

Class	Register Number	Name
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南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL
Mid-Year Examination 2018
Secondary Three

PHYSICS

Sections B & C

Wednesday

Calculators may be used

9 May 2018

1 hour 30 minutes
08:45 – 10:15

READ THESE INSTRUCTIONS FIRST

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

Write your name, register number and class in the spaces at the top of this page and on any separate answer paper used.

Section A (20 marks)

Printed in a separate document.

Section B (30 marks)

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

Section C (10 marks)

Answer the **free-response** question in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The intended number of marks is given in the brackets [] at the end of each question or part question. You are advised to spend no longer than 30 minutes on Section A and no longer than 1 hour on Sections B and C.

You are reminded that all quantitative answers should include appropriate units. You are advised to show all your working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

The use of an approved scientific calculator is expected, where appropriate.

Take the acceleration due to gravity to be 10 m s^{-2} or gravitational field strength to be 10 N kg^{-1} .

Examiner's Use	
Section A	
Section B	
21	
22	
23	
24	
25	
26	
Section C	
27	
Total	
60	
%	

This document consists of **9** printed pages and 1 blank page.

Setters: HWQ, STK

NANYANG GIRLS' HIGH SCHOOL

[Turn over

Section B (30 marks)

Write your answers in the spaces provided.

- 21** A hospital in Japan offers one of the best surgical internship programs in the country. To qualify for the position, medical students have to prove their skills in a challenge. The challenge is to create miniature sushi out of a single grain of rice as shown in Fig. 21.1.

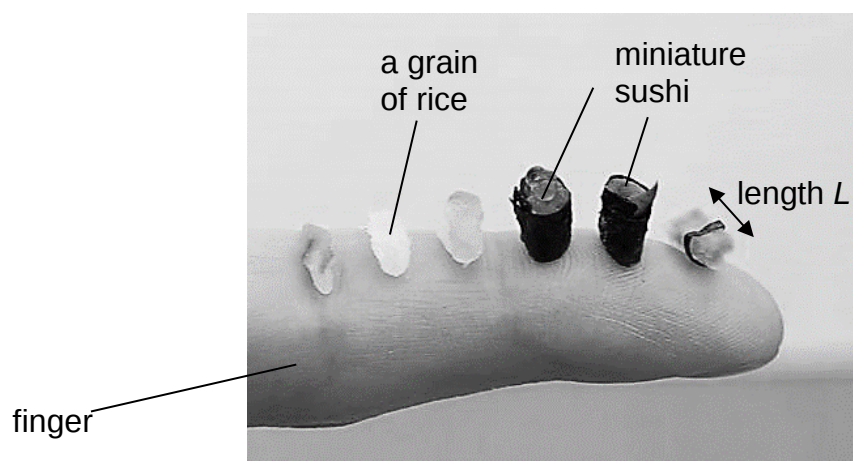


Fig. 21.1

The information of a sample of a grain of rice is given in Table 21.1.

length, L	6.23 mm
mass, m	0.0187 g

Table 21.1

- (a)** State the instrument that was used in the measurement of the length of the sample grain of rice in Table 21.1. Explain the reason for your choice.

.....
 [2]

- (b)** Describe how you can measure, as accurately as possible, the average mass of a single grain of rice using an electronic balance.

.....

 [3]

- 22** A cyclist starts from rest. He accelerates and then travels at a constant speed.

At 12 s, the cyclist applies the brakes and slows down. Photographs are taken of the cyclist at 4 s intervals. Fig. 22.1 shows the results.

