Pasir Ris Secondary School

Name	Class	Register Number

SECONDARY 4 EXPRESS

PRELIMINARY EXAMINATION 2023

PHYSICS **6091/01**

Paper 1 Multiple Choice **28 August 2023**

Monday 0830 – 0930 **1 hour**

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid or tape.

There are forty questions in this section. 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.

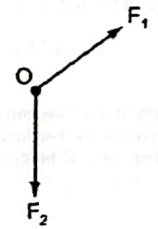
The use of an approved scientific calculator is expected, where appropriate.

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.

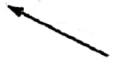
1. A student has been asked to determine, as accurately as possible, the volume of a piece of wire. The wire is about 80 cm long and about 0.2 cm in diameter. Which measuring instrument should the student use?

	length	diameter
A	metre rule	micrometer
B	metre rule	vernier calipers
C	micrometer	vernier calipers
D	vernier calipers	micrometer

2. Two forces F_1 and F_2 act on an object O in the directions shown.



What is the direction of the resultant force?

A 

B

C

D 

3. How does an increase in the mass of the bob and an increase in the length affect the period of oscillation of a simple pendulum?

	increase in mass of bob	increase in length
A	period increases	period increases
B	period is unchanged	period decreases
C	period is unchanged	period increases
D	period decreases	period increases

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4. The following statements are about motion.

(i) A plane flies due East for 600 km.
(ii) A runner's average speed in a race around a track is 5 m/s.
(iii) A snail crawls at 3 cm/s in a straight line towards a lettuce.
(iv) A tourist travels 500 km on a journey.

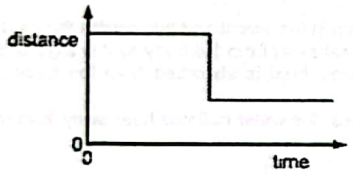
Which statements describe vector quantities?

A (i) and (ii) B (i) and (iii) C (ii) and (iii) D (ii) and (iv)

5. A free-fall parachutist falls at a constant speed. He then opens his parachute and continues to fall to Earth at a lower constant speed.

Which diagram shows how the distance fallen by the parachutist varies with time?

A



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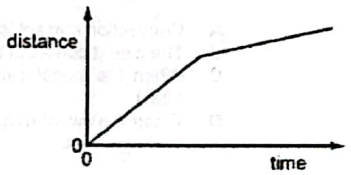
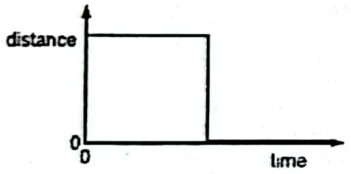
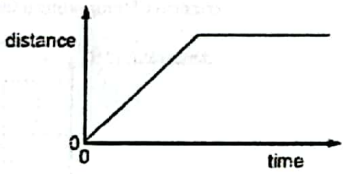


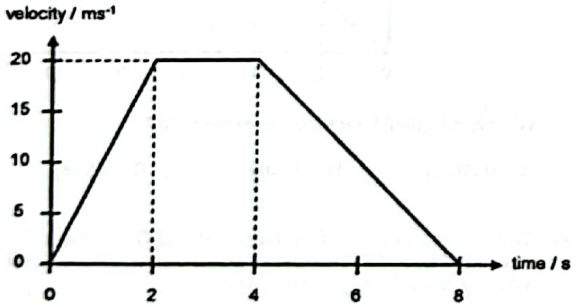
C



D



6. The velocity-time graph for a motor vehicle is shown.



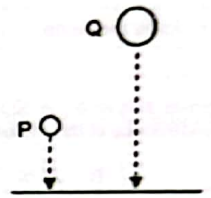
What is the average speed of the vehicle?

A 12.5 m/s B 15.0 m/s C 20.0 m/s D 22.5 m/s

7. An object of mass, m, moves with a constant acceleration of $2a$ along a smooth surface when acted upon by an applied force of F. What is the applied force required to move an object with a mass of $2m$ along the same surface with an acceleration of a?

A $\frac{1}{4}F$ B $\frac{1}{2}F$ C F D $2F$

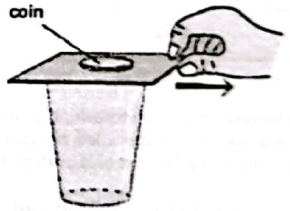
8. Two objects, P and Q are released on the Moon at different heights as shown. Q has a mass twice that of P.



