MAKTAB RENDAH SAINS MARA
MARKING SCHEME

SPM TRIAL EXAMINATION 2008

PHYSICS

PAPER 1
PAPER 2
PAPER 3

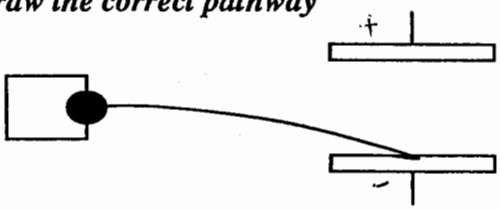
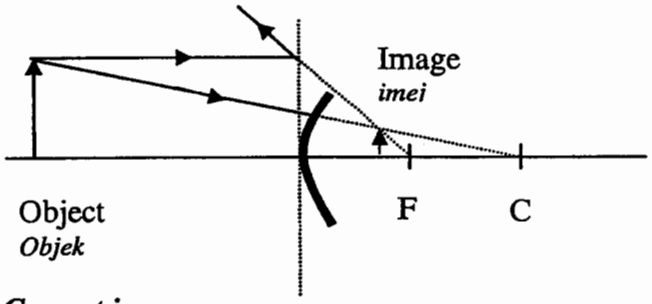
PHYSICS
PAPER 1

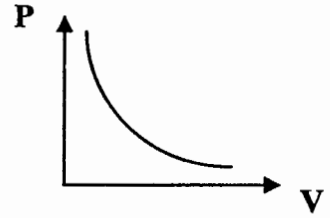
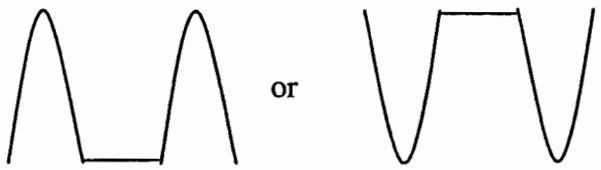
1	B	26	D
2	B	27	C
3	D	28	A
4	C	29	C
5	A	30	A
6	C	31	B
7	C	32	D
8	B	33	B
9	D	34	A
10	C	35	C
11	C	36	B
12	A	37	A
13	B	38	B
14	A	39	B
15	D	40	C
16	C	41	A
17	A	42	A
18	C	43	C
19	D	44	A
20	B	45	B
21	D	46	A
22	C	47	B
23	D	48	B
24	B	49	C
25	A	50	D

ANSWER SCHEME PAPER 2

SECTION A

Question No		Mark	Suggested answer	Note
1	(a)	1	***State the correct physical quantity*** Measures potential difference /voltage	Volt X
	(b) (i)	1	***State the correct relationship*** Increase	
	(ii)	1	***State the correct answer*** Remain unchanged	
	(c)	1	***State the correct physical quantity*** Length/temperature/cross-sectional area /resistivity of conductor / resistance	R ✓
			TOTAL = 4 MARKS	
2	(a)	1	***State the correct answer*** Product of mass and velocity	P = mv ✓ define dan symbols
	(b)	1 1	***State the correct substitution*** P = mv = (80)(100) ***State the correct answer with unit*** = 8 x 10^3 g m s^{-1} // 8 kg m s^{-1}	
	(c)	1	***State the correct answer*** Velocity decreases	
	(d)	1	***State the correct answer*** To increase time of impact// To reduce impulsive force	reduce impact X
			TOTAL = 5 MARKS	
3	(a)(i)	1	***State the correct definition*** Atom of an element which have the same proton number but different nucleon numbers and emit radioactive ray// Unstable isotopes which decay and give out radioactive emissions.	nuclei X unstable isotope ✓
	(a)(ii)	1	***State the correct answer*** Helium nucleus // alpha particle // α - particle	nucleus ^4_2He
	(b)	1 1	***Show the correct calculation*** $E= mc^2$ = 3.35 x 10^{-27} x (3 x 10^8)^2 ***State the correct answer with the correct unit*** =3.02 x 10^{-10} J	