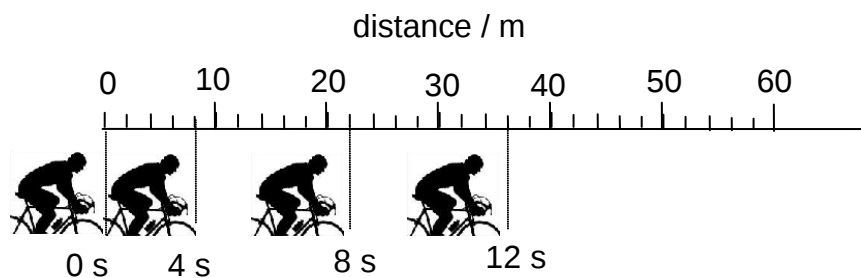
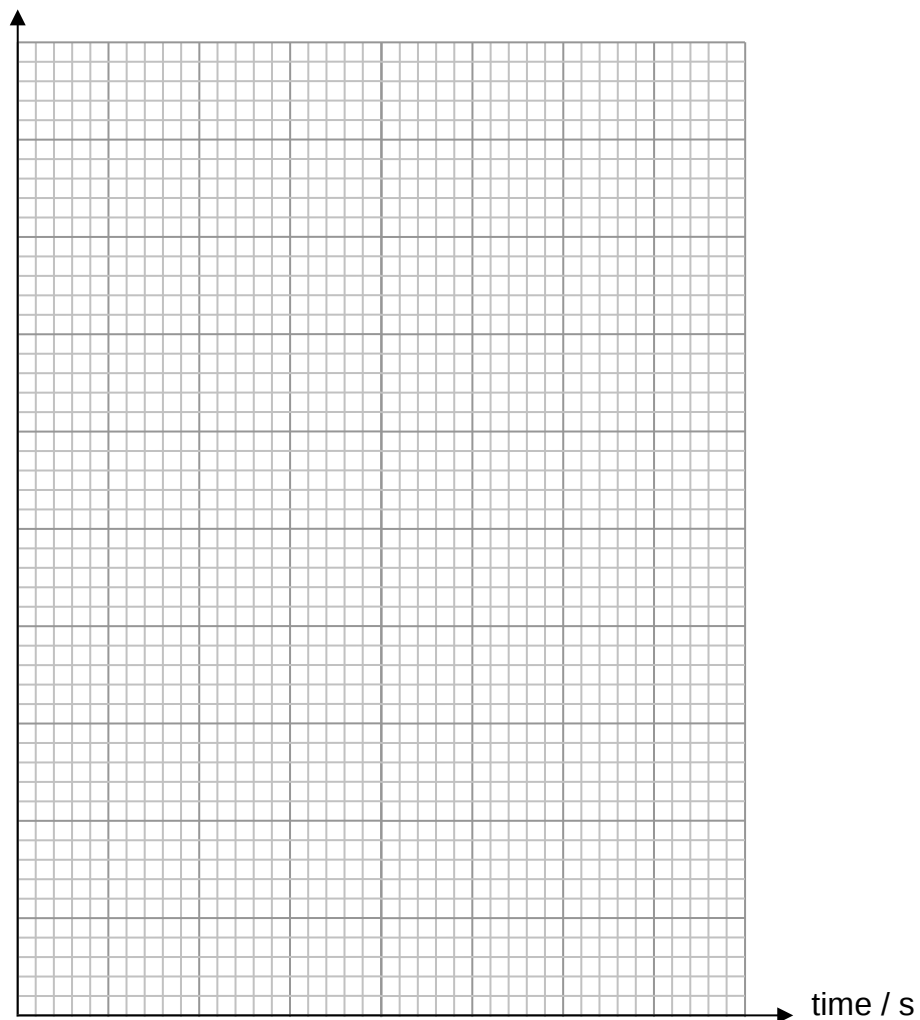


Fig. 22.1

- (a) On Fig. 22.1, draw a vertical line on the distance scale to show a possible position of the front wheel of the bicycle at 16 s. [1]
- (b) On the graph below, plot a distance-time graph of the cyclist for the first 12 s.

distance / m



[2]

- 23** Ethan tosses a coin up as shown in Fig. 23.1. The coin takes 1.50 s to return to his hand. Air resistance can be taken as negligible.

