Candidate Name _____ Class | Candidate Number

WESTWOOD SECONDARY SCHOOL

PRELIMINARY EXAMINATION

Secondary Four Express

PHYSICS 6091/01

Paper 1 August 2023

1 hour

Additional materials required:
Multiple Choice Answer Sheet (x1)

INSTRUCTIONS TO CANDIDATES

Write in soft pencil.

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

Write your name, class and candidate number in the spaces at the top of this page and on the Multiple Choice Answer sheet.

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.

INFORMATION FOR CANDIDATES

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.

The total marks for this paper is 40.

FOR EXAMINER'S USE		
PAPER	MARK	TOTAL
1		40

This question paper consists of 16 printed pages.

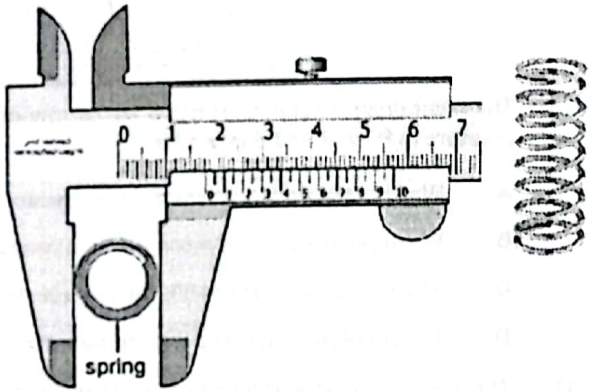
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Answer all questions.

Shade the correct answer in the Multiple Choice Answer Sheet provided.

1 A student measures the outer diameter of a spring with a pair of vernier calipers. The diagram shows the reading on the vernier calipers.



What is the outer diameter of the spring?

A 1.02 cm B 1.20 cm C 1.82 cm D 2.62 cm

2 A pendulum was made to swing 20 times before calculating its period. This was done three times before finding the average.
What is the error the student is trying to reduce?

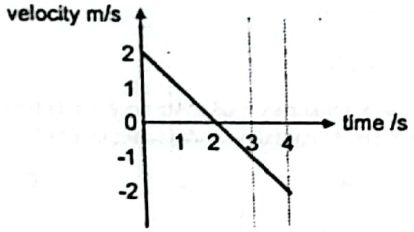
A human reaction time error

B parallax error

C random error

D zero error

3 The velocity-time graph for a falling ball is shown.

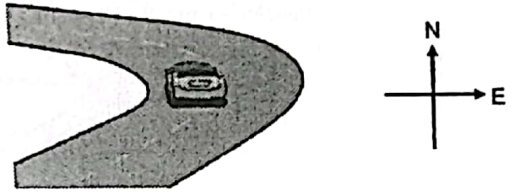


What is the displacement of the ball after 4 s?

A 0 m B 4 m C 8 m D 16 m

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4 A car travels around a bend at a constant speed of 60 km/h for 3 seconds.



What is the acceleration of the car?

A non-zero, East

B non-zero, North

C non-zero, West

D zero

5 Which statement best describes *Newton's first law*?

A A body experiencing a force by another body will exert the same type of force on the other body in the opposite direction.

B A body will accelerate in the same direction as the resultant force.

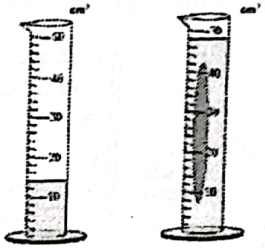
C A body will continue moving at a constant velocity unless an external net force acts on it.

D A body with mass will experience resultant force.

6 The engine of a car provides a forward force. The 500 kg car is moving forward at an acceleration of 3 m/s^2. It experiences a frictional force of 1000 N.
What is the forward force provided by the engine of the car?

A 500 N B 1500 N C 2500 N D 5000 N

7 The diagram shows the change in water level in a measuring cylinder when a piece of metal of mass 120 g is lowered into the water.



What is the density of the piece of metal?

A 0.283 g/cm^3

B 0.353 g/cm^3

C 2.83 g/cm^3

D 3.53 g/cm^3

8 A piece of block metal was heated up, melted and casted into smaller spheres of 2 mm in diameter.
Which property of the metal spheres remains constant during the entire process?

