NAMA:	TINGKATAN: 5 Ud
NO. KAD PENGENALAN	

SEKOLAH MENENGAH KEBANGSAAN ST. LUKE
SRI AMAN

PEPERIKSAAN PERCUBAAN SPM 2019

Fizik Tingkatan Lima
Kertas 2

4531/2

2 ½ Jam

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis **nama, tingkatan** dan **nombor kad pengenalan** anda pada ruang yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
4. *Jawapan kepada **Bahagian A** hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan.*
5. *Rajah tidak dilukis mengikut skala **kecuali** dinyatakan.*
6. *Markah maksimum yang diperuntukkan ditunjukkan dalam kurungan pada hujung tiap-tiap soalan atau*
7. *Penggunaan kalkulator saintifik yang **tidak** boleh diprogramkan adalah dibenarkan.*

Untuk Kegunaan Pemeriksa			
Bahagian	**Soalan**	**Markah Penuh**	**Markah Diperolehi**
A	1	4	
	2	5	
	3	6	
	4	7	
	5	8	
	6	8	
	7	10	
	8	12	
B	9	20	
	10	20	
C	11	20	
	12	20	
		Jumlah :	

Kertas soalan ini mengandungi 15 halaman bercetak

The following information may be useful. The symbols have their usual meaning.

1. $a = \frac{v-u}{t}$

2. $v^2 = u^2 + 2as$

3. $s = ut + \frac{1}{2}at^2$

4. Momentum = mv

5. $F = ma$

6. Kinetic Energy / *Tenaga Kinetik*

   $= ½\ mv^2$

7. Gravitational Potential Energy / *Tenaga keupayaan graviti*$= mgh$

8. Elastic Potential Energy /

   Tenaga keupayaan kenyal $= \frac{1}{2}Fx$

9. Power, $P = \frac{energy}{time}$

   Kuasa, $P = \frac{tenaga}{masa}$

10. $\rho = \frac{m}{V}$

11. Pressure / *Tekanan*, $P = \frac{F}{A}$

12. Pressure in liquid /
    Tekanan dalam cecair, $P = h\rho g$

13. Heat / *Haba*, Q = $mc\theta$

14. Heat / *Haba*, Q = $m\ell$

15 $\frac{pV}{T}$ = constant / *pemalar*

16 $n = \frac{\sin i}{\sin r}$

17 $n = \frac{\text{real depth}}{\text{apparent depth}}$

$n = \frac{\text{dalam nyata}}{\text{dalam ketara}}$

18 $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

19 Linear magnification /

Pembesaran linear, $m = \frac{v}{u}$

20 $v = f\lambda$

21 $\lambda = \frac{ax}{D}$

22 $Q = I\,t$

23 E = VQ

24 $V = IR$

25 Power / *Kuasa,* $P = IV$

26 $g = 10\ ms^{-2}$

27 $\frac{N_S}{N_P} = \frac{V_S}{V_P}$

28 Efficiency / *Kecekapan*

$= \frac{I_S V_S}{I_P V_P} \times 100\%$

29 $E = mc^2$

Section A[60 *marks*]

Answer **all** *questions*

1. Diagram 1 shows a measuring instrument to measure mass of a cup.

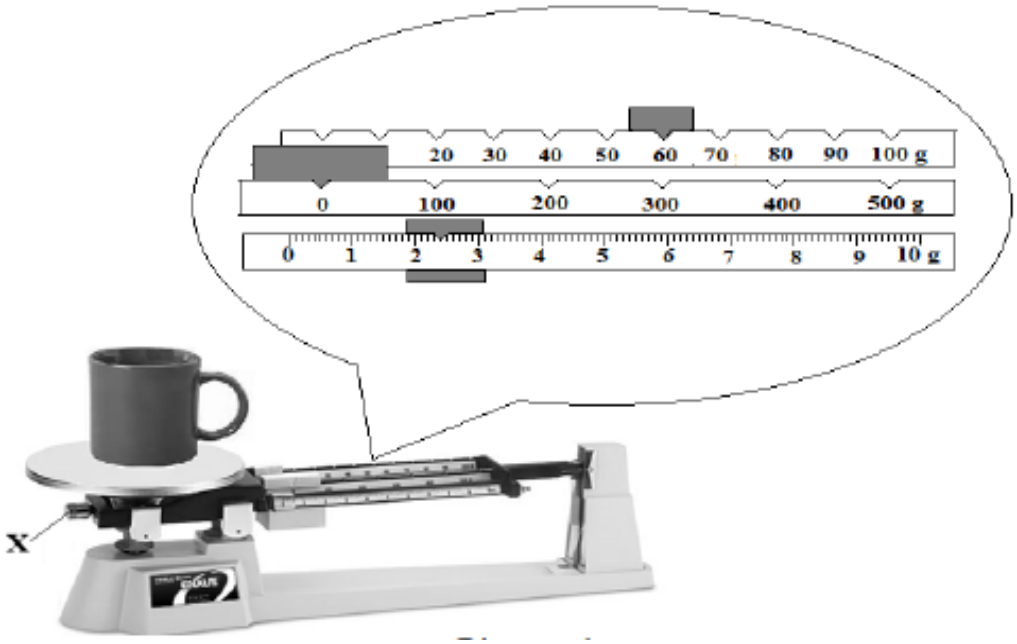

Diagram 1

(a) Name the measuring instrument shown in Diagram 1. [1 *mark*]

