Identity card number:…….. Name : …….

960/1 STPM 2020 (P1)

PHYSICS (FIZIK)

UJIAN PRAPENTAKSIRAN
(PENGGAL 1)
(1 JAM 30 MINIT)
(1 HOUR 30 MINUTES)

SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(MALAYSIA HIGHER SCHOOL CERTIFICATE)

Instructions to candidates:
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

There are **fifteen** *questions in Section A. For each question, four choices of answers are given. Choose* **one** *correct answer and indicate it on the Multiple-choice Answer Sheet provided.*
Answer **all** *questions.*

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

Answer **two** *questions only in Section C. All essential working should be shown. For numerical answers, unit should be quoted wherever appropriate. Begin each answer on a fresh sheet of paper and arrange your answers in numerical order.*

Values of constants are provided on **page 12** in this question paper.

Multiple-choice Answer Sheet:

1	A	B	C	D	9	A	B	C	D
2	A	B	C	D	10	A	B	C	D
3	A	B	C	D	11	A	B	C	D
4	A	B	C	D	12	A	B	C	D
5	A	B	C	D	13	A	B	C	D
6	A	B	C	D	14	A	B	C	D
7	A	B	C	D	15	A	B	C	D
8	A	B	C	D					

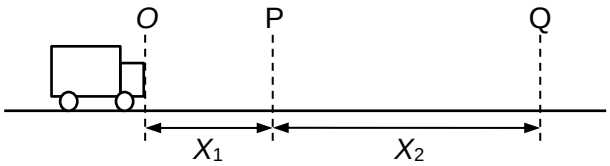
For examiner's use (Untuk kegunaan pemeriksa)	
Section A (*Bahagian A*)	
15 Q	
Section B (*Bahagian B*)	
16	
17	
Section C (*Bahagian C*)	
Total (Jumlah)	

This question paper consists of 12 printed pages and 0 blank page

Section A [15 marks]

Answer *all* questions in this section

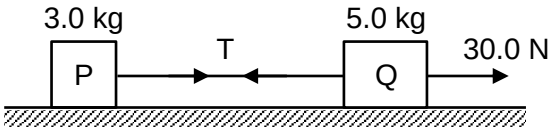
1. A car accelerates from rest at *O* with constant acceleration *a*. It passes marks P and Q at times t_P and t_Q after leaving *O*.



The acceleration of the car is given by

A $\frac{2X_2}{{t_Q}^2 - {t_P}^2}$ **B** $\frac{2X_2}{{t_P}^2 - {t_Q}^2}$ **C** $\frac{{t_Q}^2 - {t_P}^2}{2X_2}$ **D** $\frac{{t_P}^2 - {t_Q}^2}{2X_2}$

2. Diagram below shows two blocks of wood P and Q of mass 3.0 kg and 5.0 kg respectively. They are connected by a light non-elastic string and are being pulled by a force of 30.0 N along the floor.



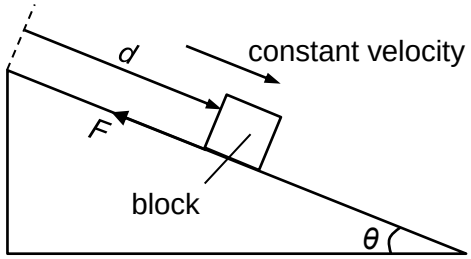
If the kinetic friction of P and Q with the floor are respectively 4.0 N and 10.0 N, how much is the tension *T* in the string?

A 4.0 N **B** 10.0 N **C** 11.3 N **D** 16.0 N

3. A bullet of mass *m* moving with a velocity of *u* penetrates a piece of plasticine of mass *M* at rest. The bullet emerges from the plasticine with a velocity *v* in its initial direction and the plasticine stuck to the bullet has the same mass as the bullet. The velocity of the plasticine left behind can be expressed as

A $\frac{m(u-2v)}{M-2m}$ **B** $\frac{m(u-2v)}{M-m}$ **C** $\frac{m(u-v)}{M-m}$ **D** $\frac{m(u-v)}{M}$

4. A block of mass *m* slides down an inclined plane with constant velocity.



If E_o was the total mechanical energy of the block at the start of the motion, what is the total mechanical energy of the block after travelling a distance *d* down the plane?

