Name: ..... Index no.: ..... Class.....

# Bukit Batok Secondary School

## GCE O LEVEL PRELIMINARY EXAMINATIONS 2023

## SECONDARY 4 EXPRESS

**PHYSICS**
Paper 1 Multiple Choice

**6091/01**
30 Aug 2023
1 Hour
1005 – 1105 h

Additional Materials: Multiple Choice Answer Sheet (OAS)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, index number and class in the spaces provided at the top of this page.

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 OAS.

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.

This Question paper consists of 16 printed pages including this cover page.



**1** A pipe has an approximate length of 80 cm with an approximate external and internal diameter of 5 cm and 3 cm respectively.

Which instruments are the most suitable for measuring accurately the length, external and internal diameters?

| | length | external diameter | internal diameter |
|---|---|---|---|
| A | rule | vernier calipers | micrometer |
| B | tape | rule | vernier calipers |
| C | rule | vernier calipers | vernier calipers |
| D | tape | micrometer | vernier calipers |

**2** Which row shows the approximate diameter of an atom and the average diameter of the Earth?

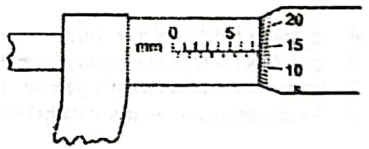
| | diameter of an atom | diameter of the Earth |
|---|---|---|
| A | 0.5 μm | 10 Mm |
| B | 0.5 μm | 10 Gm |
| C | 0.5 nm | 10 Mm |
| D | 0.5 nm | 10 Gm |

**3** A bowling ball and a feather are dropped from the top of a high building. They are released at the same time. The bowling ball reaches the ground first.

Which statement explains this?

**A** There is a smaller force of air resistance on the feather.
**B** The bowling ball reaches a greater speed before the air resistance on it balances its weight.
**C** The acceleration of free-fall *g* is greater for the bowling ball as compared to the feather.
**D** The gravitational field causes the feather to accelerate slower than the bowling ball.

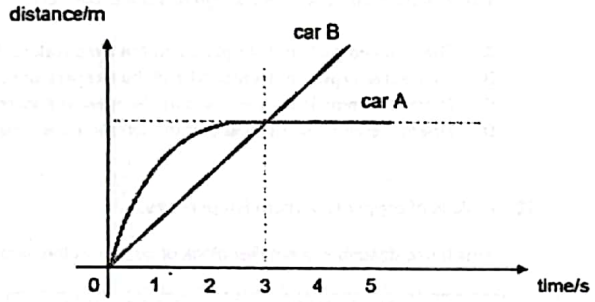
**4** The diagram shows a micrometer scale.




Which reading is shown?

**A** 5.64 mm **B** 7.14 mm **C** 7.16 mm **D** 7.64 mm

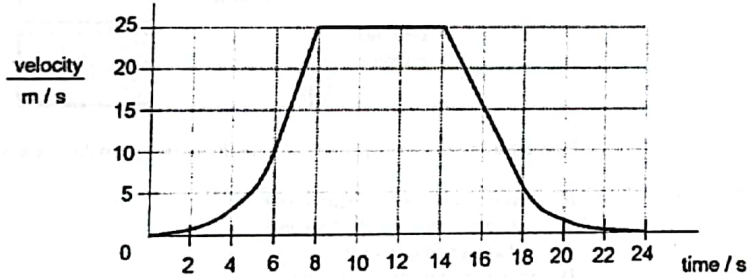
5 The diagram below shows the distance-time graph of car A and car B at the same start point.




Which of the following statements is true about the motion of the cars?

A They are both accelerating for the first two seconds.
B Car B will overtake car A.
C Car A travels with constant velocity after 3.0 s.
D Car B accelerates uniformly from rest.

