Name: ……………………………………………………… (   )   Class: ……………

ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2019

SCIENCE (PHYSICS)
5076 / 01
5077 / 01

LEVEL: 4 Express / 5 Normal (Academic)   **DATE:** 29 August 2019

CLASSES: Sec 4/1, 4/2 & 5/1   **DURATION:** 1 hour (Both Physics & Chemistry)

Additional Materials provided: 1 sheet of OAS paper

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME, INDEX NUMBER and CLASS at the top of this page and on the OAS paper. **Shade your index number on the OAS paper.**

There are 20 questions in this paper. Answer **ALL** questions. For each question, there are four possible answers A, B, C and D. Choose the correct answer and record your choice in soft or 2B pencil on the OAS paper provided. **DO NOT fold or bend the OAS paper.**

For Examiner's use:	
Paper 1	/ 20
Paper 2	/ 65
Paper 5	/ 15
Total	/ **100**

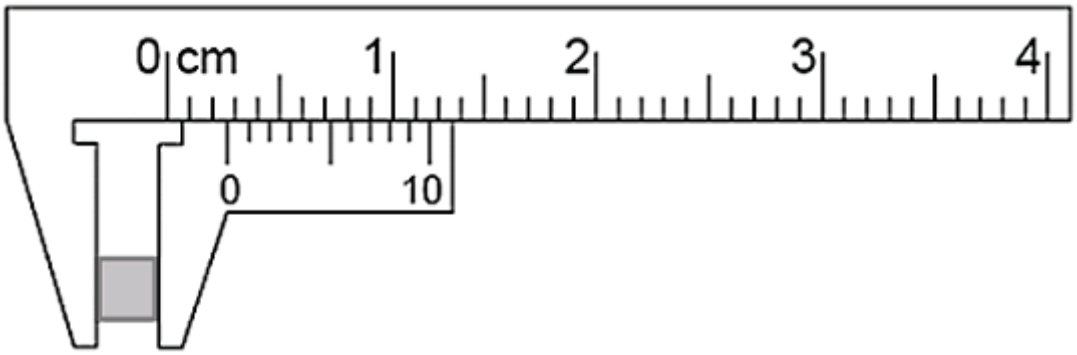
At the end of the examination, hand in your OAS paper and Question Papers separately.

This Question paper consists of <u>10</u> printed pages including this page.

[Turn Over

Answer **ALL** questions on the OAS paper provided.

1 What is the reading shown by the vernier calipers below?



A 0.07 cm

B 0.27 cm

C 0.29 cm

D 0.37 cm

2 Which scenario can cause a change in the acceleration of an object?

A The object continues to move in a straight line at constant speed.

B The object experiences a constant net force to keep it moving.

C The object remains moving in constant velocity.

D The object slides from a rough surface to a smooth surface.

3 An elephant of mass 6000 kg stands on four legs, each having an area of contact of 0.15 m^2 with the ground. What is the pressure exerted by the elephant on the ground?
Take g to be 10 N/kg.

A 10 kPa

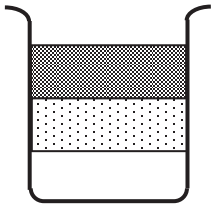
B 40 kPa

C 100 kPa

D 400 kPa

4 Three immiscible liquids are poured into a beaker. The masses and the corresponding volumes of three liquids **X**, **Y** and **Z** are recorded below.

liquid	mass / g	volume / cm^3
X	270	40
Y	400	70
Z	559	50



What is the order of the liquids in the beaker starting from the top?

A **X**, **Y**, **Z**

B **Y**, **X**, **Z**

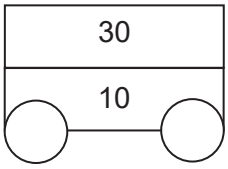
C **Z**, **Y**, **X**

D **Z**, **X**, **Y**

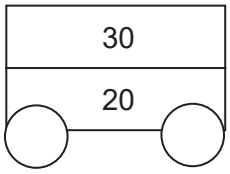
5 Some passengers are travelling on four double-decker buses along a horizontal highway. The numbers of passengers in each deck are as indicated.

Which distribution of passengers on the double-decker bus is the most stable?

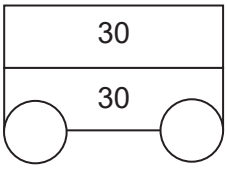
A



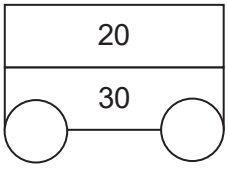
B



C



D



6 An experiment is carried out to measure the power of a student running up a flight of stairs. Which quantity is **not** required for this experiment?

A the time taken to run up the stairs

B the total horizontal distance of the stairs

C the total vertical height of the stairs

D the weight of the student

7 Which statement(s) about kinetic model of matter is / are true?

I. Particles in a gas repel each other.

II. Particles in a liquid are constantly in motion.

III. Particles in a solid expand when heated.

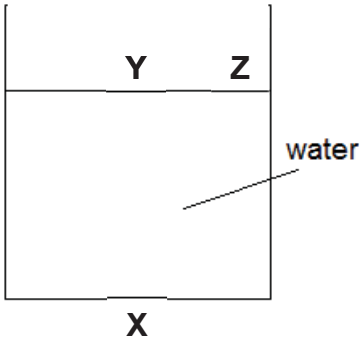
A **II** only

B **I** and **II** only

C **II** and **III** only

D **I**, **II** and **III**

8 The diagram shows a large tank of water.



Which arrangement will set up convection currents in the tank?

