KUO CHUAN PRESBYTERIAN SECONDARY SCHOOL

2023 PRELIMINARY EXAMINATION

Secondary 4 Express

NAME _____

CLASS _____ REG. NO _____

PHYSICS 6091/01

Paper 1 Multiple Choice

29 August 2023

1 hour

Additional Materials: Multiple Choice Answer Sheet

Setter: Mr. Rene Yeo

[Turn Over]

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and register 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.

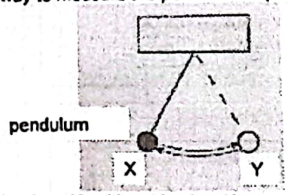
Any rough working should be done in this booklet.

This document consists of 15 printed pages including the cover page.

Multiple Choice Questions [40 marks]

Answer all questions and shade your answers on the OMR sheet provided.

1 The diagram below shows a simple pendulum. Using a stopwatch, which would be the most accurate way to measure the period of the pendulum?



A Time the motion from X to Y and back to X.
B Time the motion from X to Y and back to X again for 20 cycles and multiply by 20.
C Time the motion from X to Y and back to X for 20 cycles and divide by 20.
D Time the motion from X to Y and double it.

2 A micrometer screw gauge is used to measure the thickness of a plastic block. A student takes an initial zero reading as shown in diagram 1 and then a reading of the thickness of the plastic block in diagram 2.

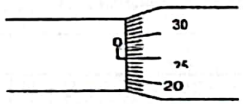


diagram 1

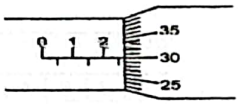
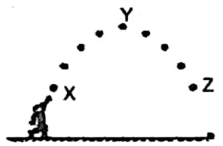


diagram 2

What is the actual thickness of the plastic block?

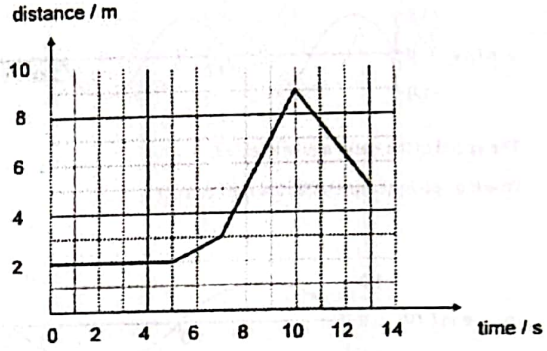
A 2.05 mm
B 2.30 mm
C 2.55 mm
D 3.05 mm

3 An object is thrown upwards from X and follows a path as shown. The highest point reached is Y. Assuming that no air resistance acts on the object, which of the following statements about the acceleration due to gravity is true?



A It is greater at X than Y.
B It is greatest at Z.
C It is the same at X, Y and Z.
D It is zero at Y.

4 The diagram shows the distance-time graph of a bicycle.



When is the speed of the bicycle 2.0 m/s?

A 0 s – 5.0 s
B 5.0 s – 7.0 s
C 7.0 s – 10.0 s
D 10.0 s – 11.5 s

5 A student studies some equations.

power = work done / time
force = mass x acceleration
velocity = displacement / time

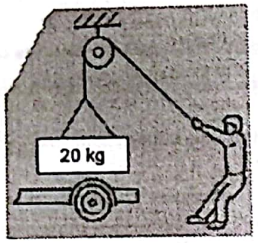
How many different scalar quantities are there in the equations?

A 2
B 3
C 4
D 5

6 What must be changing when a body is accelerating?

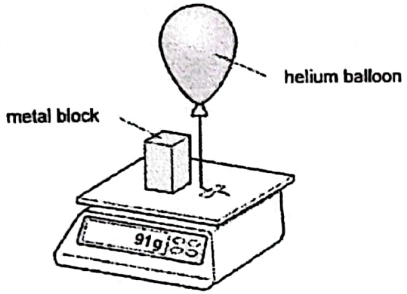
A The force acting on the body.
B The speed of the body.
C The weight of the body.
D The velocity of the body.

7 A man just supports a mass of 20 kg suspended from a rope. Given that the friction in the pulley is 10 N, what is the tension in the rope?



A 0 N
B 10 N
C 190 N
D 210 N

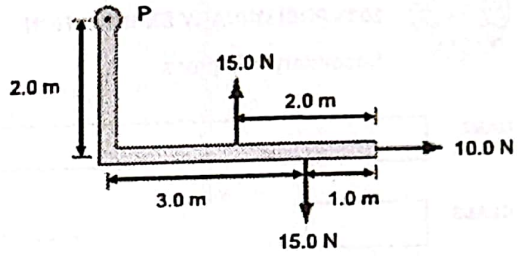
8 A helium balloon is tied to an electronic balance. A metal block of mass 100 g is placed on the balance. The reading on the balance is 91 g.



