NAME:	CLASS:	INDEX NO:

QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE (PHYSICS, CHEMISTRY) **5076/01**

Paper 1 Multiple Choice **26 August 2021**

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 and index number on the Answer Sheet in the spaces provided.

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 Periodic Table is printed on page 16.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **16** printed pages.

Setters: Mrs Pang FH, Mrs Tay PH (Phy)
Mr Glynn Tan, Ms Sharelyn Teo (Chem)

[Turn over]

1 Fig. 1.1 shows the zero error of a micrometer screw gauge. Fig. 1.2 shows the reading of the same micrometer when it measures the diameter of a wire.

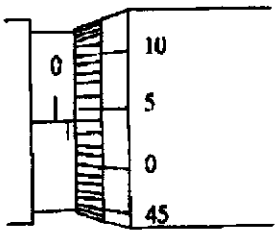


Fig. 1.1

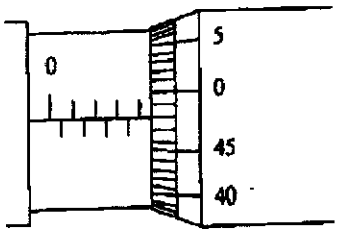


Fig. 1.2

What is the actual diameter of the wire?

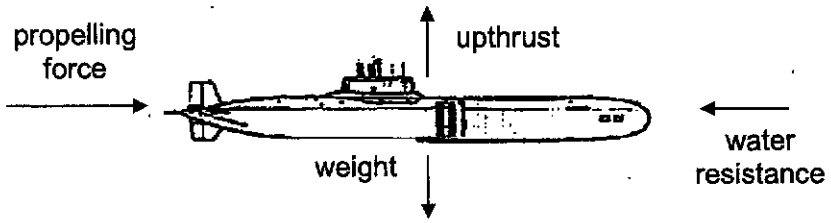
A 3.90 mm
B 3.94 mm
C 3.98 mm
D 5.02 mm

2 An object falls through a vacuum.

Which row describes the acceleration and the velocity of the object?

	acceleration	velocity
A	constant	constant
B	constant	increasing
C	increasing	constant
D	increasing	increasing

3 The diagram shows all the forces acting on a submarine. The submarine is accelerating forward underwater at a constant depth.



Which statement is correct?

A The force of gravity has no effect on the submarine.
B The resultant force acting on the submarine is zero.
C The upthrust is balanced by the weight.
D The water resistance is balanced by the propelling force.

4 An empty measuring cylinder has a mass of 200 g. Some liquid of volume 80 cm^3 is poured into the measuring cylinder. The total mass of cylinder and liquid is now 272 g.

What is the density of the liquid in g/cm^3?

A $\frac{28}{0.04}$ m/s

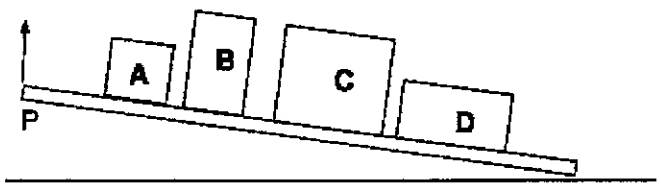
B $\frac{80}{272 - 200}$ g/cm^3

C $\frac{200}{80}$ g/cm^3

D $\frac{272 - 200}{80}$ g/cm^3

5 Four uniform wooden blocks are placed on a plank. The end of the plank P is slowly raised.

Which wooden block will topple first?



6 A boy of mass 40 kg stands on ice with his ice skates. The ice skates have a total base area of 0.5 m^2 in contact with the ice. The gravitational field strength is 10 N/kg.

What is the pressure that the boy exerts on the ice?

A 20 N/m^2
B 80 N/m^2
C 200 N/m^2
D 800 N/m^2

7 Jane held 10 books for 30 minutes and Jack held 5 similar books for 1 hour.

Which statement is correct?

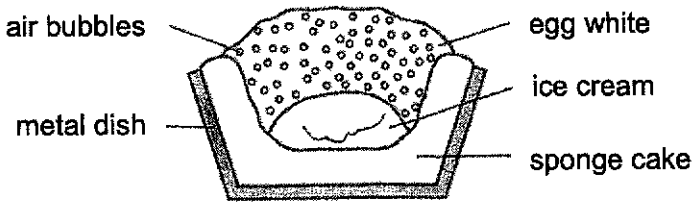
A Both of them did not do any work.
B Both sets of books gain gravitational potential energy.
C The same amount of chemical potential energy is converted to gravitational potential energy of the books in both cases.
D Jane's power is greater than Jack's power.

8 An enclosed glass container is filled with air and some smoke particles. The container is illuminated by bright light. When viewed through a microscope, bright specks of light are seen moving randomly.

Which statement about the bright specks of light is correct?

A They are molecules of air in rapid random motion.
B They move faster if there is no air in the container.
C They move faster when the air is at a higher temperature.
D They slow down and stop moving when light is turned off.

9 A baker places a pudding in a very hot oven until the top of the egg white turns brown. When the pudding is removed from the oven, the ice cream remains cold.



Which explanation is correct?

A Air is a good insulator of heat and it reduces the heat transfer to the ice cream by conduction.
B The browning of the egg white reduces heat transfer to the ice cream by radiation.
C The metal dish is a good conductor of heat and it conducts heat away from the ice cream.
D The sponge cake is a good insulator of heat and it keeps the coldness in the ice cream.

10 Which statement about the process of evaporation is **not** correct?

A Evaporation can cause cooling.
B Liquids with lower boiling points evaporate more easily.
C Moist atmosphere decreases the rate of evaporation from water surface.
D The rate of evaporation increases with increased pressure.

