PHYSICS
Kertas 1
September
1 1/4 jam

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PEPERIKSAAN PERCUBAAN SPM TAHUN 2011

SKEMA PEMARKAHAN

PHYSICS

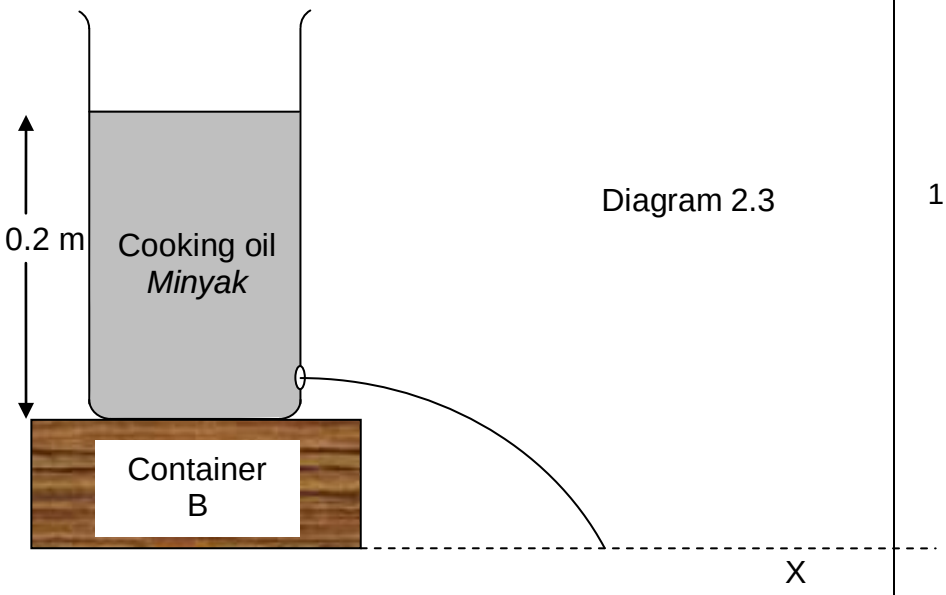
Kertas 1

Mark Scheme for Physics Paper 1

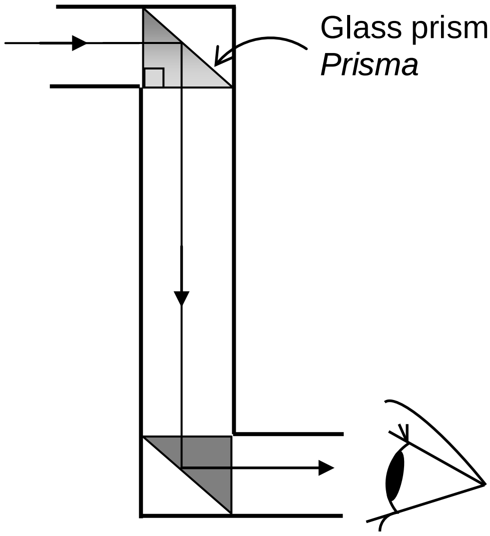
1	C	11	C	21	B	31	A	41	A
2	A	12	B	22	D	32	B	42	B
3	B	13	A	23	A	33	C	43	A
4	C	14	C	24	B	34	B	44	D
5	C	15	B	25	B	35	A	45	B
6	C	16	B	26	B	36	B	46	C
7	C	17	C	27	C	37	D	47	C
8	B	18	B	28	D	38	C	48	C
9	C	19	D	29	B	39	D	49	A
10	C	20	D	30	C	40	B	50	A