Assuming that there is no air on the Moon, which of the following statements is correct?

A Both objects will have the same change in velocity.
B P will reach the ground at the same time as Q.
C Q will reach the ground first.
D The rate of the change of velocity for P and Q is the same.

9. A coin is placed on a card on top of a glass as shown in the diagram. If the card is pulled away quickly, the coin does not move sideways but falls into the glass.



Which property of the coin makes this possible?

A density B inertia C volume D thickness

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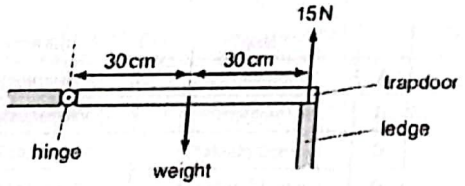
10. A wooden trapdoor is hinged along one side and, when closed, is supported on the other side by a ledge.

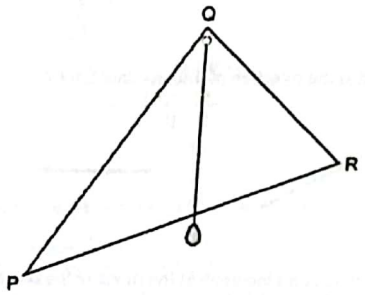


When the trapdoor is closed, the ledge exerts an upward force of 15 N on the trapdoor. The gravitational field strength is 10 N/kg.

What is the mass of the trapdoor?

A 1.5 kg B 3.0 kg C 30 kg D 150 kg

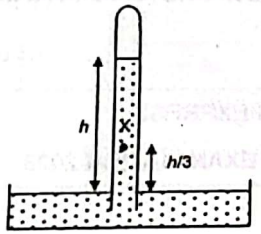
11. A student attempts to find the centre of gravity of a triangular lamina PQR. He makes a small hole at Q and suspends the lamina from a pin through the hole at Q. He then hangs a plumbline from the pin at Q before marking the position of the plumbline on the lamina.



To determine the centre of gravity, the student then repeats the experiment but with one change. What is the change?

A He suspends the lamina from a pin through a hole at R.
B He suspends the lamina from the hole at Q, with R on the left and P on the right.
C He uses a heavier weight on the plumbline.
D He uses a longer plumbline.

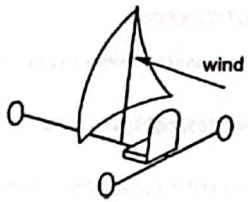
12. The height of a mercury barometer is h when the atmospheric pressure is 90 000 Pa.



What is the pressure at X?

A 30 000 Pa B 60 000 Pa C 120 000 Pa D [illegible] Pa

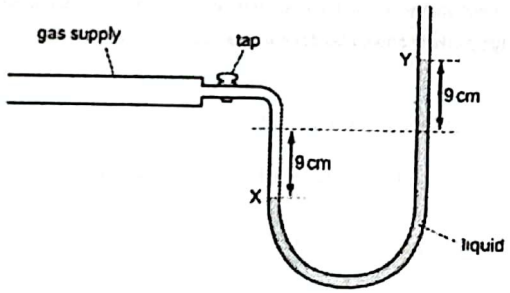
13. A sail wagon is a wheeled vehicle that is powered by wind throug



The sail wagon shown in the diagram above has a sail of area of 8×10^4 cm^2. Wind blowing at the sail creates a pressure of 3×10^2 Pa on it. If the mass of the wagon is 90 kg, what is the wind force acting on the wagon?

A 27 N B 2.4×10^3 N C 2.7×10^5 N D 2.4×10^7 N

14. The diagram shows the levels X and Y in a liquid manometer with the gas tap open.



What is the pressure of the gas supply?

A 9 cm of liquid above atmospheric pressure
B 9 cm of liquid below atmospheric pressure
C 18 cm of liquid above atmospheric pressure
D 18 cm of liquid below atmospheric pressure

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15. An aircraft, flying at a constant height, is gaining speed. What happens to its kinetic energy and potential energy?

	kinetic energy	potential energy
A	decreases to zero	increases
B	increases	decreases to zero
C	increases	remains the same
D	remains the same	increases

16. The input power to a motor is 300 W. In 20 s it lifts a load of 400 N through a height of 6.0 m. What is the efficiency of the motor?