	(c) i)	1	***Draw the correct pathway*** 	
	(c)(ii)	1	***State the correct answer*** An alpha particle is positively charged.	
			TOTAL = 6 MARKS	
4	(a)	1	***State the correct answer*** Convex mirror	
	(b)	1	***State the correct answer*** Wider field of view	
	(c)(i)	 1 1	***Complete the ray diagram***  ***Correct image*** ***Correct pathway for at least 2 rays***	Accept : rays reflected correctly on the **surface** of the curved mirror
	c)(ii)	1	***State the correct answer*** Virtual , Upright, Disminished	Any **2 correct** answers Reject: 1 correct answer
	c)(iii)	1 1	***Show the correct calculation*** m = v / u = 0.4 1.2 ***State the correct answer*** = 0.33	± 0 i cm ratio X
			TOTAL = 7 MARKS	
5	(a)	1	***State the correct instrument*** Bourdon gauge	spell rene be tol
	(b)(i)	1	***State the correct comparison*** Volume of the gas in 5.1 is greater than 5.2 more	

	(b)(ii)	1	***State the correct comparison*** lower Pressure of the gas in 5.1 is less than 5.2	
	(b)(iii)	1	***State the correct physical quantity*** Temperature is constant	Reject : mass (given in question)
	(b)(iv)	1	***Draw the correct shape of graph***  	**Correct axes**
	(b)(v)	1	***State the correct physics law*** Boyle`s Law	**Correct spelling for Boyle**
	(c)	1 1	***State the reason of change correctly*** When volume decreases, the number of collision per unit area increases. Pressure increases.	
			TOTAL = 8 MARKS	
6	(a)(i)	1	***Tick the correct answer*** Alternating current,AC.	
	(a)(ii)	1	***State the function correctly*** To change alternating current to direct current allow current to flow in one direction	convert ✓
	(a)(iii)	1 1	***Draw the correct waveform***  ***Draw the correct amplitude & frequency*** Same amplitude & frequency	
	(a)(iv)	1	***State the correct answer*** Rectification	
	(b)	1	***State the correct component*** Diode e s/c diode	
	(c)	1 1	***State the correct pure and foreign semiconductor*** Add pentavalent atoms (5 electrons atom) to tetravalent atom (4 electrons atom) ***State the extra electron correctly*** A free electron as a charge carrier	
			TOTAL = 8 MARKS	

7	(*a*)(i)	1	***State the correct answer*** Buoyant force // upthrust	
	(*a*)(ii)	1	***State the correct answer*** F = W	
	(*b*)	1 1	***Show the correct calculation*** F =W= mg = 200 x 10 ***State the correct answer and unit*** 2 000 N	
	(*c*)(i)	1	***State the correct answer*** Lower density // does not rust easily // anti-rust lighter // water resistance	stronger ✗ durable ✓
	(*c*)(ii)	1 1	***Show the correct calculation*** W = ρgV = 1020(10)(2) ***State the correct answer and unit*** = 2.04 x 10^4 N	
	(*c*)(iii)	1	***State the correct answer*** Sink	Rej: sink more Level underwater increase
	(*c*)(iv)	 1 1	***State the correct answer*** River has a lower density Weight is greater than buoyant force	
			TOTAL = 10 MARKS	
8	(*a*)	1	***State the correct meaning of electromagnet*** Electromagnet is a magnet in which a magnetic field is produced by the flow of electric current	
	(*b*) (i)	1 1	***State the suitable wire use as a coil*** Thick ***State the correct reason*** Because less resistance	
	(*b*) (ii)	1 1	***State the suitable type of core needed*** Soft iron ***State the correct reason*** Because easy to magnetise and demagnetise	
	(*b*)(iii)	1 1	***State the suitable number of turn on the coil*** Larger ***State the correct reason*** Because the strength of electromagnet increases.// Stronger magnetic field	

	(*c*)	1	***State the most suitable galvanometer to be used*** M	
	(*d*) (i)	1	***State the most suitable connection*** Parallel to the galvanometer	
	(*d*) (ii)	1	***State the correct reason*** Less effective resistance	
	(*d*) (iii)	1 1	***Show the correct calculation*** $V_R = V_G$ $(IR)_R = (IR)_G$ $(1A - 5mA)R = (5mA)(5\Omega)$ ***State the correct answer and unit*** $R = 2.51 \times 10^{-2}\Omega$	
			TOTAL = 12 MARKS	

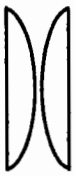
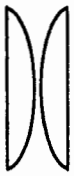
SECTION B