6 The diagram shows the velocity-time graph of an object.



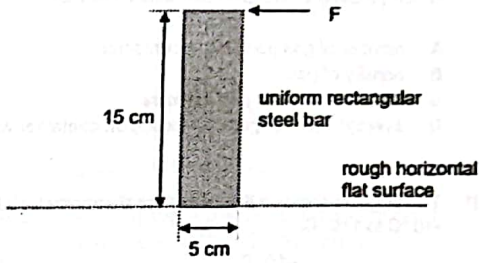

Which statement explains the motion of the car from t = 8 s to t = 22 s?

| | t = 8 s to t = 14 s | t = 14 s to t = 18 s | t = 18 s to t = 22 s |
|---|---|---|---|
| A | zero acceleration | constant deceleration | decreasing deceleration |
| B | constant acceleration | constant acceleration | decreasing acceleration |
| C | constant acceleration | constant deceleration | increasing deceleration |
| D | constant velocity | decreasing deceleration | increasing deceleration |





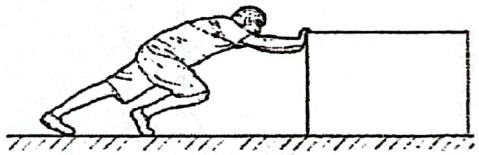
7 The diagram shows a uniform rectangular steel bar placed on a rough horizontal flat surface. A horizontal force F acts on the top end of the steel bar. The steel bar weighs 30 N.




Which expression calculate the force F required to just tilt the steel bar from the horizontal surface?

A 30 x (5 ÷ 2) = F x (15)
B 30 x (5) = F x (15)
C (30 x 10) x (5 ÷ 2) = F x (15)
D (30 x 10) x (5) = F x (15 ÷ 2)

8 A man pushes a heavy box along the ground.

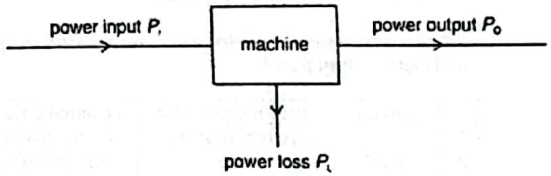


A force acts between the man's hands and the box. Another force acts between the man's feet and the floor.

In which direction do these forces act on the man?

| | forces on man's hand | forces on man's feet |
|---|---|---|
| A | towards the left | towards the left |
| B | towards the left | towards the right |
| C | towards the right | towards the left |
| D | towards the right | towards the right |

9 Power is transferred through a machine as shown.

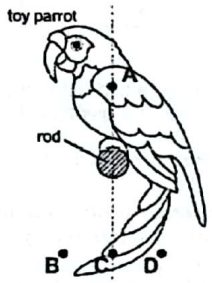



What is the efficiency of the machine?

A $\frac{P_I}{P_O}$ B $\frac{P_O}{P_I}$ C $\frac{P_I}{P_O + P_L}$ D $\frac{P_L}{P_I}$

10 The diagram shows a toy parrot pivoted on a rod at its equilibrium orientation. This toy is designed not to fall over even when it is displaced.

Where is the position of its center of gravity?




11 A stone enters a deep pool at high speed. It slows down as it moves towards the bottom of the pool.

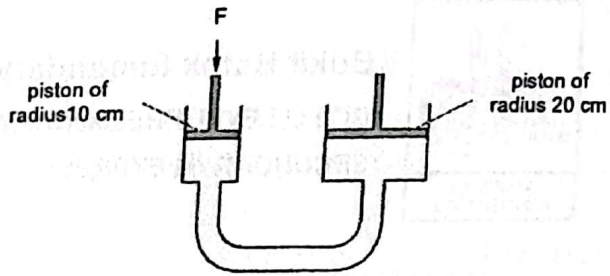
What is the energy transformation as the stone moves downwards through the water?

A gravitational potential energy ⟶ kinetic energy + thermal energy
B gravitational potential energy ⟶ kinetic energy ⟶ thermal energy
C gravitational potential energy + kinetic energy ⟶ thermal energy
D kinetic energy ⟶ gravitational potential energy + thermal energy





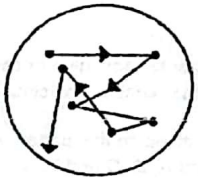
12 When a force, F, is applied to the smaller piston of a hydraulic press, as shown, the small piston moves down by a distance, D.




