

Nama: Tingkatan:

No. Kad Pengenalan: No. Pusat/Angka Giliran:

**SEKOLAH MENENGAH KEBANGSAAN LAKI-LAKI METHODIST
JALAN HANG JEBAT, 50150 KUALA LUMPUR**

**PEPERIKSAAN PERCUBAAN STPM PENGGAL 1 (2018)
KERTAS 1**

FIZIK (PHYSICS)

Satu jam setengah (One and a half hours)

Instructions to candidates:

*Section A consists of 15 questions. For each question, four suggested answers are given. Choose **one** correct answer and indicate it on the multiple-choice answer sheet provided. Answer **all** questions.*

*Answer **all** the questions in Section B in the spaces provided. All working **must** be shown. For calculations, relevant values of constants in the Data Booklet **must** be used. For numerical answers, units **must** be quoted wherever they are appropriate.*

*Answer any **two** questions from Section C. For this section, write your answers on the answer sheets provided. Begin each answer on a fresh sheet of paper, and arrange your answers in numerical order. Tie your answer sheets to this booklet.*

For examiner's use (Untuk kegunaan pemeriksa)	
Section A	
1-15	
Section B	
16	
17	
Section C	
18	
19	
20	
Total (Jumlah)	

Arahan kepada calon:

*Bahagian A mengandungi 15 soalan. Empat cadangan jawapan diberi bagi setiap soalan. Pilih **satu** jawapan dan tanda dalam kertas OMR yang dibekalkan.*

*Jawab **semua** soalan dalam Bahagian B dalam ruang yang disediakan. Semua kerja **mestilah** ditunjukkan. Bagi perhitungan, nilai pemalar yang berkaitan dalam Buku Data **mestilah** digunakan. Bagi jawapan berangka, unit **mestilah** dinyatakan di mana-mana yang sesuai.*

*Jawab mana-mana **dua** soalan daripada Bahagian C. Untuk bahagian ini, tulis jawapan anda pada helaian jawapan yang dibekalkan. Mulakan setiap jawapan pada helaian yang baru dan susun jawapan-jawapan anda mengikut tertib berangka. Ikat kertas jawapan anda bersama dengan kertas soalan ini.*

This question paper consists of 7 printed pages.

Penggubal soalan: Pn. Yang Suan Geok

Disemak oleh:

Disahkan oleh:

Disahkan oleh:

.....
(Pn. Gan Swit Peng)

.....
(Pn. Yong Wai Ping)

.....
(En. Ravi Chandran A/L Krishnan)

Ketua Panitia Fizik/PK Ting 6

Ketua Unit Sains & Matematik Ting 6

Pengetua

Section A [15 marks]

Answer ALL the questions in this section.

- Which list of units contains three base quantities and two derived quantities?
 - kelvin, newton, second, kilogram, ohm
 - volt, joule, ampere, coulomb, metre
 - kilogram, metre, second, mole, kelvin
 - mole, hertz, kelvin, joule, newton
- The gravitational constant G has the S.I. base units of
 - $\text{m}^3 \text{s}^{-2} \text{kg}^{-1}$
 - $\text{m}^3 \text{s}^{-2}$
 - $\text{m}^{-3} \text{s}^{-2} \text{kg}$
 - $\text{m}^2 \text{s}^{-2} \text{kg}^{-1}$
- A speeding bus is travelling at a constant speed of 10 m s^{-1} on a straight road. It passes a stationary car which immediately accelerates from rest with an acceleration of 2.5 m s^{-2} . Calculate the time it takes for the car to overtake the bus.
 - 4.5 s
 - 6.0 s
 - 8.0 s
 - 10 s
- A coconut with mass 200 g falls from a tree of height 10 m. Find the linear momentum of the coconut at the moment it reaches the ground.
 - 0.28 kg s^{-1}
 - 2.8 kg s^{-1}
 - 28 kg s^{-1}
 - 280 kg s^{-1}
- A car of mass 1200 kg is moving with a constant velocity, v and experiences a resistive force of 450 N. What is the velocity, v if the power of car engine is 16 kW?
 - 24 m s^{-1}
 - 30 m s^{-1}
 - 36 m s^{-1}
 - 42 m s^{-1}
- Diagram 1 below shows a small ball of weight mg is suspended by a light inextensible cord. A stream of air directed horizontally at the ball exerts a constant force F on it. The cord is inclined at an angle θ to the vertical. Which one of the following expressions is correct?

