Section A [15 *marks*]

Answer ALL the questions in this section.

1. Which list of units contains three base quantities and two derived quantities?

A kelvin, newton, second, kilogram, ohm
B volt, joule, ampere, coulomb, metre
C kilogram, metre, second, mole, kelvin
D mole, hertz, kelvin, joule, newton

2. The gravitational constant *G* has the S.I. base units of

A $m^3\ s^{-2}\ kg^{-1}$ **B** $m^3\ s^{-2}$ **C** $m^{-3}\ s^{-2}\ kg$ **D** $m^2\ s^{-2}\ kg^{-1}$

3. 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.

A 4.5 s **B** 6.0 s **C** 8.0 s **D** 10 s

4. 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.

A 0.28 kg s^{-1} **B** 2.8 kg s^{-1} **C** 28 kg s^{-1} **D** 280 kg s^{-1}

5. 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?

A 24 m s^{-1} **B** 30 m s^{-1} **C** 36 m s^{-1} **D** 42 m s^{-1}

6. 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?

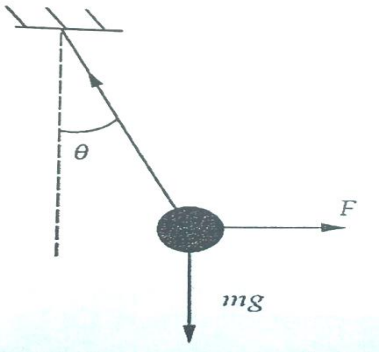


Diagram 1

A $\sin\theta = \frac{F}{mg}$ **B** $\tan\theta = \frac{mg}{F}$ **C** $\cos\theta = \frac{mg}{F}$ **D** $\tan\theta = \frac{F}{mg}$

7. 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?

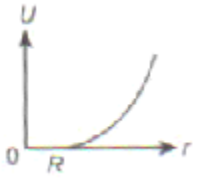
A $\frac{\mu mg}{\omega^2}$ **B** $\frac{\mu g}{m\omega^2}$ **C** $\frac{\mu g}{\omega^2}$ **D** $\frac{\omega^2}{\mu g}$

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]

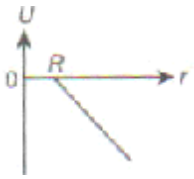
A



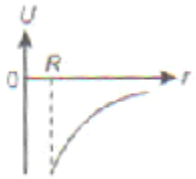
B



C



D



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?

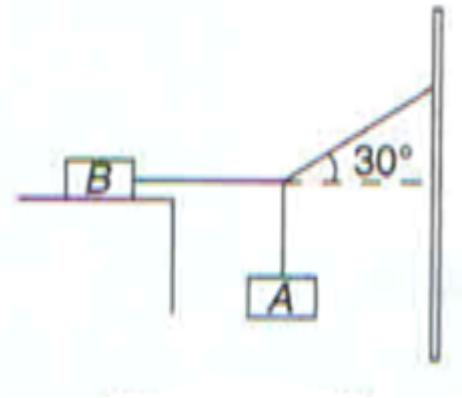


Diagram 2

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 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 1.2×10^{-4} m^2 is compressed. If the force constant of the rod is 5.6×10^7 N m^{-1}, find the Young Modulus of the rod.

A 4.5×10^4 N m^{-2} **B** 7.0×10^{10} N m^{-2} **C** 3.2×10^{13} N m^{-2} **D** 7.0×10^{13} 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 → B → C →D→ A for a container of gas

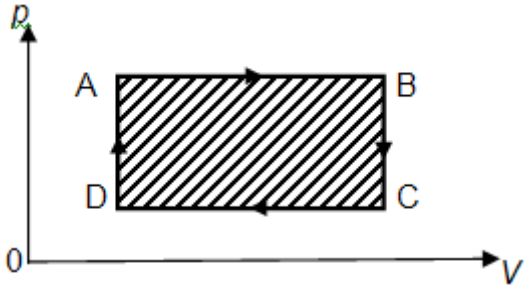


Diagram 3

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.

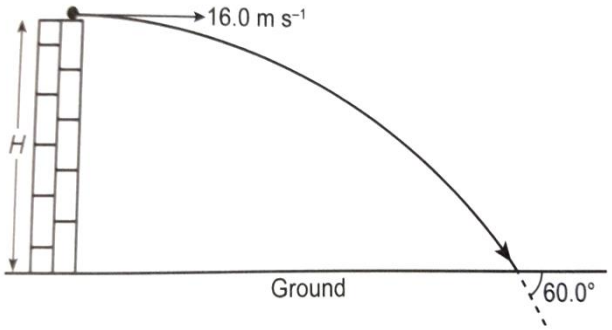


Diagram 4

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)

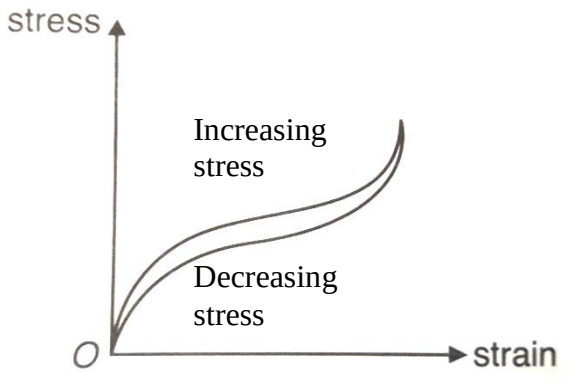


Diagram 5

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.

