Name: ……..…… Index number: ……..……...

960/1 Trial STPM 2019

SMK King George V

PHYSICS

PAPER 1

One and a half hours

SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(MALAYSIA HIGHER SCHOOL CERTIFICATE)

Instructions to candidates:

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

Answer **all** *questions in Section A. Indicate the correct answer on the Multiple-choice Answer Sheet provided.*

Answer **all** *questions in Section B. Write the answers in the spaces provided.*

Answer **two** *questions only in Section C. You may answer all the questions* **but,** *only the first* **two** *answers will be marked. Write the answers in the answer sheets provided. All working should be shown. For numerical answers, units should be quoted wherever appropriate. Begin each answer on a fresh answer sheet.*

For examiner's use		
Question	Total marks	Marks obtained
Section A		
1-15	15	
Section B		
16	7	
17	8	
Section C		
18	15	
19	15	
20	15	
Total	***60***	

This question paper consists of 11 printed pages and 1 blank page

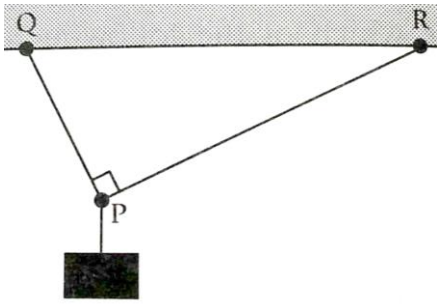
Section A [15 *marks*]

Answer all *questions in this section*.

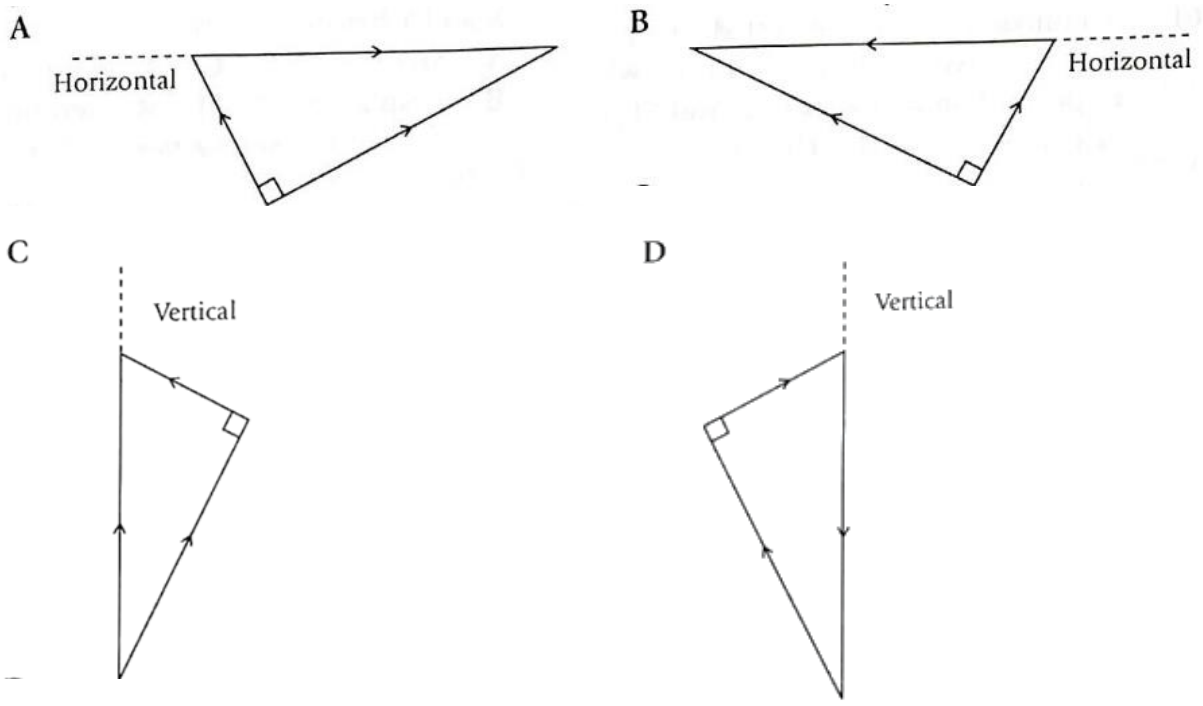
1. Which of the following physical quantities contain the same dimensions as the dimensions of impulse?

