SKEMA KERTAS 1

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

KERTAS 2

Soalan 1

1(a)	Ekor / tail	1
(b)	Mengukur kedalaman / measure depth	1
(c)(i)	Ralat sifar negatif / negative zero error	1
(c)(ii)	0.04 cm	1
	Jumlah	**4**
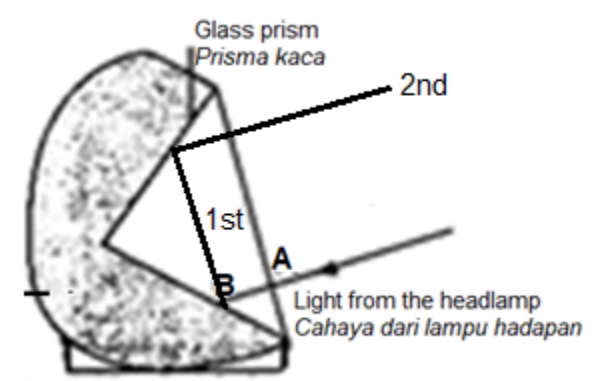
Soalan 2

(a)	Interferens	1
(b)	Interferens membina / puncak bertemu puncak / constructive interference / crest meets crest.	1
(c)	1st : $x = \underline{4}$ / 1.33 mm // $\underline{0.004}$ / 0.00133 m $\qquad$ 3 $\qquad\qquad$ 3 2nd $\quad \lambda = \underline{0.5 \times 1.33}$ // $\underline{0.0005 \times 0.00133}$ // $\underline{0.5 \times 10^{-3} \times 1.33 \times 10^{-3}}$ $\qquad\qquad$ 1500 $\qquad\qquad$ 1.5 $\qquad\qquad\qquad$ 1.5 3rd $\qquad = 4.43 \times 10^{-4}$ mm / 4.43×10^{-7} m	3
	Jumlah	**5**

Soalan 3

(a)	Induced current / arus aruhan	1
(b)	Terdapat pemotongan fluks / medan magnet // cutting of magnetic field / flux	1
(c)(i)	North / utara	1
(c)(ii)	Lenz's law	1
(d)(i)		1
(d)(ii)	Tiada pemotongan fluks magnet // No deflection of magnetic field / flux	1
	Jumlah	**6**

Soalan 4

(a)	Sudut tuju di mana sudut biasan ialah 90º Incident angle where refractive angle is 90º	1
(b)(i)		2
(b)(ii)	Pantulan dalam penuh / Total internal reflection	1
(c)	Sinar tuju selari dengan garis normal / incident angle parallel with normal lline	1
(d)	1ˢᵗ Sin c = 1/1.52 2ⁿᵈ c = 41.14º	2
	Jumlah	**7**

Soalan 5

(a)	Tenaga kinetic molekul bertambah / kinetic energy of molecules increased	1
(b)(i)	X > Y	1
(b)(ii)	Temperature cup x decreases / suhu cawan x berkurang // temperature cup Y increases / suhu cawan Y bertambah	1
(b)(iii)	Cup x releases heat / cawan X bebas haba // cup Y absorb heat / cawan Y serap haba	1
(b)(iv)	When the temperature of an object decreases, it releases heat / apabila suhu objek berkurang, objek bebaskan haba // when the temperature of an object increases, it absorbed heat / apabila suhu objek bertambah, ia serap haba.	1
(c)	Thermal equilibrium / keseimbangan terma	1
(d)(i)	Shorter time / masa lebih pendek	1
(d)(ii)	Cooking oil has a smaller specific heat capacity / minyak masak mempunyai muatan haba tentu lebih kecil.	1
	Jumlah	**8**