A cooling at **X**

B cooling at **Y**

C heating at **Y**

D heating at **Z**

9 Particles in a solid absorb thermal energy and vibrate about their fixed positions more vigorously.

Which process is being described?

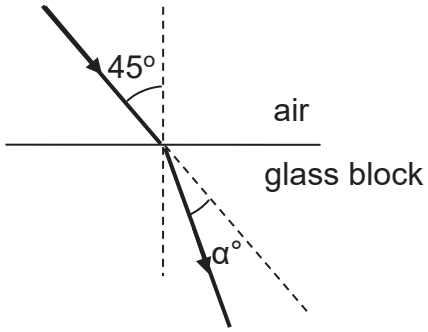
A boiling

B evaporation

C heating

D melting

10 A light ray enters a glass block at an angle of incidence of 45°.



If the glass has a refractive index of 1.41, what is the value of angle α° (not drawn to scale)?

A 14.9

B 30.1

C 40.1

D 45.0

11 Electromagnetic waves of wavelength **λ** and frequency **f** travel at speed **c** in a vacuum.

Which row correctly describes the wavelength and speed of electromagnetic waves of frequency **f**/2?

	wavelength	speed in a vacuum
A	**λ**/2	**c**/2
B	**λ**/2	**c**
C	2**λ**	**c**
D	2**λ**	2**c**

12 Which application uses ultraviolet rays?

A forgery detector

B imagery of body

C remote controller

D satellite television

13 Which statement about sound is correct?

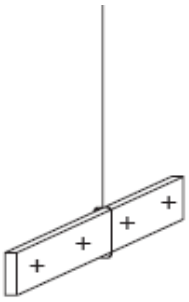
A Sound waves are transverse waves.

B Sound waves can undergo reflection.

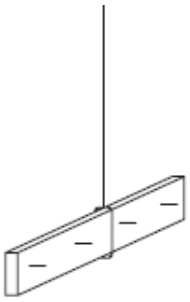
C Sound waves travel slower in steel than in air.

D The speed of sound waves in air is 3×10^8 m/s.

14 The diagram shows a freely suspended positively charged acetate strip and a negatively charged polythene strip.



acetate strip



polythene strip

Two rods **X** and **Y** are brought near to the two strips. Rod **X** repels the acetate strip but attracts the polythene strip. Rod **Y** attracts both strips.

Which type of charge is on each rod?

	rod **X**	rod **Y**
A	postive	neutral
B	positive	postive
C	negative	positive
D	neutral	negative

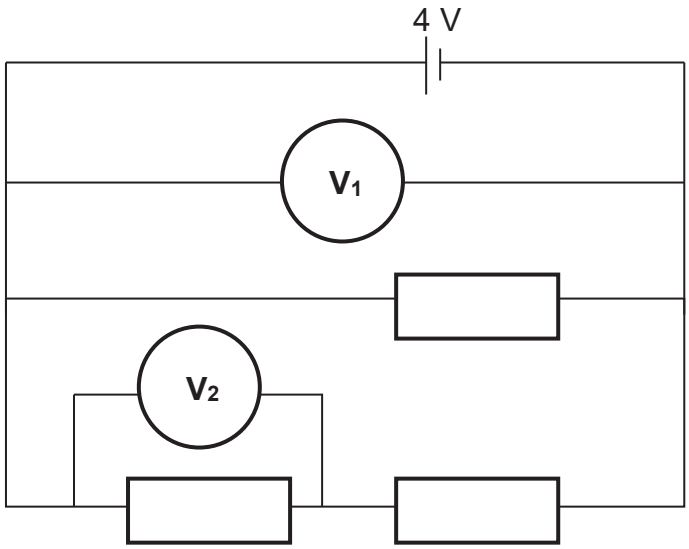
15 The current in an electric heater is 6 A. It is switched on for 5 minutes.

How much charge flows through the heater?

A 20 mC **B** 30 C

C 50 C **D** 1800 C

16 The diagram shows three identical resistors connected to a 4 V cell.

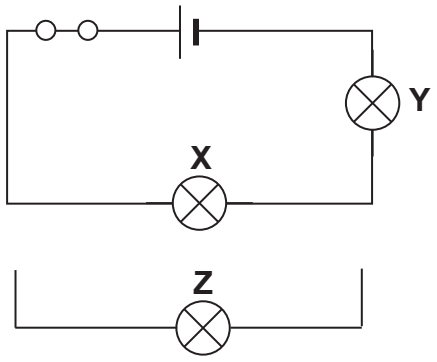


What is the correct relationship between the readings on voltmeters V_1 and V_2?

A $V_1 = V_2$ **B** $V_1 = 2V_2$

C $V_2 = 2V_1$ **D** $V_2 > V_1$

17 The diagram shows identical lamps **X** and **Y** connected in series with a dry cell. Both lamps are equally bright when the circuit is closed.