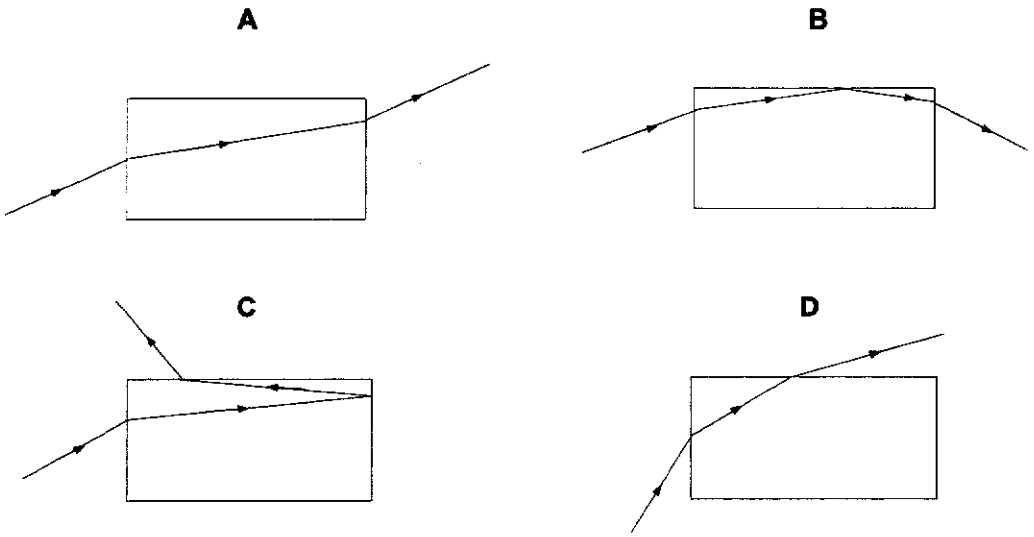
11 Which statement(s) is / are true about the difference between electromagnetic waves and sound waves?

1. Electromagnetic waves always travel perpendicularly while sound waves travel in a parallel direction.
2. Electromagnetic waves have higher frequencies than sound waves.
3. Electromagnetic waves can travel through vacuum.

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

12 A ray of light is incident on one side of a rectangular glass block.

Which path of light is **not** possible?



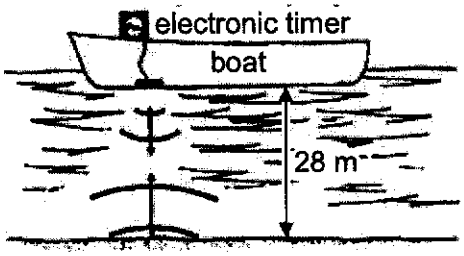
13 Which of the following correctly lists three components of electromagnetic spectrum in order of decreasing frequency?

A gamma rays, visible light, microwaves
B gamma rays, microwaves, visible light
C microwaves, gamma rays, visible light
D microwaves, visible light, gamma rays

14 Which device does **not** make use of electromagnetic waves in its operation?

A Microphone
B Handphone
C Radio
D Television

15 An underwater transmitter sends out a pulse of sound from the bottom of a boat. An electronic timer measures the time between the pulse being emitted and the echo being received.



When the water beneath the boat is 28 m deep, the timer records a time of 0.04 s.

What is the speed of sound in water?

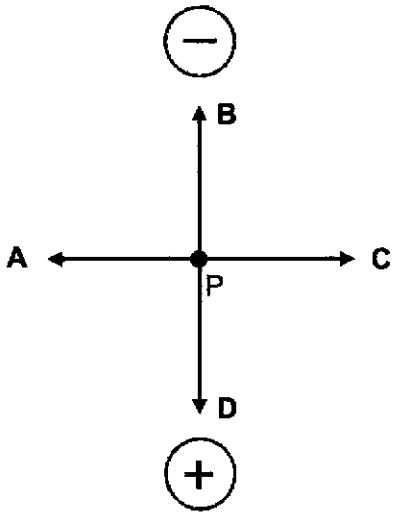
A 28×0.04 m/s

B $\frac{28}{0.04}$ m/s

C $2 \times 28 \times 0.04$ m/s

D $\frac{2 \times 28}{0.04}$ m/s

16 What is the direction of the electric field at point P?



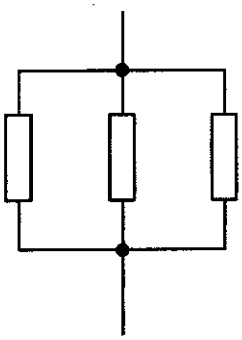
17 The potential difference between the ends of a conductor is 12 V. A current of 2 A flows through the conductor in 1 minute.

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

A 1440 J
B 360 J
C 24 J
D 0.4 J

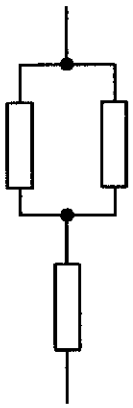
18 Which combination of identical resistors has the lowest effective resistance?

A

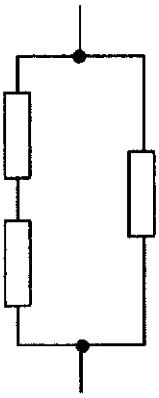


B

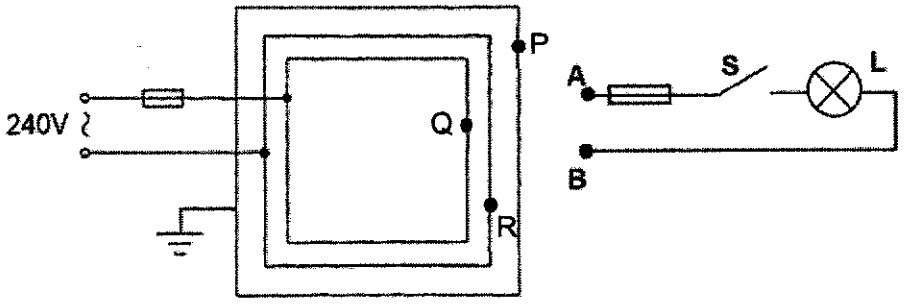
C



D



19 The diagram shows an incomplete part of a ring main circuit in a house.



Which is the correct connection for lamp L to work safely?