……

(b) (i) X is a knob to prevent an error. Name the error. [1 *marks*]

……

(ii) Suggest another way to overcome the error without adjusting X. [1 *mark*]

……

(c) What is the mass of the cup? [1 *mark*]

……

2. Diagram 2.1 shows a submarine equipped with an optical instrument P.
Diagram 2.2 shows the structure of the optical instrument P.

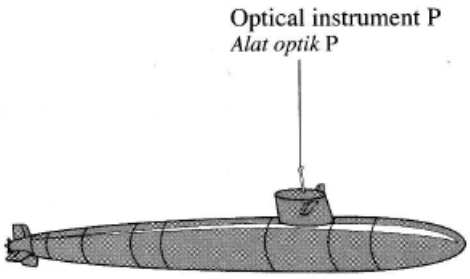

Diagram 2.1

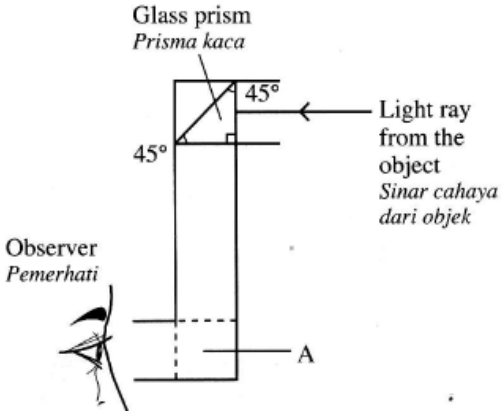

Diagram 2.2

(a) Name the optical instrument P. [1 *mark*]

……

(b) In Diagram 2.2, two glass prisms must be placed so that the object can be seen by the observer. The position of one of the glass prisms is as shown.

(i) In box A in Diagram 2.2, draw and shade the second prism. [1 *mark*]

(ii) Explain why the prism in optical instrument P are placed as in 2(b)(i). [1 *mark*]

……

(c) (i) In Diagram 2.2, complete the path of the light ray from the object to the observer's eye. [1 *mark*]

(ii) State one characteristic of the image observed. [1 *mark*]

……

3. Diagram 3 shows the activity-time graph of radioisotope P.

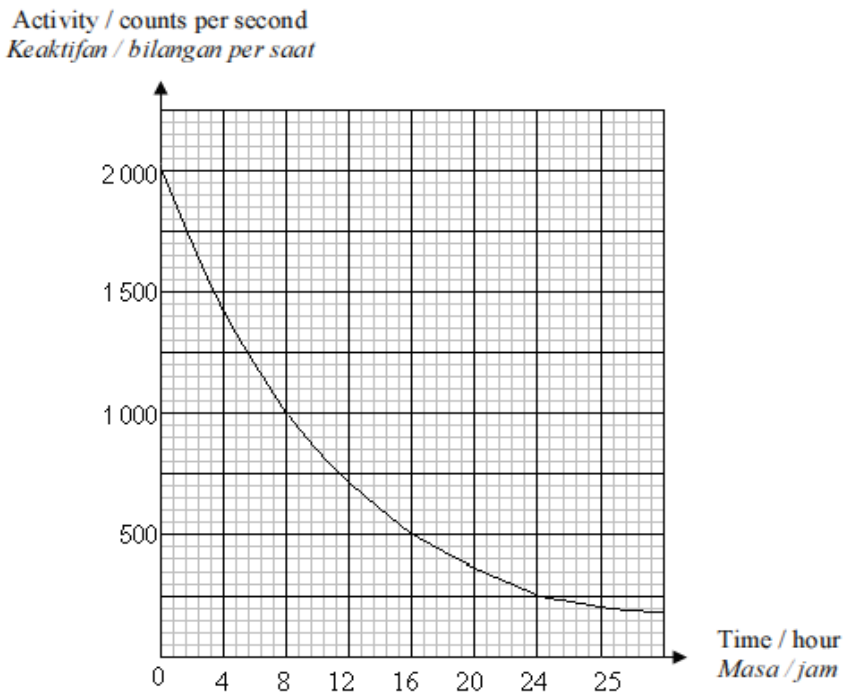

Diagram 3

(a) What is the meaning of radioisotope? [1 *mark*]

……

(b) Radioisotope P emits gamma rays. State one detector that can be used to detect gamma rays.
[1 *mark*]

……

(c) Based on Diagram 3, determine the half-life of radioisotope P.
Show on the graph how you determine the half-life of radioisotope P.
[2 *marks*]

……

(d) Calculate the time taken for radioisotope P to reduce to 12.5% of its initial activity.
[2 *marks*]

……

4. (a) Diagram 4.1 shows the symbol of a transistor.

