ASSUMPTION ENGLISH SCHOOL PRELIMINARY EXAMINATION 2020

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DURATION:

SCIENCE (PHYSICS) 5076 / 02



ASSUMPTION ENGLISH SCHOOL ASSUMPTION ENGLISH SCHOOL

LEVEL:	Sec 4 Express / 5 Normal	DATE:	28 August 2020
	(Academic)		

Additional Materials provided: -NIL-

INSTRUCTIONS TO CANDIDATES

CLASS:

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

Sec 4/1, 4/2, 4/4 SBB & 5/1

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

<u>SECTION A (45 marks)</u> SHORT-STRUCTURED QUESTIONS

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

<u>SECTION B (20 marks)</u> FREE-RESPONSE QUESTIONS

Answer **two** out of three questions. Write your answers in the spaces provided on the question paper.

For Examiner's Use							
Paper 1	/20						
Paper 2 Section A	/45						
Paper 2 Section B	/20						
Paper 3	/15						
Total Marks	/100						

1 hour 15 minutes

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

SECTION A – SHORT-STRUCTURED QUESTIONS (45 marks)

Answer **all** the questions in the spaces provided.

1 (a) Here are values of four lengths:

0.1 nm, 10 Mm, 15 km, 0.1 mm

Fill in the table below with the values given above.

diameter of Earth	
diameter of an atom	
diameter of human hair	
distance between Bukit Panjang and Bugis by car	

[2]

(b) A student wants to find out the thickness of a paper from a stack of 200 papers.

Using an appropriate measuring instrument, describe how you would measure **accurately** the thickness of a paper.

time / s	speed / m/s
0	0
2	10
4	20
6	30
8	30
10	30
12	30
14	17
16	10
18	6
20	2
22	0

2 Brenda investigated the motion of a car at different times during its journey. She measured the speed of the car every 2.0 s. The table below shows her results.

(a) On the grid below, plot these results, marking each point with a cross (x). Draw a speed-time graph taking into account all your plotted points.



speed / m/s

(b) Describe the motion of the car throughout the entire journey.

.....[2]

(c) (i) Calculate the initial acceleration of the car from t = 0 s to 6 s.

acceleration = $\dots m/s^2$ [2]

(ii) If the mass of the car is 1500 kg, calculate the resultant force acting on it during this time.

resultant force = N [1]

3 The diagram shows a barrier found in most carparks. The weight of the pole is 450 N and the centre of gravity of the pole is 1.30 m away from the pivot. The centre of gravity of the movable counterweight is 0.30 m away from the pivot.



(a) State the *principle of moments* for a body in equilibrium.



(b) Calculate the minimum force **F** to lift up the pole.

force **F** = N [2]

(c) Suggest how the force F can be reduced to lift up the pole. Explain your answer.

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4 The diagram shows a roller coaster cart and a track. The total mass of the cart and passengers is 2500 kg. The cart starts from rest at point **A** reaches **B** after some time. The gravitational field strength on Earth is 10 N/kg.



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

.....[2]

(b) The actual speed of the cart is 12 m/s at point **B**.

Calculate

(i) 1. the amount of gravitational potential energy at A,

gravitational potential energy = J [2]

2. the amount of kinetic energy at **B**.

kinetic energy = J [2]

(ii) Comment on the difference in the calculated values in (b)(i) even though energy is conserved.



5 The diagram shows the features of the vacuum flask that reduce thermal energy loss from the inside of the flask when hot water is poured inside.



Explain how these features reduce loss of thermal energy from the hot water by

(a)	conduction,	
		[2]
(b)	convection,	
		[2]
(c)	radiation.	
		[1]

6 (a) A sea wave is approaching a beach at a speed of 1.5 m/s.



- (b) Some beach-goers are sun tanning under the sun.
 - (i) State the component in the electromagnetic spectrum that causes them to get tanned.

		[1]
(ii)	Suggest why it is not advisable to be exposed to this component in (b)(i) for a long period of time.	
		[1]

7 (a) The diagram below shows how electrical charges are used in spray-painting of a car door. As the paint droplets leave the nozzle, they are charged positively.