A A to P and B to R
B A to Q and B to R
C A to R and B to Q
D A to Q and B to P

20 Which fuse is the most appropriate for a Christmas lighting set which consists of 30 bulbs each rated 5 V, 2 W? The power supply given is 5 V.

A 1 A
B 5 A
C 12 A
D 13 A

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QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE (PHYSICS, CHEMISTRY) **5076/02**

Paper 2 Physics **27th August 2021**

1 hour 15 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name and index number 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.

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.

For Examiner's Use	
Section A	/45
Q	/10
Q	/10
TOTAL	/65

This document consists of **18** printed pages.

Setters: Mrs Tay PH, Mrs Pang FH **[Turn over**

SECTION A

Answer **all** the questions in the spaces provided.
The total mark for this section is 45.

1 Fig. 1.1 shows a car travelling ahead of a truck with a full load. The car comes to a sudden stop when the truck is 20 metres behind the car. The truck driver steps on his brakes and he stops the truck just in time to avoid a collision with the car.

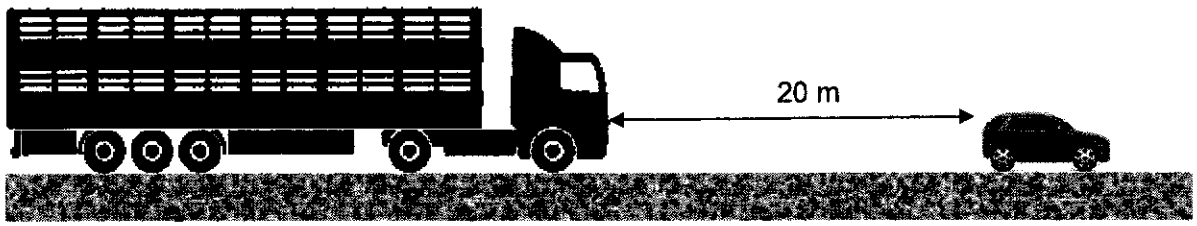

Fig. 1.1

(a) The truck driver claims that his truck is at the speed limit of 15 km/h and he takes a total of 9.6 seconds to stop his truck.

Assuming that the reaction time of the truck driver is negligible, calculate the constant deceleration of the truck.

deceleration = ... m/s^2 [2]

(b) Explain whether the truck will take a longer time to stop if it is not loaded at all.

.....

.....

.....[2]

2 Fig. 2.1 shows an experiment that is set up to estimate the mass of a retort stand.

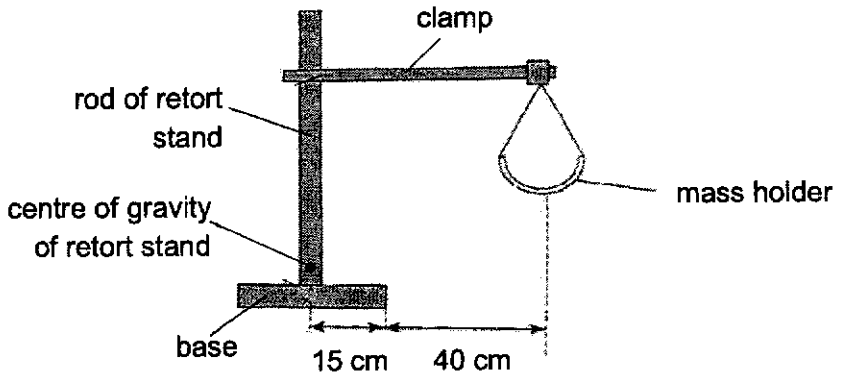

Fig. 2.1

(a) State the *principle of moments*.

.....

.....

.....[2]

(b) When a 400 g mass is added to the mass holder, the retort stand is just about to topple. The mass of the mass holder is assumed to be negligible.

Calculate the weight of the retort stand.

weight = ... N [2]

(c) Suggest two adjustments that can be made to balance a mass that is greater than 400 g with the retort stand.

.....

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.....[2]

3 Fig. 3.1 shows a box being pushed up a slope at constant speed by a man. The mass of the box is 50 kg. The gravitational field strength g is 10 N/kg.

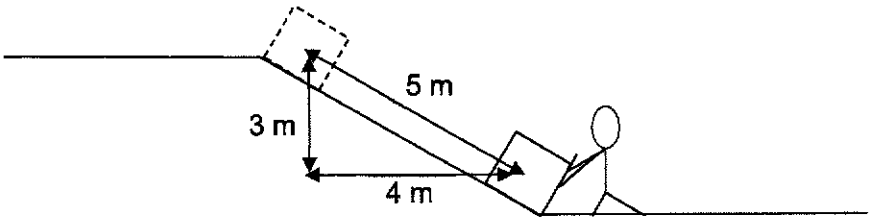


Fig. 3.1

(a) State the *principle of conservation of energy*.

.....

.....

.....[2]

(b) Calculate the amount of work done by the man.

work done = ... J [2]

(c) Explain why the actual amount of work done by the man is higher than that calculated in **(b)**.

.....