Which statement can be deduced from this experiment?

A The balloon exerts an upward force of 9.0 N on the top-pan balance.
B The balloon has a mass of -9.0 g.
C The balloon has a weight of 0.09 N.
D The resultant downward force on the electronic balance is 0.91 N.

9 An L-shaped rigid lever arm is pivoted at point P. Three forces act on the lever arm, as shown in the diagram.

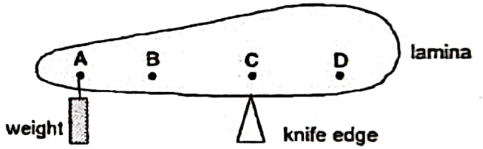


What is the magnitude of the resultant moment due to the three forces about point P?

A 0 Nm
B 5.0 Nm
C 15 Nm
D 20 Nm

10 In order to balance a non-uniform lamina on a knife edge as shown, a weight is suspended at point A.

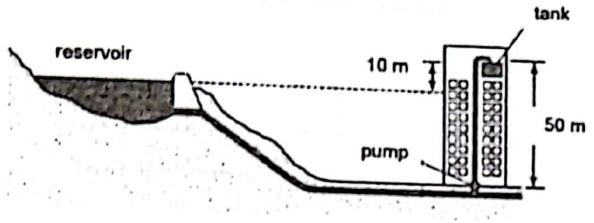
Where is the position of centre of gravity of this arrangement?



11 A crane uses a petrol engine to lift a heavy machine. What is the overall energy conversion in the system when the machine is lifted upwards at a constant speed?

A chemical potential energy to gravitational potential energy
B chemical potential energy to gravitational potential energy and kinetic energy
C electrical energy to kinetic energy
D electrical energy to gravitational potential energy

12 A building receives water from a nearby reservoir. A pump is used to lift the water into a storage tank at the top of the building.



Given that the gravitational field strength is 10 N / kg and the efficiency of the pump is 80 %, what is the energy input to the pump to lift each kilogram of water into the tank?

A 100 J
B 125 J
C 400 J
D 635 J

13 Which of the following would be the most likely to sink into soft ground?

A A loaded lorry with four wheels.
B A loaded lorry with six wheels.
C An unloaded lorry with four wheels.
D An unloaded lorry with six wheels.

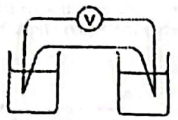
14 A barometer is carried from the sea level to the top of Mount Fuji.
Which of the following statements about the reading on the barometer is true?

A The reading falls because gravity has increased.
B The reading falls because there is less air above the barometer.
C The reading rises because air pressure has increased.
D The reading rises because temperature has increased.

15 The temperature shown by a mercury-in-glass thermometer decreases. Which of the following is constant?

A the density of the mercury
B the internal energy of the mercury
C the mass of the mercury
D the volume of the mercury

16 The table shows two measurements taken using a thermocouple.

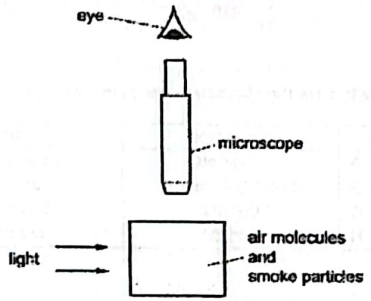


measurement	temperature of hot junction / °C	temperature of cold junction / °C	electromotive force / mV
1	100	0	25
2	\	0	58

What is the value of \?

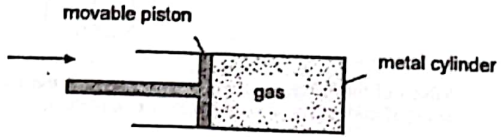
A 25 °C
B 58 °C
C 116 °C
D 232 °C

17 A student observes the Brownian motion of smoke particles in air through a low-power microscope. What does the student see when the temperature of the air is increased?



A Air molecules colliding with the smoke particles more forcefully.
B Air molecules are moving around at higher speeds.
C Smoke particles are moving around at higher speeds.
D Smoke particles are moving around at lower speeds.

