PENTAKSIRAN DIAGNOSTIK AKADEMIK
SEKOLAH BERASRAMA PENUH 2020

PEPERIKSAAN PERCUBAAN SIJIL PELAJARAN MALAYSIA
PHYSICS   **4531**
Kertas 1,2,3
Oktober 2020

PERATURAN PEMARKAHAN

PHYSICS

UNTUK KEGUNAAN PEMERIKSA SAHAJA

NAMA PEMERIKSA   :

NAMA SEKOLAH   :

TANDA TANGAN
PENERIMAAN   :
PERATURAN PERMARKAHAN

TARIKH   :

COP SEKOLAH   :

Peraturan Pemarkahan ini mengandungi **15** halaman bercetak.

PENTAKSIRAN DIAGNOSTIK AKADEMIK (FIZIK KERTAS 1)
SBP 2020
Marking Scheme Paper 1 (4531/1)

KERTAS 1

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

Analysis

Class/ Group	Min Score	Lowest Score	Highest Score	Top Incorrect response (The Question Number)

PENTAKSIRAN DIAGNOSTIK AKADEMIK (FIZIK KERTAS 2)
SBP 2020
Marking Scheme Paper 2 (4531/2)
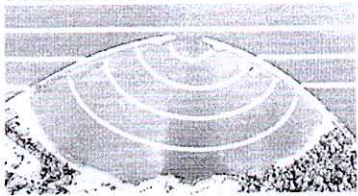
QUESTION 1

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Ammeter	1	1		
b.		Current	1	1		
c.		Series	1	1		
d.		Not light up	1	1		
		Total		**4**		
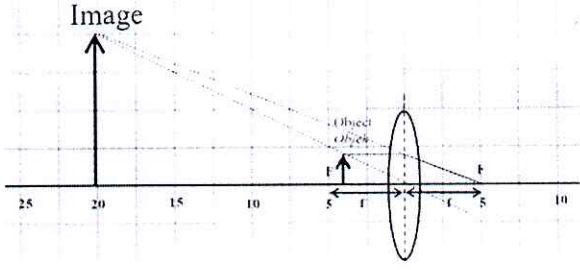
QUESTION 2

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Shortest distance between initial point to final point	1	1		
b.		Velocity increases uniformly // Conctant acceleration	1	1		
c.	i.	M1 $\frac{10-0}{18-22}$ M2 2.5 ms^{-1}	2	2		
	ii.	Velocity	1	1		
		Total		**5**		

QUESTION 3

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		The spreading out of waves when they move through a gap or obstacle	1	1		
b.		 M1 half circle (at least 3) M2 same wavelength	2	2		
c.		Decreases	1	2		
d	i.	Increases gap	1	1		
	ii.	Less obvious // less curve // less diffracted	1			
		Total		**6**		

QUESTION 4

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Converge the light	1	1		
b.		M1 light ray parallel to the principal axis passing through the F M2 light ray passing through the optical center in straight line M3 extrapolate the rays and draw an upright image at intersection point Label the direction of all the light rays		3		
c.		Alternative1 $v = 20$ cm *(v is determine from diagram)* $M = \dfrac{20}{4} = 5$ Alternative 2 $\dfrac{1}{5} = \dfrac{1}{4} + \dfrac{1}{v}$ $v = -20cm$ $M = \dfrac{20}{4} = 5$	1 1 1 1	2		
d.		Size of image is smaller	1	1		
			Total	7		
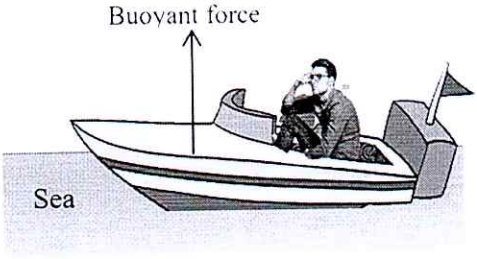
QUESTION 5

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Move randomly// move in straight line // collide with each other				
b.	i.	same mass				
	ii.	The volume of air in the syringe in Diagram 5.2 is bigger than the volume of air in the syringe in Diagram 5.1				
c.		Smaller pressure				
d		For a fixed mass of air, the pressure is decreases when the volume increases // the pressure is inversely proportional the volume				
e		Boyle's law				
f		M1 The air particles in the syringe collide less frequently with the walls of the container and with the balloon // less rate of collision occurs. M2 less force exerted by the air in the syringe on the balloon.				
		Total	**Total**	8		

QUESTION 6

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Time taken for the number of un-decay nuclei / mass/activity to be reduced to half of its original number of nuclei / mass / activity.	1	1		
b.	i.	No	1	3		
	ii.	Half-life radioactive substance X is bigger than radioactive substance Y	1			
	iii.	Less	1			
c.		Decay rate X < decay rate Y	1	1		
d.		Half-life decrease, decay rate increase	1	1		
e.		M1 Show smaller reading M1 Background radiation	1 1	2		
		Total		8		