PEPERIKSAAN PERCUBAAN SPM TAHUN 2011
MATAPELAJARAN FIZIK
SKEMA PERMARKAHAN
Paper 2

Section A

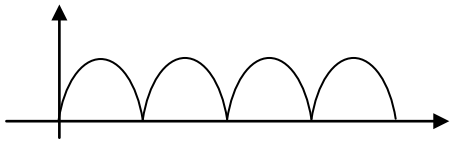
No.	MARKING CRITERIA	MARKS	TOTAL
1(a)	Electromagnetic waves consist of a combination of oscillating electrical and magnetic fields perpendicular to each other.	1	4
1(b)	They are transverse wave/ they can travel through vacuum/ their speed is 3.0×10^8 ms^{-1}	1	
1(c)(i)	Microwave	1	
1(c)(ii)	Microwave has short wavelength and high frequency/ It can be reflected/ It can penetrate haze/ It can penetrate rain or snow/ It can penetrate clouds	1	
2(a)	Pressure is force acting per unit area / Pressure = Force/ area	1	5
2(b)	Same	1	
2(c)	P = ρ h g = 1000 × 0.2 × 10 = 2000 kg m^{-1} s^{-2} / 2000 Pa /2 kPa (with correct unit)	1 1	
2(d)	 Diagram 2.3	1	
3(a)	Step-down transformer	1	6
3(b)	Easy magnetised and demagnetised	1	
3(c)	$\frac{N_S}{N_p} = \frac{V_S}{V_P}$ $Ns = \frac{12}{240} \times 3000$ = 150	1 1	
3(d)(i)	Bulb does not light up	1	
3(d(ii)	No current is induced in secondary coil/ No change in magnetic flux	1	

4(a)	80 °C	1	
4(b)(i)	Pt = m*l* 100 (800) = 0.5 *l* *l=160 000 Jkg*$^{-1}$ (with correct unit)	1 1 1	
4(b)(ii)	No heat energy lost to surrounding / All heat energy is absorbed by the solid substance from the heater	1	**7**
4(c)	- Heat supplied is used to break up/overcome bonds between molecules - No increase in kinetic energy of molecules	1 1	
5(a)	Elastic potential energy	1	
5(b)(i)	Diameter spring B > Diameter spring A	1	
5(b)(ii)	The extension of spring B > the extension of spring A	1	
5(b)(iii)	The spring constant spring A > the spring constant spring B	1	
5(c)(i)	The spring constant increases, the extension of spring decreases	1	
5(c)(ii)	Hooke's law	1	**8**
5(d)(i)	The extension of spring A becomes half. / $\frac{x}{2}$	1	
5(d)(ii)	The weight of load attached onto the springs is divided by two.	1	
6(a)		1	
6(b)	Right hand grip rule	1	
6(c)(i)	The number of turn of coils wire in Diagram 6.2 > the number of turn of coils wire in Diagram 6.1	1	
6(c)(ii)	The number of magnetic field line of force in Diagram 6.2 > the Number of magnetic field line of force in Diagram 6.1	1	
6(c)(iii)	Same	1	**8**
6(d)	When the number of turns of the coil increases, the strength magnetic field is increases	1	
6(e)(i)	The strength of magnetic field is unchanged	1	
6(e)(ii)	There is no change in magnitude of current flow	1	
7(a)(i)	$a = \frac{v-u}{t}$ $= \frac{40-0}{20}$ = 2 ms^{-2} (with correct unit)	1 1	
7(a)(ii)	F = ma = 4000 × 2 = 8000 N	1 1	

7(b)(i)	Increase/ More than 10	1	**10**
	To reduce the pressure exerted on the ground	1	
7(b)(ii)	Increase/ More than 2	1	
	To reduce the inertia effect/ any relevant reason	1	
7(c)	- Momentum of a heavy vehicle depend on its speed - Easy to control direction/ to reduce damage effect/To reduce impulsive force when accident occurs/	1 1	
8(a)(i) 8(a)(ii)		1 1	**12**
8(b)(i)	Total internal reflection	1	
8(b)(ii)	Binocular/ camera/ or any relevant gadget	1	
8(c)	$n = \frac{1}{\sin c}$ $n = \frac{1}{\sin 43°}$ $n = 1.47$	1 1	
8(d)(i)	<table><tr><th>Materials *Bahan*</th><th>Critical angle, *c* *Sudut genting, c*</th></tr><tr><td>A</td><td>53.13</td></tr><tr><td>B</td><td>48.75</td></tr><tr><td>C</td><td>41.14</td></tr><tr><td>D</td><td>50.28</td></tr></table>All corrects – 2 marks 1 – 3 correct – 1 mark	2	
8(d)(ii)	Material C	1	
8(d)(iii)	The critical angle, c < incidence angle, i/ The critical angle, c < 45°	1	
8(e)(i)	Reflection of light	1	
8(e)(ii)	To prevent overlapping image/ image blur/ not clear/ Mirror produce a distort image	1	