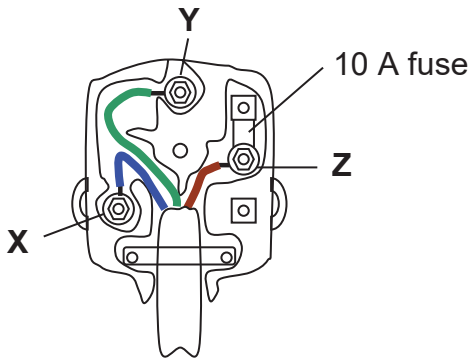


A third identical lamp **Z** is connected in parallel with lamp **X**. How does the magnitude of current in lamp **Y** change compared to the initial arrangement?

A higher **B** lower

C no change **D** no current

18 The diagram shows a three-pin plug used with a 10 A fuse.



Which row shows the possible values of the current flowing through the terminals **X**, **Y** and **Z** when there is **no** fault?

	current at **X** / A	current at **Y** / A	current at **Z** / A
A	0	9	9
B	9	0	9
C	9	0	10
D	9	9	9

19 Which method **cannot** demagnetise a steel bar?

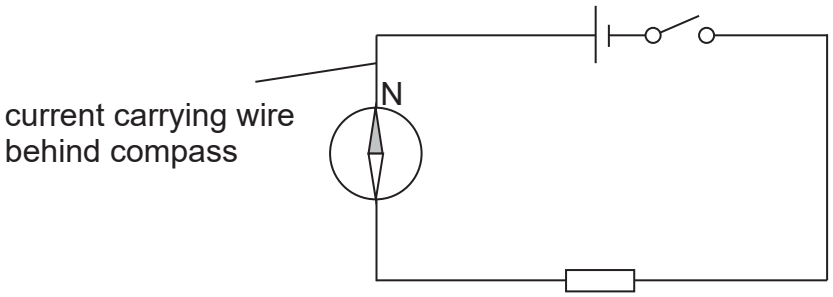
A hammering it repeatedly

B heating over a flame for a period of time

C placing it in a solenoid under an alternating current

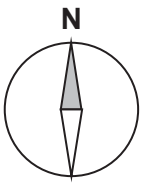
D stroking it with a bar magnet repeatedly

20 A plotting compass is placed above a current-carrying wire. Before the circuit is closed, the direction of compass is shown in the diagram.

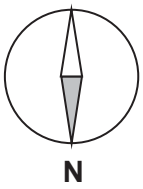


In which direction will the compass needle be pointing when the switch is closed?

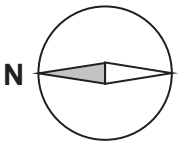
A



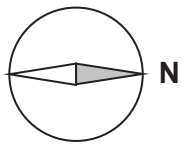
B



C



D



- END OF PAPER -

Name: ………………………………………………….…. (   )   Class: ……………

ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2019

SCIENCE (PHYSICS)
5076 / 02
5077 / 02

LEVEL: 4 Express / 5 Normal (Academic) **DATE:** 30 August 2019

CLASS(ES): Sec 4/1, 4/2 & 5/1 **DURATION:** 1 hour 15 minutes

Additional Materials provided: NIL

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME, INDEX NUMBER and CLASS at the top of this page. This paper consists of 2 sections.

SECTION A (45 marks)
Answer **all** questions. Write your answers in the spaces provided on the question paper.

SECTION B (20 marks)
Answer any **two** questions. Write your answers in the spaces provided on the question paper.

In calculations, you should show all the steps in your working, giving your answer at each stage.

For Examiner's use:	
Section A	/ 45
Section B	/ 20
Total	/ 65

At the end of the examination, hand in this question booklet.

This Question paper consists of 18 printed pages including this page.

[Turn Over

SECTION A (45 marks)

Answer **all** questions in the spaces provided on the question paper.

1 Fig 1.1 below shows a bob of weight 50 N hanging in equilibrium from a string that is pulled to one side by a horizontal force **F** of magnitude 60 N.

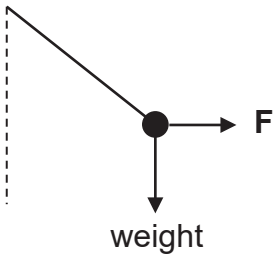


Fig. 1.1

(a) In the space below, draw a scale diagram to determine the resultant force of **F** and the weight of the bob.

resultant force = ...N [3]

(b) Hence, determine the magnitude of the tension in the string.

tension = ...N [1]

2 A car was travelling along Upper Changi Road and was about to pass a traffic crossing when a boy suddenly jay-walked across the road. The graph in Fig. 2.1 shows how the speed of the car changed from the moment the driver saw the boy until the car stopped.