State and explain what can be deduced about the car door.



(b) The diagram shows two isolated positive charges that are close to each other.



- (ii) On the diagram above, draw the electric field pattern between the two charges. [1]
- 8 The figure below shows a circuit in which all the switches S_1 , S_2 and S_3 are open.

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- (a) Define *current*.
- (b) When switches S_1 , S_2 and S_3 are closed, a current flows through the circuit.

State the ammeter reading in A_1 and explain your answer.

(c) When switches S_1 , S_2 and S_3 are closed, the ammeter reading in A_2 is recorded.

If switch S_1 is now open while S_2 and S_3 are closed, explain how this will affect the ammeter reading in A_2 .

.....[2]

(d) If the ammeter reading in A_2 is 0.5 A when only S_2 and S_3 are closed, calculate the resistance of the light bulb.

resistance = Ω [3]

SECTION B – FREE RESPONSE QUESTIONS (20 marks) Answer **two** out of three questions from this section.

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9 Fig. 9.1 shows a light ray from a ray box passing through a semi-circular glass **(a)** block.



Fig. 9.2 shows the path of the light ray when the ray box is in a different position.



Both diagrams are drawn to scale.

(i)	Mark out and label the critical angle with the letter "C" on Fig. 9.1.	[1]
(ii)	Explain how you arrived at your answer in (a)(i).	
		[1]
(iii)	Complete the ray diagram on Fig. 9.2 accurately.	[1]
(iv)	Determine the refractive index of the lens.	

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- (b) The diagram shows an image, I, formed by a converging lens. The image was twice the size of the object, O.

- (i) By drawing light ray in the diagram above, locate the focal point of the lens and label it with **F**. [1]
- (ii) Define *focal length*.

......[1]

(iii) State one application of this lens.

......[1]

(c) The diagram shows an arrow **AB** being placed in front of a plane mirror.



On the diagram above,

- (i) draw accurately the image of the arrow formed in the mirror, [1]
- (ii) draw two light rays from A to show how the image can be seen inside the mirror by the eye. [2]

10 (a) A student attempts to measure the speed of sound in air in a laboratory using a sound source and microphones A and B, each connected to a timer.

Microphone **A** is 5.0 m away from the source and microphones **A** and **B** are placed 5.0 m apart.

The table below shows the times recorded by timers 1 and 2 when a sound is sent out from the source.

timer 1	timer 2
15 ms	30 ms



(i) Explain what is meant by a *longitudinal wave*.

(ii) Explain how sound is produced and transmitted from the source to the microphones.

(iii) Show that the speed of sound in air is 333 m/s.

(b) Sound can be used to detect cracks in concrete slab. Sound is reflected when it enters a crack.



(i) The time taken for sound to travel through the concrete with cracks is measured and recorded as t. The time, t_0 , for sound to travel through a same size concrete without cracks is computed.

State and explain the difference, if any, between \mathbf{t}_0 and \mathbf{t} .

(ii) The speed of sound in concrete is 3500 m/s. Calculate the wavelength of the sound if the frequency of sound used is 20 kHz.

wavelength = [2]

(iii) Suggest a reason why the method is preferred over X-ray imaging method when detecting cracks.

.....

......[1]

11 (a) A light bulb and a rheostat are connected to a d.c. power supply.



Describe an experiment to determine the resistance of the light bulb.

Your description should include the following:

- procedure on how the required data are collected,
- how the resistance of the light bulb can be obtained from the data.

[3]

(b) Three conductors, X, Y and Z, are made from the same material.

Wire X has cross-sectional area A and length L, with a resistance of 60 Ω . Wire Y has cross-sectional area 0.5A and length L. Wire Z has cross-sectional area 2A and length 3L.

Calculate the resistance of wires Y and Z.

resistance of wire **Y** =

resistance of wire $\mathbf{Z} = \dots$ [2] uside of a plug. The plug is connected to the cable of an

(c) The diagram shows the inside of a plug. The plug is connected to the cable of an electric cooker that has an external metal casing.



- End of Paper -