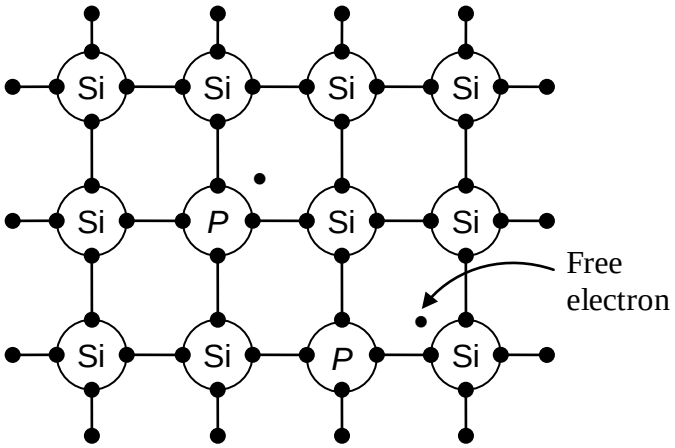
Section B

No.	MARKING CRITERIA	MARKS	TOTAL
9(a)	Atmospheric pressure is pressure exerted on the surface of any object by atmospheric gas/ Atmospheric pressure is pressure exerted on the surface of any object above the earth causes by weight of atmospheric gas	1	**1**
9(b)	- The altitude of mountain peak > the altitude of foothill - The P_{atm} at mountain peak < The P_{atm} at foothill - The density of air at mountain peak < the density of air at foothill - When the altitude increases, the air pressure decreases - When the air pressure decreases, the density of air decreases	1 1 1 1 1	**5**
9(c)	- When we suck through the straw, the air inside the straw is removed. - Produced a partial vacuum area in the straw - Difference in pressure occurs - P_{atm} is higher than the Pressure inside the straw - Force is exerted to pushed in the water into the straw Or using diagram	1 1 1 1 1	**Max 4**
9(d)	- Use warm clothing/ Thick clothing - To maintain body temperature/ to withstand low temperature/ to prevent drop in body temperature - Waterproof material for bagpack - To prevent water entering the bagpack - Light material for bagpack - Reduce load to carry - Strong material - Not easily torn - Provide oxygen tank/ Provide respiratory aids - To help breath normally/ To supply oxygen - Provide hiking sticks - To support the body balance - Provide boots with spikes - To increase grip on the surface of the ground Or any relevant design and reason	1 1 1 1 1 1 1 1 1 1 1 1 1 1	**Max 10**

10 (a)	Induced current is a current produces when a conductor is moved perpendicular to the magnetic line of force/ Current produced when the is relative motion between a conductor and magnetic field/ Current produced when the magnetic flux is cut by a conductor	1	**1**
10(b)(i)	Same	1	**5**
10(b)(ii)	The number of turns of the coils in Diagram 10.3 > the number of turns of the coils in Diagram 10.2	1	
10(b)(iii)	The induced current in Diagram 10.3 > the induced current in Diagram 10.2	1	
10(c)(i)	When the number of turns of coils increases, the change in magnetic field increases	1	
10(c)(ii)	When the number of turns of coils increases, the magnitude of induced current increases	1	
10(d)	- Magnetic flux is cut, induce current is produced in the coil. - When $\theta = 90°$, there is no current flow because the circuit is broken at the carbon brushes - When $\theta = 180°$, 360°, there is current flow in the coil. - Commutator is used to ensure the direction of the current flow in one direction. 	1 1 1 1 1	**Max 4**
10(e)	- Step down transformer - To reduce the output voltage - N_p : N_s is 12: 1 - To produce 20 V output voltage/ Reduce the voltage from 240 V to 20 V - Soft iron core/ Laminated soft iron core - Easy to magnetised and demagnetised/ Reduce eddy current/ - Connect a diode/ rectification circuit to the output voltage - Convert alternating current to direct current - Copper wire - Low resistance/More current flow/ less heat produce	1 1 1 1 1 1 1 1 1 1	**10**

