 12** The diagram shows two metal bars **x** and **y** of the same size. The bars are initially at the same temperature.



Equal amounts of heat are supplied to end **A** of both bars. End **A** of bar **X** appears red hot while end **A** of bar **Y** remains unchanged.

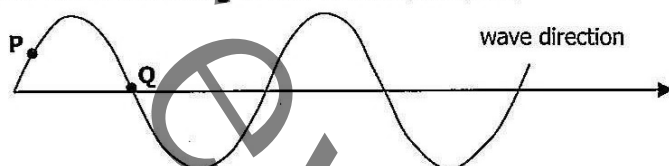
Which statement is correct?

- A** Bar **X** is a better conductor of heat than bar **Y**.
- B** Bar **Y** is a better conductor of heat than bar **X**.
- C** The two metal bars conduct heat equally.
- D** End **B** of bar **Y** is colder than end **B** of bar **X**.
- 13** A piece of aluminium of mass 0.5kg is heated to 100°C and then placed in 0.4kg of water at 10°C. If the resulting temperature is 30°C, what is the specific heat capacity of aluminium? Take specific heat capacity of water as 4 200J/kg°C.
- A** 960 J/kg°C
- B** 4 200 J/kg°C
- C** 8 400 J/kg°C
- D** 33 600 J/kg°C

- 14 A boy standing in wind in a wet swimming suit feels much colder than when the suit was dry. This is because ...

**A** he loses latent heat as water evaporates from his body.  
**B** he gains latent heat as water evaporates from his body.  
**C** the wet swimming suit conducts more heat than the dry one.  
**D** his body is now directly in contact with cold air.

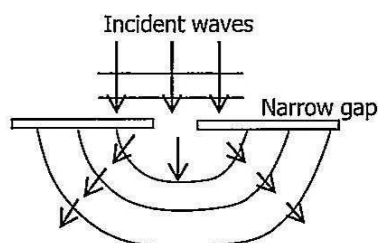
- 15 The diagram shows a transverse wave on a string with two points, **P** and **Q** marked. The wave is moving in the direction shown.



In which direction will **P** and **Q** move next?

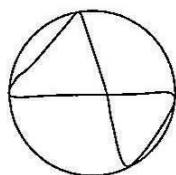
	<b>P</b>	<b>Q</b>
<b>A</b>	moves to the right	does not move
<b>B</b>	moves upwards	moves downwards
<b>C</b>	moves downwards	does not move
<b>D</b>	moves upwards	moves to the right

- 16 Which property of waves is being demonstrated in the diagram below?

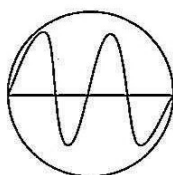


**A** Refraction  
**B** Diffraction  
**C** Bending of waves  
**D** Constructive interference

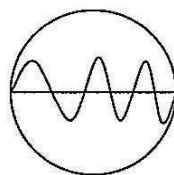
- 17 A note of sound is produced on a keyboard. Its characteristics are that it is louder and has lower pitch. Which of the following waveforms represents this note of sound?



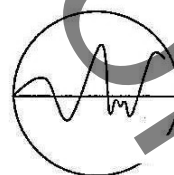
**A**



**B**

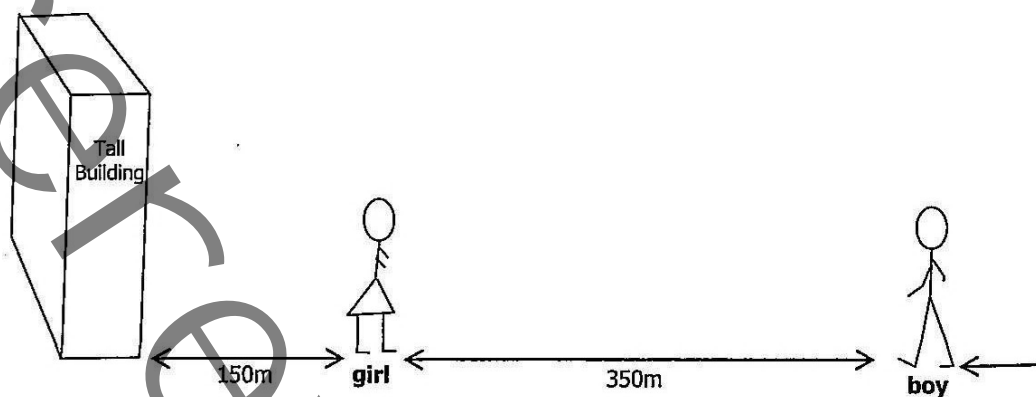


**C**



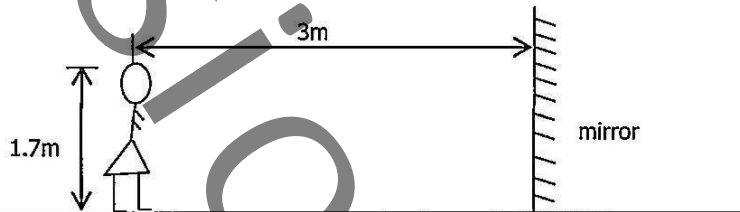
**D**

- 18** The diagram shows a girl standing 150m in front of a tall building. She fires a shot using a starting pistol. A boy, standing 350m from the girl, hears two bangs 1 second apart.