How far upwards will the larger piston move?

A D/4 B D/2 C 2D D $D^2$

13 Smoke particles in a transparent box are observed using a microscope. A small point of light is seen to move around as shown.



When the temperature in the box is raised, what change can be observed under the microscope?

A The small point of light increases in size.
B The small point of light glows brighter.
C The small point of light moves slower.
D The small point of light changes direction more frequently.

14 A cylinder contains gas and the volume of the cylinder is kept constant.

Which change to the mass of the gas and which change to its temperature each result in a decrease in pressure?

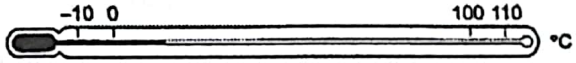
| | change in mass | change in temperature |
|---|---|---|
| A | decrease | decrease |
| B | decrease | increase |
| C | increase | decrease |
| D | increase | increase |

15 A fixed shaped sealed container filled with gas is heated.

Which property of the gas must also increase?

A number of gas particles in container
B density of gas
C distance between gas particles
D average force of particles acting on container walls

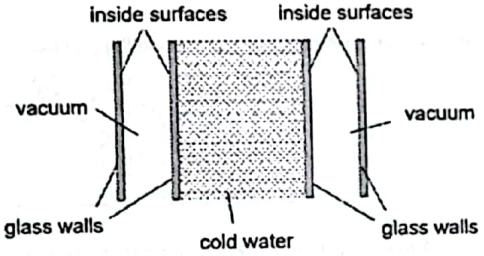
16 The diagram shows a liquid-in-glass thermometer which can read temperature from -10 °C to 110 °C.




What is the difference in temperature between the two fixed points?

A 10 °C B 100 °C C 110 °C D 120 °C

17 The diagram shows part of a vacuum flask. The vacuum flask contains cold water.




Which row gives the colour for the inside surfaces to keep the water cold and the explanation?

| | colour of inside surfaces | explanation |
|---|---|---|
| A | black | good absorber |
| B | black | good emitter |
| C | silver | poor absorber |
| D | silver | poor emitter |





18 A solid changes state by melting.

Which statement about the change of state is correct?

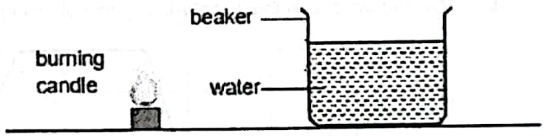
A Thermal energy is not supplied and the temperature decreases.
B Thermal energy is not supplied and the temperature is constant.
C Thermal energy is supplied and the temperature increases.
D Thermal energy is supplied and the temperature is constant.

19 A block of copper is at room temperature.

Which row describes a smaller block of copper at the same temperature?

| | internal energy | heat capacity | specific heat capacity |
|---|---|---|---|
| A | less | less | same |
| B | less | same | less |
| C | same | less | same |
| D | same | same | same |

20 The diagram shows a burning candle next to a beaker filled with water.




How does thermal energy transfer from the burning candle to the water?

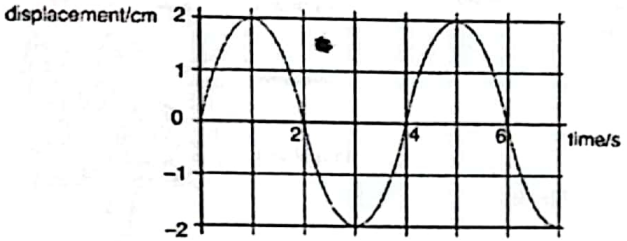
A conduction and convection only
B convection and conduction only
C radiation and conduction only
D radiation and convection only

21 Equal masses of oil and water are heated to 80 °C and then left to cool.

Which statement explains why the oil cools faster than the water?