Soalan 6

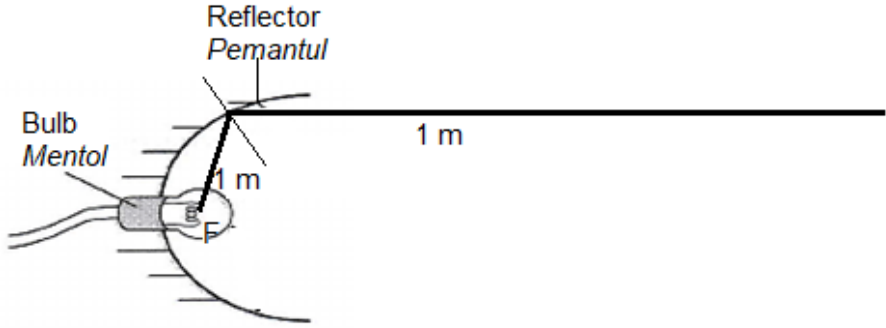| (a)	Electromagnetic waves / gelombang elektromagnet	1
(b)(i)	alpha the greatest // alfa palilng besar // alpha > beta > gamma	1
(b)(ii)	Alpha is the lowest // alfa paling kecil // alpha < beta < gamma	1
(b)(iii)	Alpha is the lowest // alfa paling kecil // alpha < beta < gamma	1
(c)(i)	Inversely proportional // berkadar songsang	1
(c)(ii)	Directly proportional // berkadar terus	1
(d)(i)	$^{238}_{92}U \rightarrow \, ^{4}_{2}He \rightarrow \, ^{234}_{90}Th$	1
(d)(ii)	Proton number and neutron number decreases // nombor proton dan nombor neutron berkurang // Z kurang 2, A kurang 4	1
	Jumlah	**8**

Soalan 7

(a)	The rate of change of momentum // Change of momentum over impact time *Kadar perubahan momentum//mv-mu/t*	1
(b)	Moves hand backward to prolongs impact time. *Gerak tangan kebelakang untuk meningkatkan masa hentaman*	1
(c)	$F = \dfrac{0.15 \text{ x } 30}{2 \text{ x } 10^{-2}}$ = 225 N (Answer with unit)	2
(d)(i)	1ˢᵗ : Thicker glove / *Sarung tangan yang lebih tebal* 2ⁿᵈ : increase the time impact / reduce impulsive force / *memanjangkan masa hentaman / mengurangkan daya impuls*	2
(d)(ii)	1ˢᵗ : Soft surface / *Permukaan lembut* 2ⁿᵈ : increase the time impact / reduce impulsive force / *memanjangkan masa hentaman / mengurangkan daya impuls*	2
(d)(iii)	1ˢᵗ: leather / *kulit* 2ⁿᵈ : Durable//Flexible//Long lasting /*Tahan lasak//mudah lentur//Tahan lama*	2
	Jumlah	**10**

Soalan 8

(a)(i)	<table><tr><td>A</td><td>B</td><td>Output</td></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table> 2 m jika betul semua	2
(a)(ii)	Exclusive OR // Exclusive ATAU	1
(a)(iii)		1
(b)	To activate second circuit which uses high voltage / current *Menghidupkan litar kedua yang menggunakan voltan tinggi / arus*	1
(c)(i)	1ˢᵗ : Thermistor / *termistor* 2ⁿᵈ : can detect heat / *mengesan haba*	2
(c)(ii)	1ˢᵗ: Alarm / *penggera* 2ⁿᵈ : produce sound / *hasilkan bunyi*	2
(c)(iii)	1ˢᵗ : cell 2 2ⁿᵈ : The collector terminal must be connected to the positive terminal of the cell / current can flow // *litar pengumpul mesti disambung ke terminal positif bateri / arus boleh mengalir.*	2
(c)(iv)	X	1
	Jumlah	**12**

Soalan 9

(a)	Distance between the pole of the mirror and focal point. *Jarak antara kutub cermin, P dan titik fokus.*	1
(b)	1st : curvature of the mirror surface: 9.2 > 9.1 *Kelengkungkan permukaan cermin* 2nd : The angle of bending of light rays: 9.2 > 9.1 *Sudut pembengkokan sinar cahaya* 3rd : focal length of the mirror: 9.2 < 9.1 *Panjang fokus cermin* 4th : the bigger the curvature of the mirror surface, the bigger the angle of bending of light rays *Semakin besar kelengkungkan cermin, semakin besar sudut pembengkokan sinar cahaya.* 5th : The bigger the curvature of the mirror surface, the shorter the focal length of the mirror. *Semakin besar kelengkungan permukaan cermin, semakin pendek panjang fokus cermin*	5
(c)	 (i)	2
(c)(ii)	1st : shiny reflector / use mirror as reflector / high power of light bulb / *pemantul berkilat / guna cermin sebagai pemantul / mentol berkuasa tinggi* 2nd : more light can be reflected / *lebih banyak cahaya dapat dipantulkan*	2