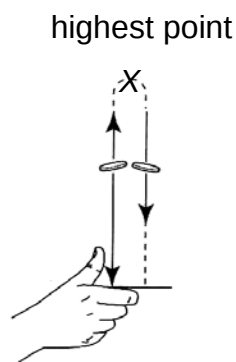


Fig. 23.1

- (a)** State the time taken for the coin to reach the highest point, X.

time taken = [1]

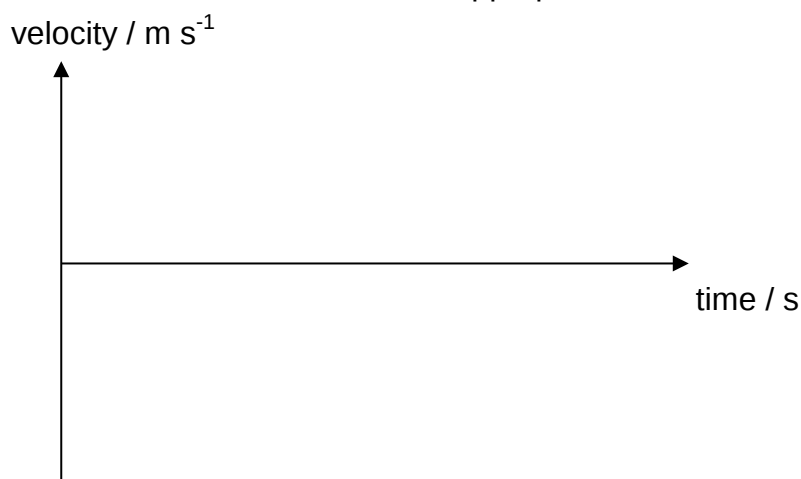
- (b)** State the acceleration of the coin at the highest point, X.

acceleration = [1]

- (c)** Calculate the initial speed of the coin.

speed = [2]

- (d)(i)** In the space below, sketch the velocity-time graph of the motion of the coin, starting from the time the coin leaves Ethan's hand to the time it returns to his hand. Label all values on the axes where appropriate.



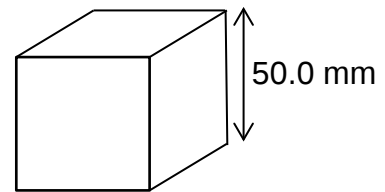
[2]

- (ii)** Hence, calculate the distance between his hand and the highest point, X.

distance = [2]

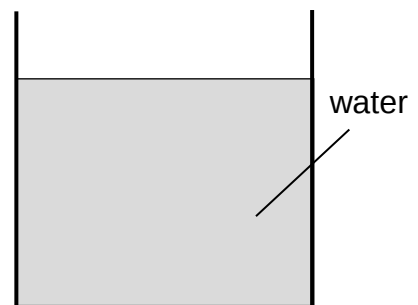
24 A cube Q of mass 1.0 kg has a length of 50.0 mm.

(a) Calculate the density of the cube.



density of cube = [2]

(b) Cube Q is placed in a tank of water. Given that the density of water is 1000 kg m^{-3} , draw on the diagram to show where the cube will settle in the tank of water.



[1]

25 A spaceship descends vertically towards the surface of the Moon. The total mass of the spaceship is $5.0 \times 10^3 \text{ kg}$. Assume the gravitational field strength on the Moon is 1.60 N kg^{-1} .

(a) State Newton's First Law of Motion.

.....
..... [1]

(b) Determine the thrust required for the spaceship to descend with a constant speed.

thrust = [2]

- (c) As the spaceship approaches the surface of the Moon, the thrust is changed to 1.0×10^4 N. Calculate the deceleration of the spaceship.

deceleration = [2]

- 26** When filled with helium gas, a big advertising balloon has a mass of 25 kg. The upthrust on the balloon is 450 N.

- (a) Calculate the resultant force on the balloon when released in air.

resultant force = [1]

- (b) To prevent the balloon from floating up and away, it is tied to the ground as shown in Fig 26.1. The figure is not drawn to scale.

