MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

SCIENCE (PHYSICS, CHEMISTRY) 5076/01

Paper 1 Multiple Choice

October/November 2022

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE ON ANY BARCODES.

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.
A copy of the Data Sheet is printed on page 19.
A copy of the Periodic Table is printed on page 20.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **17** printed pages and **3** blank pages.

Singapore Examinations and Assessment Board

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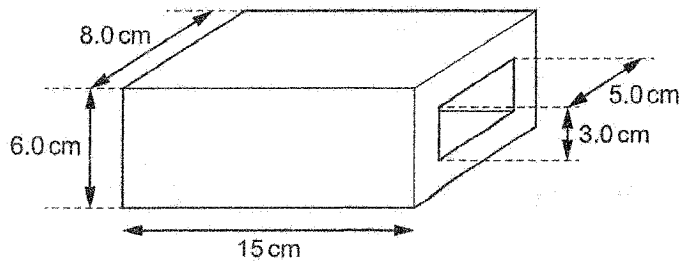
4 A hollow rectangular plastic block has the dimensions shown.



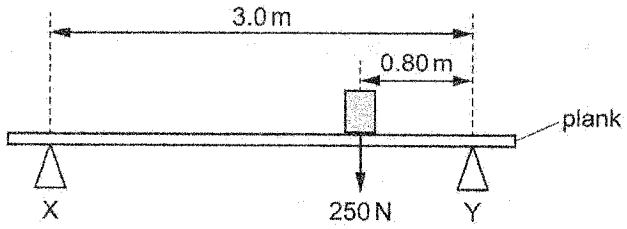
The density of the plastic is 1.2 g/cm^3.

What is the mass of the block?

A 270 g **B** 410 g **C** 590 g **D** 860 g

5 A plank of negligible mass is held horizontal by supports X and Y that are placed 3.0 m apart.

A weight of 250 N is placed on the plank 0.80 m from support Y.



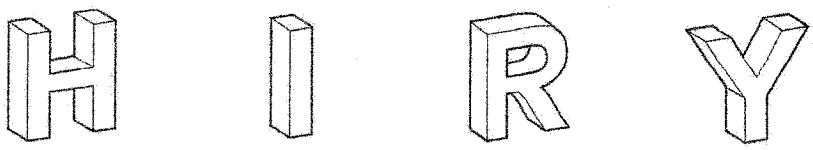
What is the force exerted by support Y on the plank?

A 67 N **B** 100 N **C** 180 N **D** 200 N

6 A child has a set of wooden 3-dimensional capital letters.

Which letter, H, I, R or Y, is the most stable when standing upright on a table?

A **B** **C** **D**



10 The volume of air trapped in a cylinder is rapidly reduced to half its original volume.

The temperature of the air increases.

Which statement is correct?

A The molecules in the air hit the walls of the cylinder less frequently.

B The molecules in the air move faster.

C The molecules in the air move further apart.

D The molecules in the air have the same internal energy.

11 Ten periods of a simple pendulum is X s.

Which equation is correct?

A $\text{frequency} = \frac{1}{X}$

B $\text{frequency} = \frac{10}{X}$

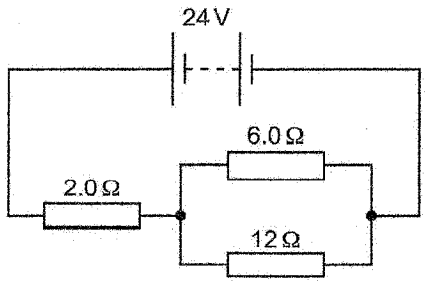
C $\text{frequency} = \frac{X}{10}$

D $\text{frequency} = X \times 10$

12 Which row defines refractive index and critical angle?

	refractive index	critical angle
A	$\frac{\text{speed of light in the medium}}{\text{speed of light in vacuum}}$	maximum angle of refraction for which refraction takes place
B	$\frac{\text{speed of light in the medium}}{\text{speed of light in vacuum}}$	minimum angle of refraction for which refraction takes place
C	$\frac{\text{speed of light in vacuum}}{\text{speed of light in the medium}}$	maximum angle of incidence for which refraction takes place
D	$\frac{\text{speed of light in vacuum}}{\text{speed of light in the medium}}$	minimum angle of incidence for which refraction takes place

16 A 24 V battery is connected in series with a 2.0 Ω resistor and a parallel arrangement of a 6.0 Ω and a 12 Ω resistor.