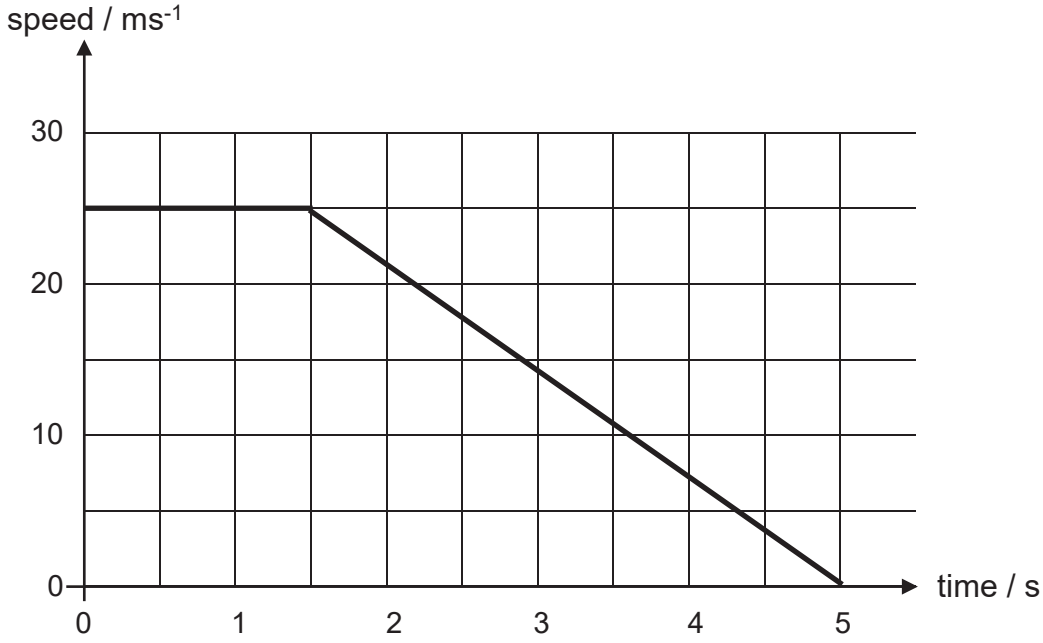


Fig. 2.1

(a) Suggest why the car continued at constant speed for the first 1.5 s, even though the driver had seen the boy.

……

…… [1]

(b) From the moment the driver saw the boy, determine how far the car travelled before the car started to decelerate.

distance = ...m [1]

(c) Calculate the deceleration of the car.

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

(d) A boy is standing 50 m away from the car. Determine if the boy will be knocked down by the car.

.....

.....

..... [2]

3 An uniform wooden plank **AB**, 2 m long, weighing 54 N, rests on a knife edge 0.50 m from **B**. The end **A** is supported by a vertical string represented by tension **T** in Fig. 3.1, so that **AB** is horizontal.

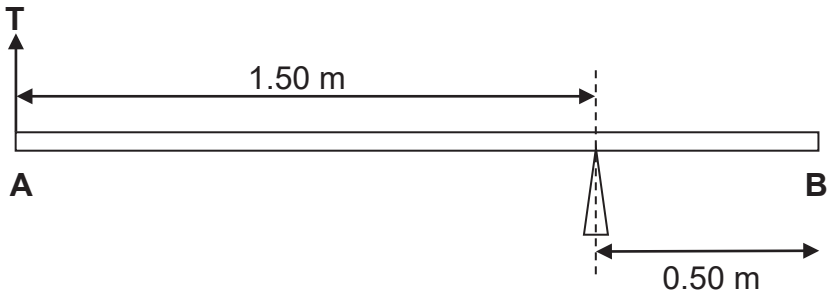


Fig. 3.1

(a) Draw and label the weight **W** of the plank on **Fig. 3.1**, indicating the distance between **A** and **W**.

distance between **A** and **W** = ……m [1]

(b) Hence, find the tension **T** in the string.

tension = ...N [2]

(c) Without any calculations, state what will happen to tension **T** as the knife edge is shifted towards **B**.

…….....

…..... [1]

4 Fig. 4.1 shows a metal pan containing water on a cooker. The hotplate heats the water.

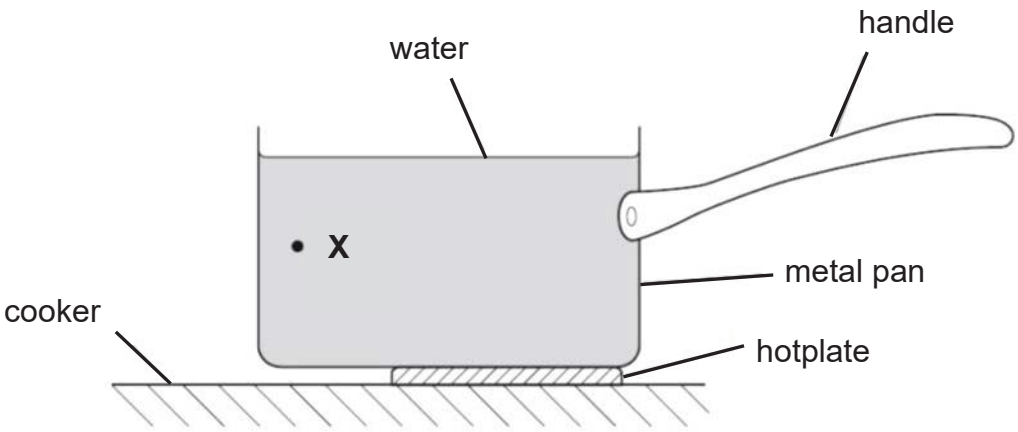


Fig. 4.1

(a) Describe how the heat is transferred through the base of the metal pan.