(d)	Answer	Reason	
	1st: Parabolic mirror // *cermin parabolik / cermin melengkung*	2nd : can focus heat / *tumpukan haba*	
	3rd: shining or smooth mirror // *cermin yang berkilat atau licin*	4th : reflection will be effective / *pantulan lebih berkesan*	
	5th :Big mirror // *cermin besar*	6th : More heat will be collected *Lebih banyak haba dapat dikumpulkan*	
	7th : kettle is at the focal point of the mirror / *cerek berada di titik fokus cermin*	8th : Heat converge to kettle / *haba ditumpukan ke cerek*	10
	9th :mirror is facing the sun / *cerek mengadap matahari*	10th: can capture more solar energy / heat *Boleh perangkap lebih banyak tenaga suria / haba*	

	Jumlah	20

Soalan 10

(a)(i)	Diffraction *Pembelauan*		1

(ii)	1st : Wave pattern before pass through the gaps are plane for two diagrams.
	corak gelombang sebelum lalu celah adalah lurus bagi kedua-dua rajah
	2nd : Wave pattern after through the gap is more circular in Diagram 10.1
	Corak gelombang selepas melalui celah lebih membulat dalam Rajah 10.1
	3rd : wavelength before and after passing through the gaps are equal
	// panjang gelombang sebelum dan selepas melalui celah adalah sama
	4th : The smaller the gap, the more circular the wave pattern after the go through
	   the gap / *Semakin kecil saiz celah, semakin membulat corak gelombang*
	   selepas melalui celah.
	5th : Wavelengths before and after passing the gaps are equal
	   Panjang gelombang sebelum dan selepas lalu celah adalah sama.
			5

	1st : Energy of the waves focused at the cape.
	Tenaga gelombang ditumpukan di tanjung.
	2nd : Energy increases, amplitude increase // directly proportional / energy
	   increases / amplitude increase.
	Tenaga bertambah, amplitud bertambah // berkadar terus / tenaga bertambah /
	   amplitud bertambah
	3rd : Energy at the bay area is spread out.// *Tenaga di telok disebarkan.*
	4th : Energy decreases / amplitude zero / *Tenaga berkurang / amplitud zero*		

(b)	Answer	Reason		
	1st: buoys has low density // *pelampung berketumpatan rendah*	2nd : light / float easily / *mudah terapung/ ringan*		
	3rd: strong buoys // *pelampung kuat*	4th : can withstand high wave / does not break easily / *boleh menahan ombak besar / tidak mudah pecah*		10
	5th :anchor made with high density material / heavy material // *sauh dari bahan yang berketumpatan tinggi / bahan berat*	6th : can sink in the water / hold the buoys in water at the same place/ *Boleh tenggelam dalam air / pegang pelampung supaya terapung di tempat yang sama.*		
	7th : pengesan di bawah laut *Detector under the sea*	8th : detect the earth quake activity and send signal to the buoys. / *kesan pergerakan gempa bumi dan hantar isyarat ke pelampung*		
	9th :satelit and receiver at the shore / satelit dan penerima di pantai	10th: The signal receive from the detector under water is sent to the satellite and then send to the receiver at the shore. *Isyarat di terima dari pengesan di bawah laut dihantar ke satelit dan kemudian diterima oleh penerima di pantai.*		10