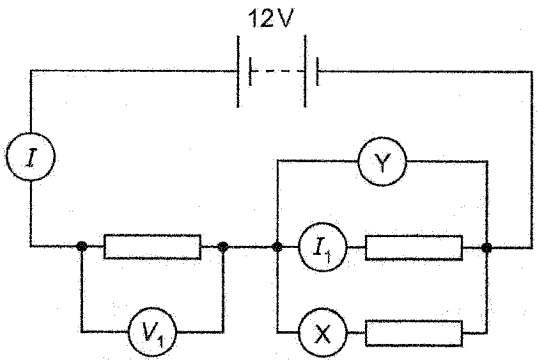


What is the potential difference across the 6.0 Ω resistor?

A 8.0 V **B** 12 V **C** 16 V **D** 24 V

17 A 12 V battery is connected in a circuit containing three resistors.

X is an ammeter and Y is a voltmeter.



What are expressions for the readings on X and Y?

	X/A	Y/V
A	$I + I_1$	$12 + V_1$
B	$I + I_1$	$12 - V_1$
C	$I - I_1$	$12 + V_1$
D	$I - I_1$	$12 - V_1$

18 A television has a power of 240 W and is connected to a 240 V mains supply.

Which fuse rating is appropriate for the fuse used with the television?

A 1 A **B** 3 A **C** 10 A **D** 13 A

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CANDIDATE NAME

CENTRE NUMBER | S | | | | |

INDEX NUMBER | | | | |

SCIENCE (PHYSICS, CHEMISTRY) 5076/02

Paper 2 Physics

October/November 2022

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.
DO **NOT** WRITE ON ANY BARCODES.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **22** printed pages and **2** blank pages.

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[Turn over

2 The surface of a rectangular swimming pool has a length of 12 m and a width of 5.0 m, as shown in Fig. 2.1.

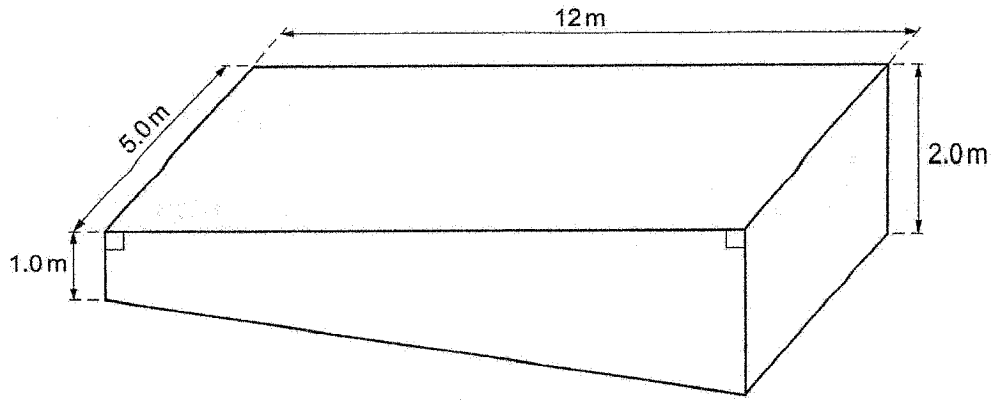


Fig. 2.1 (not to scale)

The depth of the water in the swimming pool varies uniformly from 1.0 m to 2.0 m.

(a) Show that the volume of water in the swimming pool is 90 m^3.

[1]

(b) The density of the water in the pool is 1000 kg/m^3.
The gravitational field strength is 10 N/kg.

Calculate:

(i) the mass of water in the pool

mass = ... kg [1]

(ii) the weight of water in the pool.

weight = ... N [1]

[Total: 3]

(b) The sled is moving at constant speed.
State the name of the force that opposes its motion. State the magnitude of this force.

name of force .....

magnitude of force = ... N
[2]

(c) The runners on the sled that are in contact with the snow are very long and wide, rather than short and narrow.

Explain why crossing a snowfield is easier when the runners are long and wide.

.....

.....

.....