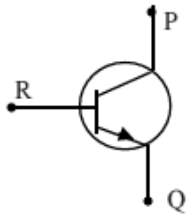

Diagram 4.1

(i) Name the type of transistor in Diagram 4.1. [1 *mark*]

……

(ii) What is the name of terminal P, Q and R. [2 *marks*]

Terminal P : …… Terminal Q : …… Terminal R : ……

(b) Diagram 4.2 shows a circuit which acts as a switch for a fire alarm system.
The resistance of thermistor, T, at room temperature is 1000 kΩ. The resistance of R_2 is 100 kΩ.

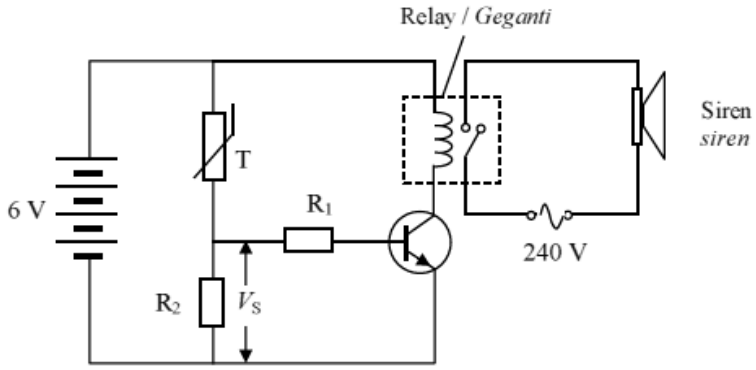

Diagram 4.2

(i) Calculate the potential difference, V_s, at room temperature. [2 *marks*]

(ii) Explain how the fire alarm system operates. [2 *marks*]

……..

……..

5. Diagram 5.1 and 5.2 show how two different spring, P and Q behave when the same load is hanging from each spring.

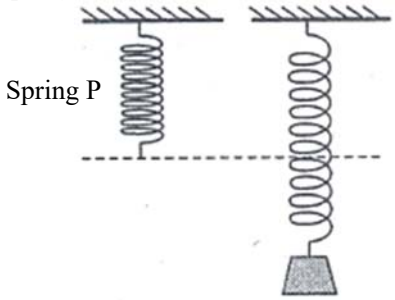

Diagram 5.1

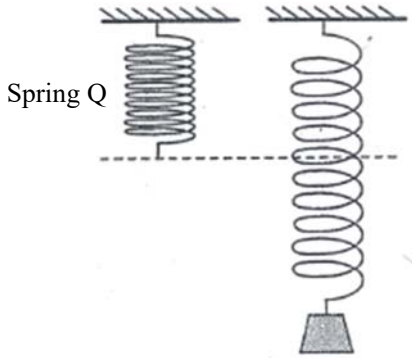

Diagram 5.2

Both spring P and Q are elastic. They are made of the same material and with wire of the same diameter. However the diameter of coil of spring Q is bigger than that of spring P.

(a) What is the meaning of elasticity? [1 *mark*]

……..

(b) Using Diagram 5.1 and Diagram 5.2, compare

(i) The forces exerted on the spring. [1 *mark*]

……

(ii) The spring constant of the spring. [1 *mark*]

……

(iii) The extensions of the spring. [1 *mark*]

……

(c) Relate the force constant to the diameter of coil of the spring. [1 *mark*]

……

(d) If extension of spring P is 6 cm when it is used to hang an object of 100 g, what is the spring constant of spring P? [2 *marks*]

(e) What happen to the spring constant of spring P if another identical spring is arrange in series with spring P? [1 *mark*]

……

6. Diagram 6.1 and Diagram 6.2 show two hydraulic lifts used to lift a load.

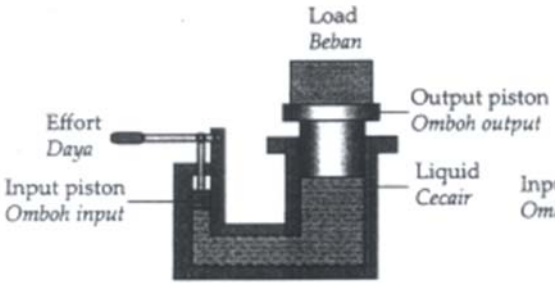

Diagram 6.1

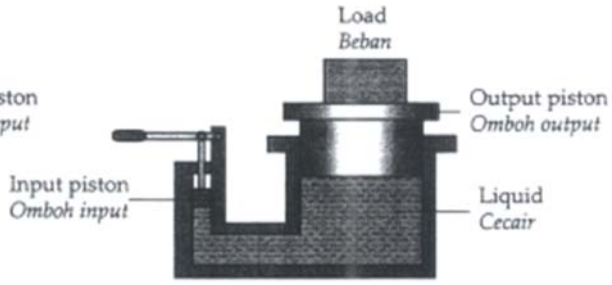

Diagram 6.2

(a) State one characteristic of the liquid used in the above hydraulic lifts. [1 *mark*]

…….