……

……

…… [2]

(b) **(i)** On Fig. 4.1, draw an arrow to show the direction of movement of the water at point **X**. [1]

(ii) Explain why the water moves in this direction.

……

……

…… [2]

(c) The pan has a polished and silvery metallic surface. Explain how that feature minimises heat loss from the metal pan.

……

…… [1]

5 Fig. 5.1 shows an arrow shaped object placed in front of a thin converging lens. Two rays from the top of the object are shown passing through the lens.

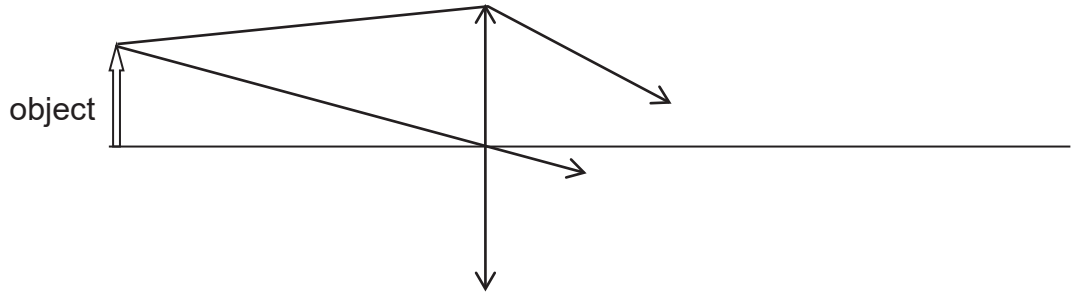


Fig. 5.1

(a) **(i)** On Fig. 5.1, complete the paths of the two rays and mark the image formed with **I**. [2]

(ii) If the top half of the lens is covered by an opaque sticker, state any change to the full image drawn in **(a)(i)**.

.....

..... [1]

(b) Table 5.1 shows the speed of light in different materials.

material	air or vacuum	glass block
speed of light / ms^{-1}	3.0×10^8	1.9×10^8

Table 5.1

(i) Calculate the refractive index of glass block.

refractive index = ... [2]

(b) **(ii)** Determine the critical angle of the glass block.

critical angle = ...° [1]

6 Fig 6.1 shows a battery connected to a lamp.

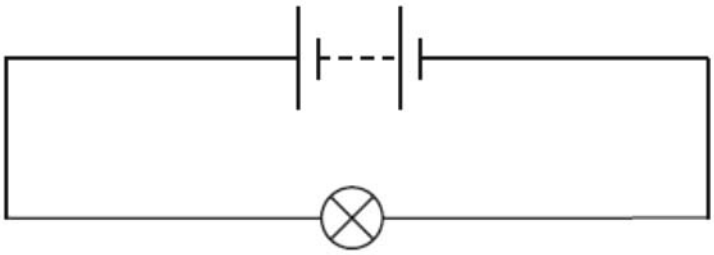


Fig. 6.1

A charge of 150 C flows through the lamp in 100 s.

The energy transferred is 900 J.

(a) Calculate the potential difference across the lamp.

potential difference = ...V [2]

(b) Calculate the current in the lamp.

current = ...A [2]

(c) Calculate the power of the lamp.

power = ...W [2]

7 Fig. 7.1 shows a circuit in which all the switches are opened.

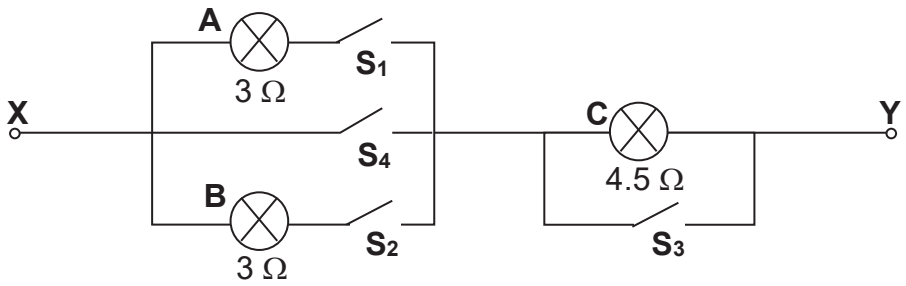


Fig. 7.1

(a) Calculate the effective resistance between **X** and **Y** when S_1 and S_2 are closed.

effective resistance = ... Ω [3]

(b) State the effective resistance between **X** and **Y** when all switches are closed.

..... [1]

(c) State the switches that have to be closed in order to light up bulbs **A** and **B** only.

..... [1]

8 The table lamp shown in Fig 8.1 is made from plastic and has double insulation. It has only two wires in the cable. The lamp has a power rating of 100 W and is used on a 230 V supply.