	JUMLAH	20

Soalan 11

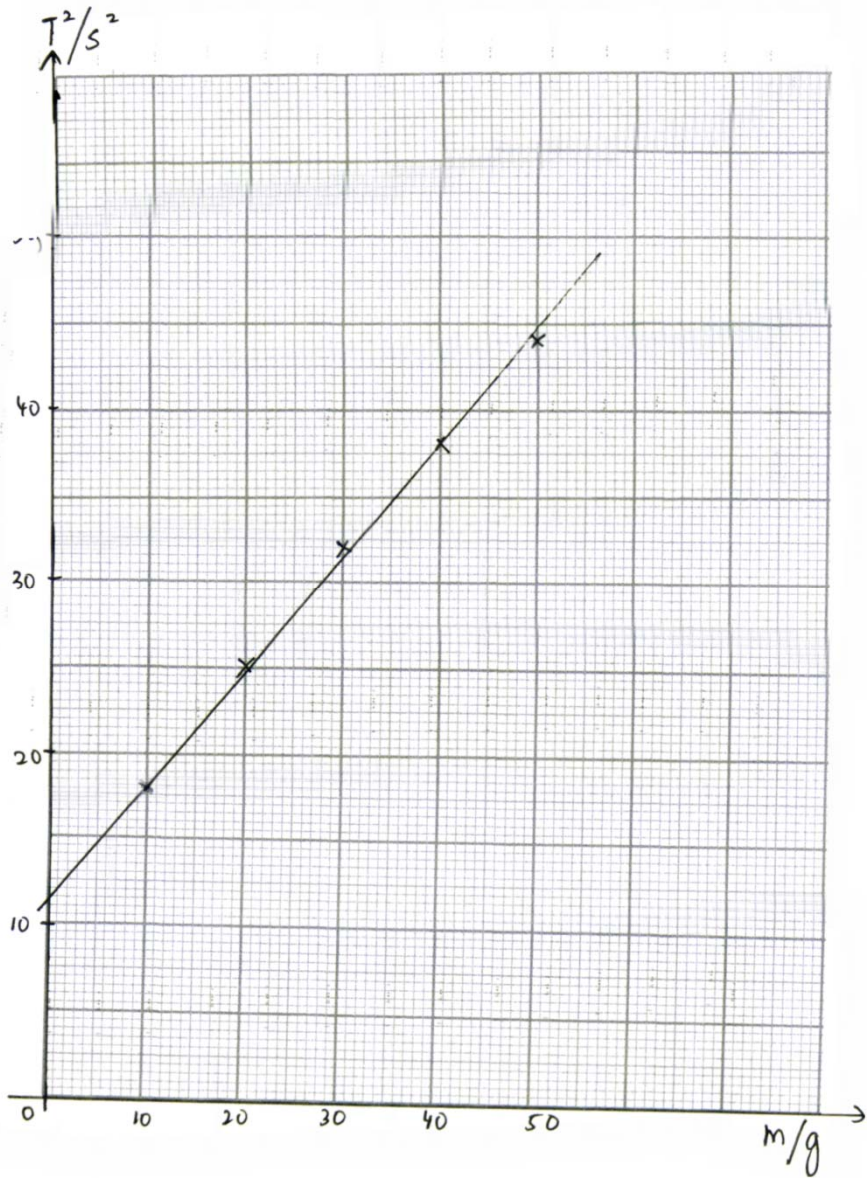|		
(a)	Archimedes Principle	1
(b)(i)	To ensure the ship will not be overload / Ensure the safety of the ship // memastikan kapal tidak melebihi had muatan / memastikan keselamatan kapal	1
(b)(ii)	1st: density of sea water varies in different location due to different temperature. // Ketumpatan air laut berbeza mengikut lokasi disebabkan perubahan suhu. 2nd: Ship sinks deeper in river because river less dense than sea water. Kapal tenggelam lebih dalam dalam air tawar kerana ketumpatan air tawar lebih rendah dari air laut. 3rd: Ship sinks lower in cold water during winter because cold water is denser than hot water. // Kapal tenggelam lebih rendah dalam air sejuk di musim sejuk kerana air sejuk lebih tumpat dari air panas. 4th : Plimsoll line will enable the ship to travel safely in different densities of sea water / *Garis Plimsoll akan pastikan kapal berlayar dengan selamat dalam ketumpatan air laut yang berbeza.*	3 max
(c)	<table><tr><th>Characteristics</th><th>Reason</th></tr><tr><td>1st :Streamlined shape *Bentuk larus*</td><td>2nd : To reduce water resistance / *kurangkan rintangan air*</td></tr><tr><td>3rd : High strength of metal // *kekuatan logam tinggi*</td><td>4th : To withstand high water pressure *Menahan tekanan air yang tinggi*</td></tr><tr><td>5th : Wide base cross section area // *luas keratan rentas dasar yang luas*</td><td>6th : So that ship can float//Prevent from overturn//Ship more stable/Ship not sink deeper // *kapal boleh terapung // elak kapal terbalik / kapal stabil*</td></tr><tr><td>7th :High volume of air space in the ship / *isipadu ruangan udara dalam kapal yang tinggi*</td><td>8th : Produce air buoyant force//Ship can float // *hasilkan daya apungan besar // kapal boleh terapung*</td></tr><tr><td>9th : Structure P</td><td>10th : Streamlined shape,high strength of metal, wide base cross section area, high volume of air space in the ship // *bentuk larus, kekuatan logam tinggi, luas keratan rentas dasar yang luas, isipadu ruangan udara dalam kapal yang tinggi*</td></tr></table>	10
(d) (i)	Volume of water displaced = Volume of wooden block $= m/p = 3/800$ $= 3.75 \times 10^{-3} m^3$	2
(ii)	Weight of load + Weight of wooden block = Weight of water displaced Weight of load + Weight of wooden block = pVg Weight of load + (3 x 10) = 1000 x 3.75 x 10^{-3} x 10 Weight of load + (3 x 10) = 37.5 Weight of load = 37.5 – 30 = 7.5 N	3