A $E_o - Fd$ **B** $E_o - Fd \sin\theta$ **C** $E_o - Fd \cos\theta$ **D** E_o

5. A body moves in a circle on a smooth horizontal surface. If the speed of the body 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 work done by the centripetal force increases when the centripetal force on the body increases.

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

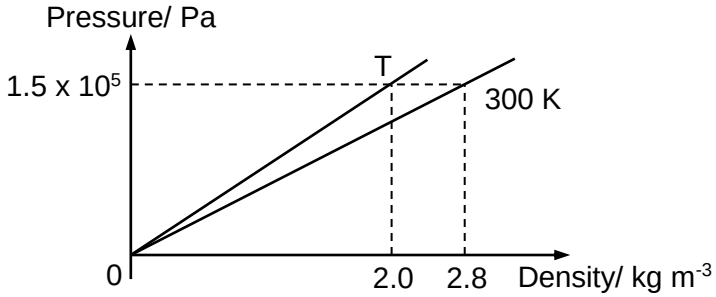
6. A communication satellite of mass *m* is launched into a wrong orbit of radius r_1. An altitude control jet of the satellite is activated to place the satellite into the correct orbit of radius r_2. Given that *G* is the gravitational constant and *M* is the mass of the Earth, the energy needed to place the satellite into the correct orbit is

A $\frac{GMm}{2}(r_1 - r_2)$ **B** $\frac{GMm}{2}(r_2 - r_1)$ **C** $\frac{GMm}{2}(\frac{1}{r_1} - \frac{1}{r_2})$ **D** $\frac{GMm}{2}(\frac{1}{r_2} - \frac{1}{r_1})$

7. The Palapa satellite orbits around the Earth at a height *h* from the surface of the Earth. If the radius of the Earth is *r* and the acceleration due to gravity at the surface of the Earth is *g*, the period of the motion of the satellite is

A $2\pi\sqrt{\frac{(r+h)}{g}}$ **B** $2\pi\sqrt{\frac{r^2}{g(r+h)}}$ **C** $2\pi\sqrt{\frac{(r+h)^2}{gr}}$ **D** $2\pi\sqrt{\frac{(r+h)^3}{gr^2}}$

10. The graph below shows the variation in pressure *P* against density ρ for an ideal gas.



Two experiments have been carried out, one at temperature *T* and the other at temperature 300 K. Based on the graph, the temperature of *T* is

A 255 K **B** 278 K **C** 300 K **D** 420 K

11. A container contains a diatomic ideal gas at the absolute temperature *T* and the average kinetic energy of the molecules of the gas is *E*. Another container contains a monoatomic ideal gas at the absolute temperature of 2*T*. The average kinetic energy, in terms of *E*, for the atoms of the monoatomic gas in the second container is

A $\frac{1}{2}E$ **B** $\frac{3}{5}E$ **C** $\frac{6}{5}E$ **D** $2E$

12. The work done by an idea gas at a temperature of *T* in an isothermal expansion is W_1 for a change of pressure from P_1 to P_2, whereas, the work done the gas in an adiabatic expansion from an initial temperature of *T* is W_2 for the same change of pressure.
Which of the following relationships involving W_1 and W_2 is **correct**?