A Oil has a higher boiling point than water.
B Oil has a lower melting point than water.
C Oil has a lower specific latent heat than water.
D Oil has a lower specific heat capacity than water.

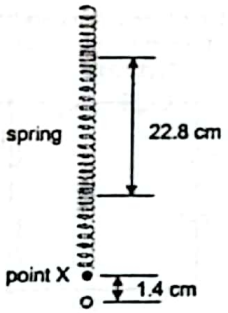
**22** The graph shows how the displacement of a particle in a wave varies with time.




Which characteristics of the wave can be deduced from the graph?

**A** Its period is 2.0 s and its speed is 0.5 cm/s.
**B** Its period is 4.0 s and its frequency is 0.25 Hz.
**C** Its period is 4.0 s and its frequency is 1.75 Hz.
**D** Its period is 6.0 s and its frequency is 0.17 Hz

**23** The diagram shows a spring oscillating vertically. Point X at the end of the spring is oscillating between two vertical points 1.4 cm apart.



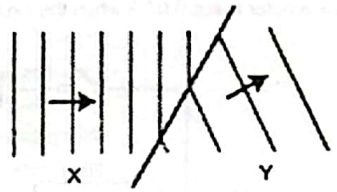

Which row describes the wave?

| | amplitude / cm | wavelength / cm |
|---|---|---|
| **A** | 0.7 | 11.4 |
| **B** | 0.7 | 22.8 |
| **C** | 1.4 | 11.4 |
| **D** | 1.4 | 22.8 |





**24** The diagram shows the wavefronts of water waves in sections X and Y which are of different depths.



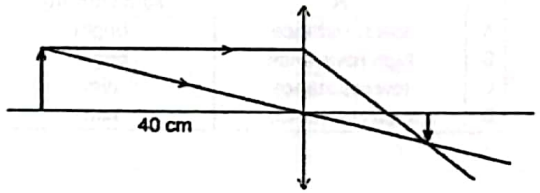

How do the speed and frequency of the wave change when the waves move from section X to Y?

| | speed | frequency |
|---|---|---|
| **A** | decreases | no change |
| **B** | decreases | increases |
| **C** | increases | no change |
| **D** | increases | increases |

**25** Which row gives an example of a longitudinal wave and of a transverse wave?

| | longitudinal wave | transverse wave |
|---|---|---|
| **A** | ultrasound | ultraviolet |
| **B** | microwaves | radio waves |
| **C** | radio waves | microwaves |
| **D** | ultraviolet | ultrasound |

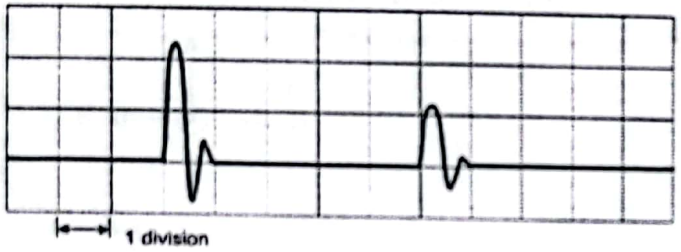
**26** The diagram shows an object placed 40 cm in front of a thin converging lens used to form a real image in a camera.




What is the focal length of this lens?

**A** 10 cm
**B** 20 cm
**C** 30 cm
**D** 50 cm

27 The diagram shows a cathode-ray oscilloscope screen measuring sound signal and its echo. Each horizontal division is set at 20 ms and speed of sound in air is 300 m/s.

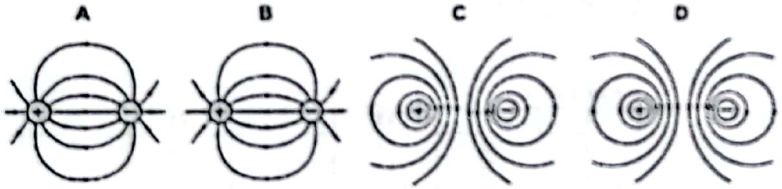



What is the distance between the source of sound and the surface where the sound was reflected?