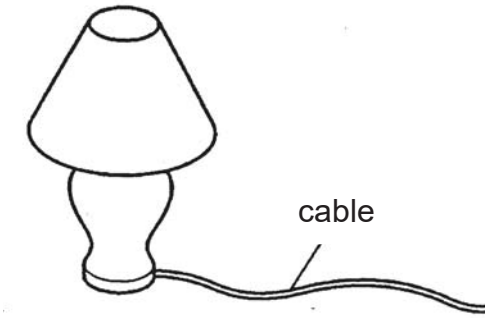


Fig. 8.1

(a) **(i)** State the name and colour of the two wires that are found in the cable.

	name of wire	colour
first wire		
second wire		

[2]

(ii) Explain why the lamp is safe to use even though it has only two wires.

.....

.....

.....

..... [2]

(b) **(i)** Calculate the rating of the fuse that should be used for this lamp.

rating = ...A [2]

(ii) Singapore Power charges 26.70 cents for each kWh of electrical energy used. Calculate the cost of using the lamp in 30 minutes.

cost = ...cents [2]

Section B (20 marks)

Answer 2 out of 3 questions. Each question carries 10 marks. Write your answers in the spaces provided on the question paper.

9 A car accelerates from rest to reach a constant velocity during a 24 seconds journey. The car experiences friction while it is moving as shown in Fig. 9.1.

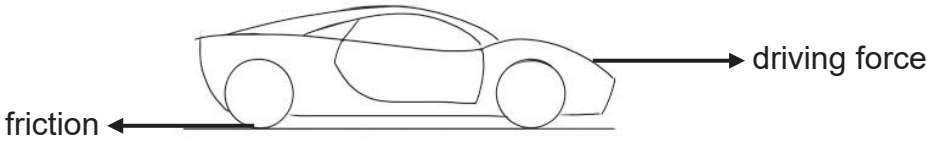


Fig. 9.1

Fig. 9.2 shows how the friction changes with time, **t**, over a period of 24 seconds.

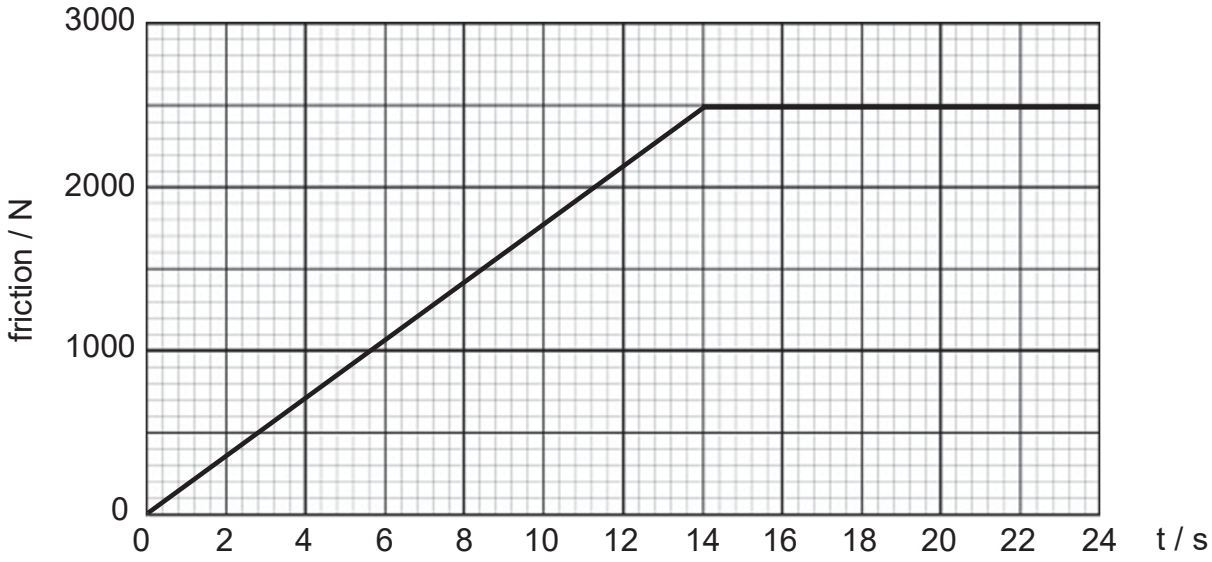


Fig. 9.2

The car has a mass of 850 kg and moves under a constant driving force of 2500 N for the entire journey.

(a) At t = 8 seconds, determine the

(i) friction experienced by the car,

friction = ...N [1]

(ii) resultant force of the car,

resultant force = ...N [1]

(iii) acceleration of the car.

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

(b) The car travels at a constant velocity of 20 m/s between 14 seconds and 24 seconds.

(i) Using Fig 9.2, explain how the graph can be used to show the car is travelling at constant velocity in the last 10 seconds of the journey.

……

……

…… [2]

(ii) Calculate the distance covered when the car is travelling at a constant velocity.

distance = ...m [1]

(iii) Calculate the work done by the car's engine during this period.

work = ...J [2]

(iv) If the kinetic energy of the car is 170 kJ, explain why it is less than the work done by the car's engine.

……

…… [1]

10 Fig 10.1 shows the cross section of a swimming pool. A wave machine at one end creates waves that travel across the pool. The diagram shows the surface of the water 1.5 seconds after the wave machine began making waves.