18 A fixed mass of gas is trapped in a metal cylinder by a movable piston. The piston is moved inwards slowly. The volume of the gas decreases but its internal energy is unchanged



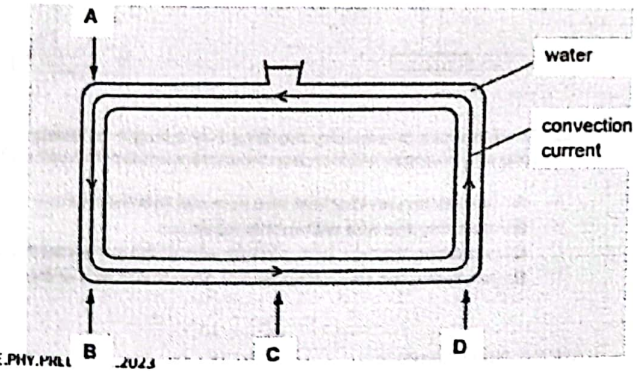
What happens to the speed of the gas molecules and their rate of collision with the piston?

	speed of gas molecules	rate of collision
A	deceases	increases
B	Increases	decreases
C	unchanged	increases
D	unchanged	unchanged

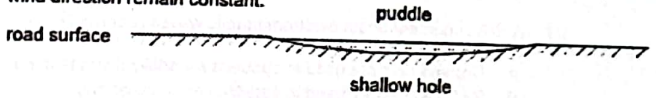
19 Which statement about aluminium explains why it is a better conductor of heat than glass?

A Atoms in aluminium are more closely packed than those in glass.
B Atoms move through aluminium and pass on kinetic energy.
C Atoms vibrate and emits infra-red radiation to the cold end of the glass at a slower rate.
D There are mobile electrons in aluminium.

20 The diagram shows a convection current produced when water in a standing container is heated. Where is the container heated to produce the convection current?



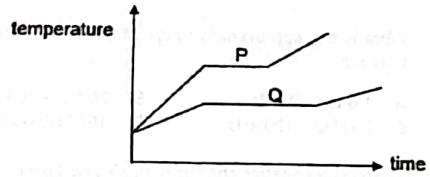
21 The diagram shows a cross-section through a rain-water puddle formed in a shallow hole in the road surface. Over a period of time, air temperature, wind speed and wind direction remain constant.



What happens to the rate of evaporation of water from the puddle?

A It decreases, because the surface area decreases.
B It increases, because the puddle gets shallower.
C It increases, because the temperature of water has decreased.
D It remains constant, because air temperature and wind speed is unchanged.

22 Two solids P and Q have the same mass. They are heated separately by the same heater under identical conditions. The changes in temperature with time for the two solids are as shown.

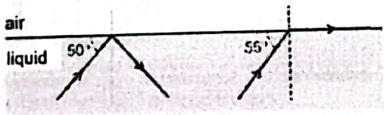


Which of these statement(s) is/are correct?

1 The specific latent heat of fusion of P is higher than that of Q.
2 P has a higher specific heat capacity than Q.
3 The freezing point of P is higher than that of Q.

A 3 only
B 1 and 2 only
C 2 and 3 only
D All of the above.

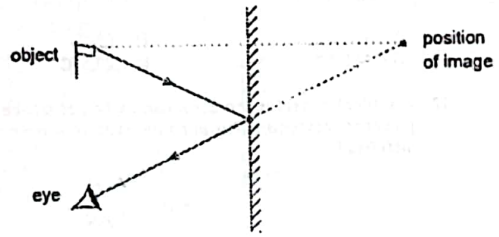
23 The diagram represents the surface of a transparent liquid. Two rays of light are travelling within the liquid. They both reach the surface. The path of each ray is shown.



What is the refractive index of this liquid?

A 1.2
B 1.3
C 1.6
D 1.7

24 The diagram shows the position of an image formed by a plane mirror.

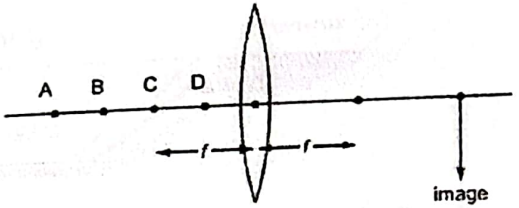


What are the characteristics of the image?

	orientation	size
A	inverted	same size
B	laterally inverted	same size
C	upright	diminished
D	upright	enlarged

25 The diagram shows a thin converging lens of focal length *f* and an image.

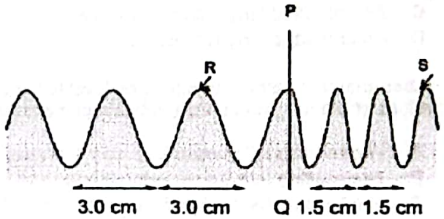
Where should the object be placed in order to produce an image that is real and has the same size as the object?



26 What is meant by the term *wavefront*?

A A line joining a trough and a crest on a wave.
B A line joining all the troughs on a wave.
C The distance between successive crests on a wave.
D The distance travelled by a complete wave.

27 The diagram shows a water wave in a ripple tank.



The wave has a speed of 0.15 m / s at R.

The wave crosses a boundary PQ where the distance between crests changes from 3.0 cm to 1.5 cm.

What is the velocity of the wave at point S?

A 0.075 m/s
B 0.15 m/s
C 0.30 m/s
D 0.45 m/s

28 The wavelength of X-ray is approximately the diameter of an atom.

What is the frequency of X-ray?