.....[1]

(d) Calculate the effective power produced by the man if it takes him 1 minute to move the box up the slope.

effective power = ... W [2]

4 Fig. 4.1 shows a white container filled with liquid X. Fig. 4.2 shows the cooling curve of liquid X measured by the temperature probe.

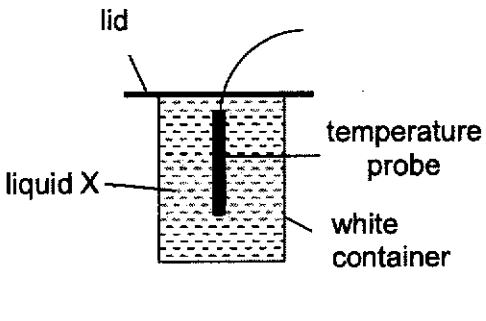


Fig. 4.1

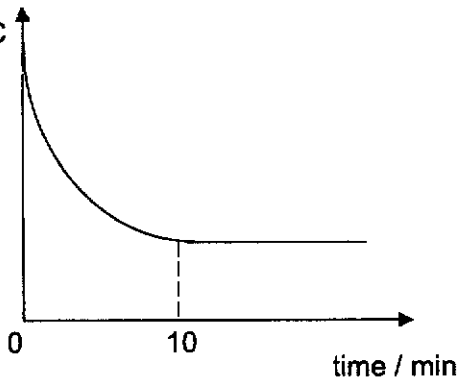


Fig. 4.2

(a) Explain, using the kinetic model of matter, why liquid X has no fixed shape.

.....

.....

.....[1]

(b) Describe, in terms of molecules, the change that takes place between time = 0 to time = 10 minutes.

.....

.....

.....[1]

(c) **(i)** On Fig. 4.2, sketch the cooling curve of liquid X if the surface of the container is black instead of white. [1]

(ii) Explain your sketch in **(c)(i)**.

.....

.....

.....[1]

5 Fig. 5.1 shows plane waves in water travelling to the right. The vertical straight lines represent the positions of successive crests of the waves at an instant.

Fig. 5.1 (drawn to scale)

(a) Given that the frequency of water waves is 4.0 Hz and Fig. 5.1 is drawn to scale,

(i) determine the wavelength of the waves,

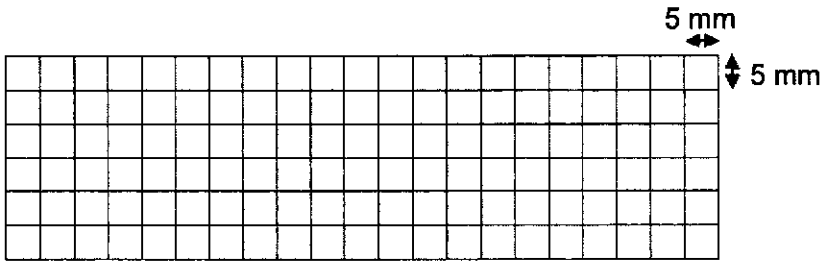
wavelength = ... cm [1]

(ii) calculate the speed of the waves.

speed = ... cm/s [2]

(b) The amplitude of the wave is 7.5 mm.

On Fig. 5.2, draw a full-scale diagram to show the displacement-distance graph of the waves between A to C.



[3]

Fig. 5.2

(c) Describe the movement of a water particle at point B as the wave moves through one wavelength.

.....

.....[2]

6 Fig. 6.1 shows a plane mirror placed perpendicularly to the principal axis of a converging lens. Light rays from a point source S pass through the lens and are incident on the mirror.

Fig. 6.2 shows how the light rays are reflected from the mirror and pass through the lens again.

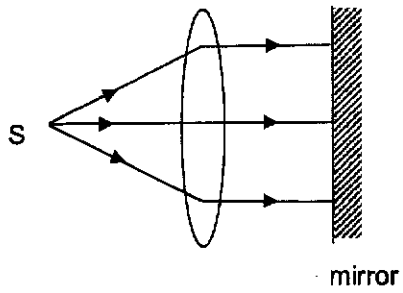


Fig. 6.1

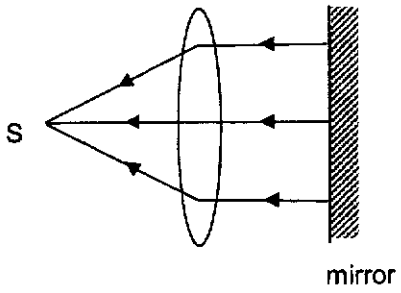


Fig. 6.2

(a) **(i)** Mark the focal length of the lens and label it as *f* on Fig. 6.1. [1]

(ii) State what is meant by focal length.

.....

.....[1]

(b) Explain the path of light rays in Fig. 6.2 when

(i) the rays are reflected by the mirror; and

.....

.....

.....

.....[2]

(ii) the reflected light rays from the mirror pass through the lens again.

.....

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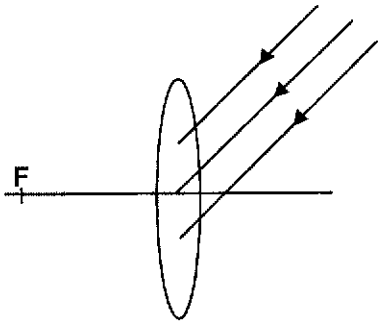
.....[2]

(c) On Fig. 6.3, complete the path of the light rays.



[1]

Fig. 6.3

7 Fig. 7.1 shows a small uncharged conducting sphere hanging on a cotton thread. It is placed between two equally oppositely charged metal plates.