A Weight B Pressure C Momentum D Kinetic energy

2. Figure below shows a load hung in equilibrium by two cords PQ and PR.



Which of the following diagrams represents correctly the forces acting at point P?



3. A gun fires 200 bullets per minute at a speed of 300 ms^{-1} relative to the gun. If the mass of each bullet is 10 g, what is the recoil force acting on the gun?

A 5.20 N B 6.25 N C 10.0 N D 600 N

7. The wheel of an airplane suddenly drops off when the airplane is flying horizontally with a speed of 40 m s^{-1} at a height of 500 m from the Earth. How far is the horizontal distance travelled by the wheel before it hits the Earth? [Take g as 10 m s^{-2}]

A 200 m B 400 m C 600 m D 800 N

8. An object moves in a circle on a smooth horizontal surface. If the speed of the object is constant, which of the following statements is *true* regarding the circular motion of the body?

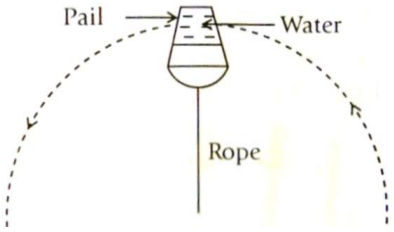
A The linear momentum remains the same because the speed of the body is constant.

B The angular velocity of the body increases when the radius of the circular path increases.

C The radius of the circular path decreases if the centripetal force acting on the body increases.

D The work done by the centripetal force increases when the centripetal force on the body increases.

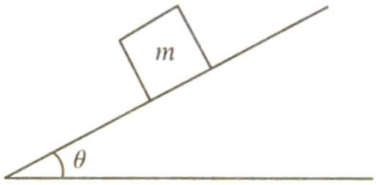
9. A bucket containing water is rotated in a vertical circle, but the water does not spill.



If T is the tension in the rope, R is the normal reaction on the water by the bucket, m is the mass of water in the bucket and g is the acceleration due to gravity, the centripetal force on the water at the highest point is

A R B T C $R + mg$ D $R - mg$

10. Figure below shows a block of wood on a rough inclined plane. The mass of the block of wood is m and the coefficient of friction between the wood and the plane is μ.



If the body does not slide downwards, the maximum angle θ between the inclined plane and the horizontal is

A $tan^{-1}(\mu)$ B $tan^{-1}\left(\frac{\mu}{mg}\right)$ C $tan^{-1}\left(\frac{mg}{\mu}\right)$ D $tan^{-1}(mg)$

Section B [15 *marks*]

Answer all *questions in this section*.

16. (a) What is a projectile motion? [2 marks]

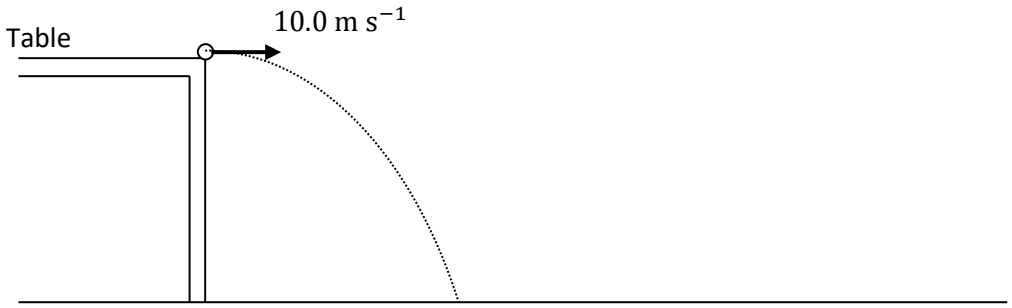
_____

_____

_____

_____

(b) A ball rolls off from the top of a table at 10.0 m s^{-1}. The table has a height of 85.0 cm.