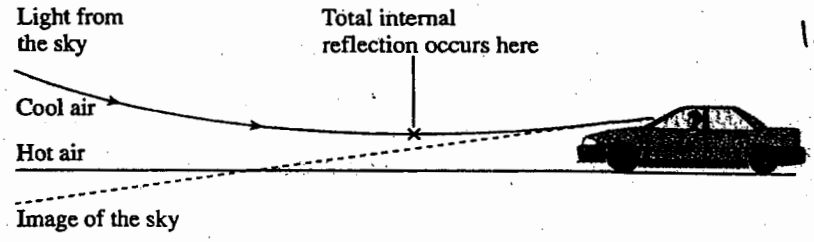
Question No		Mark	Suggested Answers
9	(a)		***Comparing the mass of both objects correctly***
		1	The coin is heavier than the ~~feather~~ // leaf mass of coin is greater than the mass of ~~feather~~ leaf
			Comparing the time taken to fall correctly
		2	Both objects reach the ground at the same time
			Comparing the positions of the objects correctly
		3	While falling, both objects are at the same position / both objects travel the same distance at any time
			Comparing the increase in velocity correctly
		4	The coin and ~~feather~~ leaf have the same increase in velocity // acceleration
			Deduce the physical quantity correctly , gravitational force X
		5	✓All objects falling under the influence of same gravitational field strength, g // all objects fall with the same gravitational acceleration due to gravity, g
	(b)		***State the suitable properties and their reasons correctly*** bottle X
		1	The material must be tough / strong - ℓ ↓
		2	Does not break easily when pressure is applied - easy to ~~launch~~ launch
		3	The shape is aerodynamic / streamlined aerofoil X
		4	Can move with the least amount of friction / reduce air resistance
		5	Angle of launching is 45° small / big X
		6	So that the rocket can travel very far // max. distance
		7	The volume of water is 1/3 of the whole volume // less // half ✓
		8	~~The rocket is light and can take off easily~~ // to increase momentum + impulsive force
		9	Attach/ fix fins at the tail of the rocket
		10	Rocket can move smoothly and stable / does not wobble X to pusing
	(c)(i)		***State the correct meaning of energy***
		1	Energy is the ability to do work
	(c)(ii)		***State the correct energy changes***
		1	Total energy at any time is constant potential energy X
		2	As the stone falls, gravitational potential energy converts to kinetic energy
		3	gravitational potential energy is maximum at the highest point
		4	Kinetic energy converts to heat and sound when it hits the ground
			TOTAL = 20 MARKS MOZ@C

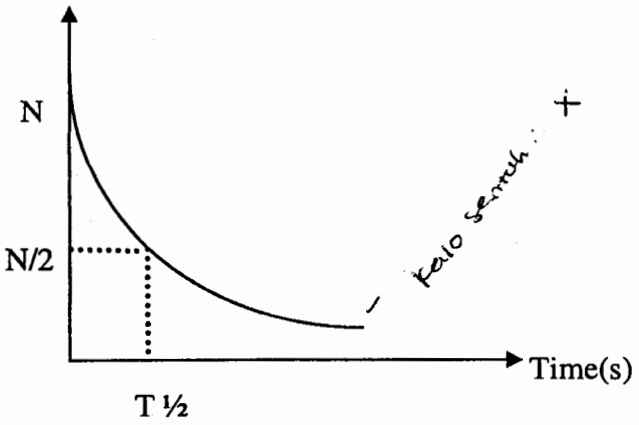
Question No		Mark	Suggested Answer
10	(a)		***State the correct meaning***
		1	Light of one frequency / wavelength // one colour
	(b)		***State the correct comparison***
	Reject nilai	1	In figure 10.1(a), distance between the double slit and screen, D is smaller
		2	In figure 10.1(b), distance between two successive bright fringes, x is smaller
		3	In figure 10.1(b), the number of fringes is bigger / more fringes
		4	In figure 10.1(b), the width of fringes is smaller/ fringes are narrower (*accept : opposite answers for figure 10.2(a)*)
			State the correct relationship
		5	When the distance between the double slit and screen, D increases, the distance between two successive fringes, x increases
	(c)		***State the suitable characteristics and the justifications correctly***
		(i)	***Design (maximum 2 characteristics):*** * increase the size - able to accommodate more no. of students
		1	Build a dome-shaped or circular roof
		2	It improves the acoustic effect of sound
		3	Reduce the number of gaps/holes/opening like doors and windows
		4	Reduce the effect of diffraction
		(ii)	***Furnishing (maximum 2 characteristics):***
		5	Build the walls from sound-proof materials
		6	To avoid disturbance from outside / prevent loss of sound or diffraction
		7	Use soft materials/fabrics/cushion for the chairs
		8	To absorb the sound / to avoid reflection of sound
			Hang curtains on the walls / put carpets on the floors
			To absorb the sound / to avoid reflection of sound
		(iii)	***Sound and lighting systems (maximum 2 characteristics):***
		9	Place the loud speakers far away from each other / at the corners of the hall
		10	~~To prevent destructive~~ interference // to produce more constructive interference
			Increase the number of lamps or lights
			To get sufficient amount of light
		Max: 10	* place one speakers - to avoid interference