(b) Observe Diagram 6.1 and Diagram 6.2,

(i) Compare the cross-sectional area of the input pistons. [1 *mark*]

…….

(ii) Compare the cross-sectional area of the output pistons. [1 *mark*]

…….

(iii) Compare the force exerted on the output pistons. [1 *mark*]

…….

(c) Based on the answer in 6(b)(ii) and 6(b)(iii),

(i) State the relationship between the cross-sectional area of the output piston and the force exerted on it. [1 *mark*]

…….

(ii) Name the physics principle involved. [1 *mark*]

…….

(d) If a liquid of higher density is used in the hydraulic lift,

(i) What will happen to the distance displaced by the output piston? [1 *mark*]

…….

(ii) Give a reason for your answer in 6(d)(i). [1 *mark*]

…….

7. Diagram 7 shows an electrical kettle with specification of "240 V, 2200 W".

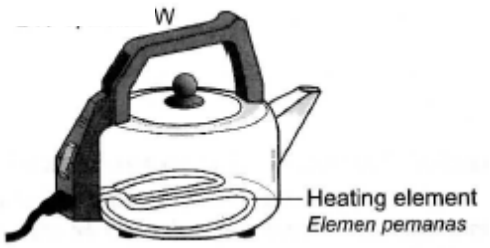

Diagram 7

(a) What is the meaning of "240 V, 2200 W" for the electric kettle? [1 *mark*]

…….

(b) If the electrical kettle is connected to the power supply of 240 V, calculate

(i) the current flow through the heating element. [2 *marks*]

(ii) the energy consumed by the electrical kettle when it is used for 10 minutes. [3 *marks*]

(c) Based on the following aspects, give suggestions on how to improve the heating element used in the electrical kettle so that it can boil the water rapidly.

(i) The number of loop of heating elements: [1]

…….

Reason: [1]

…….

(ii) The material of heating element: [1]

…….

Reason: [1]

…….

8. Diagram 8.1 shows the wave pattern produced in a ripple tank by the vibration of two dippers.

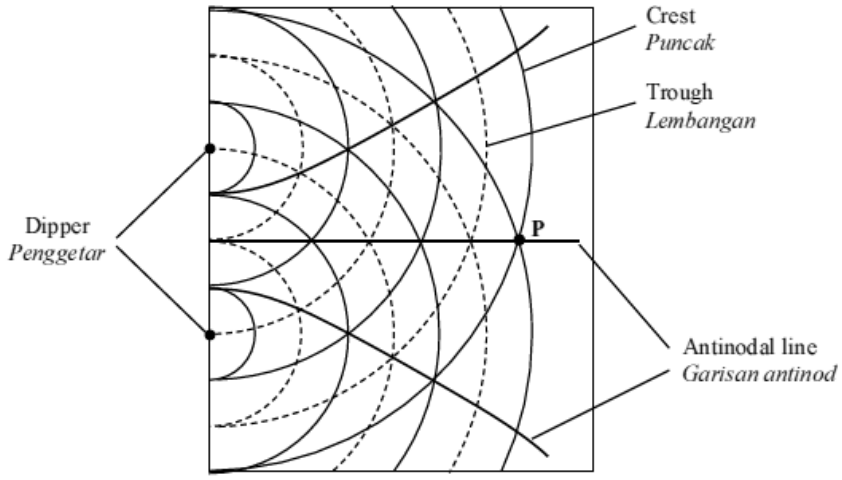

Diagram 8.1

(a) Name the wave phenomenon that produced the wave pattern in Diagram 8.1? [1 *mark*]

……..

(b) What will happen to the distance between two consecutive antinodal lines when the distance between the dippers is decreased? [1 *mark*]

……..

(c) (i) A small piece of cork is placed at point P. State the motion of the cork. [1 *mark*]

……..

(ii) Explain your answer in 8(c)(i). [1 *mark*]

……..

(d) The depth of water is increased.
What happens to the distance between two consecutive antinodal lines? Explain your answer.
[3 *marks*]

……..

……..

……..

(e) Diagram 8.2 shows a lecture hall at a university. Students suggest that some improvements need to be made to the sound system. Suggest a suitable setting of the speakers so that sound can be heard clearly throughout the hall.