..... [3]

[Total: 8]

The weight of the suitcase is 160 N. The line of action of the weight of the suitcase is a perpendicular distance of 30 cm from the pivot.

A horizontal force F is applied at the handle. Force F is a perpendicular distance of 150 cm from the pivot.

(a) Calculate the minimum force F that is needed to raise the platform of the trolley with the suitcase on it.

F = ... N [3]

(b) The trolley is tilted until the centre of gravity of the suitcase is vertically above the pivot.

Explain why this reduces the force needed to balance the trolley and suitcase.

.....

.....

.....

..... [2]

[Total: 5]

6 Three cans, **A**, **B** and **C**, are fitted with lids and each contains an equal volume of water, as shown in Fig. 6.1.

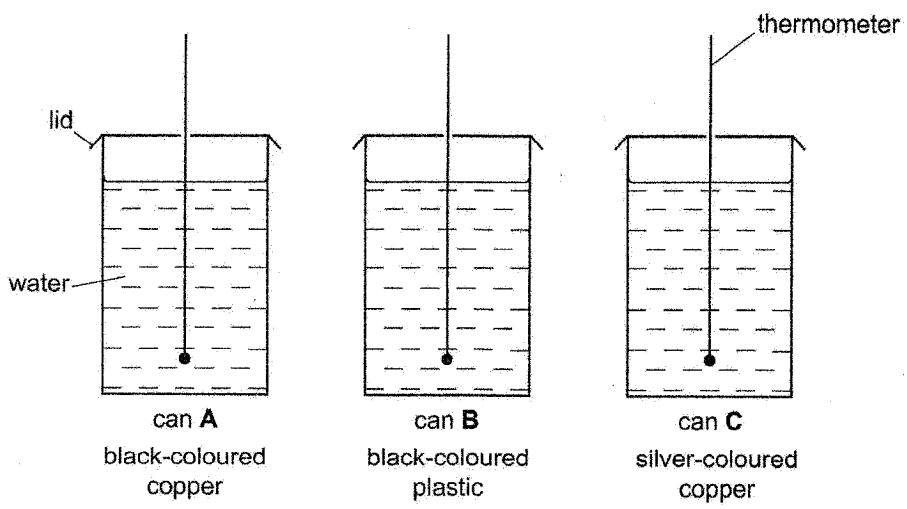


Fig. 6.1

Each can has the same dimensions.

Can **A** is made from black-coloured copper.
Can **B** is made from black-coloured plastic.
Can **C** is made from silver-coloured copper.

The initial temperature of the water in each can is 95 °C.
The temperature of the water in each can is measured again after 10 minutes.
The temperature of the water in can **A** is now 70 °C.

(a) Suggest a value for the temperature of the water in can **B** after it has cooled for 10 minutes. Give a reason for your answer.

temperature of water in can **B** = ... °C

reason .....

..... [2]

(b) Explain why, after the cans have cooled for 10 minutes, the temperature of the water in can **C** is higher than the temperature of the water in can **A**.

.....

..... [1]

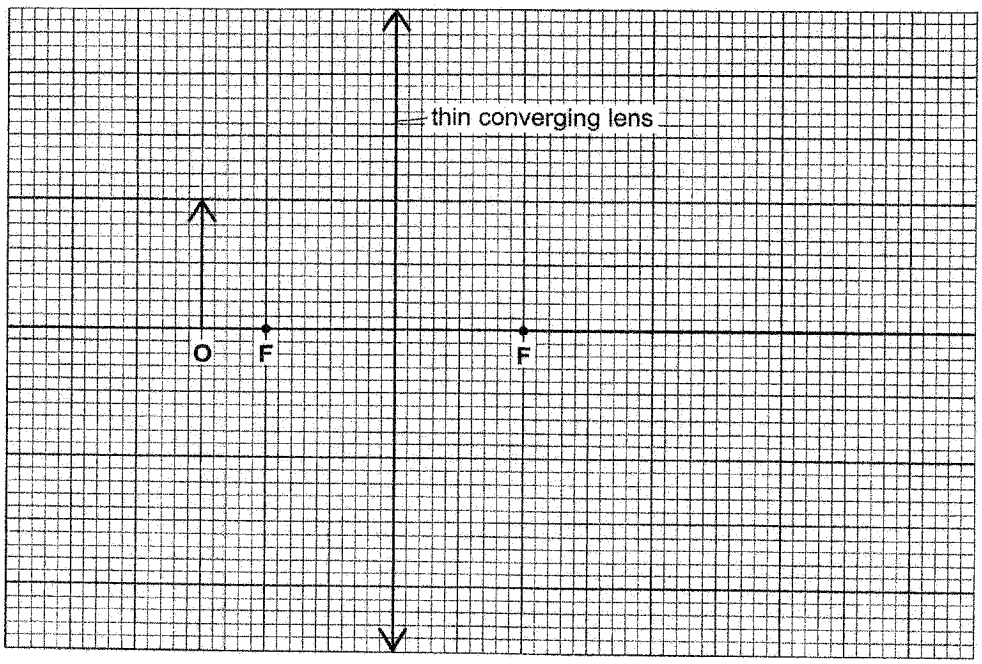
[Total: 3]