Calculate

(i) time taken for the ball to strike the ground, and [2 marks]

(ii) the velocity at which it strikes the ground. [3 marks]

17. (a) If a body is projected horizontally with a low velocity in air, it falls back to the Earth with projectile motion.

Show that for a mass m to escape completely from the gravitational pull of the Earth, its minimum velocity is $\sqrt{2gR}$, where g is the acceleration due to gravity on the surface of the Earth, and R is the radius of the Earth. [3 marks]

(b) A geostationary satellite has a period of 24 hours with its orbit concentric with the Equator. Calculate the distance of the satellite from the centre of the Earth. [3 marks]

(c) A satellite of mass m in circular orbit of radius r round the Earth of mass M.

Sketch a labelled graph to show how kinetic energy K, potential energy U, and total mechanical energy E of the satellite varies with distance r from the centre of the Earth. [2 marks]

Section C [30 *marks*]

Answer any two *questions in this section*.

18. (a) Define Newton's third law of motion. [1 mark]

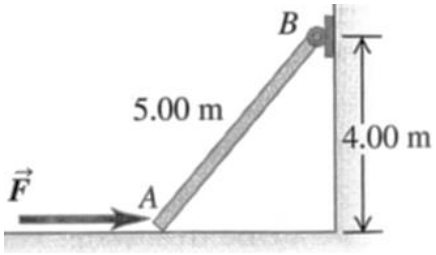
(b) A rocket is fixed vertically on its launching pad. Before launching is started, the mass of the rocket and its fuel is 2.5 x 10^3 kg. During launching, gas is emitted from the rocket with a velocity of 3.0 x 10^3 ms^{-1} relative to the rocket. The fuel is used at the constant rate of 7.5 kg s^{-1}.
(i) Determine the thrust of the rocket. [2 marks]
(ii) Explain why there is a time lapse between the firing and the launching. [3 marks]

(c) (i) Define work-energy theorem. [1 mark]
(ii) A retarding force causes the velocity of an object of mass *m*, to decrease from *u* to *v*. Using Newton's second law of motion, show that the work done by the retarding force on the object is equal to the loss in its kinetic energy. [3 marks]

(d) A body with mass *m* and moving with a speed *u* collides head-on with an identical body initially at rest. The bodies combine and move with a common velocity *v*.
(i) Determine the common velocity *v* after collision. [2 marks]
(ii) Determine the ratio of the kinetic energy of the system after collision to the kinetic energy of the system before collision. [2 marks]
(iii) What happens to the kinetic energy that is loss? [1 mark]

19. (a) State the conditions for equilibrium of a rigid body. [2 marks]

(b) End *A* of a 2.0 kg bar in figure below rests on a frictionless horizontal surface, and end *B* is hinged. A horizontal force *F* of magnitude 150 N is exerted on end *A*.



(i) Sketch a diagram showing all the forces acting on the bar. [1 mark]
(ii) Determine the horizontal and vertical components of the force exerted on the bar by the hinge at *B*. [3 marks]
(iii) Determine the normal force exerted on the bar by the surface at *A*. [1 mark]

(c)(i) Define *applied stress* and the *strain produced* for a metal wire that is being stretched. [2 marks]

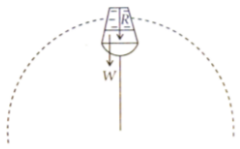
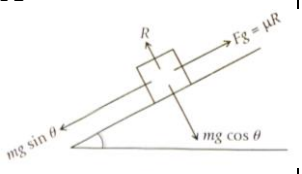
(ii) What is the relationship between the two physical quantities mentioned in (c)(i). State the conditions for that relationship to be valid. [2 marks]

(d) (i) Write down an expression for the energy stored in a wire extended by an extension *e*, when a tensile force increasing at a uniform rate from zero to *F* acts on it. [1 mark]

