Class	Full Name	Index Number

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End of Year Examination 2019

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5105/02

SCIENCE (Physics)
Paper 2
Secondary 3 Normal Academic

9th October 2019

1 h 15 min
(For Papers 1 and 2)

READ THESE INSTRUCTIONS FIRST
Write your name and index number on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

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

In calculations, you should show all steps in your working, giving your answer at each stage.
Express **all** answers to 3 significant figures, unless otherwise specified.
Take the value of *g*, the gravitational field strength of Earth = 10 N/kg, unless otherwise specified.

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.

You are advised not to spend more than **45 minutes** on Paper 2.

DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

For Examiner's Use	
Section A	
Section B	
.....	
.....	
Total	

This document consists of **11** printed pages, including this cover page.

Setter: Mr. Mohd Farid

Section A

Answer **all** questions in this section in the spaces provided.
The total marks for this section is 14.

For Examiner's Use

A1 In an accident, a truck goes off the road and into a large drain. Two tow-trucks, A and B, are used to pull the truck out of the drain, as shown in **Fig. 1.1**.

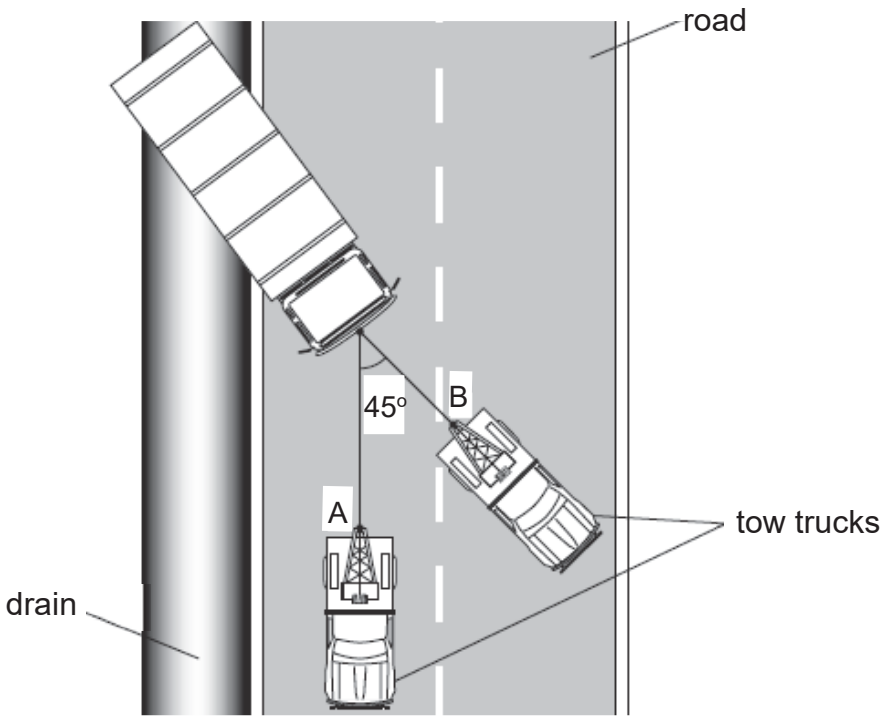


Fig. 1.1

(a) At one point in the rescue operation, tow truck A is exerting a force of 4000 N and tow truck B is exerting a force of 2000 N.

Using a scale of 1 cm = 500 N, construct a scale drawing to show the resultant force on the truck.

[3]

[Turn over

For Examiner's Use

(b) Use your diagram to find the magnitude and direction of the resultant force on the truck.

magnitude of resultant force = ... [1]

direction of resultant force = ...[1]

[Total: 5 marks]

A2 **Fig. 2.1** shows a windsurfer, sail and board.

