SF016/2
Physics
Paper 2
Semester I
Session 2012/2013
2½ hours

SF016/2
Fizik
Kertas 2
Semester I
Sesi 2012/2013
2½ jam

BAHAGIAN MATRIKULASI
KEMENTERIAN PELAJARAN MALAYSIA
MATRICULATION DIVISION
MINISTRY OF EDUCATION MALAYSIA

PEPERIKSAAN SEMESTER PROGRAM MATRIKULASI
MATRICULATION PROGRAMME EXAMINATION

FIZIK
Kertas 2
2 jam 30 minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

Kertas soalan ini mengandungi **21** halaman bercetak.
This question paper consists of 21 printed pages.

*Answer **question 1** and **any other five** questions.*

1 A student measured the period of oscillation, T of a simple pendulum for six different lengths, l and the results are shown in **TABLE 1**.

TABLE 1

l (m)	T (s)	T^2 (s^2)
0.25	1.15	
0.50	1.43	
0.75	1.84	
1.00	2.02	
1.25	2.26	
1.50	2.45	

(a) Copy and complete **TABLE 1**.

[2 *marks*]

(b) Plot a graph of T^2 against l.

[6 *marks*]

(c) Determine the gradient of the graph.

[4 *marks*]

(d) Given that

$$T = 2\pi\sqrt{\frac{l}{g}}$$

determine g from the gradient of the graph.

[3 *marks*]

2 (a) A train initially at rest, accelerates uniformly until its speed reaches 8 m s^{-1} in 25 s. For the next 200 s, the train continues its journey with constant speed, before it slows down uniformly and comes to a complete stop in 20 s.

(i) Sketch a labeled graph of speed versus time for the whole journey.

(ii) Calculate the accelerations of the train for the three parts of the journey.

(iii) Determine the total distance travelled by the train.

[8 *marks*]

(b) An object is thrown vertically downward at 5 m s^{-1} from a height of 30 m. Calculate

(i) the speed of the object just before it hits the ground.

(ii) the time taken by the object to reach the ground.

[4 *marks*]

(c) A ball is thrown horizontally at 10 m s^{-1} from a height of 15 m above the ground. Calculate the horizontal range covered by the ball.

[3 *marks*]

3 (a) (i) State the work-energy theorem.

(ii) A 0.5 kg box is initially at rest on a smooth horizontal surface. It is acted upon by a horizontal force for a distance of 3 m. If the final speed of the box is 5 m s^{-1}, calculate the magnitude of the force.

[4 *marks*]

(b)

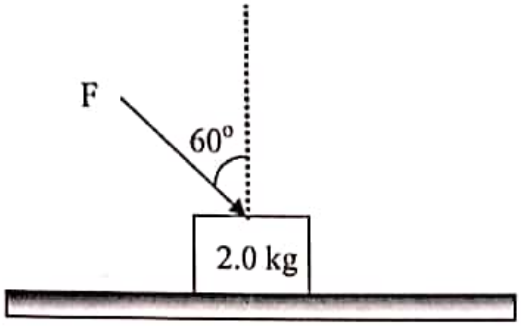

FIGURE 1

FIGURE 1 shows a 2.0 kg block is being pushed along a rough horizontal surface by a force F = 30 N at an angle 60° from the normal.

(i) Sketch a free body diagram for the block. Use common symbol for each force.

(ii) If the block moves at constant acceleration 0.5 m s^{-2}, calculate the coefficient of friction.

[8 *marks*]

(c) Two identical balls with speeds 4 m s^{-1} and 2 m s^{-1} collide head-on and stick together. Calculate their speed after the collision.

[3 *marks*]

4 (a) Name the centripetal force that is responsible for the following motions:

(i) A car moves around a curve without skidding.

(ii) The moon orbiting the earth.

[2 *marks*]

(b)

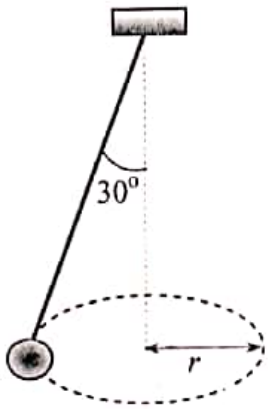

FIGURE 2

FIGURE 2 shows a bob revolves in a horizontal circle of radius *r*. The string has a length of 0.5 m and makes 30° with the vertical.

(i) Sketch the free body diagram for the bob.

(ii) Calculate the speed of the bob.

(iii) Calculate the period of revolution.

[8 *marks*]

(c) (i) Define gravitational field strength.

(ii) Sketch a labeled graph of gravitational field strength against distance from the centre of the earth up to three times the radius of the earth.