From this information, what is the speed of sound in air?

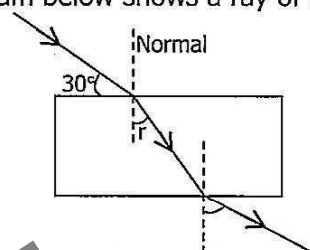
- A** 300m/s
  - B** 350m/s
  - C** 500m/s
  - D** 650m/s
- 19** A girl stands 3.0m in front of a plane mirror as shown below.



How far from the girl is her image?

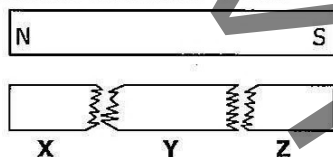
- A** 3.0m
- B** 3.7m
- C** 4.5m
- D** 6.0m

- 20 The diagram below shows a ray of light entering a glass block of refractive index 1.51.



What is the angle of refraction in the glass?

- A 20°  
 B 30°  
 C 35°  
 D 60°
- 21 A pupil breaks down a bar magnet into three equal parts without disturbing its position as shown below.



Which diagram shows the poles in X, Y and Z?

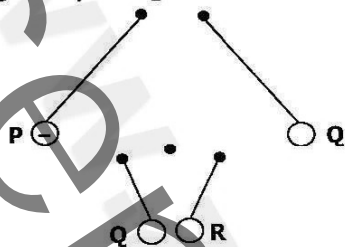
- A
- B
- C
- D

- 22 Which statement describes an example of induced magnetism?

- A Two north poles repel each other, but a north pole attracts a south pole.  
 B A bar magnet swinging freely comes to rest pointing north-south.  
 C A bar magnet attracts a piece of soft iron.  
 D A bar magnet loses its magnetism if it is repeatedly dropped.

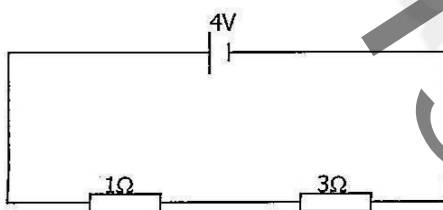


- 23 Three charged objects **P**, **Q** and **R** are suspended by insulated threads. Object **P** is negatively charged.



What could be the charges on **Q** and on **R**?

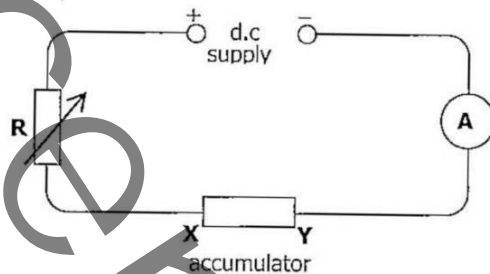
- |          | <b>Q</b> | <b>R</b> |
|----------|----------|----------|
| <b>A</b> | Positive | Positive |
| <b>B</b> | Positive | Negative |
| <b>C</b> | Negative | Positive |
| <b>D</b> | Negative | Negative |
- 24 The diagram shows a 4V battery connected in series with  $1\Omega$  and  $3\Omega$  resistors.



How much charge and current flows in the circuit in 1 minute?

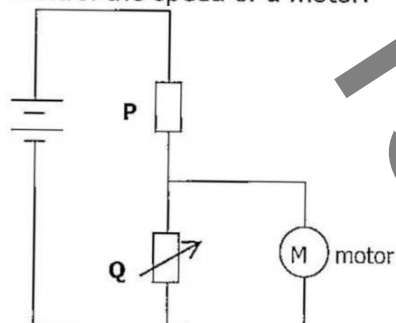
- |          | <b>CURRENT</b> | <b>CHARGE</b> |
|----------|----------------|---------------|
| <b>A</b> | 1A             | 1C            |
| <b>B</b> | 1A             | 60C           |
| <b>C</b> | 2A             | 60C           |
| <b>D</b> | 4A             | 30C           |

- 25 The diagram below shows a charging circuit for an accumulator.



Which statement is correct?

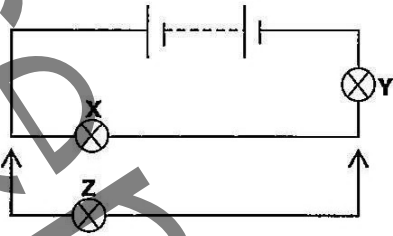
- A When freshly made, each accumulator has an e.m.f of about 12V.
  - B X represents the positive (red terminal) side of the accumulator.
  - C Y represents the positive (red terminal) side of the accumulator.
  - D X represents the negative (black or blue terminal) side of the accumulator.
- 26 In the circuit shown below, resistors P and Q act as a potential divider used to control the speed of a motor.



What is the potential divider for? To vary the ...