A density

B mass

C surface area

D volume

9 A banner with an area of 3 m^2 is attached to some poles on a windy day, the pressure on one side of the banner was 120 kPa. The pressure on the other side of the banner is 125 kPa.
What was the resultant force on the banner?

A 0.6 kN

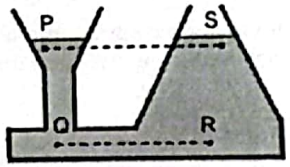
B 1.6 kN

C 15 kN

D 15 N

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10 Two vessels are joined together with a tube and filled with water. Both vessels are open at the top.



The water pressure at P, Q, R and S are compared. Which statement about the water pressure at P, Q, R and S is correct?

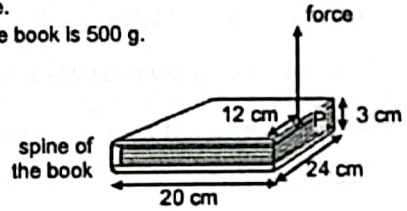
A Water pressure at P is less than at S; water pressure at Q is less than at R.

B Water pressure at P is more than at S; water pressure at Q is more than at R.

C Water pressure at P and S is the same; water pressure at Q and R is the same.

D Water pressure at P and S is the same; water pressure at Q is less than at R.

11 The diagram shows a uniform book of dimensions 20 cm x 24 cm x 3 cm on a table.
A student intends to apply an upward force at point P to lift the book up with its spine still on the table.
The mass of the book is 500 g.



What is the minimum force required at point P to lift the book up but with its spine still on the table?

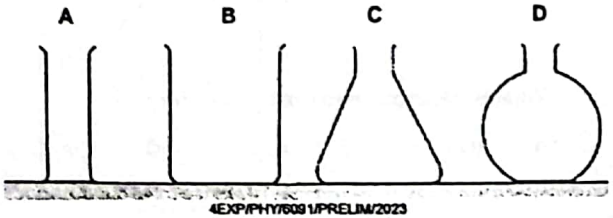
A 0.025 N

B 0.05 N

C 0.25 N

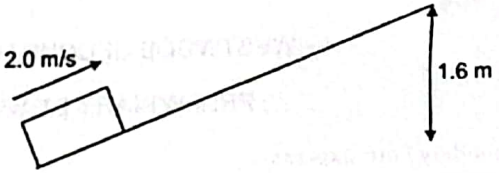
D 0.5 N

12 The diagram shows four containers made from thin glass.
Which empty container is the least stable?



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13 The diagram shows a load being pushed up a rough ramp with a constant speed of 2.0 m/s. The mass of the load is 4 kg.



The gravitational field strength g is 10 N/kg.
What is the work done needed to push the load up the ramp?

A 0 J

B 32 J

C 64 J

D 80 J

14 A car is travelling at a constant speed along an expressway.
The forward force acting on the car is 2100 N and the power developed by the car is 300 000 J/s.

How far does the car travel in 2 minutes?

A 17 000 m B 34 000 m C 126 km D 600 km

15 A bag of chips is placed inside a bell jar. The bell jar is connected to an air pump.
The air pump is switched on and air is removed from the bell jar.

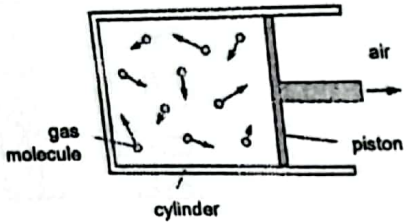
What happens to the pressure, volume and temperature of the gas inside the bag of chips?

	pressure	volume	temperature
A	decrease	decrease	increase
B	decrease	increase	no change
C	increase	decrease	no change
D	increase	decrease	decrease

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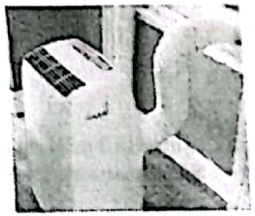
16 Gas inside a cylinder is heated slowly to a higher temperature and the piston moves outwards.
As the volume increases, the pressure of the gas remains constant.