A 12 % B 25 % C 40 % D 75 %

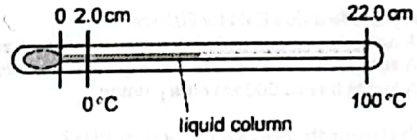
17. According to the kinetic theory, matter is made up of very small particles in a constant state of motion. Which row best describes the particle behaviour in the gas state?

	force between particles	motion of particles
A	strong	move randomly at high speed
B	strong	vibrate to and fro about a fixed position
C	weak	vibrate but are free to move
D	weak	move randomly at high speed

18. In a Brownian motion experiment involving smoke particles in air, heavy particles settle quickly but very small particles remain suspended for a long period of time. Which statement explains why the small smoke particles do not settle?

A Air molecules randomly bombard the smaller particles.
B Air pressure has a greater effect on smaller particles.
C The Earth's gravitational field does not act on small particles.
D The small smoke particles have the same density as the air.

19. The diagram shows a liquid-in-glass thermometer.



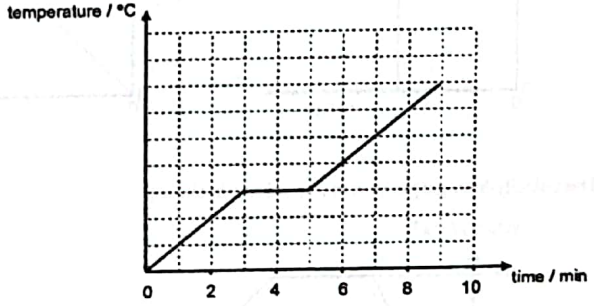
At 0°C, the length of the liquid column is 2.0 cm. At 100°C, the length of the liquid column is 22.0 cm. What is the length of the liquid column at 40°C?

A 6.0 cm B 8.0 cm C 8.8 cm D 10.0 cm

20. The body temperature of a marathon runner rises during a race. To cool down, the body responds by generating sweat on his body. How does the runner maintain his body temperature in this way?

A Convection current is set up in the sweat and this carries the heat away from the body.
B The sweat conducts the heat away from the body as it is a good conductor of heat.
C When the sweat evaporates, heat is absorbed from the body thus giving the cooling effect.
D When the sweat evaporates, the water radiates heat away from the body thus giving the cooling effect.

21. A 50 g solid, originally at 0°C, is heated by a 10 W heater. The graph shows the resulting change of temperature with time.



What is the latent heat of fusion of the solid?

A 0.20 J/g B 12 J/g C 18 J/g D 24 J/g

22. Two iron spheres of different sizes, P and Q, are heated by the same source for the same amount of time. The increase in temperature of P is twice the increase in temperature of Q. Which of the following statements is correct?

A P and Q have the same heat capacities.
B P and Q have the same specific heat capacities.
C The specific heat capacity of P is half that of Q.
D The specific heat capacity of P is twice that of Q.

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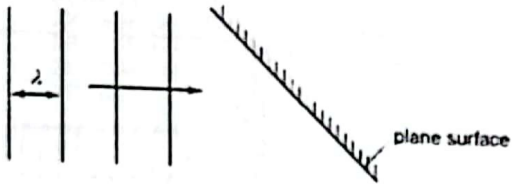
23. In an experiment using a ripple tank, plane wavefronts arrive at a plane surface.



Which of the following correctly describes the waves after they are reflected from the surface?

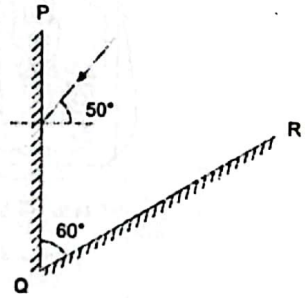
	speed of waves	wavelength, λ
A	faster	shorter
B	slower	longer
C	slower	the same
D	the same	the same

24. A tuning fork vibrates and produces sound waves in the form of compressions and rarefactions. The frequency of vibration is 50 Hz.

A compression is at point P. How much time elapses before the next rarefaction arrives at P?

A 0.010 s B 0.020 s C 25 s D 50 s

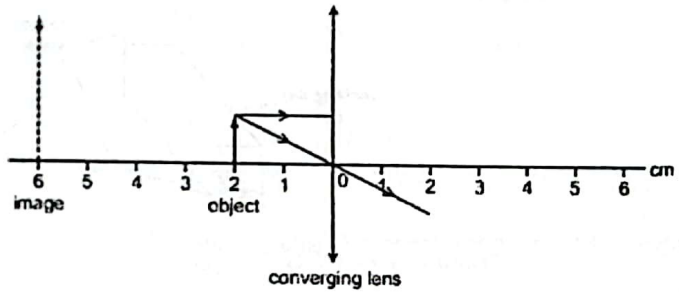
25. A ray of light is incident at an angle of 50° to a mirror PQ. Another mirror QR is arranged at an angle of 60° to PQ.