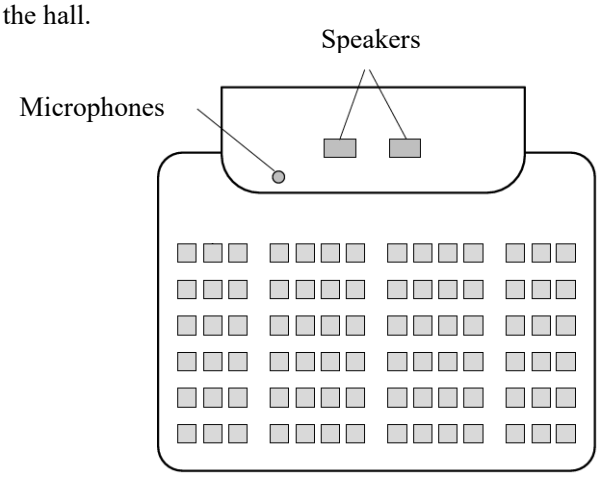

Diagram 8.2

Table 8 shows four settings of the speakers to improve the sound system in the hall.

Settings of the speakers	Position of the speaker	Distance between the speakers
P	Behind the microphones	Close to each other
Q	In front of the microphones	Further from each other
R	In front of the microphones	Close to each other
S	Behind the microphones	Further from each other

Table 8

(i) Which position of the speakers is suitable? [1 *mark*]

……

Reason : [1 *mark*]

……

(ii) Which distance between the speakers is suitable? [1 *mark*]

……

Reason : [1 *mark*]

……

(iii) Based on your answers to 8(e)(i) and 8(e)(ii), which setting of the speakers is suitable? [1 *mark*]

……

Section B[20 *marks*]
Answer any one question from this section

9. Diagram 9.1 and Diagram 9.2 shows the image form of convex lenses from a ray box with triangle hole as an object. Both the lenses are same focal length.

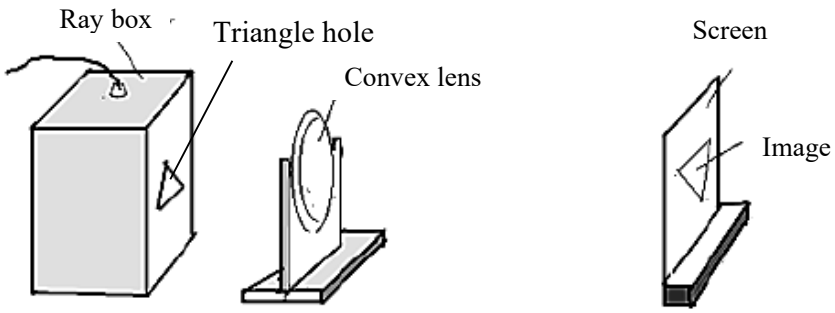

Diagram 9.1

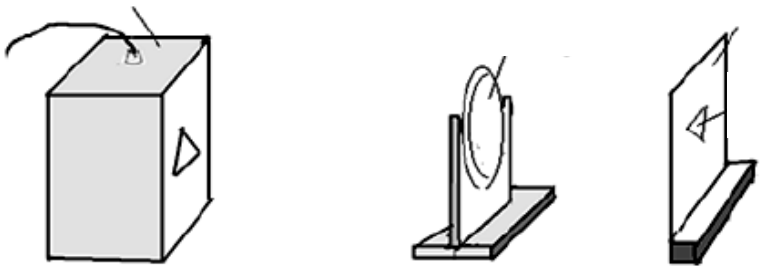

Diagram 9.2

(a) (i) What is the meaning of power of lens? [1 *mark*]

(ii) Observe Diagram 9.1 and Diagram 9.2. Compare the object distance, the image distance and the size of image. State the relationship between the object distance and image distance and the size of image. [5 *marks*]

(b) While driving on a hot day, you may see mirage on the road. Explain briefly how this phenomenon occurs? [4 *marks*]

(c) Diagram 9.3 shows a simple telescope constructed in a laboratory that can be used to see distant object.

Diagram 9.3

You are given two lenses, R and S of focal lengths 5 cm and 40 cm respectively. Both the lenses are used to build a simple astronomical telescope at normal adjustment.

(i) Using the two lenses, explain how you are going to build a simple astronomical telescope. [6 *marks*]

(ii) Suggest modifications that need to be done on the telescope to produce clearer and bigger images. [4 *marks*]

10. Diagram 10.1 and Diagram 10.2 show the deflection of a radioactive emission in an electric field.

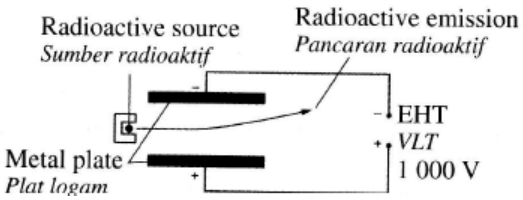

Diagram 10.1

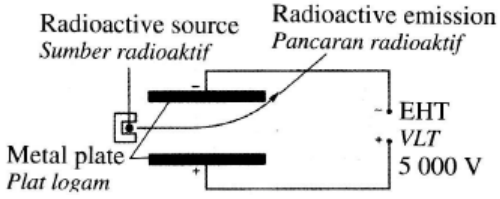

Diagram 10.2

(a) What is the meaning of radioactivity? [1 *mark*]

(b) Using Diagram 10.1 and Diagram 10.2,

(i) name the radioactive emission, [1 *mark*]

(ii) compare the voltage of the EHT and the deflection of the radioactive emission. [2 *marks*]

(c) State the relationship between

(i) the voltage of the EHT and the strength of the electric field between the plates, [1 *mark*]

(ii) the strength of the electric field between the plates and the deflection of the radioactive emission. [1 *mark*]

(d) Diagram 10.3 shows a type of nuclear reaction.