Fig. 10.1

(a) Estimate the number of wavelengths between points **X** and **Y** in Fig. 10.1.

number of wavelengths = ... [1]

(b) Calculate the frequency of the waves.

frequency = ...Hz [2]

(c) Fig 10.2 shows the surface of the pool several minutes after the wave machine has begun working. Three toy ducks are placed at different positions in the pool as shown below. The line **LL** represents the original water level before the wave machine began working

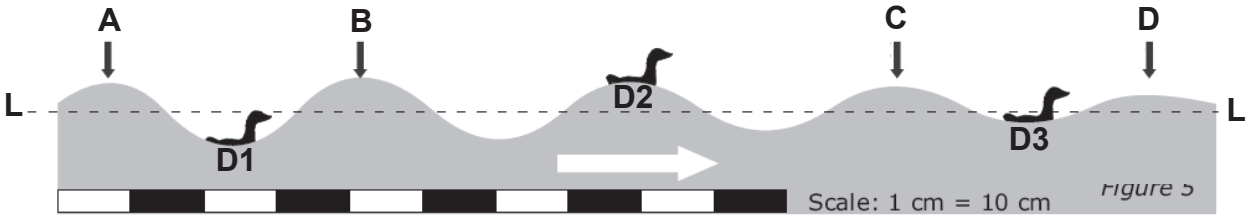


Fig. 10.2

(i) Use Fig. 10.2 to state what happens to the amplitude as the wave travels across the pool from **A** to **D**. Explain why this happens.

……

……

…… [2]

(ii) If the wavelength of the wave is 35 cm, calculate the speed of the wave in section **AB**. Explain whether this speed would change when the wave reaches section **CD**. Show your working below.

speed = ……..m/s

……

……

……

…… [3]

(iii) The three ducks are set in motion as the wave travels across the water. Explain whether duck at **D1** would hit the other two ducks after some time.

……

……

……

…… [2]

11 A lift in a tall building needs a very powerful electric motor to move it. Fig. 11.1 shows an arrangement which uses a relay circuit on the left to switch the electric motor on and off.

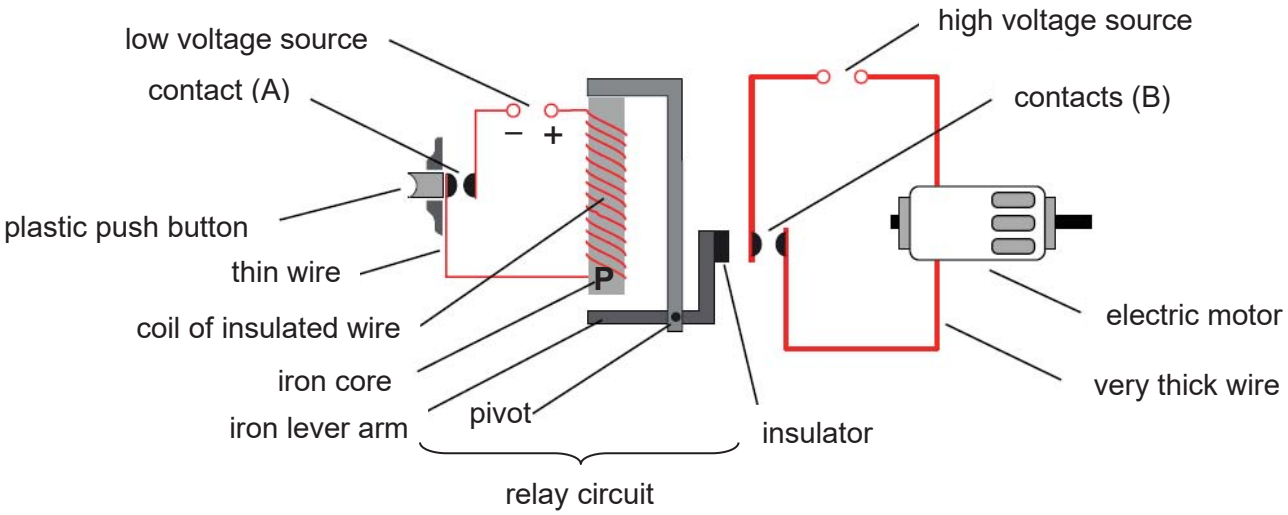


Fig. 11.1

(a) The electric motor circuit uses thicker wire than the one in the relay circuit. Explain why a thicker wire is used in the electric motor circuit.

.....

..... [1]

(b) A user on the left pushes the plastic push button in the relay circuit to start the motor running.

(i) State the polarity at the end of the iron core indicated by **P**, when the relay circuit is turned on.

..... [1]

(ii) Explain why it is suitable to use an iron core in the relay circuit.

.....

.....

…… [2]

(ii) Describe the sequence of events that take place from the moment the button is pushed to the time when the motor starts.

……

……

……

……

……

…… [4]

(c) The low voltage source in the relay circuit is a battery which has to be replaced once its energy runs low. State whether the motor can still be switched on if a battery low on energy is not replaced. Explain your answer.