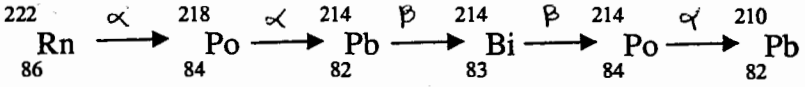
	(d)		***Explain the reason correctly***
		1	All particles in a material/matter/glass vibrate at its natural frequency
		2	The airplane engine produces noise which cause the air to vibrate
		3	Due to resonance, the glass particles vibrate at a higher / maximum amplitude
		4	Need strong glasses to withstand the effect of resonance/ the strong vibration/high amplitude so that it does not break easily.
			Total=20 MARKS

SECTION C

Question No		Mark	Suggested Answers
11	(a)		***State the correct meaning*** captured it can be seen
		1	Real image is the image that can be formed/caught on a screen
	(b)(i)		***State the correct specifications and the reasons***
		1	Type of mirror used is concave / draw the mirror 
		2	To focus light from the source to the slide
		3	The suitable arrangement is  P or R
		4	Light from the source is spread evenly to the slide to form a **bright** image on the screen
		5	The distance of slide from the projection slides is between f and 2f
		6	So that the image formed is **real**
		7	The slide should be placed inverted in the slide holder
		8	So that the image formed on the screen is **upright**
	(b)(ii)		***State the best choice and the reasons correctly***
		9	The most suitable is Q 
		10	Because the mirror used is concave or the arrangement of lenses is  The distance of slide is between f and 2f and the slide is placed inverted.

	(c)		***State the correct process***
		1	Light which travels from high density (cold) to low density (hot) is refracted away from normal/ diagram
		2	Near the road surface, the angle of incidence exceeds / greater than the critical angle
		3	Total internal reflection occurs and light bends towards the eye of the observer / diagram
			 label length → 3m
		4	***State the correct answer*** Yes
	(d)(i)		***State the correct explanation***
		1	Light from object travels from high density to low density
		2	Light is refracted away from normal ⇒ accept diagram.
		3	Image is formed nearer to the water surface
	(d)(ii)		***Show the correct substitution and correct answer***
		1	$1.33 = \frac{h}{0.4}$
		2	h = 0.53 m
			Total=20 MARKS

Question No		Mark	Suggested Answers
12	(a)		***State the correct meaning***
		1	Half-life is the time taken for half the atoms in a given sample to decay / for the activity remaining to become half
	(b)		***Sketch the correct graph***
		1	***Label the axes and unit correctly*** (Accept : any other units)
		2	***Draw the shape of decay curve correctly***
			Activity (number per s) 
		3	***Label N and N/2 correctly on the graph***
		4	***Label T ½ correctly on the graph***
	(c) (i)		***State the suitable properties and the justifications correctly***
		1	The type of radiation is gamma
		2	Gamma has a high penetrating power /can penetrate the ~~body~~ easily
		3	The half-life is ~~short~~ long
		4	~~Prevent over exposure to radiation/ Less harmful to the healthy cells / sufficient time to get the results~~
		5	The radioactive substance should be ~~liquid~~ solid
		6	~~Can flow easily into the blood system~~
		7	Ionizing power is low
		8	Does not ionize healthy cells / does not cause cell mutation
	(ii)		***State the best choice and the reasons correctly***
		9	The most suitable is K L K and L
		10	Because it radiates gamma ray, the half-life is ~~short~~ long, the state of matter is ~~liquid~~ solid and it has low ionizing power