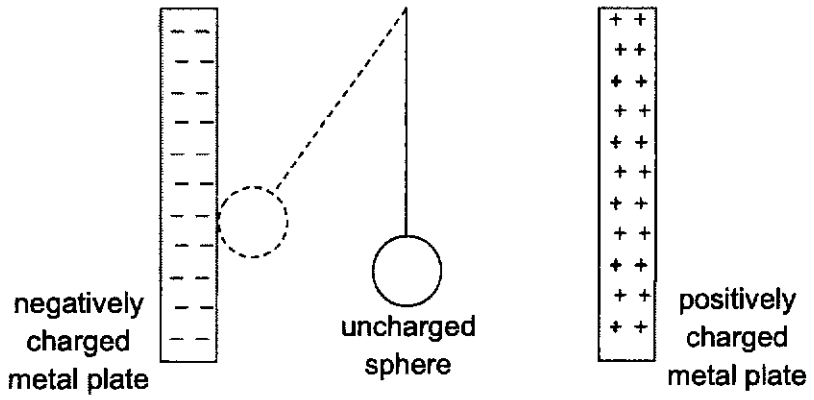


Fig. 7.1

The sphere starts touching the negatively charged plate. It is then repelled from the negatively charged plate, swings and touches the positively charged plate.

(a) Explain why the sphere was repelled from the negatively charged plate after touching it.

.....

.....

.....

.....[2]

(b) The sphere touches the negatively and positively charged plates alternatingly, and eventually comes to a stop. Explain why this is so.

.....

.....

.....

.....[2]

8 Fig. 8.1 shows a circuit with two resistors connected in parallel. Switch S is connected in series with the 4 Ω resistor. A_1 and A_2 are identical ammeters.

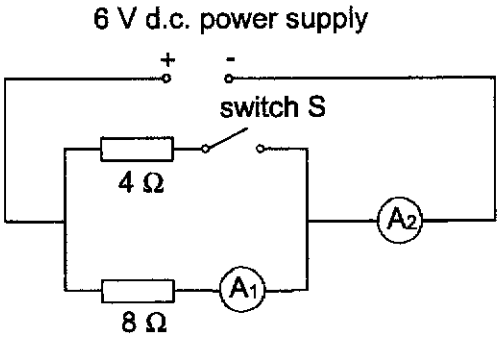


Fig. 8.1

Calculate the current in A_1 and A_2

(a) when switch S is closed; and

current in A_1 = ... A [2]

current in A_2 = ... A [1]

(b) when switch S is open.

current in A_1 = ... A [1]

current in A_2 = ... A [1]

END OF SECTION A

SECTION B

Answer any **two** questions in this section.

Write your answers in the spaces provided.

9 Fig. 9.1 shows the cross-section of a manhole on a dry day. Fig. 9.2 shows the manhole filled with some water on a rainy day. The gravitational field strength is 10 N/kg.

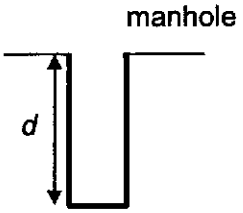


Fig. 9.1

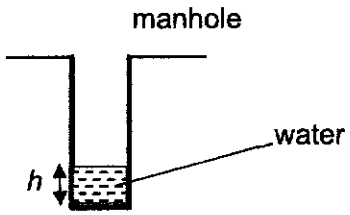


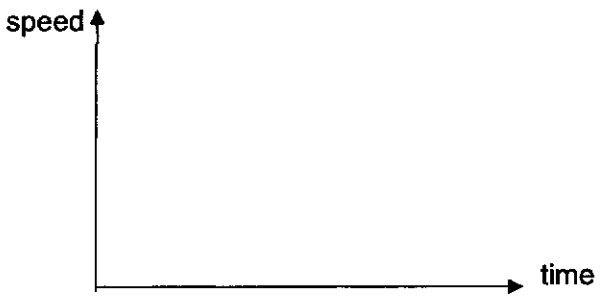
Fig. 9.2

(a) A stone released from the top of the manhole takes 3.0 s to hit the bottom of the manhole on a dry day in Fig. 9.1.

Assuming air resistance is negligible, calculate the speed of the stone just before it hits the bottom of the manhole.

speed = ... m/s [2]

(b) On Fig. 9.3, sketch the speed-time graph of the stone from t = 0.0 s to t = 3.0 s.



[1]

Fig. 9.3

(c) Calculate the depth of the manhole, *d*.

d = ... m [2]

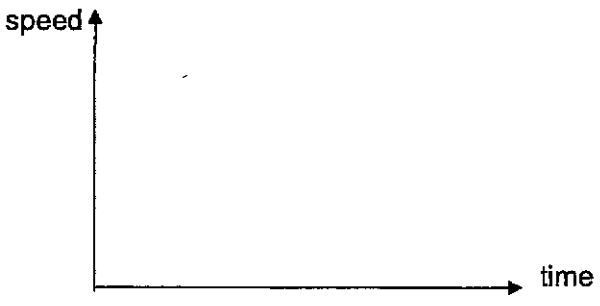
(d) On a rainy day, a stone is released from rest at the top of the manhole. It takes 2.0 s before it hits the surface of the water.

Calculate the depth of the water in the manhole, *h*.

h = ... m [2]

(e) As the stone strikes the surface of the water, it decelerates and reaches a constant speed as it sinks.

(i) On Fig. 9.4, sketch the speed-time graph of the stone after it strikes the surface of the water.



[1]

Fig. 9.4

(ii) Explain, in terms of forces, the motion of the stone.

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.....

.....

.....

.....

.....[2]

10 Thermal flasks are used to keep hot liquids warm. There are two common types of thermal flasks. Fig. 10.1 shows a thermal flask that makes use of foam as the insulating material. Fig. 10.2 shows a vacuum thermal flask with the inner surface of the walls of the glass container painted silver. As glass is fragile, the glass container is protected by an outer case with an insulated support.