After reflection from PQ, the ray is incident on QR. What is the angle of incidence of the ray at the mirror QR?

A 10° B 30° C 50° D 60°

26. An object is placed 2.0 cm from a converging lens. The image produced is 6.0 cm from the lens as shown in the diagram.



What is the focal length of the lens?

A 2.0 cm B 3.0 cm C 4.0 cm D 6.0 cm

27. Which statement is correct?

A Gamma rays have a longer wavelength than ultra-violet waves.
B Infra-red waves have a lower frequency than radio waves.
C Microwaves have a longer wavelength than visible light.
D X-rays have a higher speed in air than visible light.

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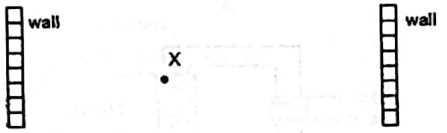
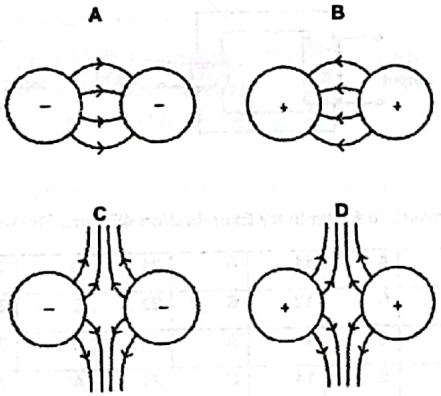
28. A man, at position X, fires a starting pistol. He hears two echoes 0.6 s and 0.8 s after firing. When can a further echo be heard (after the firing)?

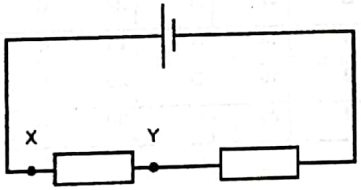


A 1.2 s B 1.4 s C 2.0 s D 2.4 s

29. Which diagram shows the correct electric field between two charged spheres?



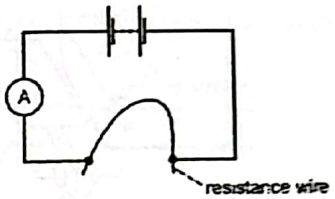
30. The diagram shows two resistors connected in series with a cell.



Which of the following describes the potential difference across XY?

A the power needed to drive one unit of charge through the cell
B the power needed to drive one unit of charge between X and Y
C the work done in driving one unit of charge between X and Y
D the work done in driving one unit of charge through the cell

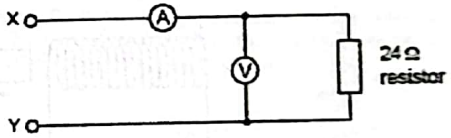
31. A length of resistance wire is used as a resistor in a simple circuit.



Which change will not reduce the value of the resistance of the wire?

A connecting another wire in parallel with the resistance wire
B decrease the length of the resistance wire
C decrease the temperature of the resistance wire
D increase the cross-sectional area of the resistance wire

32. The diagram shows an electric circuit.



Which pair of readings is obtained when a suitable power supply is connected between X and Y?

	ammeter	voltmeter
A	0.5 A	2.0 V
B	0.5 A	12.0 V
C	2.0 A	12.0 V
D	6.0 A	2.0 V

33. A 1000 W electric toaster is to be connected to a 240 V mains supply. Two types of fuses, 5 A and 13 A, can be used with the plug. Which fuse should be used, and in which part of the circuit should it be positioned?

A 5 A fuse in the live wire
B 5 A fuse in the neutral wire
C 13 A fuse in the live wire
D 13 A fuse in the neutral wire

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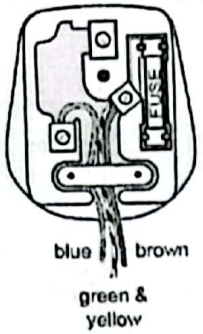
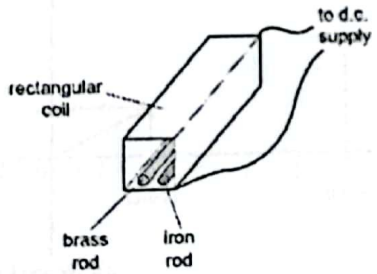
34. A plug is wrongly wired as shown. It is connected to kettle, which has a metal case.