8 A thin converging lens is used to produce an image of an object.

The principal focuses **F** are 10 cm from the lens.

(a) The lens is placed 15 cm from object **O**.

(i) Complete the scale diagram in Fig. 8.1 to show how the lens forms the image of object **O**. Label this image with the letter **I**.



Scale: 1 cm represents 5 cm

Fig. 8.1

[2]

(ii) Describe the image that is formed.

.....

.....

..... [3]

9 The variation with time of the speed of a train as it travels between two stations is shown in Fig. 9.1.

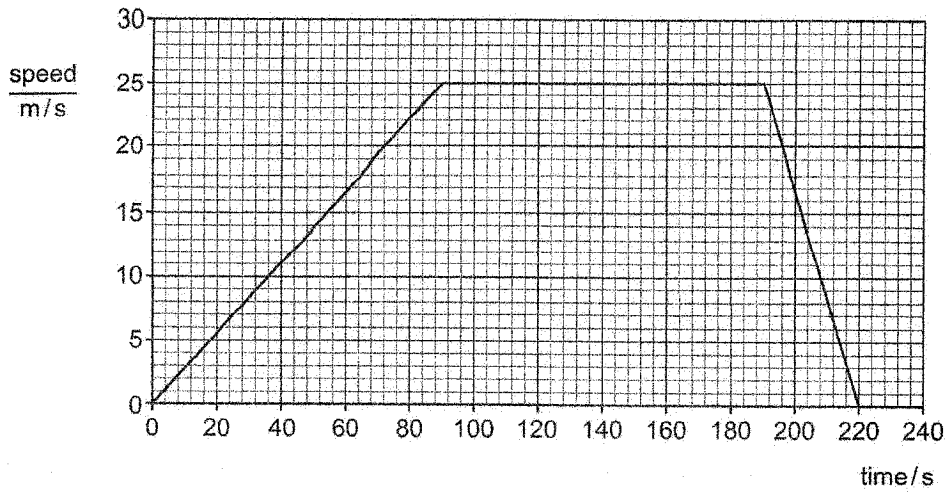


Fig. 9.1

Use Fig. 9.1 to determine:

(a) the greatest rate of change of speed of the train between the two stations

greatest rate of change of speed = ... m/s^2 [2]

(b) the distance between the two stations.

distance = ... m [2]

[Total: 4]

(b) Four of these decorations are now connected in parallel to the 9.0 V supply, as shown in Fig. 10.3.