Section C

No.	MARKING CRITERIA	MARKS	TOTAL
11(a)	The degree of hotness of a substance	1	**1**
11(b)	- The thermometer is put under the tongue/inside the mouth/under armpit - The heat is transferred from the body to the thermometer - Alcohol liquid expand until it reaches a state of thermal equilibrium - The temperature of the thermometer is the same as the body	1 1 1 1	**4**
11(c)(i)	$\theta_x = \left(\frac{L_x - L_0}{L_{100} - L_0}\right) \times 100^\circ C$ $\theta_x = \left(\frac{12-5}{25-5}\right) \times 100^\circ C$ $\theta_x = 35^\circ C$	1 1	**2**
11(c)(ii)	(35 + 273)K = 308K	1	**1**
	$30^\circ C = \left(\frac{L_{30} - 5}{20}\right) \times 100^\circ C$ $L_{30} = 11\text{cm}$		**1** **1**
11(d)	- Freezing point is low/ Freezing point < -65°C - To prevent liquid freeze at -65°C/ Not easy to freeze/ The thermometer can be used to record temperature at -65°C - Boiling point is high/ Boiling point > 20°C - Not easy to boil/The thermometer can be used to record temperature at 20°C - Opaque/Clear red in colour - Easy to observe the reading of thermometer - Thin glass wall of bulb - More sensitive to heat - R is chosen - Because it has freezing point < -65°C, high boiling point > 20°C, Clear red in colour and thin glass wall of bulb	1 1 1 1 1 1 1 1 1 1	**10**
12(a)	Semiconductor is a material with electrical conductivity better than insulator but weaker than a conductor	1	**1**
12(b)	- Doping process/Silicon is doped with pentavalent atoms/Phosphorus/Antimony - To produce covalent bond - Increase the free electron inside the semiconductor - Majority charge-carriers is negative electron	1 1 1 1	

		1	**Max 4**
12(c)(i)	$V_{X-Z} = 6$ V	1	**1**
12(c)(ii)	$V_{X-Y} = 6 - 1 = 5$ V	1	**1**
12(c)(iii)	$V_M = \left(\frac{R_M}{R_M + R_N}\right) \times 6V$ $5 = \left(\frac{R_M}{R_M + 1000}\right) \times 6V$ $5R_M + 5000 = 6R_M$ $R_M = 5000\ \Omega$	1 1 1	**3**
12(d)	- LDR is connected at base circuit - When intensity of light is low / dark, resistance of LDR increases / so V_{base} is large / transistor switched on - Terminal positive of batteries is connected to collector - So that the transistor is forward biased - Bulbs are arranged in parallel circuit - All bulbs are connected to voltage supply of 95V - Relay switch is used - So that the secondary circuit will switch on // So that the electromagnet will switch on the secondary circuit - Choose A - Because LDR is connected at base circuit, terminal positive of batteries is connected to collector; bulbs are arranged in parallel circuit and relay switch is used.	1 1 1 1 1 1 1 1 1 1 1 1	**10**