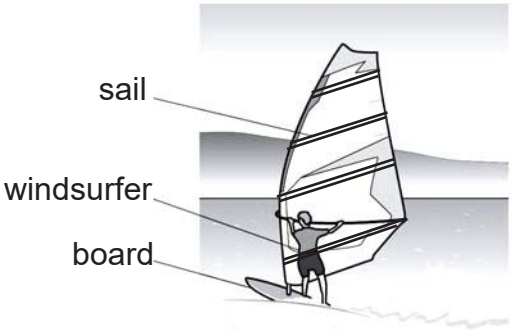
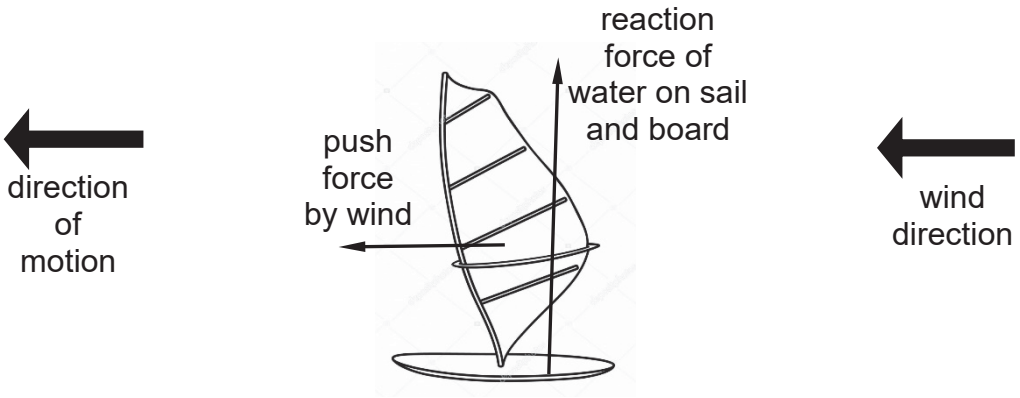


Fig. 2.1

The windsurfer, sail and board travel at a certain constant speed.

(a) Draw on the free-body diagram below, <u>all</u> the forces acting on the sail and board when it is in motion. Label the forces clearly.

Two of these forces have been done for you.



[1]

[Turn over

For Examiner's Use

(b) The wind exerts a forward force on the sail.

Explain, in terms of the forces acting, why the sail and board travels at a constant speed.

……..

……

……

…… [2]

[Total: 3 marks]

A3 **Fig. 3.1** shows Peihua sitting on a chair.

Fig. 3.2 shows him sitting with the chair tilted slightly backwards. **Any further tilting will cause the chair to fall over**.

Fig. 3.1

Fig. 3.2

(a) Explain how the pressure of the chair on the floor differs in the two positions.

……

……

…… [1]

(b) Peihua will fall over if the chair is tilted backwards more than in **Fig. 3.1.**

Explain why this will happen.

……

……

……

……

…… [2]

[Total: 3 marks]

[Turn over

For Examiner's Use

A4 **Fig. 4.1** illustrates the arrangement of the molecules of a substance in its solid, liquid and gaseous states.

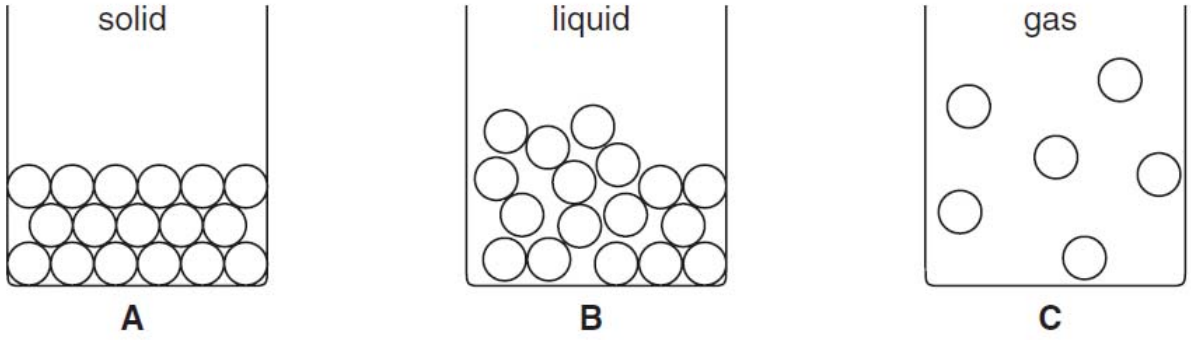


Fig. 4.1

(a) Describe the property of liquids in terms of movement of the liquid molecules.

……

……

…… [1]

(b) Explain, in terms of the arrangement of particles, why solids generally have higher densities as compared to gases.

……

……

……

…… [2]

[Total: 3 marks]

[Turn over

Section B

Answer any two questions in this section.
The total marks for this section is 16.

For Examiner's Use

B5 A parachutist jumps from an aircraft at **time t = 0 s**. A while later, the parachute opens.

Fig. 5.1 is a graph of the vertical speed of the parachutist plotted against time t.