(iii) Given the mass and radius of planet Mars are 6.42×10^{23} kg and 3.40×10^{6} m, calculate the gravitational acceleration on the surface of the planet.

[5 *marks*]

5 (a) State the conditions of equilibrium for a rigid body.

[2 *marks*]

(b) A disc rotates at 25 revolutions per minute and takes 15 s to come to rest. Calculate

(i) the angular acceleration of the disc.

(ii) the number of rotation the disc makes before it comes to rest.

(iii) the initial kinetic energy of the disc if its moment of inertia is 2.5 kg m^2.

[7 *marks*]

(c)

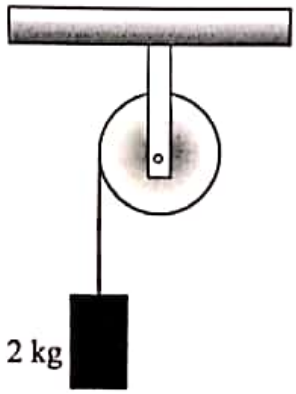

FIGURE 3

FIGURE 3 shows a 2 kg box hung by a cord wound on a light pulley is released from rest. The radius and the moment of inertia of the pulley are 0.25 m and 1.5 kg m^2. Calculate the acceleration of the box.

[6 *marks*]

6 (a) What is meant by simple harmonic motion?

[1 *mark*]

(b)

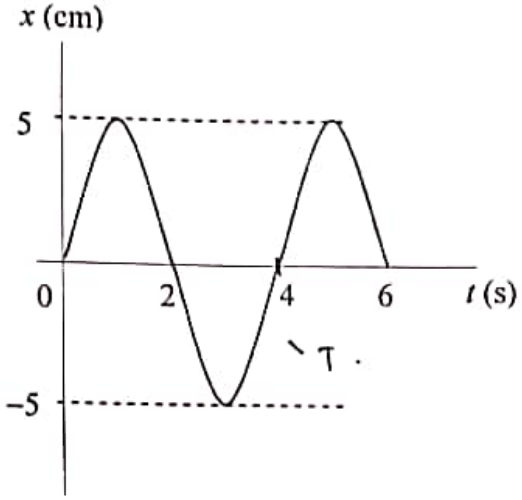

FIGURE 4

FIGURE 4 shows a displacement-time graph of simple harmonic motion. Determine

(i) the amplitude.

(ii) the frequency.

(iii) the angular velocity.

(iv) the equation for the simple harmonic motion.

[7 *marks*]

(c) A 175 g mass on a smooth surface is attached to a horizontal spring with a spring constant 8 N m^{-1}. The mass is set to oscillate by pulling it 10 cm from its equilibrium position and released. Calculate

(i) the period of the oscillation.

(ii) the maximum speed of the mass.

(iii) the total energy of the system.

[7 *marks*]

7 (a) What is the difference between transverse wave and longitudinal wave? Give an example for each wave.

[2 *marks*]

(b) A progressive wave is represented by the following equation:

$$y = 10\sin\left(\frac{\pi}{4}t + x\right)$$

where y is in centimeter and t is in second. Determine

(i) the direction of wave propagation. - left.

(ii) the wavelength.

[4 *marks*]

(c) (i) Define sound intensity.

(ii) A 0.5 kg object is hung at the end of a string of mass 72 g and length 1.2 m. Calculate the speed of the wave propagation in the string when the system is disturbed.

[4 *marks*]

(d) (i) Define Young's modulus.

(ii) Sketch a labeled stress-strain graph of a ductile material.

(iii) A wire fixed to a ceiling has a length of 1.5 m and cross-sectional area 0.2 cm^2. The wire stretches by 0.15 cm when a 50 kg load is attached to its free end. Calculate the Young's modulus of the wire.

[5 *marks*]

8 (a) Define

(i) heat.

(ii) temperature.

[2 *marks*]

(b) The length of a metal bar is 300 cm at −30 °C. Given the coefficient of linear expansion of the metal bar is $11 \times 10^{-6}\,°C^{-1}$, calculate the length of the bar at 80 °C.

[3 *marks*]

(c) (i) Write the ideal gas equation.

(ii) The pressure of a 50 cm^3 ideal gas at 25 °C is 75 Pa. Determine the number of molecules of the gas.

[4 *marks*]

(d) (i) State the first law of thermodynamics.

(ii) In an isovolumetric process, a system is supplied with 250 J of heat. What is the change in its internal energy?

(iii) What is the work done by 1.56×10^{-4} moles of ideal gas that expands from 65 cm^3 to 135 cm^3 at a constant temperature of 40 °C?

[6 *marks*]

END OF QUESTION PAPER