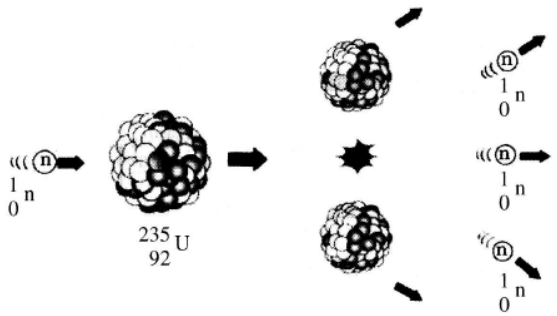

Diagram 10.3

(i) Name this type of nuclear reaction. [1 *mark*]

(ii) Explain how nuclear energy is produced from the nuclear reaction shown in Diagram above. [3 *marks*]

(e) Diagram 10.4 shows how a radioactive source is handled by a student.

Diagram 10.4

The method shown is not safe. Suggest and explain:

(i) The equipment to be used in handling a radioactive source.
(ii) Modifications to the storing method to ensure safe keeping of the radioactive source.
(iii) Other precautions that need to be taken when handling a radioactive source.

[10 *marks*]

Section C[20 *marks*]

Answer any one question from this section

11. Diagram 11.1 shows a pile driver used to drive a concrete pile in the ground. This is an example of application of principle of conservation of momentum.

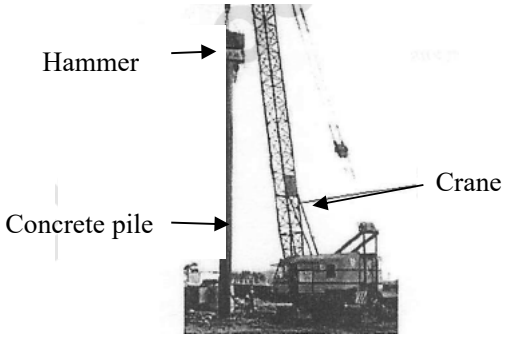

Diagram 11.1

(a) (i) State principle of conservation of momentum? [1 *mark*]

(ii) Explain how the concrete pile is driven in the ground. [4 *marks*]

(b) Diagram 11.2 shows a tennis player hitting a tennis ball with his racket.

Diagram 11.2

You are required to investigate the techniques done by the player and the characteristics of the racket's string as shown in Table 11.

.

Techniques and characteristics of string	Action after hitting the ball	Time contact between the ball and racket	String tension	Material of the string
P	Continue to swing the racket after hitting the ball	Long	High	Steel
Q	Continue to swing the racket after hitting the ball	Short	High	Nylon
R	Stops the racket immediately after hitting the ball	Short	Low	Steel
S	Stops the racket immediately after hitting the ball	Long	Low	Nylon

Table 11

Explain the suitability of the techniques done by the tennis player and characteristics of the racket's string. Determine the most effective technique done by the tennis player and the most suitable characteristics of the racket's string to produce high speed motion of the tennis ball after being hit. Give reasons for the choice. [10 *marks*]

(c) A tennis ball of mass 100 g is moving at a velocity of 40 m s^{-1}. A player hits the ball and moves in the opposite direction with a velocity of 50 m s^{-1}. The time of collision is 20 ms.

(i) State the mass of ball and the time of collision time in S.I. base unit. [2 *marks*]

(iii) Calculate the impulsive force acted on the tennis ball. [3 *marks*]

12. Diagram 12.1 shows a type of transformer.

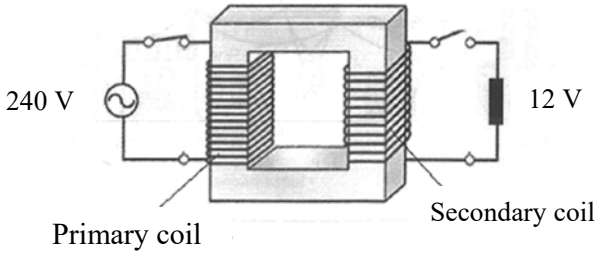

Diagram 12.1

(a) (i) Name the transformer? [1 *marks*]

(ii) Explain the working principle of the transformer. [4 *marks*]

(b) (i) The number of turns on the primary coil in Diagram 12.1 is 1500 turns. Calculate the number of turns on the secondary coil. [2 *marks*]

(ii) The transformer in Diagram 12.1 is used to switch on an electrical appliance. The current in the primary coil is 0.1 A and the efficiency is 85%. Calculate the output power of the transformer. [3 *marks*]

(c) Diagram 12.2 shows the National Grid Network System.