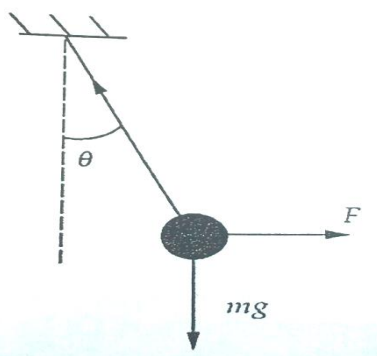
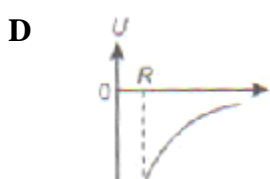
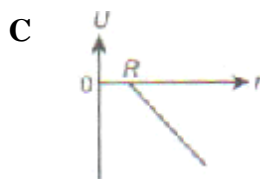
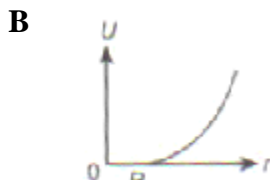
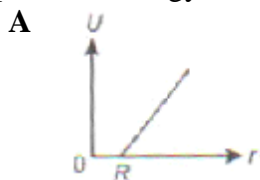


Diagram 1

- $\sin \theta = \frac{F}{mg}$
 - $\tan \theta = \frac{mg}{F}$
 - $\cos \theta = \frac{mg}{F}$
 - $\tan \theta = \frac{F}{mg}$
- A coin of mass m is placed on a turntable rotating about a vertical axis at a constant angular velocity, ω . The coefficient of static friction between the coin and the turntable is μ . If the coin does not slip, what is the maximum distance of the coin from the axis of rotation?
 - $\frac{\mu mg}{\omega^2}$
 - $\frac{\mu g}{m\omega^2}$
 - $\frac{\mu g}{\omega^2}$
 - $\frac{\omega^2}{\mu g}$

8. A spacecraft moves away from the Earth. Which graph shows the variation of its gravitational potential energy U with the distance r from the centre of the Earth? [R = radius of the Earth]



9. Inextensible strings are attached to block A and block B as shown in Diagram 2. Block B has a weight of 720 N and the frictional force between block B and the table is 180 N . What is the weight of block A if the system is in equilibrium?

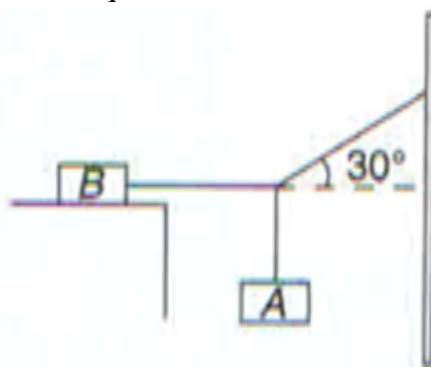


Diagram 2

- A** 104 N **B** 212 N **C** 320 N **D** 400 N
10. What is the work done by the force of gravity in pulling a 10 kg box for a distance of 8.0 m down a smooth plane inclined at 30° to the horizontal? [$g = 10.0\text{ m s}^{-2}$]
- A** 40 J **B** 69 J **C** 400 J **D** 690 J
11. An aluminium rod of unstretched length 150 mm and cross-sectional area $1.2 \times 10^{-4}\text{ m}^2$ is compressed. If the force constant of the rod is $5.6 \times 10^7\text{ N m}^{-1}$, find the Young Modulus of the rod.
- A** $4.5 \times 10^4\text{ N m}^{-2}$ **B** $7.0 \times 10^{10}\text{ N m}^{-2}$ **C** $3.2 \times 10^{13}\text{ N m}^{-2}$ **D** $7.0 \times 10^{13}\text{ N m}^{-2}$
12. The internal energy of a system is
- A** the total change in momentum of all the molecules in the system.
B the sum of the kinetic energy and potential energies of the system.
C the thermal energy required to raise the temperature of the system by 1 K .
D the total potential energies of the system.
13. The most probable speed of oxygen molecules at room temperature is 400 m s^{-1} . Which of the following is most likely the r.m.s. speed of the oxygen molecules at that temperature? (The answer can be obtained without calculation)
- A** 80 m s^{-1} **B** 360 m s^{-1} **C** 400 m s^{-1} **D** 490 m s^{-1}