SECTION A

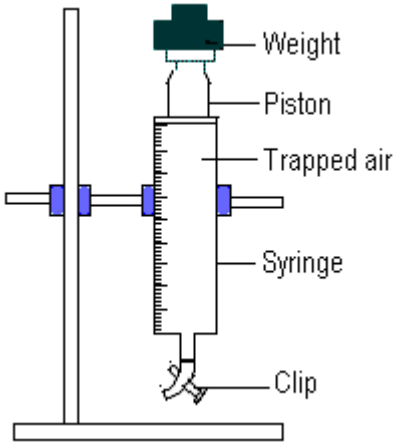
NO	MARKING SCHEME	MARK SUB	MARK TOTAL
1. (a) (i)	- Depth of water, d	1	**1**
(ii)	- wavelength, λ	1	**1**
(iii)	-Frequency	1	**1**
(b) (i)	-Diagram 1.3 : 4.2 cm, number of λ =7 -Diagram 1.4 : 4.0 cm, number of λ =5 -Diagram 1.5 : 4.0 cm, number of λ =4 -Diagram 1.6 : 3.6 cm, number of λ =3 *Note : Only 3 pairs correct, award 1 mark*	2	**2**
(ii)	<table><tr><th>d/cm</th><th>Distance AB/ cm</th><th>Number of λ</th><th>λ/cm</th></tr><tr><td>1.0</td><td>4.0</td><td>10</td><td>0.4</td></tr><tr><td>1.5</td><td>4.2</td><td>7</td><td>0.6</td></tr><tr><td>2.0</td><td>4.0</td><td>5</td><td>0.8</td></tr><tr><td>2.5</td><td>4.0</td><td>4</td><td>1.0</td></tr><tr><td>3.0</td><td>3.6</td><td>3</td><td>1.2</td></tr></table>		
	- *Quantities of d, distance AB, number of λ and λ shown in the table*	1	**1**
	- *State the units of d, distance AB, number of λ and λ correctly*	1	**1**
	- *All values of λ are calculated correctly (Only 3 values correct, award 1 mark)*	2	**2**
	- *λ must be consistent to 1 decimal place*	1	**1**
(c)	Draw a complete graph of λ against d Tick √ based on the following aspects : - A. Show λ on y-axis and *d* on x-axis - B. State the units of the variables correctly - C. Both axes are marked with uniform scale - D. All five points are plotted correctly, Note : Only three points plotted correctly, award √ - E. Best straight line is drawn - F. Show the minimum size of graph at least 5 x 4 (10 cm x 8 cm) square (counted from the origin until the furthest point)	√ √ √ √√ √ √	

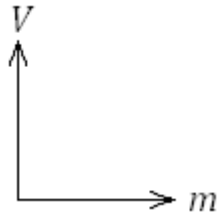
	Score **Number of √** → **Score** **7** → **5** **5-6** → **4** **3-4** → **3** **2** → **2** **1** → **1**	5	**5**
(d)	λ is directly proportional to d	1	**1**

Question 2

Section	Marks	Marking scheme
2 **(a) (i)**	**1**	uv is directly proportional to (u+v)
(ii)	**1**	Straight line from uv = 400 at *y*-axis and straight line to x-axis
	1	u+v = 40 cm
(iii)	**1**	when u = 20 m, v = 20 cm
(iv)	**1**	Draw a sufficient large triangle 5 x 4 (10 cm x 8 cm)
	1	Correct substitution(based on candidate's triangle)
	1	State the value /answer with unit : 10 cm
(b)	1	$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$
	1	$\frac{v+u}{uv} = \frac{1}{f}$
	1	*uv = f(u+v)*
(c)	1	**From** *uv = f(u+v)* and *y = mx + c*
	1	*f = gradient, m*
		= 10 cm
(d)	1	Carry out the experiment in a dark room to observe a clearer image //(any relevant answers)
Total	12	