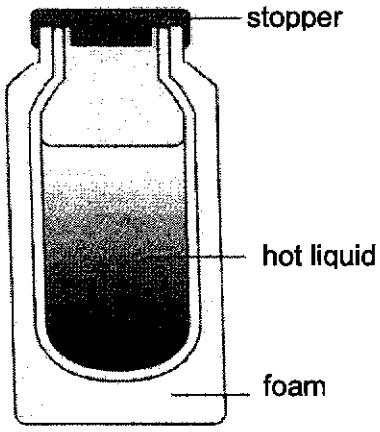


Fig. 10.1

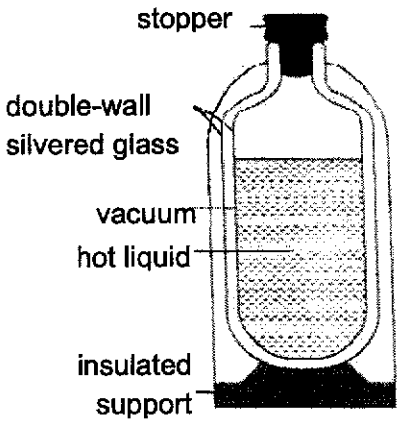


Fig. 10.2

(a) Explain whether foam or vacuum is more effective in keeping hot liquids warm in the thermal flask.

.....

.....

.....

.....[2]

(b) State and explain one design in the vacuum thermal flask that reduces transfer of heat by radiation.

.....

.....

.....[2]

(c) The vacuum thermal flask is now filled with ice instead of hot liquid.

Explain whether the vacuum thermal flask can keep the ice from melting.

.....

.....[1]

(d) The vacuum thermal flask containing ice has its stopper removed. Fig. 10.3 shows how the temperature of ice varies with time.

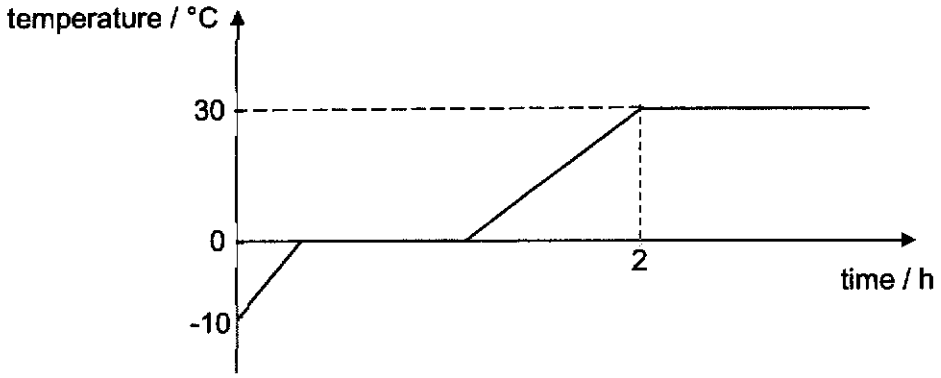


Fig. 10.3

(i) Explain which process of heat transfer is least likely to take place in the thermal flask for the ice to gain heat from the surrounding.

.....

.....

.....[2]

(ii) Describe the changes to the arrangement and the motion of the molecules at temperature 0 °C.

Arrangement : .....

.....

.....

.....

Motion : .....

.....

.....[2]

(iii) Explain why the temperature becomes constant at 30 °C after 2 hours.

.....

.....

.....

.....[1]

11 Fig. 11.1 shows an electric kettle connected to the mains supply by a flexible cable. The kettle has a power rating of 2.5 kW, 220 V.

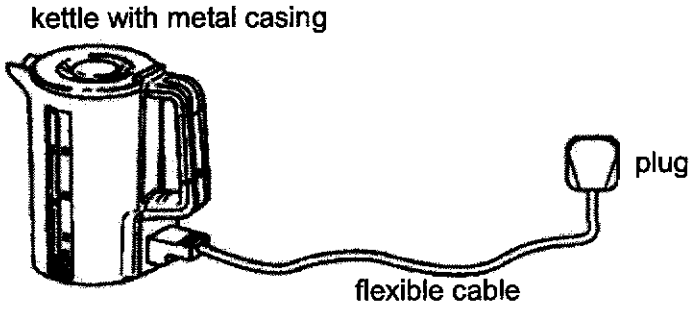


Fig. 11.1

The table in Fig. 11.2 shows the maximum current that may be carried safely by wires of various diameters.

wire diameter / mm	maximum current / A
0.50	3
0.75	6
1.00	10
1.25	13
1.50	15

Fig. 11.2

(a) (i) From Fig. 11.2, select the smallest diameter of wire that can be used safely for this kettle. Show any necessary calculations.

diameter of wire = ... mm [2]

(ii) Explain why it is dangerous to use a wire thinner than that in **(a)(i)**.

.....

.....[1]

(b) Describe one fault that may occur in the flexible cable that will cause the fuse in the plug to melt.

.....

.....[1]

(c) Explain why a three-pin plug is necessary for this appliance, instead of a two-pin plug.

.....

.....

.....

.....[2]

(d) Explain why this kettle must not be connected directly to a 240 V power supply.

.....

.....

.....

.....[2]

(e) The kettle was switched on for 3 minutes each time and is used five times a day.

If one unit (kWh) of electricity costs $0.25, calculate the cost of using the kettle.

cost = ... [2]

END OF PAPER

NAME: **MARKING SCHEME**	CLASS:	INDEX NO:

QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE (PHYSICS, CHEMISTRY) **5076/02**

Paper 2 Physics **27th August 2021**

1 hour 15 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name and index number 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.