14. Diagram 3 below represents a cyclic process $A \rightarrow B \rightarrow C \rightarrow D \rightarrow A$ for a container of gas

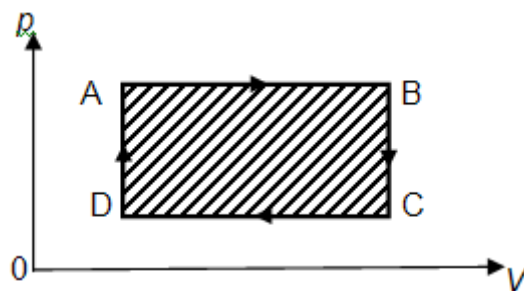


Diagram 3

The shaded area represents

- A net heat released by the gas in a cycle
 - B net heat absorbed by the gas in a cycle
 - C the increase in internal energy of the gas
 - D the decrease in internal energy of the gas
15. Which of the following is the mechanism of thermal conduction in non-metallic solids?
- A The flow of free electrons.
 - B The drift of atoms.
 - C The vibration of atoms.
 - D The dislocation of atoms.

Section B [15 marks]

Answer ALL the questions in this section.

16. A ball is thrown horizontally from the roof of a building of height H as shown in Diagram 4 below.

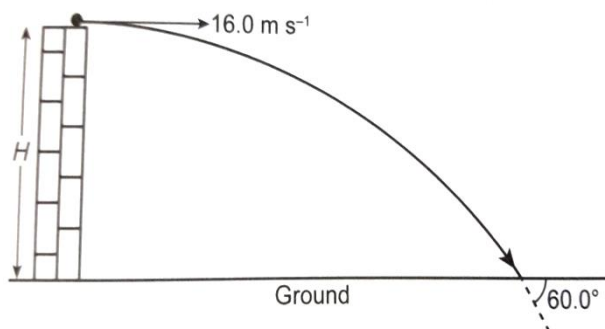


Diagram 4

The initial speed of the ball is 16.0 m s^{-1} . It hits the ground at an angle of 60.0° with the horizontal.

- a) Assuming that air resistance is negligible, determine
- (i) the vertical component of the velocity of the ball when it hits the ground, [2 marks]

(ii) the height H of the building.

[2 marks]

(iii) the horizontal distance from the building when the ball hit the ground.

[2 marks]

b) If there is air resistance, what is the effect on the angle when the ball hits the ground? Give a reason for your answer. [2 marks]

Effect: _____

Reason: _____

17. a) Define *centripetal force*.

[1 mark]

b) A ball of mass 0.60 kg attached to the end of a string and swings horizontally over a circle of radius 0.60 m. The ball swings at constant speed of 3.3 m s^{-1} . Determine the centripetal acceleration. [2 marks]

- c) An object of mass 6.0 kg at the end of a string moves around in a vertical circle of radius 2.0 m at constant speed of 5.0 m/s. Determine the maximum and minimum tension in the string. [4 marks]

Section C [30 marks]

Answer TWO questions in this section.

18. a) Explain what is meant by a substance that is elastic and differentiate between elastic limit and proportional limit. [3 marks]
 b)

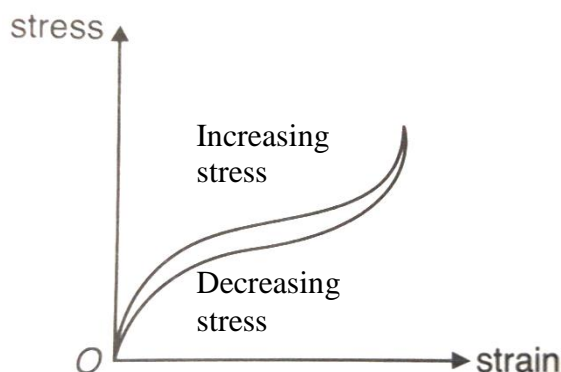


Diagram 5

Diagram 5 shows a graph of the stress versus the strain for an elastic material, X. When material X is placed between a vibrating machine and the floor, explain what will happen to material X. [3 marks]