A 12 m
B 15 m
C 18 m
D 30 m

28 A positive charge and a negative charge of equal magnitude are placed a short distance apart.

Which diagram best represents the associated electric field?




29 In 4.0 s, $4.2 \times 10^{19}$ electrons pass through a resistor. As the electrons pass, thermal energy is produced in the resistor at a rate of 6.0 W. The charge on an electron is $1.6 \times 10^{-19}$ C.

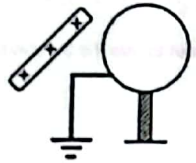
What is the potential difference across the resistor?

A 0.28 V
B 0.89 V
C 3.60 V
D 9.10 V





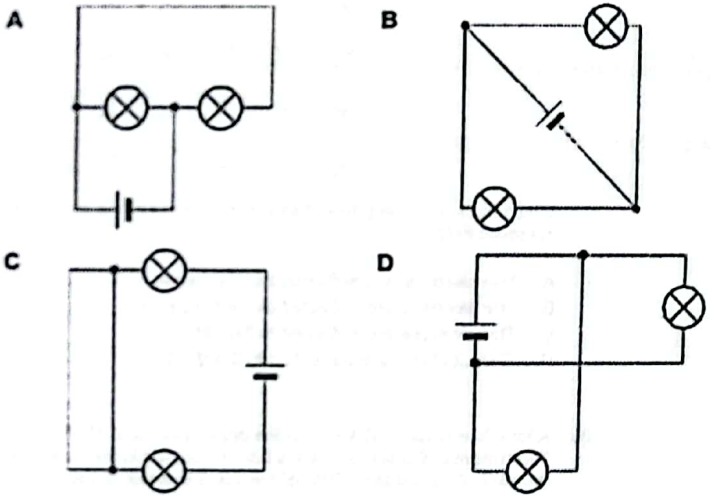
30 A positively charged rod is held close to an earthed metal sphere.



What describes the charge on the metal sphere?

A It is negative because electrons are attracted towards the rod.
B It is negative because protons are repelled by the rod.
C It is neutral because the number of protons and electrons remained constant.
D It is neutral because it is earthed.

31 In which of the following circuits are the light bulbs not connected in parallel?



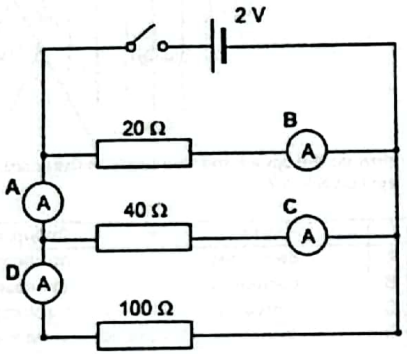

32 The potential difference between the ends of a resistance wire is 40 V. A current of 80 mA flows through the resistance wire in 350 μs.

How much electrical energy is converted to other forms of energy in the resistance wire?

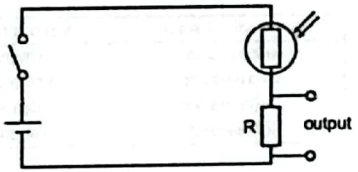
A 1.12 mJ B 1.43 mJ C 1.12 MJ D 1.43 MJ

33 The diagram shows three resistors, four ammeters, a cell, and a switch.

Which ammeter reads 0.07 A when the circuit is switched on?




34 The diagram shows a potential divider.



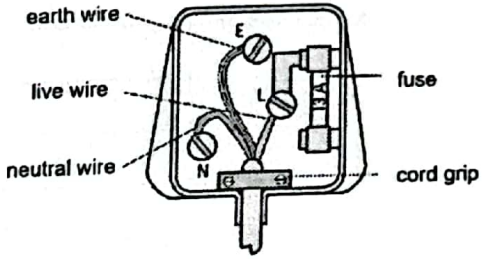

Which row will result in the largest potential difference across the output?