……

……

…… [2]

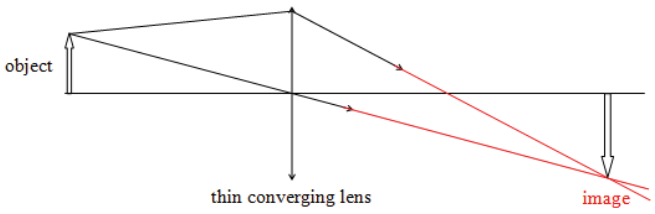
- END OF PAPER -

4E5N Sc(Physics) Prelim Marking Scheme 2019

Paper 1: MCQ [20]

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

Section a: Short Structured Questions [45]

Qn	Ans	Marks
1a	use of appropriate scale (1 cm : 10 N or 1 cm : 5 N) parallelogram method resultant force = 78 N (accept answers between 70 N to 86 N)	C1 C1 A1
b	tension = 78 N (same ans as 1a)	B1 ECF
2a	The driver took 1.5 s to react.	B1
b	distance = 25 x 1.5 = 37.5 m	B1
c	deceleration = 25/(5-1.5) = 7.14 m/s^2	C1 A1
d	braking distance = 0.5(25)(3.5) = 47.25 m Total distance = 37.5 + 47.25 m = 81.25 m Car did not manage to stop in time, pedestrian will be knocked down by the car.	C1 A1
3a	Draw an arrow from the 1 m mark of the plank and label it W. Distance between A and W is 1.0m	 B1
b	T x 1.5 = 54 x 0.5 T = 18 N	C1 A1
c	T increases.	B1
4a	When the metal pan is heated, the molecules at the base gained kinetic energy, collided with the neighbouring molecules and transferred energy in the process. This process is called conduction.	 B1 B1
bi	arrow pointing downwards.	B1
bii	water above the hotplate gets heated and expands, resulting in a lower density and hence rises. the cooler water at X hence sinks to replace the water above the hotplate.	 B1 B1
c	Polished and shiny surface is a poor radiator/emitter of heat, hence heat loss is minimised.	B1
5ai		 B1

	B1-complete the paths of the two rays correctly. B1- The image I is marked correctly.	B1
aii	The **full image** would still be seen but appear **dimmer**	B1
bi	$n = \frac{c}{v}$ $= \frac{3.0 \times 10^8 \text{ m s}^{-1}}{1.9 \times 10^8 \text{ m s}^{-1}}$ = 1.58	C1 A1
bii	sin c = 1 / n sin c = 1/ 1.58 *c* = 39.3 ° ECF	B1
6a	p.d. = E/Q = 900/150 = 6 V.	C1 A1
b	I = Q/t = 150/100 = 1.5 A	C1 A1
c	P = VI = 6 x 1.5 = 9 W ECF OR P = E/t = 900/100 = 9 W	C1 A1 or C1 A1
7a	effective resistance of A and B in parallel = $(1/3 + 1/3)^{-1}$ = 1.5 Ω effective resistance of A, B and C = 1.5 + 4.5 = 6 Ω	C1 C1 A1
b	zero.	B1
c	S_1, S_2 and S_3.	B1
8ai	Live (brown) and neutral (blue)	B1 B1
aii	Lamp is made of plastic which is an electrical insulator, lamp casing would never become 'live' OR current cannot flow to the user through the casing.	B1 B1
bi	current in cable, I = P/V = 100/230 = 0.435 A 1A fuse rating (accept 0.5 A, 1.0 A)	C1 A1

bii	Electrical energy = 0.1kW x 0.5h = 0.05 kWh Cost = 0.05 x 26.70 = 1.34 cents	C1 A1
9ai	1400 N or 1450 N	B1
aii	2500 – 1400 = 1100 N ECF	B1
aiii	a = 1100 / 850 1.29 m/s^2	C1 A1
bi	Friction at this time is equal to the driving force and so the acceleration becomes zero	B1 B1
bii	200 m	B1
biii	W = 2500 * 200 500 kJ ECF	C1 A1
biv	Remaining energy has been converted into sound and heat energy	B1
10a	3 (accept range between 2.75 to 3.25)	B1
b	T = 0.5 s OR f = 3 / 1.5 2 Hz (accept range between 1.83 Hz to 2.17 Hz)	C1 A1
ci	Amplitude decreases. As the wave propagates from A to D, energy is lost to the surroundings, hence the amplitude decreases.	B1 B1
cii	2 Hz x 0.35 m = 0.70 m/s ECF but accept values between 0.63 m/s and 0.77 m/s The speed of the wave would not change because both frequency and wavelength of the wave do not change	C1 A1 B1
ciii	Duck at D1 would never hit the other two ducks because All three ducks would only move vertically at the same position	B1 B1
11a	Thicker wire is used because it has lower resistance and it carries a larger current.	 B1
bi	South pole	B1
bii	Iron core is a soft magnetic material that can be demagnetized easily When the push button is pushed, the iron core has to be demagnetized so as to allow the iron lever arm to return to original position to switch off the motor	B1 B1
biii	Current flows in the relay circuit to magnetise the iron core Iron lever arm is induced to be a magnet to be attracted to the iron core Contacts in the motor circuit closes as iron lever arm swings clockwise Current flows in the motor circuit to run the motor	B1 B1 B1 B1
c	The motor can no longer be switched on because Current in the relay circuit would be reduced which lowers the magnetic strength of the iron core and unable to cause the iron lever to turn clockwise OR iron core may not be magnetized to attract the iron lever	B1 B1