- c) In an experiment to determine the value of Young's modulus, a student obtained the following data:
 Original length of wire = 3.255 m
 Diameter of wire = 0.63 mm
 Weight of load = 26.5 N
 Extension of wire = 1.40 mm
- (i) Calculate Young's modulus of the wire. [3 marks]
 (ii) Suggest **two** ways to improve the experimental results of the student. [2 marks]
- d) A copper wire and fibreglass of the same dimensions are each suspended from a retort stand. Each of them is then slowly stretched by adding loads to their free ends until they break.
- (i) On the same axes, sketch graphs of stress against strain to show the two materials. [2 marks]
 (ii) From your graphs in (d)(i), state **two** different characteristics of the materials. [2 marks]

- 19 a) State the conditions for the equilibrium of a rigid body. [2 marks]
 b) A spherical steel ball of mass 2.0 kg is supported by two cords fixed to a ceiling and wall is shown in Diagram 6 below.

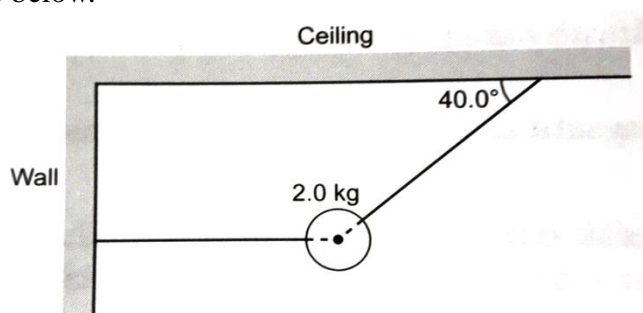


Diagram 6

The angle between the cord and the ceiling is 40.0° while the other cord is attached horizontally to the steel ball.

- (i) Sketch a triangle of forces representing the forces in equilibrium. [1 mark]
 (ii) Determine the tensions in the two cords. [4 marks]
 (iii) If the breaking tension of both cord is 45 N, calculate the maximum mass of the steel ball which can be supported by the cords. [2 marks]
- c) A uniform ladder of weight 150 N is leaned against a smooth wall, and is placed on a rough floor is shown in Diagram 7 below.

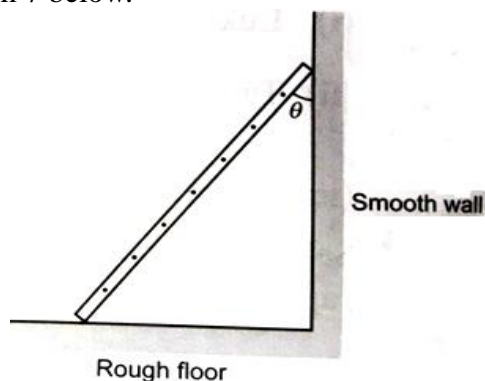


Diagram 7

- (i) Sketch a diagram showing all the forces acting on the ladder. [1 mark]
 (ii) Determine the angle θ when the ladder is about to slide. [5 marks]
- 20 a) (i) What is meant by the *degree of freedom of a gas molecule*? [1 mark]
 (ii) Explain why the number of degrees of freedom of a diatomic gas molecule is different at temperatures 30 K, 300 K and 3000 K. [3 marks]
 b) (i) State the *law of equipartition of energy*. [1 mark]
 (ii) A molecule of an ideal gas has f degrees of freedom. By using the law of equipartition of energy, deduce an expression for internal energy, U , of n moles of the ideal gas. [3 marks]
 (iii) If the pressure of the ideal gas in b)(ii) is p and its volume is V , deduce an expression for internal energy, U , of the gas in terms of f , p and V . [1 mark]
 c) A container of volume $2.00 \times 10^{-3} \text{ m}^3$ contains 8.00 g of helium gas at pressure $1.01 \times 10^5 \text{ Pa}$.
 (i) What is the internal energy of the gas? [3 marks]
 (ii) What is the mean kinetic energy of one molecule of helium gas? [3 marks]

-End of paper-