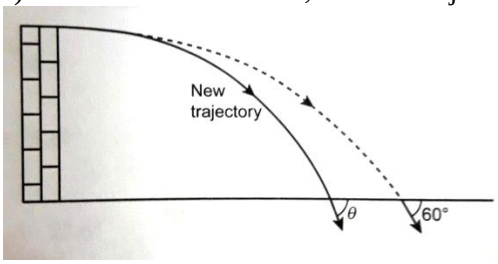
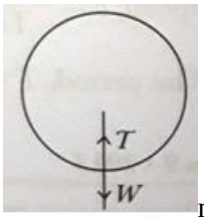
(i) On the same axes, sketch graphs of stress against strain to show the two materials. [2 *marks*]

(ii) From your graphs in (d)(i), state **two** different characteristics of the materials. [2 *marks*]

PEPERIKSAAN PERCUBAAN STPM PENGGAL 1 (2018)

	Solution:
1	A
2	A
3	C When the car overtakes the bus, their distances travelled are the same. Bus: $x = ut$ $x = 10t$ Car: $s = ut + \frac{1}{2}at^2$ $x = 0 + \frac{1}{2}(2.5)t^2$ $10t = \frac{1}{2}(2.5)t^2$ $t = 8.0s$
4	B The coconut undergoes free fall. $\therefore a = g$ $v^2 = u^2 + 2gs$ $v^2 = 0 + 2(9.81)(10)$ $v = 14.0m/s$ Linear momentum =mv =(0.2)(14) =2.8 kg m/s
5	C $F - 450 = 0$ $F = 450N$ $P = Fv$ $16000 = 450v$ $v = 35.56m/s$
6	D $T\cos\theta = mg$ ……1 $T\sin\theta = F$ …. …….2 Eq 2÷1: $\frac{\sin\theta}{\cos\theta} = \frac{F}{mg}$ $\tan\theta = \frac{F}{mg}$

7	C Maximum frictional force, F=μmg But $F = mr\omega^2$ (centripet al force) $\therefore mr\omega^2 = \mu mg$ Hence, the maximum distance, $r = \frac{\mu g}{\omega^2}$.
8	D
9	A $\frac{T\sin 30° = W}{T\cos 30° = 180N}$ $\tan 30° = \frac{W}{180N}$ $W = 104N$
10	C $W = mg\sin 30°s$ $W = (10)(10)\sin 30°(8)$ $W = 400J$
11	B $E = \frac{Stress}{Strain} = \frac{F/A}{e/l} = \frac{F}{e}\times\frac{l}{A} = k\times\frac{l}{A} = \frac{(5.6\times10^7)(150\times10^{-3})}{1.2\times10^{-4}} = 7.0\times10^{10}\,Nm^{-2}$
12	B
13	D r.m.s. speed> most probable speed
14	B
15	C The vibration of atoms at the hot end set up waves that propagate through the solid.
16	a) (i) Horizontal component of velocity, v_x =16.0 m s^{-1} Let vertical component of velocity = v_y $\tan 60° = \frac{v_y}{v_x} = \frac{v_y}{16.0}$ $v_y = (16.0)(\tan 60°) = 27.7m/s.$ [1][1] (ii)Vertical motion: u=0, a=9.81 m/s^2, v_y=27.7 m/s Use $v^2 = u^2 + 2aH$ Height, H=$\frac{27.7^2 - 0}{2(9.81)} = 39.1m$ [1][1] (iii) s_y=39.1

	$s_y = ut + \frac{1}{2}at^2$ $39.1 = 0 + \frac{1}{2}(9.81)t^2$ $t = 2.823$ $s_x = ut$ $s_x = 16(2.823) = 45.17$ [1][1] b) If there is air resistance, the new trajectory of the ball is as shown in the figure.  [1] Hence, the angle θ that the ball makes with the ground is larger.[1] The range is reduced.[1]
17	a) Centripetal force is the force exists when a body is moving in circular motion and its direction is always directed toward the centre of the circle.[1] b) $a_c = \frac{v^2}{r} = \frac{(3.3)^2}{0.6}$ $a_c = 18.15 m/s^2$ [1] [1] c) $T + W = \frac{mv^2}{r}$ [1] $T_{\min} = \frac{mv^2}{r} - mg$ $T_{\min} = \frac{6(5)^2}{2} - 6(9.81)$ [1]  min $T_{\min} = 16.14N // 16N // 16.1N$

Suka sampel ini?

Kertas Percubaan STPM

Sem 1 · Fizik

- Semester 1: kertas percubaan (trial) negeri, subjek yang dipilih + skema
- Blueprint 30 hari Semester 1 (setiap subjek)
- Semester 3: percubaan 2024, 10 subjek, banyak negeri, soalan + skema dalam satu fail

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