A 3.0×10^{-18} Hz
B 3.0×10^{-6} Hz
C 3.0×10^{4} Hz
D 3.0×10^{18} Hz

29 Which statement about electromagnetic waves is correct?

A Gamma rays are used in sunbeds for artificial sun tanning.
B Radio waves are used in satellite communications.
C Visible light can damage human proteins and DNA.
D X-rays are used to check for cracks in metals.

30 Ultrasound is used to map the ocean floor. During one survey, the depth of water is 1800 m. An ultrasound pulse is sent from the surface and when it returns to the receiver, another pulse is sent immediately. In any period of 12 s, five pulses are sent down from the surface and received.

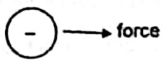
What is the speed of the ultrasound in water?

A 150 m/s
B 360 m/s
C 1200 m/s
D 1500 m/s

31 What is the approximate range of audible frequencies for a young and healthy person?

A 1.0 Hz – 20 Hz
B 20 Hz – 20 kHz
C 20 kHz – 100 kHz
D 100 kHz – 2000 kHz

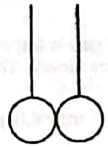
32 A stationary negative charge in an electric field experiences an electric force in the direction shown.



What is the direction of the electric field?

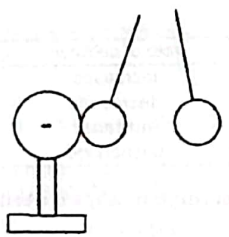
A horizontally to the left
B horizontally to the right
C into the page
D out of the page

33 Two identical uncharged light conducting balls are suspended by insulating thread and touching each other as shown.

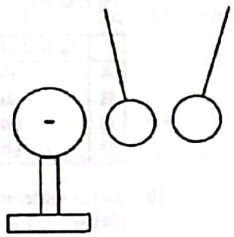


Which of the following shows the position of the balls when a strong negatively charged conducting sphere touches one of them?

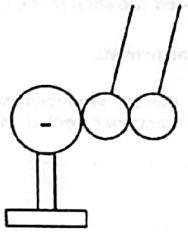
A



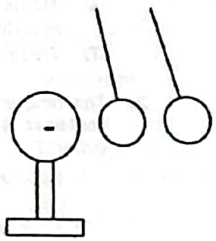
B



C



D



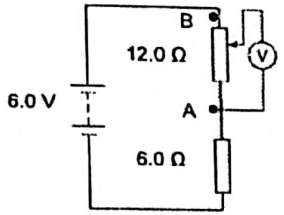
34 The terminals of a battery are joined by a length of resistance wire. Which of the following changes will increase the current through the battery?

A connecting an identical wire in series with the first one
B covering the wire with rubber insulation
C replacing the wire with a longer wire of the same material and thickness
D replacing the wire with a thicker and shorter wire of the same material

35 Which of the following is equivalent to the unit for potential difference?

A A/s
B Cs
C J/C
D W/s

36 The diagram shows a circuit with a potential divider connected in series with a fixed resistor.



What are the minimum and maximum readings that can be obtained on the voltmeter when the contact of the potential divider moved from A to B?

	minimum / V	maximum / V
A	0	4.0
B	0	6.0
C	2.0	4.0
D	6.0	12.0

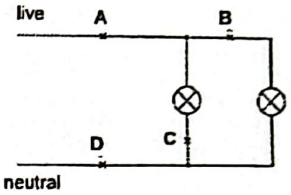
37 In which of the following situation(s) will a fuse possibly melt?

1 The live wire touches the earth wire.
2 The live wire touches the neutral wire.

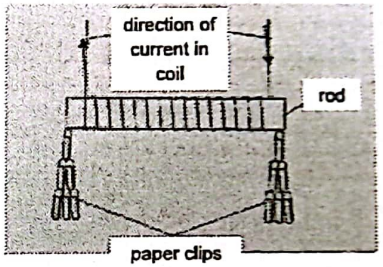
3 The earth wire is touched by a person.
4 The fuse is fixed on the neutral wire instead of the live wire.

A 2 only
B 1 and 2 only
C 3 and 4 only
D 1, 2 and 3 only

38 In order to turn off only one lamp, which is the safest switch position?



39 Four rods are placed, in turn, inside a coil of copper wire.



The table below gives the results of the experiment. Which rod would be the most suitable to use as the core of a coil in a circuit breaker?

rod	number of paper clips picked up when there is current in the coil	number of paper clips picked up when there is no current in the coil
A	1	0
B	20	5
C	40	0
D	40	20

40 An imported device is designed to operate when connected to a 110 V mains supply. When connected to a transformer, the current in the device is 19 A.

The transformer is connected to the 240 V mains supply and has an efficiency of 100%.

What is the input current to the transformer?

A 8.7 A
B 13 A
C 19 A
D 41 A

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