What happens to the speed of the gas molecules and their rate of collision with the piston?

	speed of gas molecules	rate of collision
A	decrease	decrease
B	increase	decrease
C	increase	stays the same
D	stays the same	decrease

17 The diagram shows a portable air conditioner with a pipe connected to release hot air into the surrounding.



Which feature of the pipe does not help to reduce heat loss back into the room?

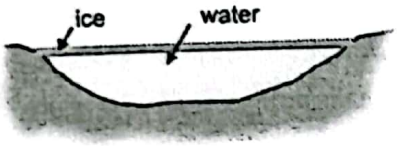
A The pipe has a shiny finish.

B The pipe has many folds and is bendable.

C The pipe is made of plastic

D The pipe is white in colour.

18 The diagram shows a frozen pond with the surface of the ice slowly melting as heat is transferred from the warmer air above it to the ice.



By which processes is heat transferred from the air to the ice?

A conduction only

B conduction and convection only

C conduction and radiation only

D conduction, convection and radiation

19 Physical properties of materials are used in the measurement of temperature.
Which physical property is not suitable for this purpose?

A conductivity of a metal

B expansion of a gas

C mass of a liquid

D pressure of a gas

20 The diagrams show the scale on a galvanometer connected to a thermocouple thermometer.


thermocouple probe in melting ice


thermocouple probe in wet steam


thermocouple probe in liquid

What is the temperature of the liquid?

A -25 °C

B 30 °C

C 67 °C

D 70 °C

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21 A land breeze occurs at night because the land cools faster than the sea.
Which statement is true about land breeze?

A Land cools faster because its latent heat of fusion is higher than the sea's.

B Land cools faster because its latent heat of fusion is lower than the sea's.

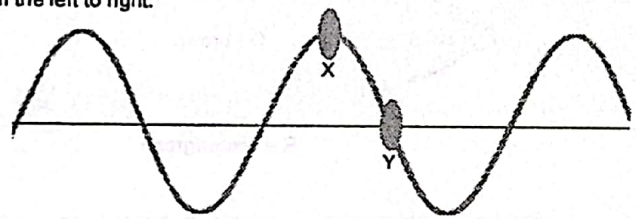
C Land cools faster because its specific heat capacity is higher than the sea's.

D Land cools faster because its specific heat capacity is lower than the sea's.

22 Different amounts of thermal energy are supplied to iron blocks of different masses.
Which block experience the greatest temperature change?

	mass of block / kg	energy supplied / J
A	0.10	150
B	0.25	500
C	0.40	900
D	0.80	1300

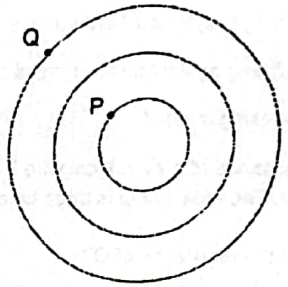
23 The diagram shows two buoys in a still reservoir. A wave moves across the reservoir from the left to right.



At the moment shown, buoy X is at maximum displacement, *A* cm, and buoy Y has zero displacement.
Which row describes the displacement of the buoys during the next half cycle of the wave?

	displacement of buoy X / cm	displacement of buoy Y / cm
A	$-A$	0
B	0	$-\frac{1}{2}A$
C	0	$\frac{1}{2}A$
D	A	0

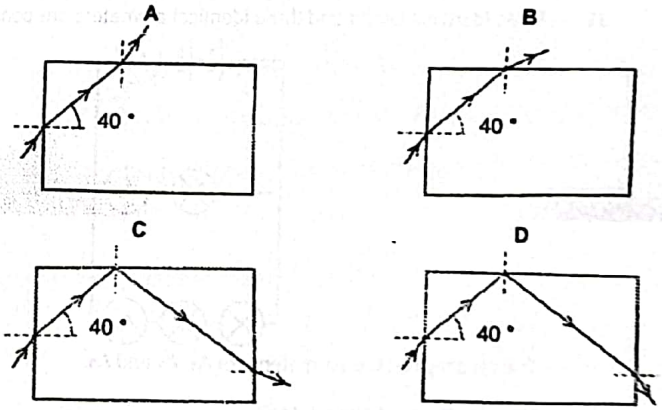
24 A water wave travels from the centre of the pond and moves radially outwards. It takes 3 seconds for the wave to move from position P to Q.