A $(W_1 - W_2) = 0$
B $(W_1 - W_2) > 0$
C $(W_1 - W_2) < 0$
D $W_1 < 0$, $W_2 > 0$

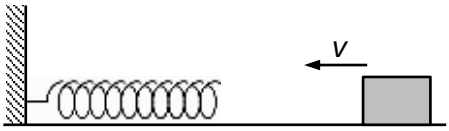
13. A fixed mass of an ideal gas is heated at constant pressure. When the gas is doing work ΔW, the internal energy changes by ΔU. If γ is the principle molar heat capacity, then the ratio of $\frac{\Delta W}{\Delta U}$ is equal to

A $\gamma - 1$ **B** $\gamma + 1$ **C** $\frac{1}{\gamma - 1}$ **D** $\frac{1}{\gamma + 1}$

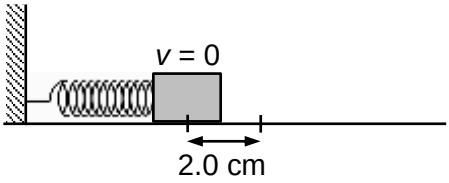
Section B [15 marks]

Answer *all* questions in this section

16. A block of mass 2.0 kg moves with a velocity *v* towards a spring as shown in diagram.



The block compresses the spring by 2.0 cm as shown below. Given that the force constant of the spring is 1000 N m^{-1}.



Calculate the velocity, *v* of the block if

(a) the surface is smooth

[3 *marks*]

(b) the surface is rough and the frictional force between the block and the surface is 3.0 N.

[3 *marks*]

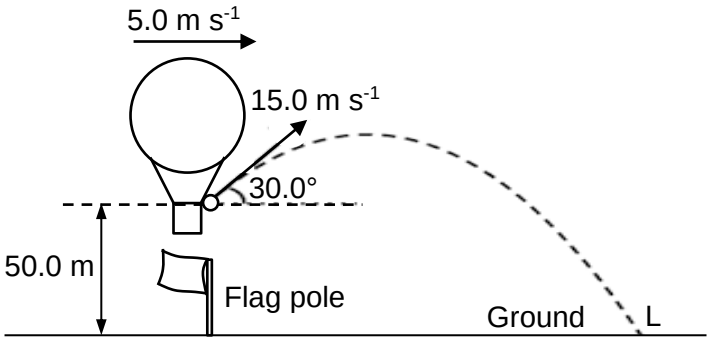
Section C [30 marks]

Answer *two* questions only in this section

18. (a) (i) Define acceleration. [1 *mark*]

(ii) A body moves in a straight line with uniform acceleration. Sketch a graph to show how the displacement of the body varies with time when the initial velocity is zero.
[1 *mark*]

(b) A hot-air balloon is travelling horizontally at a constant speed of 5.0 m s^{-1} just 50.0 m above the ground as shown in the diagram below.



When the balloon passes a flag pole, the balloonist projects a ball with a speed of 15.0 m s^{-1} and inclined at an angle of 30° to the horizontal.
[Assume air resistance to the ball's motion is negligible]

(i) the vertical and horizontal components of the velocity of the ball. [2 *marks*]

(ii) the maximum height of the ball to the ground. [3 *marks*]

(iii) the time taken for the ball to land at L. [2 *marks*]

(iv) the velocity of the ball just before it lands at L. [4 *marks*]

(v) the distance from the flag-pole to L. [2 *marks*]

ANSWER SCHEME

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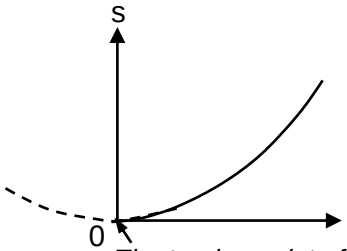
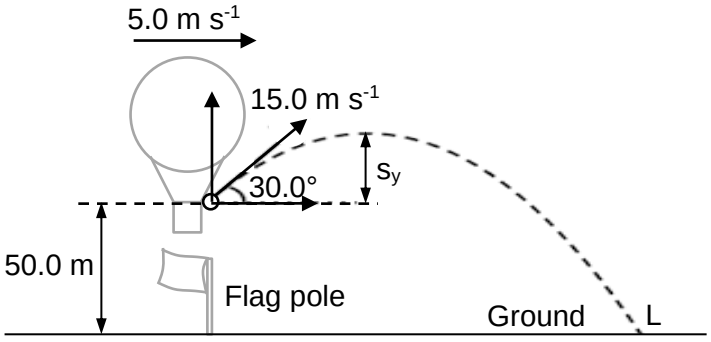
UJIAN PRAPENTAKSIRAN
(FIZIK)
PHYSICS PAPER 1