Soalan 12

(a)(ii)	A region where a charge will experience an electrical force. *Suatu kawasan di mana suatu cas akan mengalami suatu daya elektrik.*	1
(ii)	1ˢᵗ : It receives positive charges and becomes positively charged *Ia menerima cas positif dan menjadi bercas positif* 2ⁿᵈ : The positively charged polystyrene ball attracted to negative plate *Bola polisterin yang bercas positif tertarik ke plat negative* 3ʳᵈ : Positive charges neutralized and the ball becomes negatively charged when touches negative plate // *cas-cas positif dineutralkan dan bola menjadi bercas negatif apabila menyentuh plat negatif.* 4ᵗʰ : then attracted to plate positive, the cycle repeats causes the polystyrene ball oscillates between the two metal plates / *dan kemudian tertarik ke plat positif. Kitar tersebut berulang menyebabkan bola polistirena berayun di antara dua plat logam tersebut*	4

(b)	Answer	Reason	
	1ˢᵗ: The cells connected in series // *bateri disambung secara sesiri*	2ⁿᵈ : to produce a higher total voltage / *hasilkan jumlah voltan tinggi*	
	3ʳᵈ: positive terminals of the cells are connected to negative terminals of the cells // *terminal positif bateri disambung ke terminal negatif bateri*	4ᵗʰ : to make current flow / *arus boleh mengalir*	
	5ᵗʰ :resistor connected with the bulbs in series // *perintang disambung secara sesiri dengan mentol* $I_{bulb} = P/V = 0.5 / 2 = 0.25$ A $I_{total} = 0.25 \times 2 = 0.5$ A $V_{bulb} = 2$ V $V_R = (0.5)(5) = 2.5$ V	6ᵗʰ : To ensure the voltage across the bulb does not exceed 2 V Bulb does not blown up Increase resistance. *Pastikan voltan merentasi mentol tidak melebihi 2 V. Mentol tidak terbakar. Tambah rintangan.*	10
	7ᵗʰ : Bulbs are connected in parallel *Mentol disambung selari*	8ᵗʰ : the other bulbs still light up when one is blown / *mentol yang lain menyala jika satu terbakar*	
	9ᵗʰ :Circuit S	10ᵗʰ: Connect the cells in series, connect the positive terminals to the negative terminals, resistor connected with the bulb in series, the bulb connected in parallel *Bateri disambung sesiri, terminal positif bateri disambung ke terminal negatif bateri, perintang sesiri dengan mentol dan mentol disambung selari*	

(c) (i)	$E = I (R + r)$ $9.0 = I (7.0 + 4.0)$ $I = \dfrac{9.0}{11.0}$ $I = 0.82$ *A*	
(ii)	$\dfrac{1}{R} = \dfrac{1}{7} + \dfrac{1}{10}$	

		$R = \dfrac{70}{17}$		
		$R = 4.11\ \Omega$		
		$E = I\ (R + r)$		
		$9.0 = I\ (4.11 + 4.0)$		
		$I = \dfrac{9.0}{8.11}$		
		$I = 1.11\ A$		5
			TOTAL	