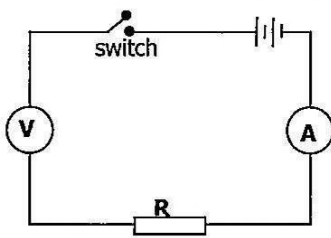
- A resistance of the motor.
- B e.m.f of the battery.
- C potential difference across the motor.
- D current through P.

- 27 The diagram below shows identical lamps **X** and **Y** connected in series with a battery. The lamps light with normal brightness.

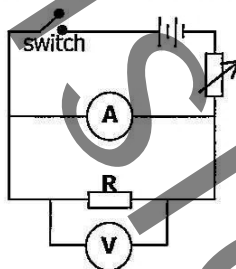


A third lamp **Z** is connected in parallel with lamp **X**. What happens to the brightness of lamp **Y**?

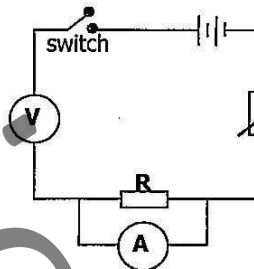
- A Brighter than normal.
  - B Normal as before.
  - C Dimmer than normal.
  - D Very dim (cannot be seen)
- 28 Which circuit diagram can be used to verify ohm's law?



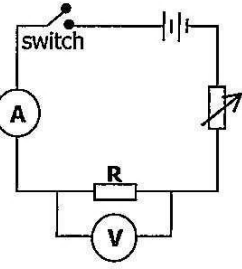
A



B



C

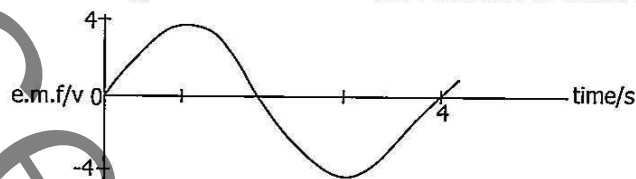


D

- 29 An immersion water heater is marked 240V, 2kW and it is operated for 180 minutes. If the cost of 1 unit (kWh) of electricity is K5.00 what is the cost of running this water heater?

- A K6.00
- B K10.00
- C K15.00
- D K30.00

- 30 The diagram below shows the variation of e.m.f of a simple a.c generator with time.



What is the frequency of the a.c generator?

- A 4 s
  - B 4 Hz
  - C 0.75 Hz
  - D 0.25 Hz
- 31 A moving coil loudspeaker ...
- A receives sound from a microphone.
  - B receives sound from the speaker through the cables.
  - C receives audio-frequency electric currents produced in the wires.
  - D produces audio-frequency electric currents in the speech coil.
- 32 Which statement is correct? Heat engines ...
- A are always more than 100% efficient.
  - B change fuel into mechanical energy.
  - C change heat energy into mechanical energy.
  - D change mechanical energy into heat energy.
- 33 Thermionic emission is the loss of ...
- A heat by hot objects.
  - B electrons by protons.
  - C electrons by heated metal surfaces.
  - D heat by electrons.
- 34 A capacitor of capacitance  $10 \times 10^{-6}\text{F}$  is charged by a battery of 6V. How much charge is stored on each plate?
- A  $2 \times 10^{-6}\text{C}$
  - B  $9 \times 10^{-5}\text{C}$
  - C  $6 \times 10^{-5}\text{C}$
  - D  $1 \times 10^{-4}\text{C}$

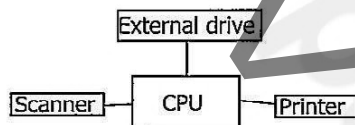
35 Which of the following is a basic memory unit used in computers?

- A Bistable
- B Astable
- C Control unit
- D Arithmetic logic unit

36 Which of the following can be used to produce a series of voltage pulses?

- A Voltmeter
- B Cathode ray oscillography
- C Bistable circuits
- D Astable circuits

37 The diagram shows a sketch computer system.



Which of the components above processes data?

- A Scanner
- B Printer
- C CPU
- D External drive

38 Uranium -238 ( ${}_{92}^{238}\text{U}$ ) emits one beta particle to form a new daughter element whose symbol is **Np**. Which of the following is the correct decay equation?

- A  ${}_{92}^{238}\text{U} \rightarrow {}_{90}^{234}\text{Np} + {}_{-1}^0e$
- B  ${}_{92}^{238}\text{U} \rightarrow {}_{91}^{236}\text{Np} + {}_{-1}^0e$
- C  ${}_{92}^{238}\text{U} \rightarrow {}_{92}^{238}\text{Np} + {}_{-1}^0e$
- D  ${}_{92}^{238}\text{U} \rightarrow {}_{93}^{238}\text{Np} + {}_{-1}^0e$

39 A radioactive substance has a half-life of 15 minutes. If the original mass is 10kg, what mass remains undecayed after 1 hour?

- A 625g
- B 740g
- C 820g
- D 960g

40 How do the nucleon number and proton number of two isotopes of an element compare?

	Nucleon number	Proton number
A	different	different
B	different	same
C	same	different
D	same	same