	(d)(i)		***State the answer correctly*** ✓ ✓ increase ✗
		1	The number of nucleon changes // ~~decrease~~ // constant ═ Fakta proton no. changes ✓
	(ii)	2	***State the correct decay series***
		3	***State the correct nucleon number and the proton number for each radioactive substance in the series*** 
	(iii)		***State the number of alpha and beta particles correctly***
		4	3 alpha particles
		5	2 beta particles Kene nyatakan.
			TOTAL = 20 MARKS

508
510
505
502
501
518

ANSWER SCHEME (PAPER 3)

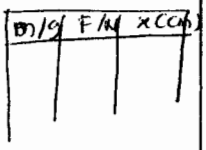
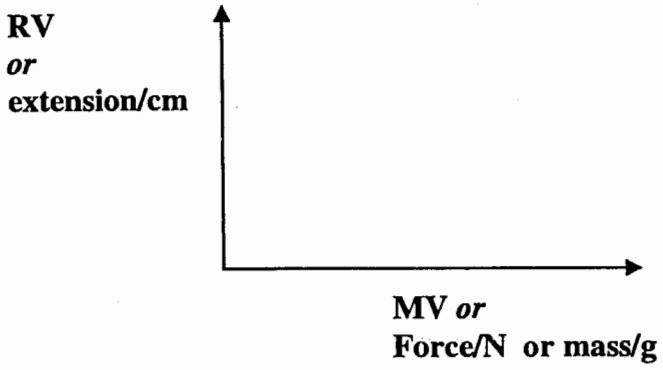
No.	Marks	Rubric and Answer	Notes
1(*a*)(i)	1	***State the manipulated variable correctly.*** Depth of water // *h*	
1(*a*)(ii)	1	***State the responding variable correctly*** Pressure of the liquid, *P* // different level in the manometer // *ℓ* // length of liquid rises in manometer ✗	
1(*a*)(iii)	1	***State the fixed variable correctly*** Density of water//atmospheric pressure // type of liquid ✓	Reject: the type of water
1(*b*)(i)	1 1 1	***Tabulate the data correctly.*** ***All values of x_1 and unit are correct*** 2.7, 2.9, 3.2, 3.9 and 4.5 ***All values of x_2 and unit are correct*** 2.3, 1.8, 1.3, 1.1 and 0.9 ***All values of ℓ for each depth of water using the formulae $\ell = x_1 - x_2$ are correct*** ***4 value of ℓ for each depth of water using the formulae $\ell = x_1 - x_2$ are correct*** When h = 0.5 cm, $\ell = 2.7 - 2.3 = 0.4$ cm h = 1.0 cm, $\ell = 2.9 - 1.8 = 1.1$ cm h = 1.5 cm, $\ell = 3.2 - 1.3 = 1.9$ cm h = 2.0 cm, $\ell = 3.9 - 1.1 = 2.8$ cm h = 2.5 cm, $\ell = 4.5 - 0.9 = 3.6$ cm	All answers in 1 decimal point Accept: without unit
1(b)(ii)			

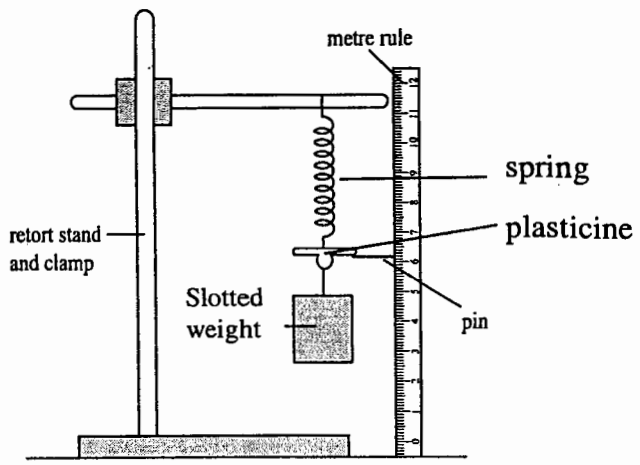
***h*/cm**	***x_1*/cm**	***x_2*/cm**	***ℓ* /cm**
0.5	2.3	2.7	0.4
1.0	1.8	2.9	1.1
1.5	1.3	3.2	1.9
2.0	1.1	3.9	2.8
2.5	0.9	4.5	3.6