KERTAS 3

Section A
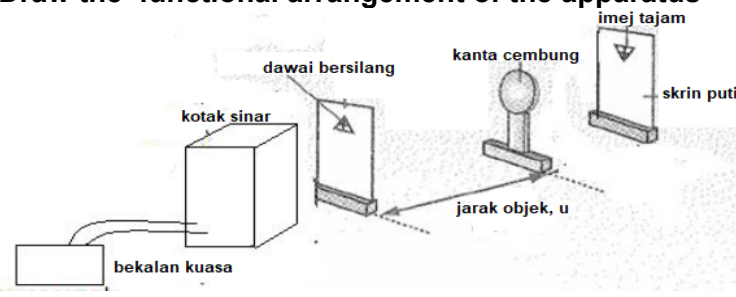
NO			MARKING SCHEME	MARK
1	(a) i		Mass / jisim / m	1
	ii		Period / Tempoh / T	1
	iii		Length of the jigsaw blade / panjang bilah gergaji	1
	(b) i		minimum 3 correct reading of h	1
			minimum 5 correct reading of h	1
	ii		Minimum 5 correct reading of W	1
	iii		minimum 3 correct reading of h	1
			minimum 5 correct reading of h	1

(c)					
	m/g	t/s	T/s	T^2/s^2	
	10	42.4	4.24	17.98	
	20	50.0	5.00	25.00	
	30	56.2	5.62	31.58	3
	40	61.6	6.16	37.94	
	50	66.2	6.62	43.82	

M1 – four column m, t, T and T^2
M2 – correct unitg, s, s and s^2
M3 – uniform decimal point for T^2 (1 or 2 d.p)

c	✓1 – label x-axis (m) and y-axis (h) correct	
	✓2 – correct unit for x-axis and y-axis	
	✓3 – even and uniform scale	
	✓4,5 – plotted all points correctly	
	✓6 – best fit graph	
	✓7 – Graph size (5 x 4 squares of 2 cm)	5

7✓	5 marks
6 -5 ✓	4 marks
4 - 3 ✓	3 marks
2 ✓	2 marks
1 ✓	1 mark
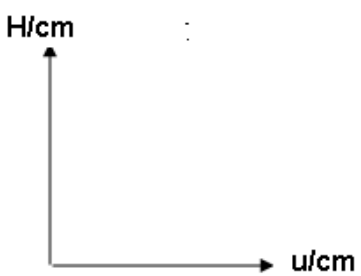
d	$T^2$is increases linearly to m T^2 bertambah secara linear dengan m	1
	Total	**16**

NO		MARKING SCHEME	MARK
2	a.i	**State the relationship between f and 1/x correctly** directly proportional / berkadar terus	1
	a.ii	When f = 570 Hz ; **Show the horizontal/vertical line to the axis** $1/x = 0.9 \text{ m}^{-1}$ x = 1/0.9 = 1.11 m	1 1 1
	a.iii	**Calculate the gradient of the graph and state the value within the acceptable range** Show the triangle with an acceptable size (5 x 4 squares of 2 cm) **Substitute correctly (according to the candidate's graph)** $m = \dfrac{570 - 0}{0.9 - 0}$ **State the correct value of the gradient with unit** **m = 633.33 Hzm // 633.33 ms⁻¹**	1 1 1
	b	$v = \dfrac{ma}{D}$ $v = \dfrac{(633.33)(2)}{10}$ **Show the value of v** $v = 126.67 \text{ ms}^{-1}$	1 1

	c	m = vD/a
		  (i) Gradient decreases / kecerunan berkurang
		  (ii) m is inversely proportional to a
			1
			1

	d	**State ONE correct precaution so as to produce an accurate result of the experiment** M1 The position of the eyes is perpendicular to scale readings of meter ruler to avoid parallax error // Repeat the experiment two times and then calculate the average reading, to increase accuracy.	1
		Total	**12**