What is the frequency of the wave?

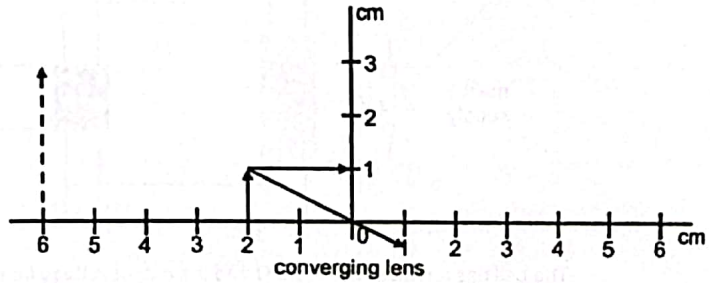
A 0.67 Hz B 1.5 Hz C 2 Hz D 6 Hz

25 A ray of light is incident on one side of a rectangular block. The angle of refraction is 40° in the block. The critical angle for light in the block is 44°.
Which diagram shows the path of this ray?



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26 An object of height 1.0 cm is placed 2.0 cm from a converging (convex) lens which is being used as a magnifying glass.
The image produced is 6.0 cm from the lens and has a height of 3.0 cm.



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 about infrared radiation and ultraviolet radiation is correct?

A They can bounce off a mirror at a speed close to 3.0×10^8 m/s.

B They have the same frequency in a vacuum.

C They have the same wavelength in air.

D They travel as longitudinal waves in water.

28 Which statement about red and violet light is **incorrect**?

A Red light has a longer wavelength than violet light.

B Red light has a lower frequency than violet light.

C They can be seen with our naked eyes.

D They can be used to heat up food.

29 A pulse of sound is transmitted vertically downwards from an echo-sounder at the bottom of a ship. The pulse is reflected from the seabed and returns to the ship. The time taken between transmitting and receiving the pulse is 0.5 s. The speed of sound in water is 1500 m/s.

What is the depth of water under the ship?

A 375 m B 750 m C 1500 m D 3000 m

30 The table shows the density, atomic mass and size of each particle of mercury, styrofoam and steel.

	density / kg/m³	mass / g	size / pm
mercury	13 500	200.6	150
styrofoam	40	104.1	125 000 000
steel	8 000	55.8	5 000 000

Which material will sound travel the fastest in?

A mercury

B steel

C styrofoam

D sound travels at the same speed in all the materials above

31 A student holds a rod in one hand and rubs the rod with a thin sheet of material held in his other hand. Both the rod and the thin sheet become charged and remain charged.

What materials could the rod and the thin sheet be made from?

	rod	thin sheet
A	copper	silk cloth
B	glass	aluminium foil
C	iron	paper towel
D	nylon	woollen cloth

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32 Which is the best method to uncharge a metal rod?

A earthing it

B hitting it against a hard surface

C rubbing against another metal surface

D stroking method

33 The resistance of a cylindrical wire P is 80 Ω. A second wire Q is made of the same material. The radius of Q is three times of P. The length of Q is one third of P.

What is the resistance of Q?

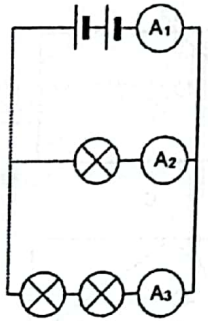
A 3.0 Ω B 8.9 Ω C 27 Ω D 80 Ω

34 A spark plug produces a spark. The average current in the spark plug is 28 mA.

How long does it take for a charge of 96 μC to pass through the spark plug?

A 0.0027 ms B 3.4 ms C 290 ms D 2688 ms

35 Three identical lamps and three identical ammeters are connected as shown.



The readings on the ammeters are A_1, A_2 and A_3.

How are the readings related?