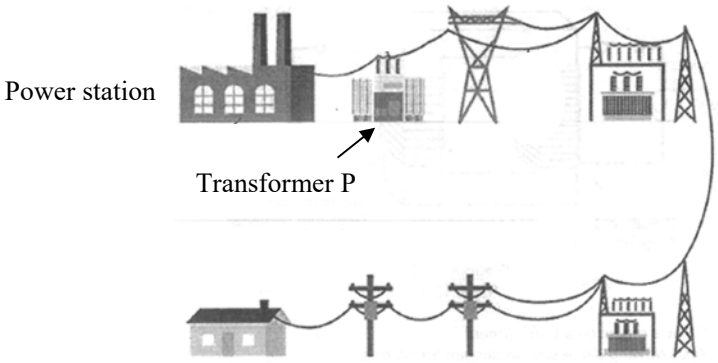

Diagram 12.2

Using your knowledge about electrical and Diagram 12.2, you are asked to determine the suitable characteristics used in the system J, K, L and M for a National Grid Network System in Table 12.

System	Type of transformer P	Material of the cable	Transmission voltage	Rate of expansion of the cable
J	Step-up	Aluminium	Low	Low
K	Step-down	Nichrome	High	High
L	Step-up	Copper	High	Low
M	Step-down	Tungsten	Low	High

Table 12

Study the specification of the system and explain the suitability of each system based on the following aspects:

(i) Type of transformer P
(ii) Material of the cable
(iii) Transmission voltage
(iv) Rate of expansion of the cable

Explain the suitability of each aspects and determine the most suitable system. Give reason for your answer. [10 *marks*]

END OF QUESTION PAPER

Peperiksaan Percubaan SPM 2019
Physics F5 (Paper 2)
Answer scheme

1.	(a)	Triple beam balance / neraca tiga alur		1
	(b)	(i)	Zero error	1
		(ii)	Record the reading of zero error and deduct it from the reading obtained / Reading obtained – reading of zero error	1
	(c)	62.4 g		1

2.	(a)	Periscope		1
	(b)	(i)	Label, draw and shade the glass prism in the correct position	1
		(ii)	So that total internal reflection occur	1
	(c)	(i)	Draw the correct ray diagram	1
		(ii)	Virtual // upright // same size as the object (any one)	1

3.	(a)	Unstable nuclei which decays to become stable by emitting radioactive particles	1
	(b)	GM-tube / cloud chamber	1
	(c)	(show on graph) Half-lift = 8 hours	1 1
	(d)	100% → 50% →25% →12.5% Time = 3(8 hours) = 24 hours	1 1

4.	(a)	(i)	n-p-n transistor	1
		(ii)	P –collector Q –emitter R –base	2
	(b)	(i)	$V_s = \frac{100 \times 10^3}{100 \times 10^3 + 1000 \times 10^3} \times 6$ $= 0.545$ V	2
		(ii)	- V_s higher // V_B higher // I_B flows higher - Larger I_C flows // Transistor switches ON	2

5.	(a)	Ability to returns to its original shape and size after the external force has been remove		1
	(b)	(i)	The forces exerted in D5.1 = D5.2	1
		(ii)	The spring constant in D5.1 > D5.2	1
		(iii)	The extensions of the spring in D5.1 < D5.2	1
	(c)	The diameter of coil of the spring increases, the force constant decreases		1
	(d)	1 N = k (6 cm) k = 0.16 N cm^{-1}		1 1
	(e)	Spring constant decreases		1

6.	(a)	Incompressible liquid		1
	(b)	(i)	Cross-sectional area of input piston in D6.1 = D6.2	1
		(ii)	Cross-sectional area of output piston in D6.1 < D6.2	1
		(iii)	Force exerted on the output piston in D6.1 < D6.2	1
	(c)	(i)	The cross-sectional area of output piston increases, the force exerted increases	1
		(ii)	Pascal's principle	1
	(d)	(i)	No change	1
		(ii)	No change in input pressure	1

7.	(a)	If the kettle supply with 240 V, it will release 2200 J of energy in 1 s.		1
		(i)	2200 W = (240 V) I I = 9.167 A	1 1
		(ii)	E = (2200 W) (10 × 60 s) = 1320000 J	1,1 1
	(b)	(i)	More number of loop / Increase surface area of heating element /	1 1
		(ii)	Nichrome / High resistance material High resistance / produce more heat	1 1

8.	(a)	Interference		1
	(b)	Increases		1
	(c)	(i)	Oscillates up and down with a large amplitude	1
		(ii)	Constructive interference occurs at P	1
	(d)	Distance increases Speed of the waves increase Wavelength is longer		1 1 1
	(e)	(i)	In front of the microphone Avoid disturbance // to prevent the sound from speakers being amplified again by the microphones	1 1
		(ii)	Further distance between the speakers So that positions of constructive and destructive interference are closer together until they are hardly noticeable.	1 1
		(iii)	Q	1