Section B

|	NO	MARKING SCHEME	MARK
3	a	**State a suitable inference** The object distance affects the size of the image Jarak objek mempengaruhi jarak imej / saiz imej.	1
	b	**State a relevant hypothesis** The greater the object distance, the smaller the size of the image *Semakin panjang jarak obje, semakin kecil saiz imej / semakin pendek jarak imej*	1
	c.i	**State the aim of experiment** To investigate the relationship between the object distance and the size of the image *Untuk mengkaji hubungan antara jarak objek, u, dengan saiz imej // jarak imej, v*	1
	c.ii	**State the suitable manipulated variables and responding variable (Quantity that can be measured)** Manipulated variable : object distance, u *Jarak objek, u* Responding variable : height image, h / image distance, v *Tinggi image, h / jarak imej, v*	1
		State the constant variable Focal length, f *Panjang fokus kanta*	1
	c.iii	**State the complete list of apparatus and materials** Convex lens with holder, light bulb with power supply or candle light, screen, meter Ruler *Kanta cembung dengan pemegang, mentol bersama bekalan kuasa atau nyalaan lilin, skrin, pembaris meter.*	1
	c.iv	**Draw the functional arrangement of the apparatus** 	1
	c.v	**State the method to control the manipulated variable** **Procedure:** ✓ The convex lens is placed at distance of, *u* = 15 cm from the object ✓ *Kanta cembung diletakkan pada jarak, u = 15 cm daripada objek.*	1
		State the method to measure the responding variable ✓ The screen is adjusted until a sharp image is formed on it. ✓ The size of the image, *H* is measured. ✓ *Skrin dilaraskan sehingga imej tajam terbentuk di atas skrin.* ✓ *Tinggi imej, H diukur.*	1
		Repeat the experiment at least 4 times with the values The procedure is repeated with values of *u* = 20 cm, 25 cm, 30 cm, and 35 cm	1

		Eksperimen diulang dengan u = 20 cm, 25 cm, 30 cm, 35 cm	

	c.vi	**State how the data tabulated with the title MV and RV**		1
	c.vii	**State how the data is analysed, plot a graph RV against MV** H/cm : u/cm		1
			Total	**12**

Table for c.vi:

u/cm	H/cm
15	
20	
25	
30	
35	

3	(a)		Resistance// brightness of bulb depends on the diameter/ thickness of the conductor wire	1	
	(b)		W If the diameter/ thickness increase, the resistance decrease	1	
	(c)	(i)	To investigate the relationship between the diameter/ thickness of the conductor wire and resistance	1	
		(ii)	Manipulated : diameter/ thickness	1	
			Responding : resistance / voltage		
			Fixed : length of conductor	1	
			<u>Apparatus and material</u>	1	
			Dry cells, insulated constantan wire, connector wire, ammeter, voltmeter, rheostat, switch, meter rule		
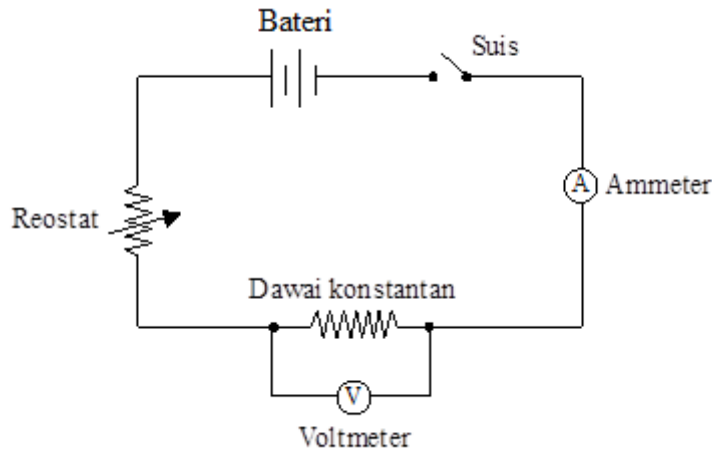
1

Procedure

A 20 cm length of constantan wire of diameter of 0.1 mm is connected to a circuit as shown in diagram above.

Adjust the rheostat and until the ammeter reading is I =(0.2 A)

Measure the corresponding reading on the voltmeter, V

1

Calculate the resistance of conductor using equation;

R=V/I

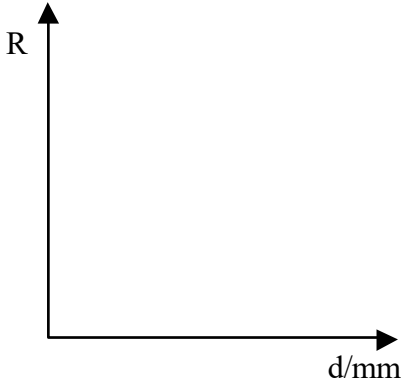Repeat the experiment with the diameter of constantan wire, 0.2 mm, 0.3 mm, 0.4 mm and 0.5 mm.

1

1

Diameter, d /mm	Resistance, R/Ω
0.1	
0.2	
0.3	
0.4	
0.5	

1

(accept : swg as a scale of diameter)

					1
			R ↑ d/mm →			12