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.

For Examiner's Use	
Section A	/45
Q	/10
Q	/10
TOTAL	/65

This document consists of **7** printed pages.

Setters: Mrs Tay PH, Mrs Pang FH **[Turn over**

Answer to Paper 1

1	2	3	4	5	6	7	8	9	10
B	B	C	D	B	D	A	C	A	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	C	A	A	D	B	A	A	B	D

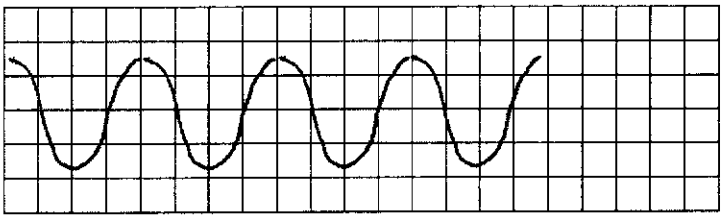
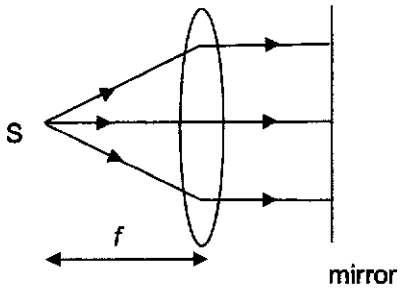
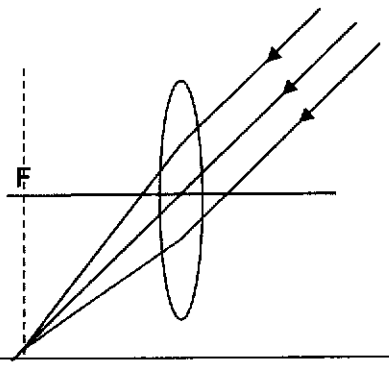
SECTION A

Answer **all** the questions in the spaces provided.
The total mark for this section is 45.

1	**(a)**	Acceleration = $\frac{v-u}{t}$ $= \frac{0-\frac{15\,000}{60\times 60}}{9.6}$ [1] – conversion of km/h to m/s $= -0.434\ m/s^2$ Deceleration = $0.434\ m/s^2$ [1]
	(b)	The truck will take a shorter time if it is not loaded at all. [no marks] As mass of the truck is reduced without the load, [1] the inertia of the truck will also be reduced. [1] so, the truck will take a shorter time to change its state of motion.

2	**(a)**	The principle of moments states that when a body is in **equilibrium [1]**, the sum of **clockwise moments about a pivot** is **equal to the sum of anti-clockwise moments** about the **same pivot**. [1]
	(b)	Anti-clockwise moment = clockwise moment Weight of retort stand x 15 = 4 x 40 [1] Weight of retort stand = 10.7 N [1]
	(c)	Any two: [2] - Shorten the clamp of the retort stand holding the mass. - Increase the base area of the retort stand. (this will move the pivot more to the right to increase the anti-clockwise moment). - Move the mass holder towards the CG or rod of the retort stand. - Add weight to the base of the retort stand (to increase the anti-clockwise moment).
3	**(a)**	The *principle of conservation of energy* states that energy cannot be created or destroyed, but can be converted from one form to another [1]. The total energy in an isolated system is constant [1].

	(b)	Work done, W = mgh = 50 × 10 × 3 [1] = 1500 J [1]	
	(c)	More work needs to be done by the man than the value calculated in **(a)** because work needs to be done against friction along the slope. [1]	
	(d)	Effective power, P = E / t = 1500 / 60 [1] = 25 W [1]	
4	**(a)**	In liquid state, the forces of attraction between particles are slightly weaker than in solid states. This allows the liquid particles to move about and slide over one another. Thus, the free motion of the liquid particles allow the shape of liquid to change. Hence, liquid has no fixed shape. **[1]**	
	(b)	As the temperature of liquid X decreases, the kinetic energy of the molecules in liquid X decreases. The molecules of the liquid slides past each other at a slower rate. [1]	
	(c) (i)	[1] – curve with a steeper slope temperature / °C time / min	
	(c) (ii)	The cooling curve of the black container has a steeper gradient since black surface is a **better** emitter of infrared radiation than white surface so the rate of heat lost by liquid X is higher. [1]	
5	**(a)**	**(i)**	2.0 cm [1]
		(ii)	v = f λ = 4.0 x 2.0 [1] = 8 cm/s or 0.08 m/s [1]

	(b)	Amplitude = 7.5 mm [1]; wavelength = 20 mm [1]  Correct shape [1] – start with crest; 4 cycles	
	(c)	At B, there is a crest [1]. The water particle falls to the lowest point (trough) and rises again to the highest point from its equilibrium position. [1]	
6	(a) (i)	 Correct focal length marked in Fig. 6.1 [1]	
	(a) (ii)	Focal length is the distance between the optical centre of the lens to the principal focus of the lens [1]	
	(b)	(i)	The incident ray on the mirror is perpendicular to the mirror [1] since the mirror is placed perpendicularly to the principal axis [1] and so by law of reflection, the reflected ray is also perpendicular to the mirror. (angle of reflection is zero)
		(ii)	The incident rays to the lens after reflection from the mirror are parallel to the principal axis [1] and so converge to S after refraction by the lens because S is the focal point. [1]
	(c)		