(ii) Determine the energy per unit volume stored in the wire if the Young's modulus is 8.0 x 10^{10} Nm^{-2} and the final tensile stress in the wire is 4.0 x 10^7 Nm^{-2}. [3 marks]

960/1 Trial STPM 2019
SMK King George V
PHYSICS
PAPER 1
Marking Scheme

Section A [15 *marks*]

1	C [I]=[Ft] $[I] = MLT^{-1}$	6	D From $F = ma$ $30 - 4 - 10 = 8a$ $a = 2\ m\ s^{-2}$ Body Q: $F = ma$ $30 - T - 10 = 5(2)$ $T = 20 - 10$ Tension, $T = 10\ N$	11	B Using $\frac{GMm}{R^2} = mg$ $\therefore \frac{G}{g} = \frac{R^2}{M}$
2	D	7	B Vertical component: $s = ut + \frac{1}{2}at^2$ $500 = 0 + \frac{1}{2}(10)(t^2)$ $\therefore t = 10$ seconds Horizontal component: $s = ut$ $= 40\ (10)$ $= 400$ m	12	B Potential energy $= \frac{1}{2}Fe$ = area under curve $= \frac{1}{2}(40)(2.0 \times 10^{-3})$ $= 4 \times 10^{-2}$ J
3	C $F = v\frac{dm}{dt}$ $F = (300)\frac{200(0.010)}{60}$ $F = 10.0\ N$	8	C $F = \frac{mv^2}{r}$ Speed and mass is constant. $\therefore Fr = mv^2$ = constant When F increases, r decreases.	13	D Modal speed = most probable speed
4	A $v_{ave} = \frac{Total\ displacement}{time}$	9	C  Centripetal force $= R + W$ $= R + mg$	14	D The internal energy for a fixed mass of ideal gas depends solely on its temperature.
5	D Area below F-t graph = mv – mu, u = 0 =1/2 (6+4)(10) 50 Ns.	10	A  $mg \sin\theta \leq Fg = \mu R$ $mg \sin\theta \leq \mu\ mg \cos\theta$ $\frac{\sin\theta}{\cos\theta} \leq \mu$ $\tan\theta \leq \mu$ $\theta \leq \tan^{-1}\mu$	15	B

Section B [15 *marks*]

16. (a)	An object moving in both horizontal and vertical directions simultaneously under the influence of gravity/ constant acceleration	1 1
(b)(i)	$y = u\sin\theta\, t + \frac{1}{2}gt^2$ $0.85 = 0 + \frac{1}{2}(9.81)t^2$ $t = 0.416$ s or 0.42 s	 1 1
(ii)	$V_x = 10.0\ ms^{-1}$ $V_y = u + at$ $V_y = 0 + 9.81(0.416)$ $V_y = 4.08\ ms^{-1}$ $v = \sqrt{10.0^2 + 4.08^2}$ $v = 10.8\ ms^{-1}$ $tan\theta = \frac{4.08}{10.0}$ $\theta = 22.2^o$	 1 1 1
17.(a)	K.E of the object = U_∞ - U_o $\frac{1}{2}mV_e{}^2 = 0 - (-\frac{GMm}{R})$ $\frac{1}{2}mV_e{}^2 = \frac{GMm}{R}$ $V_e = \sqrt{\frac{2GM}{R}}$ $V_e = \sqrt{2gR}$, $mg = \frac{GMm}{R^2}$ or $gR^2 = GM$	 1 1 1
(b)	$mr\omega^2 = \frac{GMm}{r^2}$ $r\left(\frac{2\pi}{T}\right)^2 = \frac{GM}{r^2}$ $T^2 = \frac{4\pi^2}{GM}r^3$ $(24x60x60)^2 = \frac{4\pi^2}{(6.67x10^{-11})(5.97x10^{24})}r^3$ $r = 4.22\ x\ 10^7 m$	1 1 1

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

RM12.90

BELI SEKARANG >

nightmew.com/p/stpm · FPX online banking · download serta-merta