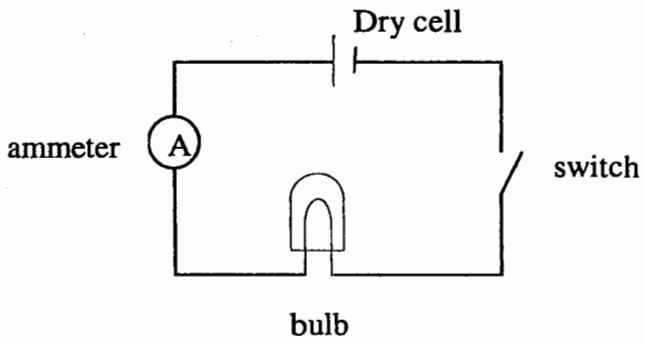
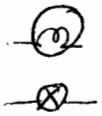
		Give one ✓ based on these:	
	A	Table consists of h, x_1, x_2, *and* ℓ (4 columns)	Give ✓
	B	State the unit for each of the above physical quantities	Give ✓
	C	State the values of h correctly	Give ✓
	D	State the values of x_1 correctly	Give ✓
	E	State the values of x_2 correctly	Give✓
	F	All values of h, x_1, x_2 are written in 1 decimal place	Give ✓

			No. of ✓	
	4		6	
	3		5	
	2		4	
	1		3	
	0		2/1	
1(*c*)			***Draw the graph correctly***	
	1	A	Label axes and unit x -axis : *h*/cm y- axis : ℓ /cm	Give ✓
	1	B	Even and uniform scales on both axes	Give ✓
	1	C	5 points plotted correctly	Give ✓
	1	D	Draw the best straight line (Balance)	Give ✓
	1	E	Large graph, minimum size: 10 cm x 8 cm	Give ✓
1(*d*)	1		***State the relationship correctly*** Pressure in liquid is directly proportional to its depth (through origin) // Pressure in liquid is linearly proportional to its depth (straight line, does not pass through origin)	
Total	**16**			

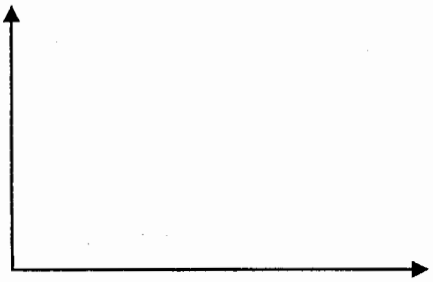
No.	Marks	Rubric and Answer	Notes
2(*a*)(i)	1	***State the relationship correctly*** v is directly proportional to x	
2(a)(ii)	1 1	***Show /Draw the dotted line on graph at $v = 4.0\ cms^{-1}$*** ***Correct answer and unit*** x = 2.25 cm	Solid line ✓
2(b)(i)	1 2 3	***Draw the triangle on the graph.*** (minimum size : 8 cm x 8 cm) ***Show the substitution correctly*** k = (6.7 –1.7) / (3.75 -1.0) ***Correct answer with correct unit*** = 1.82//1.818 s^{-1}@Hz	
2(*b*)(ii)	1 1	***Show the substitution correctly*** *P* = k/0.1 = 1.82/0.1//1.818/0.1 ecf ***Correct answer and unit*** 18.2//18.18 s^{-1} @Hz	
2(c)	1 1	***Show the substitution correctly*** t= 1/P = 1/18.2// 1/18.18 ecf ***Correct answer and unit*** 0.055 s e 0.0549 s	
2(*e*)	1 1	***State the precaution correctly*** ▪ Make sure that the depth of water in the ripple tank is constant (tank is horizontal) ▪ Use a sponge to avoid reflection of wave ▪ Use the same motor frequency	Accept other logical answers
Total	**12**	- do in dark room - repeat the exp. to calculate average reading.	