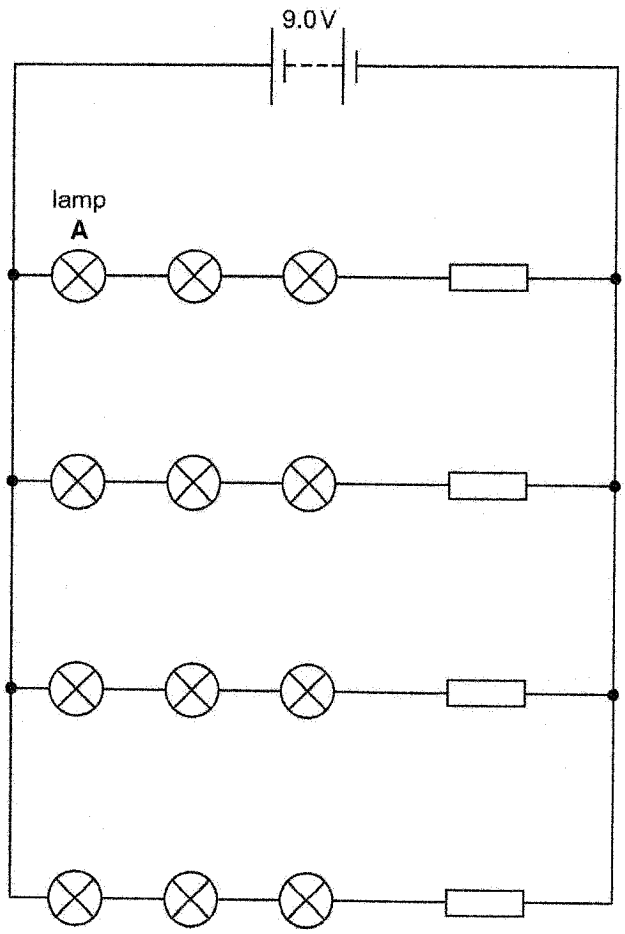


Fig. 10.3

The current in lamp **A** remains at 15 mA.

(i) Calculate the current in the 9.0 V supply.

current = ... mA [1]

(ii) Lamp **A** breaks and stops conducting.
State the effect (if any) that this has on all the other lamps connected to the supply.

.....

.....

..... [1]

[Total: 6]

(i) Calculate the energy supplied to the water after the water begins to boil.

energy = ... J [2]

(ii) 2260 J of energy is needed to convert 1.0 g of boiling water into steam.

Use your answer in **(a)(i)** to calculate the mass of boiling water that is converted into steam by the heater. Assume that there are no heat losses.

mass = ... g [1]

(iii) By reference to water molecules, explain why energy is needed to change boiling water into steam.

.....

.....

..... [2]

(b) Hot water in a dish begins to evaporate.

(i) Energy is needed to change liquid water into a vapour.

State where this energy comes from during evaporation.

.....

..... [1]

(ii) Explain why water at 85 °C evaporates at a faster rate than water at 50 °C when both are in similar dishes.

.....

.....

..... [2]

(c) State two differences between boiling and evaporation.

1. .....

.....

2. .....

.....

[2]

[Total: 10]

Calculate:

(i) the change in gravitational potential energy of the block after it is raised through a height of 120 m

change in gravitational potential energy = ... J [1]

(ii) the output power of the crane's motor to provide the gravitational potential energy in **(b)(i)**.

power = ... W [2]

(c) When energy is needed at night-time, the crane lowers the block to the ground at constant speed.

This causes the motor on the crane to generate an electromotive force (e.m.f.).

(i) State the useful energy transfer that takes place when the block is lowered.

from ..... energy to ..... energy [1]

(ii) Suggest two reasons why the energy generated when the block is lowered is less than the energy originally supplied by the solar cells.

1. .....

.....

2. .....

.....

[2]

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(c) When the musician plays a note, the vibrations from the guitar string are converted into electrical vibrations. These vibrations cause varying currents in the coil around the soft iron core.

(i) A guitar string can produce vibrations of different frequencies.

State the effect of changing the frequency of vibration on the sound that is heard.

.....

..... [2]

(ii) The variation with time of the current in the coil when one note is played is shown in Fig. 13.2.

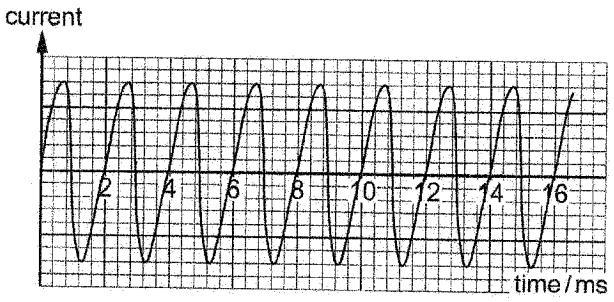

Fig. 13.2

The frequency of the varying current is equal to the frequency of the sound wave produced by the loudspeaker.

Use Fig. 13.2 to determine the frequency of the note that the musician plays.

frequency = ... Hz [3]

(iii) Calculate the wavelength of the sound wave that leaves the loudspeaker (the speed of sound in air = 320 m/s).

wavelength = ... m [1]

[Total: 10]