<table>
<tr><td>9.</td><td>(a)</td><td>(i)</td><td>Power = 1 / focal length in meter</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>- the object distance in D9.1 < D9.2
- the image distance in D9.1 > D9.2
- the size of image in D9.1 > D9.2
- the object distance increases, the image distance decreases
- the object distance increases, the size of image decreases</td><td>5</td></tr>
<tr><td></td><td>(b)</td><td colspan="2">- during hot day, air layer near surface of the road is hotter
- density of hot air is less dense
- reflected ray (blue sky) travel from denser medium toward less dense medium, it will refracted and bend away from normal
- when the incidence angle > critical angle,
- the ray experience total internal reflection and the image of the blue sky will seen by the driver</td><td>Max.4</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>.(Using the two lenses, explain how you are going to build a simple astronomical telescope)
<table>
<tr><th>Construction</th><th>Explanation</th></tr>
<tr><td>Lens R as eyepiece lens</td><td>Short focal length / increase linear magnification</td></tr>
<tr><td>Lens S as objective lens</td><td>Long focal length / increase linear magnification</td></tr>
<tr><td>Distance lens R and lens S 45 cm</td><td>Normal adjustment / final image formed at infinity</td></tr>
</table>
.</td><td>Max.6</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>.(Suggest modifications that need to be done on the telescope to produce clearer and bigger images)
<table>
<tr><th>Modification</th><th>Explanation</th></tr>
<tr><td>Use bigger diameter objective lens</td><td>More light can enter the telescope</td></tr>
<tr><td>Use longer focal length lens as objective lens</td><td>Increase linear magnification</td></tr>
<tr><td>Use shorter focal length lens as eyepiece lens</td><td>Increase linear magnification</td></tr>
</table>
.</td><td>Max.4</td></tr>
</table>

<table>
<tr><td>10.</td><td>(a)</td><td colspan="2">Radioaactivity is the spontaneous disintegration of an unstable nucleus into a more stable nucleus with emission radiation</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>positive</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>voltage of the EHT in D10.1 < D10.2
the deflection of the radioactive emission in D10.1 < D10.2</td><td>1
1</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>The higher the voltage of the EHT, the stronger the strength of the electric field between the plates.</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>The stronger the strength of the electric field between the plates, the greater the deflection of the radioactive emission.</td><td>1</td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td>Nuclear fission</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>M1: heavy nucleus bombarded with a neutron
M2: split into two smaller nuclei with mass defect
M3: releasing large amount energy, $E = mc^2$ (m = mass defect, c = speed of light)</td><td>1
1
1</td></tr>
<tr><td></td><td>(c)</td><td colspan="2">
<table>
<tr><th>Suggestion</th><th>Explaination</th></tr>
<tr><td>The radioactive source should be handle with robot arm</td><td>Reduce direct exposure to the source</td></tr>
<tr><td>The radioactive source shoud be store in thick lead container</td><td>Prevent nuclear radiation from being exposed</td></tr>
<tr><td>Wear film badge</td><td>To monitor the dosage of radiation exposure</td></tr>
<tr><td>Wear protective clothing</td><td>Protect from radiation</td></tr>
</table>
</td><td></td></tr>
</table>

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11.	(a)	(i)	The total momentum before and after the collision or explosion is remain the same	1
		(ii)	• Hammer with greater mass • While falling down with high velocity, it will poses high momentum • The contact surface (hammer and concrete pile) is hard. • The contact time is short • High impulsive is produced to drive the pile	Max.4
	(b)		.	10

Techniques and characteristics	Explanation
Continue to swing the racket after hitting the ball	Extended the stopping time of the racket / reduce the impact toward hand / avoid injury
Short time contact between the ball and racket	Increase the impulsive force
High string tension	Shorten the contact time with the ball / produce higher impulsive force
Material of the string is nylon	Produced higher elastic potential energy
Q. ……	

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	(c)	(i)	mass = 0.1 kg, time = 0.02 s	2
		(ii)	Imp. F = [(0.1)(–50) – (0.1)(40)] / 0.02 = –450 N	1,1 1

12.	(a)	(i)	Step-down transformer	1
		(ii)	• An alternating current flows in primary coil • Soft iron core is magnetized • A changing magnetic flux is produced and flow through the secondary coil • An induced e.m.f is produced at the secondary coil	1 1 1 1
	(b)	(i)	1500 turns / N_s = 240 V / 12 V N_s = 75 turns	1 1
		(ii)	Power input = (0.1 A)(240 V) = 24 W P_{output}/ 24 W × 100% = 85% P_{output} = 20.4 W	1 1 1
	(c)		.	Max. 10

Suggestions	Explanations
(type of transformer P) Step up transformer	Increase the output voltage
(material of the cable) Copper	Low resistance / reduce energy loss
(transmission voltage) High	Small current transmitted / reduce heat loss
(rate of expansion of cable) Low	Constant length
L is chosen	

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