<table>
<tr><td></td><td>7</td><td>State the method of controlling the responding variable
Calculate the extension of the spring,x using the formula (length,l) – (initial length, l_o)</td><td></td></tr>
<tr><td></td><td>8</td><td>Repeat the experiment at least 4 times
Repeat the experiment using mass 100g, 150 g, 200g and 250 g (or force, F = 1.0 N, 1.5N, 2.0 N and 2.5 N)</td><td></td></tr>
<tr><td>(vi)</td><td>9</td><td>Tabulating the data
<table><tr><td>Mass / g or Force/N</td><td>Extension, x/cm</td></tr><tr><td>50.0 g or 0.5 N</td><td></td></tr><tr><td>100.0 g or 1.0 N</td><td></td></tr><tr><td>150.0 g or 1.5 N</td><td></td></tr><tr><td>200.0g or 2.0 N</td><td></td></tr><tr><td>250.0 g or 2.5 N</td><td></td></tr></table></td><td>Ifect cm
  </td></tr>
<tr><td>(vii)</td><td>10</td><td>State how the data will be analysed
 
</td><td></td></tr>
<tr><td>Total</td><td>12</td><td></td><td></td></tr>
</table>

No.	Marks	Rubric and Answer	Notes
3(*a*)	1	***State the suitable inference correctly.*** The pulling force influences the extension of the spring// The length spring is influenced by the pulling force // Length of spring depends on the force acting on it.	
3(*b*)	1	***State the hypothesis correctly*** The bigger the force, the longer the spring // the bigger the extension mass When the force increases, the length of spring increases	mass ✓
3(*c*)	***Explain the suitable frame of experiment correctly***		
(i)	1	***State the aim of experiment*** mass ✓ To study the relationship between force and the extension of spring.	
(ii)	2	***State the manipulated and responding variables correctly*** Manipulated variable : Force, F//mass,m ✓ Responding variable : extension of spring, x	no. of slotted weight ✗
	3	***State the constant / fixed variable*** Diameter//stiffness of spring/ The initial length, l_o/ Force constant of spring(k)	type of the spring ✗
(iii)	4	***List of apparatus and materials*** ✓ Spring ✓, pin, slotted weight ✓, retort stand with clamp, meter ✓ rule and plasticine. ***Mark for*** 6/5 item – 1 mark <= 4 item – 0 mark	at least 4 ∠4 ∴ 0
(iv)	5	***Show the arrangement of apparatus.***  ***Marks for labeling*** **6/5 – 1 mark** **<= 4 – 0 mark**	pemberat cefuk ∴ ✗
(v)	6	***State the method of controlling the manipulated variable*** Determine the initial length, l_o, without any slotted weight hang to the spring. Hang a slotted weight of mass 50 g (or force / weight of 0.5 N) and measure the length of the spring, l	

No	Marks	Rubrics and Answer	Notes
4(*a*)	1	***State the suitable inference correctly.*** The brightness of the bulb is influenced by// depends on the number of dry cell// The number of cells influences the brightness of the bulb	
4(*b*)	1	***State the hypothesis correctly*** voltage / potential different When the number of dry cell increases, the current passing through the bulb increases	Brightness ✗ V α I ✓
4(*c*)	***Explain the suitable frame of experiment correctly***		directly proportional ✗
4(*c*)(i)	1	***State the aim of the experiment*** voltage & current To study the relationship between the number of the dry cells//e.m.f and the current	
	2	***State the manipulated and responding variables correctly*** Manipulated variable : number of dry cell//e.m.f // voltage Responding variable : current	
	3	***State the constant / fixed variable*** Fixed variable: power of bulb// resistance of bulb ✓	only resistance ✗
	4	***List of apparatus and materials*** Dry cell, bulb, ammeter, switch, connecting wire, battery holder ***Mark for*** 6/5 item – 1 mark <= 4 item – 0 mark	power supply ✓ rheostat, voltmeter } Ohm's Law
	5	***Show the correct arrangement of apparatus.***  ***Marks for labeling*** **4 items – 1 mark** **<= 3 items – 0 mark**	
	6	***State the method of controlling the manipulated*** Connect one dry cell and close the switch	
	7	***State the method of controlling the responding variable*** Record the current shown by the ammeter	
	8	***Repeat the experiment at least 4 times*** Repeat the experiment by increasing the number of dry cell to 2, 3, 4 and 5	

<table>
<tr>
<td></td>
<td>9</td>
<td>Tabulate the data correctly
<table>
<tr><th>Number of dry cell</th><th>current, I/A</th></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>State how the data will be analysed

RV
or
I / A


MV or number of dry cells / voltage</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</table>

END OF ANSWER SCHEME