

SERANGOON SECONDARY SCHOOL PRELIMINARY EXAMINATION SECONDARY 4 EXPRESS

CANDIDATE NAME				()	CLASS		
CENTRE NUMBER	S					INDEX NUMBER		

SCIENCE PHYSICS

Paper 2 (Section B)

5086/02 26 Aug 2024 1 hour 15 minutes

Candidates answer on the Question Paper.

Setter(s):

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in. Write in dark blue or black pen. You may use an HB pencil for any diagrams or graphs. Do not use staplers, 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 B Answer **one** question. Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [] at the end of each question or part question.

For examiner's use						
Section B						
Total	10					

This question paper consists of **7** printed pages, including this **cover** page.

Answer **one** question from this section.

12 Fig. 12.1 shows a space rocket bring launched at sea level. The space rocket has a main engine and boosters that help the shuttle to lift off from the Earth. For the rocket to escape Earth's gravitational field, it has to reach its breaking speed.



Fig. 12.1

The combined mass of the space rocket remains constant at 22 500 kg throughout the launch. It accelerates uniformly over a distance of 825 km before it reaches its breaking speed of 10 km/s.

(a) (i) On Fig. 12.2, sketch a speed-time graph of the rocket from launch to reaching its breaking speed.
 Label all relevant values on your graph.

speed / m/s

time / s

[2]

Fig. 12.2

(ii) Determine the time taken for the rocket to reach its breaking speed.

(iii) Determine the acceleration of the rocket.

acceleration =[2]

(iv) Assuming no air resistance, calculate the upward thrust of the rocket. The gravitational field strength *g* is 10 N/kg.

(b) In reality during launch, the space rocket will burn solid fuel that is inside the fuel compartment until it reaches its breaking speed to escape Earth's gravitational field. Once the compartment is empty, it will be detached from the main body. The main engine will be cut off as the rocket continues to travel through outer space with no air resistance.

Explain how this affects the acceleration and the speed of the rocket.

[2] [Total: 10] **13** Fig. 13.1 shows an electric kettle labelled "240 V, 1200 W".



Fig. 13.1

- (a) On Fig. 13.1, draw suitable wires to connect the electric kettle to the mains supply.[2]
- (b) On Fig. 13.1, draw and label a fuse and a switch for the electric kettle on the appropriate wire(s). [1]

(c) The kettle is switched on at time t = 0 s. Fig. 13.2 shows how the temperature of the water changes with time t.



(i) Determine the amount of electrical energy consumed by the kettle to raise the temperature of water from 30 °C to 100 °C.

(ii) Describe the changes, if any, in the movement and arrangement of the water molecules when the temperature of water in the kettle is raised from 30 °C to 100 °C.

- (iii) On Fig. 13.1, draw an arrow to indicate the movement of water in the kettle when its temperature is raised from 30 °C to 100 °C.
 [1]
- (iv) When the temperature of water reaches 100 °C, the kettle is still operating with electrical energy supplied continuously until *t* = 200 s. The water boils as bubbles are formed and rise to the surface.
 Explain, in terms of the molecules, why the temperature of the water remains constant at 100 °C.

[2] [Total: 10]

END OF PAPER