| | R | light intensity |
|---|---|---|
| A | low resistance | bright |
| B | high resistance | bright |
| C | low resistance | dim |
| D | high resistance | dim |





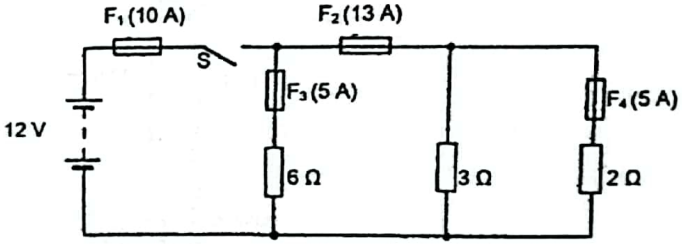
35 The diagram shows an electrical plug of a 1500 W electric kettle connected to a 240 V supply.




What is the current in the three wires when the kettle is working normally?

| | live wire / A | neutral wire / A | earth wire / A |
|---|---|---|---|
| A | 0 | 0 | 6.25 |
| B | 6.25 | 0 | 0 |
| C | 6.25 | 6.25 | 0 |
| D | 6.25 | 6.25 | 6.25 |

36 Which two fuses (rating values are labelled in brackets) in the circuit below will be blown when the switch S is closed?



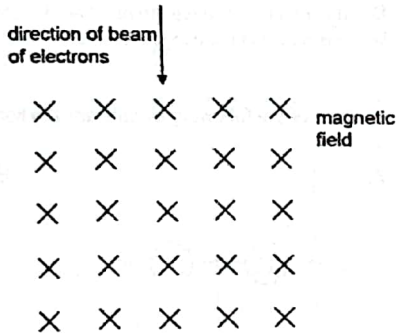

A $F_1$ and $F_2$ only
B $F_2$ and $F_3$ only
C $F_3$ and $F_4$ only
D $F_1$ and $F_4$ only

37 A 2500 W air-conditioner is switched on for 6 h daily. It cost $0.32 for 1 kW h of electrical energy.

What is the cost to use the air-conditioner for 1 month (30 days)?

A $4.00
B $4.80
C $144
D $144 000

38 The diagram shows a beam of electrons entering a magnetic field.




Which of the following describes the movement of the electrons as it enters the magnetic field?

A The electrons are deflected into the paper.
B The electrons are deflected out of the paper.
C The electrons are deflected to the left.
D The electrons are deflected to the right.

39 A transformer has 500 turns on the primary coil and 1500 turns on the secondary coil. The current in the primary coil is 0.60 A. Losses in the transformer cause the current in the secondary coil to be 90% of the value in an ideal transformer.

What is the current in the secondary coil?

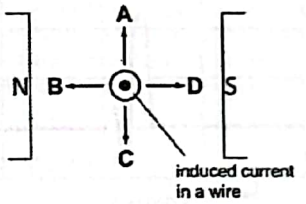
A 0.18 A
B 0.20 A
C 1.60 A
D 1.80 A





40 The diagram shows an induced current flowing through a wire between the poles of a magnet.

What is the direction of the force applied on the wire?




**End of Paper**

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BUKIT BATOK SECONDARY SCHOOL

## Bukit Batok Secondary School

### GCE O LEVEL PRELIMINARY EXAMINATIONS 2023

### SECONDARY 4 EXPRESS MARK SCHEME

**Paper 1 MCQs**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | C | 11 | C | 21 | D | 31 | C |
| 2 | C | 12 | A | 22 | B | 32 | A |
| 3 | B | 13 | D | 23 | B | 33 | A |
| 4 | D | 14 | A | 24 | C | 34 | B |
| 5 | B | 15 | D | 25 | A | 35 | C |
| 6 | A | 16 | B | 26 | A | 36 | D |
| 7 | A | 17 | C | 27 | B | 37 | C |
| 8 | B | 18 | D | 28 | B | 38 | C |
| 9 | B | 19 | A | 29 | C | 39 | A |
| 10 | C | 20 | C | 30 | A | 40 | C |