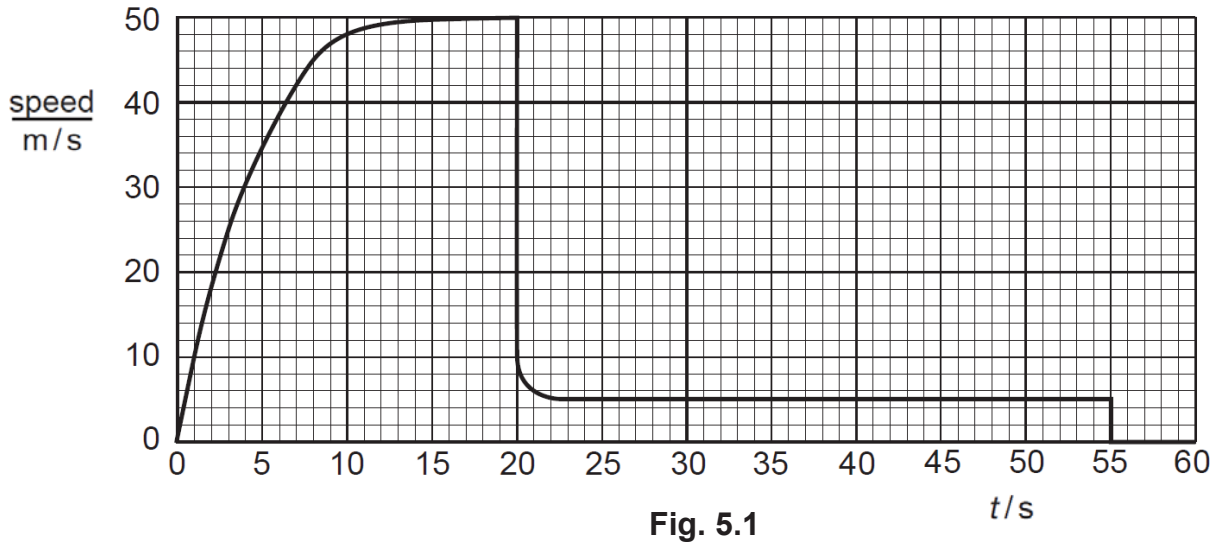


Fig. 5.1

(a) State what happens at t = 20 s and t = 55 s.

at 20 s ..... [1]

at 55 s ..... [1]

(b) Describe the motion of the parachutist between t = 0 and t = 20 s.

.....

.....

.....

..... [2]

(c) Explain, in terms of the forces acting, why the speed of the parachutist is constant between t = 25 s and t = 55 s.

.....

.....

.....

..... [2]

[Turn over

(d) Calculate the distance travelled by the parachutist between t = 25 s and t = 55 s.

For Examiner's Use

distance travelled = ... [2]

[Total: 8 marks]

[Turn over

For Examiner's Use

B6 **Fig. 6.1** shows a car braking system. The brake fluid is an oily liquid.

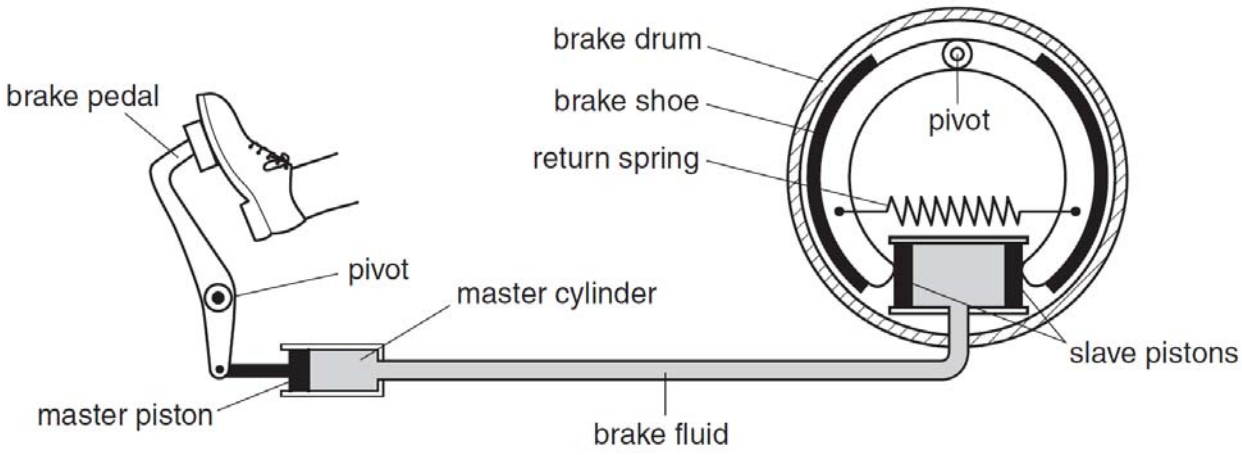


Fig. 6.1

The brake drum rotates with the wheel of the car.