A $A_1 = A_2 = A_3$

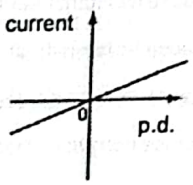
B $A_2 = A_3 < A_1$

C $A_2 < A_3 < A_1$

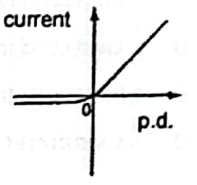
D $A_3 < A_2 < A_1$

36 Which graphs show the I/V characteristic for a semiconductor diode?

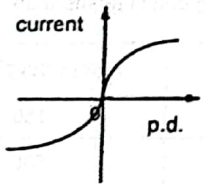
A



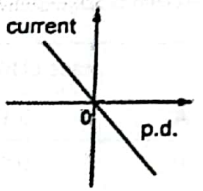
B



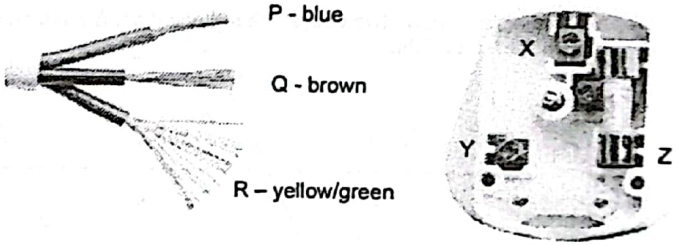
C



D



37 The diagram shows three wires P, Q and R within a cable and an electric plug with its cover removed.



What is the effect of connecting P to Z, Q to Y and R to X?

A The appliance might not be able to switch on.

B The appliance will be live when the wires are faulty.

C The appliance will catch fire.

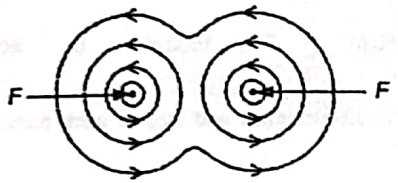
D The fuse will blow immediately.

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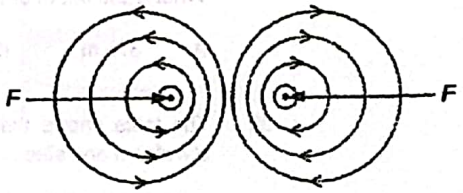
38 Two parallel, vertical wires each carry an electrical current.

Which diagram shows the magnetic field pattern around the wires and the direction of the force *F* on each wire?

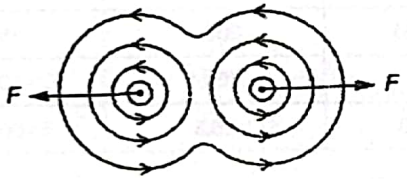
A



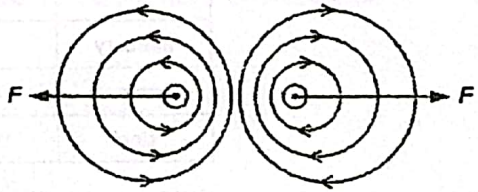
B



C

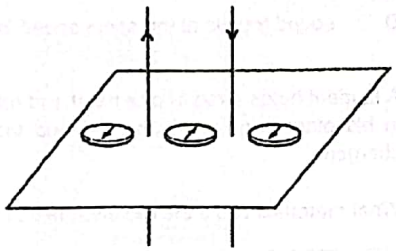


D



39 Two parallel wires carry 2 A of current in opposite directions. Three plotting compasses are placed in the positions shown.

The Earth's magnetic field has no effect on the plotting compasses.

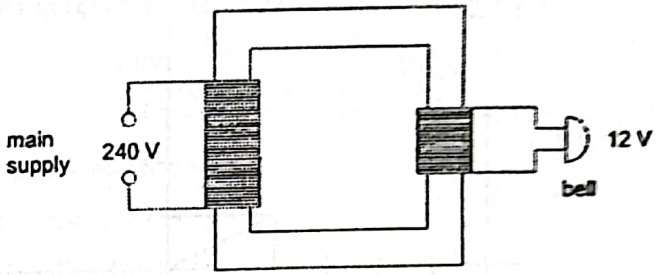


The currents in both wires are reversed.

How many compass needles change direction?

A 0 B 1 C 2 D 3

40 The diagram shows an ideal transformer connected to a door bell. The mains supply of 240 V is connected to the transformer.



The bell has a resistance of 8.0 Ω and the output voltage from the transformer is 12 V.

What is the current in the mains supply?

A 0.075 A B 0.40 A C 1.5 A D 30 A

END OF PAPER

WESTWOOD SECONDARY SCHOOL

Answer Scheme
Paper 1

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

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