SECTION A:

NO	ANS	NO	ANS	NO	ANS
1	A	6	C	11	C
2	B	7	D	12	B
3	B	8	C	13	A
4	A	9	D	14	B
5	D	10	D	15	A

SECTION B & C:

NO		ANSWER	M
16	(a)	Change in KE = work done to compress the spring = elastic PE stored in the spring	
		$\frac{1}{2}mv^2 = \frac{1}{2}kx^2$	1
		$\frac{1}{2}(2)v^2 = \frac{1}{2}(1000)(2\times10^{-2})^2$	1
		$v = 0.447\ m\ s^{-1}$ $= 0.45\ m\ s^{-1}$	1
	(b)	Change in KE = elastic PE stored in the spring + work done against friction	
		$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 + Fs$	1
		$\frac{1}{2}(2)v^2 = \frac{1}{2}(1000)(2\times10^{-2})^2 + 3.0(2\times10^{-2})$	1
		$v = 0.5099\ m\ s^{-1}$ $= 0.51\ m\ s^{-1}$	1
		Total	**6**
17	(a)(i)	$Q = \Delta U + \Delta W \quad ; \quad Q = 0\ (for\ adiabatic)$	1
		$\Delta W = -\Delta U = -C_v(T_2 - T_1) \quad ; \quad PV = nRT$	1,1
		$= -C_v\frac{(P_2V_2 - P_1V_1)}{R} \quad ; \quad \gamma = \frac{C_p}{C_v} \; ; \; R = C_p - C_v$	1
		$= -\frac{C_p}{\gamma}\times\frac{(P_2V_2 - P_1V_1)}{C_p - C_v}$	1
		$= -\frac{1}{\gamma}\frac{(P_2V_2 - P_1V_1)}{\frac{C_p - C_v}{C_p}}$	
		$= -\frac{1}{\gamma}\frac{(P_2V_2 - P_1V_1)}{1 - \frac{1}{\gamma}}$	

		$= -\frac{1}{\gamma}\frac{(P_2V_2 - P_1V_1)}{\frac{\gamma-1}{\gamma}}$ $W = \frac{P_1V_1 - P_2V_2}{\gamma - 1}$	
	(a)(ii)	$PV^\gamma = \kappa \;;\; PV = nRT$ $P(\frac{nRT}{P})^\gamma = \kappa$ $P^{1-\gamma}T^\gamma = \mathrm{K}$ $P_1{}^{1-\gamma}\ T_1{}^\gamma = P_2{}^{1-\gamma}\ T_2{}^\gamma$ $\left(\frac{P_1}{P_2}\right)^{1-\gamma} = \left(\frac{T_2}{T_1}\right)^\gamma$ $\left(\frac{135k}{105k}\right)^{1-\gamma} = \left(\frac{290}{320}\right)^\gamma$ $(1-\gamma)\ln\left(\frac{135}{105}\right) = \gamma\ln\left(\frac{290}{320}\right)$ $(1-\gamma)0.251314 = -0.098440\gamma$ $\gamma = 1.6439$ $\approx 1.67\ (Monoatomic)$	1 1 1 1
		Total	**9**
18	(a)(i)	Acceleration is the rate of change of velocity.	1
	(a)(ii)	 *The turning point of the curve where gradient = 0*	1
	(b)(i)	 $u_x = 5.0 + 15\cos 30^\circ = 18.0\ m\ s^{-1}$ $u_y = 15\sin 30^\circ = 7.50\ m\ s^{-1}$	 1 1
	(b)(ii)	$s_y = ?\ ;\ u_y = 7.50\ m\ s^{-1}\ ;\ g = 9.81\ m\ s^{-2}\ ;\ v_y = 0$ $v^2 = u^2 + 2as$ $0 = 7.50^2 + 2(-9.81)s_y$ $s_y = 2.86697m$ $\sum S_y = 50.0\ + 2.86697$	 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

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