(a) Explain how pushing the brake pedal makes the brake shoes rub against the drum.

……

……

…… [2]

(b) The cross-sectional area of the master piston is 2.0 cm^2. A force of 140 N is applied to the master piston.

(i) Calculate the pressure created in the brake fluid by the master piston.

pressure = …….. N/cm^2 [2]

[Turn over

For Examiner's Use

(ii) The cross-sectional area of each slave piston is 2.8 cm^2.

Calculate the force exerted on each slave piston by the brake fluid.

force = …….. N [2]

(iii) The force exerted on the master piston is greater than the force applied by the foot on the brake pedal. Using the **principle of moments**, explain this.

…….....

…….....

…….....…

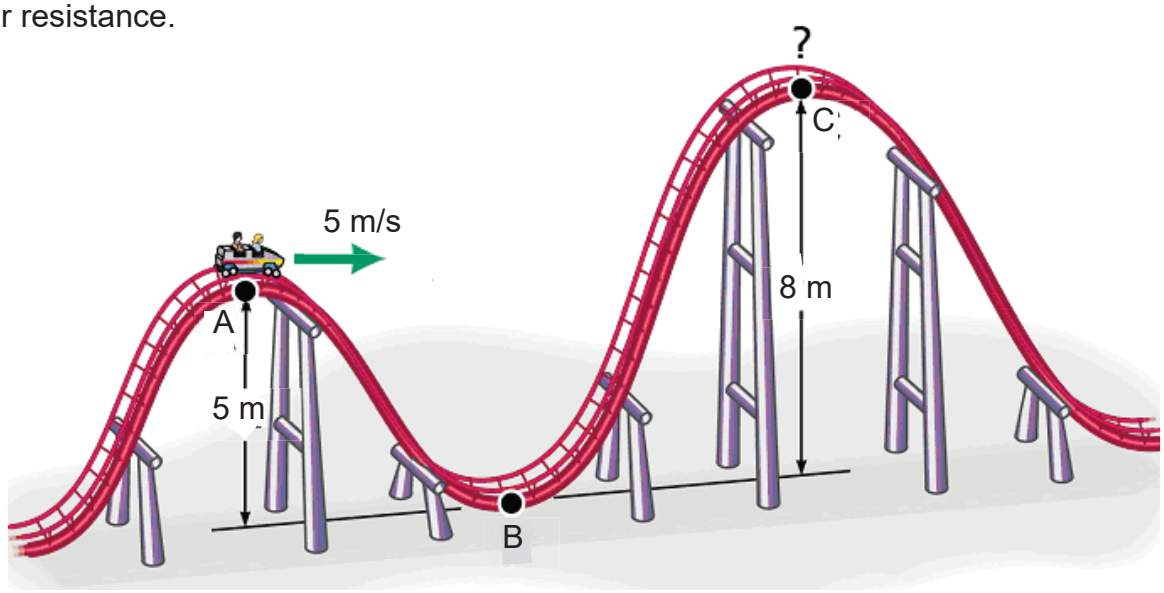
……..... [2]

[Total: 8 marks]

[Turn over

B7 The diagram below shows a roller coaster with a mass of 900 kg coasting on a track. When it reaches point A, it is already moving at 5 m/s. Assume there is no friction and air resistance.

For Examiner's Use



(a) Calculate for the roller coaster,

(i) its kinetic energy at point A,

kinetic energy = ……..…… [1]

(ii) its kinetic energy at point B, and

kinetic energy = ……..…… [1]

(iii) the minimum energy required for it to move from point A to point C.

minimum energy = ……..……[2]

[Turn over

For Examiner's Use

(b) State and explain if the roller coaster will reach point C if its velocity is 5 m/s at point A.

……

……

……

…… [2]

(c) Describe the main energy change which takes place when the roller coaster is moving from points B to C.

……

…… [1]

(d) Suggest an alternative design so that it will be more energy efficient.

……

…… [1]

[Total: 8 marks]

END OF PAPER

[Turn over