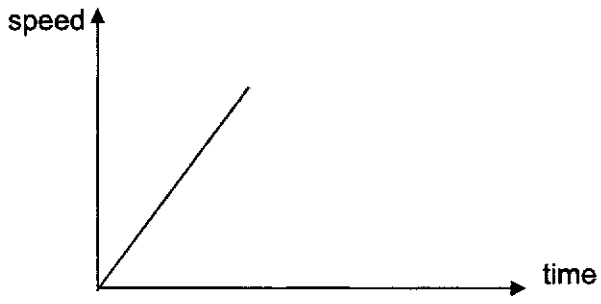
			Correct rays of light [1]
7	(a)	When the sphere touches the negatively charged plate, electrons flow from the plate to the sphere. The sphere becomes negatively charged [1] As like charges repel [1], the sphere swings away from the negatively charged plate.	
	(b)	When the sphere swings from touching the negatively and positively charged plates alternatively, electrons from the negatively charged plates are transferred to the positively charged plates [1]. Eventually both the metal plates will be neutralised and stops swinging as the negative plate loses its excess negative charges while the positive plate gains the negative charges [1]. Both are equally oppositely charged at the beginning.	
8	(a)	Total resistance = (¼ + 1/8)$^{-1}$ = 8/3 = 2.6 Ω [1] I_2 = V/R = 6.0 / 2.6 =2.3 A [1] I_1 = V/R = 6.0 / 8 = 0.75 A [1]	
	(b)	I = V/R = 6.0 / 8 = 0.75 A [1] $I_1 = I_2$ = 0.75 A [1]	

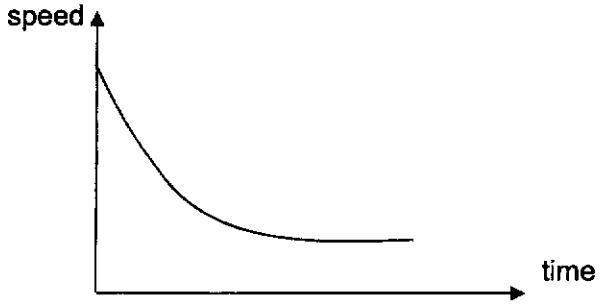
END OF SECTION A

SECTION B

Answer any **two** questions in this section.

Write your answers in the spaces provided.

9	(a)	a = (v – u) / t 10 = (v – 0) / 3 [1] v = 30 ms^{-1} [1]	
	(b)	 Correct sketch [1]	

	(c)		Depth of manhole, d = area under speed-time graph d = ½ x 3 x 30 [1] = 45 m [1] full [ECF]
	(d)		New final speed of stone = 0+(10 x 2) = 20 ms^{-1} New depth of manhole to surface of liquid = ½ x 20 x 2 = 20 m [1] Depth of liquid to bottom of manhole, d = 45 – 20 = **<u>25 m</u>** [1] Full [ECF]
	(e)	**(i)**	 [1] –graph shows decreasing speed (gradient can be constant or decreasing gradient), followed by zero gradient.
		(ii)	As the stone sinks in the water, (Net force acting on the stone) = weight of the stone – water resistance) = ma As the stone enters the water, <u>the water resistance is greater than the weight of the stone. This causes the stone to decelerate</u> [1]. <u>As the stone decelerates, the water resistance decreases. When the magnitude of the weight of the stone is equal to the water resistance, the stone sinks in constant speed</u>. [1]
10	**(a)**		The vacuum between the walls of the flask prevents transfer of heat by conduction [1] The foam in Fig. 11.1 can only reduce heat lost by conduction. [1]. So, vacuum is more effective in keeping hot liquids warm.
	(b)		The silvered glass. [1] It is a good reflector of infrared radiation and it reflects heat from the hot liquid back to the liquid [1] to reduce heat lost by the hot liquid.
	(c)		The thermal flask reduces heat transfer from the surrounding to the ice [1]. This helps to keep the ice from melting.

	(d)	(i)	Two possible answers: Conduction. [1] Since air is a poor conductor of heat, it will take some time for heat from the surrounding to be transferred to ice which is at the bottom of the flask. [1] Convection. [1] Since cold air is denser than warmer air, the cold air around ice will remain at the bottom of the flask and the warmer air in the surrounding will stay above the ice. Convection current cannot be set up.
		(ii)	Arrangement: The molecules changed from being closely packed together in a regular pattern to become randomly arranged with particles slightly further apart as compared to the solids. [1] Motion: The molecules changes from vibrating about their fixed positions to moving about and sliding over one another. [1]
		(iii)	T_2 is the room temperature. The melted ice (water) reaches thermal equilibrium with the surrounding. So, there is no net flow of heat between the water and the surrounding. So, temperature of water is constant at T_2. [1]
11	(a)	(i)	P = VI I = P / V = 2500 / 220 = 11.4 A [1] The smallest diameter of wire is 1.25 mm which allows a maximum current of 13 A which is slightly higher than 11.4 A. [1]
		(ii)	A wire thinner than 1.25 mm allows a maximum current which is less than the normal operating current of 11.4 A. Such wires will overheat and melt when 11.4 A flows through it and will cause electrical fire. [1]
	(b)		The insulation of the flexible cable could be damaged and caused the live wire to touch the neutral wire or the earth wire. This causes a short circuit and brings about excessive current that will cause the fuse to melt. [1]
	(c)		The kettle has metal casing and metal parts. A 3-pin plug has an earth wire which provides a path for current to flow from the metal casing to earth and blow the fuse if the metal casing becomes 'live' accidentally [1]. This prevents the user from getting an electric shock. [1]
	(d)		If the kettle of 220 V rating is connected to the 240 V, the current drawn from the supply will be higher [1] than the normal operating current. This may cause overheating of the appliance and a fire may occur. [1]
	(e)		Total cost = Pt x \$0.25 = 2.5 x 3/60 x 5 x 0.25 [1] = \$0.16 [1]

END OF MARKING SCHEME