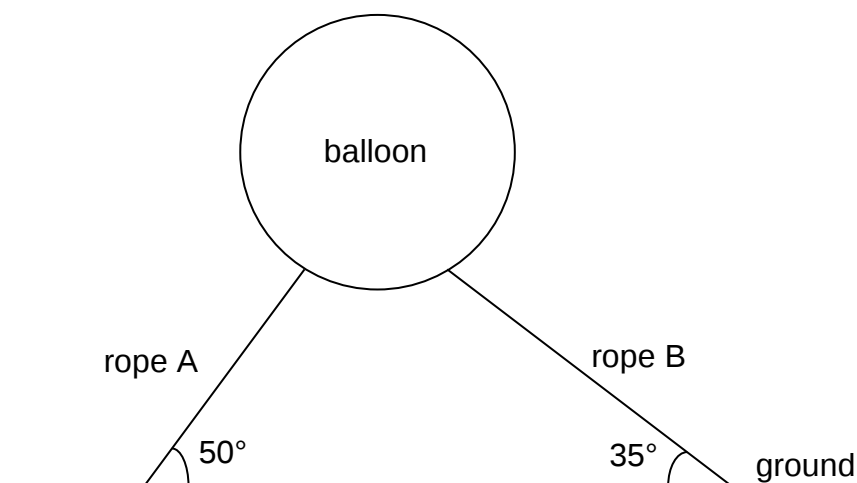


Fig. 26.1

By using a scaled diagram or otherwise, find the tensions in the two ropes.

tension in rope A =

tension in rope B = [3]

- (c) When the helium gas is replaced with hydrogen, the resultant force in part (a) experienced by the balloon would increase.

If the balloon is still tied to the ground by rope A and B at the same angles, how will the tensions in both ropes change? Explain your answer.

.....

..... [2]

Section C (10 marks)

Write your answers in the spaces provided.

- 27** Block A rests on a frictionless surface and is attached to block B by a light, thin string which passes over a frictionless pulley. Block A has mass 2.0 kg , while block B has mass 1.0 kg . Block B is released at 0.50 m above the floor (Fig. 27.1) and it accelerates downwards.

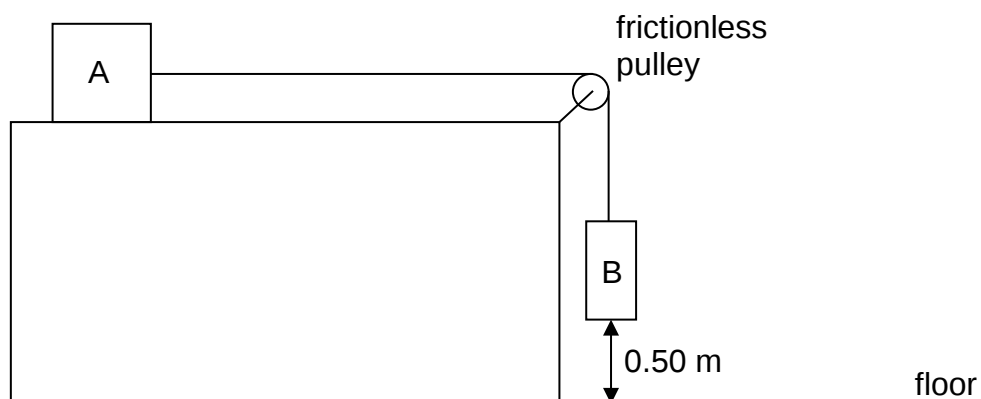


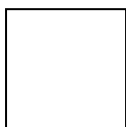
Fig. 27.1

- (a)** State Newton's Second Law of Motion.

.....
..... [1]

- (b)** Draw and label the free-body diagrams for both blocks A and B in Fig. 27.2 and Fig. 27.3 below. [3]

Block A:



Block B:

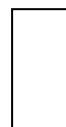


Fig. 27.2

Fig. 27.3

- (c) Hence or otherwise, calculate the magnitude of acceleration of block B.

acceleration = [2]

- (d) Calculate the final speed of block B after falling through a distance of 0.50 m.

speed = [2]

- (e) Sketch and label the velocity-time graph for the motion of block B. Indicate on the graph any known values. [2]



End of paper

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