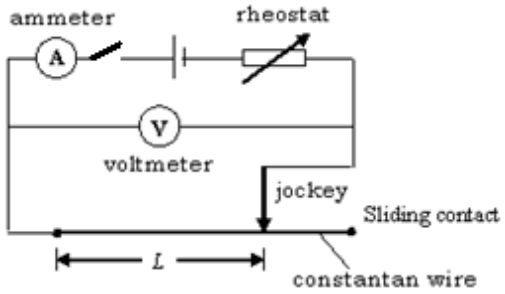
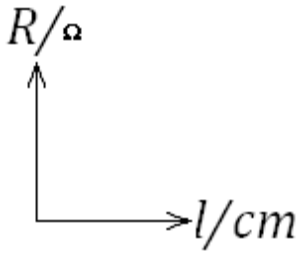
Question 3

(a)	1	*State a suitable inference* **Volume of the balloon depends on its pressure**
(b)	1	*State relevant hypothesis (with direction)* **The smaller the pressure, the greater the volume**
(c)	 1	*Describe a complete and suitable experimental framework* *State the aim of the experiment* **To investigate the relationship between mass of slotted weight and volume of gas**
	1	*State the manipulated variable and the responding variable* **Manipulated variable - mass of slotted weight, m** **Responding variable - Volume of gas, V**
	1	*State the constant variable* **Constant variable – cross section area, A // temperature**
	1	List out the important apparatus and materials **A big syringe and piston, slotted weights, rubber hose, clip and retort stand**
	1	*State a functional arrangement of the apparatus*  *Must: **syringe with scale***
	1	*State the method of controlling the manipulated variable* **Place a 200 g slotted weight onto the piston**
	1	*State the method of measuring the responding variable* **Measure the volume of the gas // Record the reading of the syringe, V**
	1	*Repeat the experiment at least 4 times with different values* **Repeat the experiment for different weights, 400 g. 600 g, 800 g and 1000 g .**

	1	*Tabulate the data* **Records the data.** **Mass, m/g** | **Volume, V/cm³** **200** | **400** | **600** | **800** | **1000** |
	1	*State how data will be analysed (sketch graph/statement)* 
Total	**12**	

Question 4

Section	Mark	Answer
(a)	1	*State a suitable inference* **Brightness of the bulb depends on the length of wire**
(b)	1	*State relevant hypothesis (with direction)* **The longer the wire, the higher the resistance**
(c)	 1	*Describe a complete and suitable experimental framework* *State the aim of the experiment* **To investigate the relationship between length of wire and its resistance**
	1	*State the manipulated variable and the responding variable* **Manipulated variable : length of wire, *l*** **Responding variable : resistance, R**
	1	*State the constant variable* **Constant variable – cross section area, A // temperature**
	1	List out the important apparatus and materials **Constantan wire, dry cells, rheostat, voltmeter, ammeter, ruler, connecting wires, switch and jockey**

<table>
<tr><td></td><td>1</td><td>State a functional arrangement of the apparatus
 
</td></tr>
<tr><td></td><td>1</td><td>State the method of controlling the manipulated variable
Turn on the switch.
Place the jockey at length of wire, l = 20.0 cm
Adjust the rheostat until the ammeter shows, I = 0.5 A</td></tr>
<tr><td></td><td>1</td><td>State the method of measuring the responding variable
Measure the potential difference, V.
Calculate resistance, R using the formula, R = V/I</td></tr>
<tr><td></td><td>1</td><td>Repeat the experiment at least 4 times with different values
Repeat the experiment for different lengths, l = 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.</td></tr>
<tr><td></td><td>1</td><td>Tabulate the data
Records the data.
<table>
<tr><th>l/cm</th><th>R/Ω</th></tr>
<tr><td>20.0</td><td></td></tr>
<tr><td>40.0</td><td></td></tr>
<tr><td>60.0</td><td></td></tr>
<tr><td>80.0</td><td></td></tr>
<tr><td>100.0</td><td></td></tr>
</table></td></tr>
<tr><td></td><td>1</td><td>State how data will be analysed (sketch graph/statement)
 
</td></tr>
<tr><td>Total</td><td>12</td><td></td></tr>
</table>

END OF MARKING SCHEME