What is the effect of using the plug wired in this way?

A The fuse in the plug blows.
B The heating element in the kettle melts.
C The metal case is live.
D The neutral wire melts.

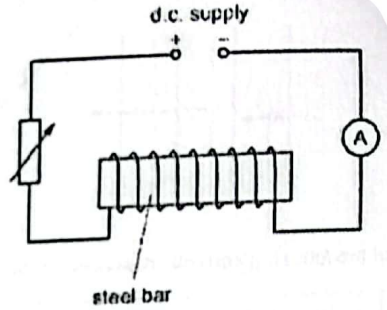
35. The diagram shows a brass rod and an iron rod beside each other at the bottom of a rectangular coil.



What happens when a direct current (d.c.) passes through the coil?

A Only the brass rod is magnetised.
B Only the iron rod is magnetised.
C The two rods attract each other.
D The two rods repel each other.

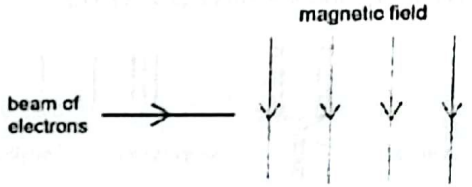
36. The diagram shows how a steel bar can be magnetised.



Which statement describes how the steel bar can be demagnetised?

A Reverse the d.c. supply and gradually decrease the current in the circui
B Reverse the d.c. supply and gradually increase the current in the circuit.
C Use an a.c. supply and gradually decrease the current in the circuit.
D Use an a.c. supply and gradually increase the current in the circuit.

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



What is the effect of the magnetic field on the electrons?

A The electrons are deflected into the plane of the paper.
B The electrons are deflected out of the plane of the paper.
C The electrons are deflected towards the bottom of the paper.
D The electrons are deflected towards the top of the paper.

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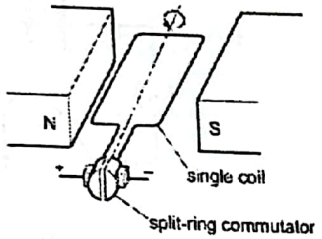
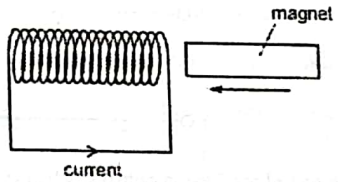
38. The diagram shows a simple electric motor.



The split-ring commutator reverses the current in the coil as the coil rotates. If the coil is rotated 360° from the position shown, how many times is the current in the coil reversed?

A 1 B 2 C 3 D 4

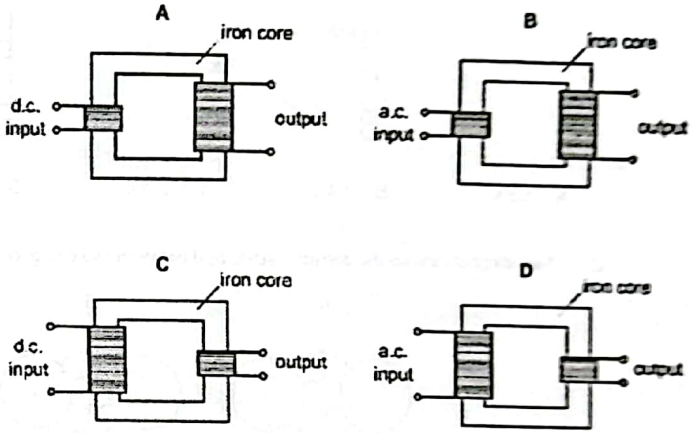
39. A magnet is pushed slowly into a coil and there is a current in the coil in the direction shown.



The magnet is then pulled out quickly from the same end of the coil. What happens to the size and direction of the current?

	size	current
A	decreased	reversed
B	decreased	unchanged
C	increased	reversed
D	increased	unchanged

40. Which transformer arrangement produces an output voltage that is lower than the input voltage?



Answers to Preliminary Examination 4E Pure Physics Paper 1 (2023)

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

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