QUESTION 7

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a	i	Buoyant force	1	1		
	ii	Buoyant force Sea	1	1		
b		$W = \rho V g$ $10000 \div 700 = 1020 \times V \times 10$ $V = 1.045 \ m^3$	1 1	2		
c	i	Shape of the boat: Steamline//Oval//Bullet Reason: To reduce water resistance	1 1	2		
	ii	Density of the boat material: Small Reason: Small mass//Lighter	1 1	2		
	iii	Add bouy//Drum//Float pods Reason: To stay afloat	1 1	2		
		Total	Total	10.		

QUESTION 8

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		The current that is induced by electromagnetic inductions when the circuit is complete// The current that can be produced without any electrical supply/source The current produced when the magnetic flux is cut across by a conductor// Changing of flux at conductor	1	1		
b.	i.	$P = (6)(0.5)$ $P = 3W$	1 1	2		
	ii.	$Efficiency = \dfrac{3}{15} \times 100\%$ $= 20\%$	1 1	2		
c.	i.	M1 Cylindrical magnet M2 Produce a magnetic flux that rotate // The rotating magnet produce a changing magnetic field	2	7		
	ii.	M1 High number of turn of the coil M2 Cut change of magnetic flux	2			
	iii.	M1 Soft iron core M2 Easy to magnetize and demagnetize	2			
	iv.	S	1			
		Total		**8**		

QUESTION 9

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		Velocity	1	1		
b.		Refractive index of lake water < Refractive index of sea water	1	5		
		The bending of paddle in lake water < bending of paddle in sea water	1			
		Velocity of light in lake water > Velocity of light in sea water	1			
		Refractive index increase, velocity of light decrease	1			
		Refraction of light	1			
c.		1. Light travel from turtle (object) in water (high density) into the air (low density).	1	4.		
		2. Refraction of light occurs when light bend away from normal and enter into eyes.	1			
		3. Light travel in straight line	1			
		4. cause the image form at above object at apparent depth; apparent depth < real depth	1			
d				10		

Suggestion	Reason	Mark
Type of cable: Fiber optic	Total internal reflection can occur	2
Cable length: Long	- More of cable able to be insert into the engine - Able to inspect deep part of engine	2
Diameter of cable: Small	Can enter narrow pipe or space in the engine	2
High power lamp at the end of cable	-Image is brighter -Image seen can be seen clearly	2
Flexible	Can be bend similar to the shape of engine space	2

				Total	20		

QUESTION 10

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.		An electronic circuit with a single output and one or more inputs	1	1		
b.	i.	P = 0, Q = 0, R = 1 J = 0, K = 0, L = 1 M1 minimum 2 are correct M2 minimum 4 are correct M3 All are correct	3	4		
	ii.	When both inputs are 0/OFF/Low, output = 1/ON *Apabila kedua-dua input 0/OFF/Rendah, maka output = 1/ON*	1			
c		NOR // TAKATAU	1	1		
d	i	Air-conditioner ON	1			
	ii	M1 If the temperature increases, X is ON. If human is presence in the room, Y is ON.	1	4		
		M2 Output ON and the potential difference across the resistor is high,	1			
		M3 the relay switch will switch on the secondary circuit//Air conditioner ON	1			
e		<table><tr><th>Suggestion</th><th>Reason</th></tr><tr><td>Type of 1st detector : LDR</td><td>resistance low when light is detected by the LDR</td></tr><tr><td>Type of 2nd detector: Rain detector</td><td>Resistance low when rain/water is detected by the detector</td></tr><tr><td>Waterproof material</td><td>Prevent water from penetrates the roof</td></tr><tr><td>Low density</td><td>Lighter, so it can be pulled or installed faster.</td></tr><tr><td>high power motor</td><td>More force is produced to pull the roof faster.</td></tr><tr><td>OR gate and NOT gate</td><td>1st input is high / 1 (rain is detected, and NOT gate reversed the output), or 2nd input is high (light is presence), output is on (roof is pulled by motor)</td></tr></table>	2 2 2 2 2 2	Max 10		
		Total		20		

QUESTION 11

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.	i.	*Draw the aerofoil correctly shape*	1	1		
	ii.	*State the explanation correctly* M1 higher trus force //move with high speed M2 high speed on the upper surface and lower speed on the lower surface (cross-sectional of a wing) M3 produced lower pressure on the upper surface and higher pressure on the lower surface M4 difference pressure occur M5 Produce lifting force	1 1 1 1 1	Max 4		
b.	i.	*Show the calculation correctly* *Substitute the value correctly* $a = \dfrac{F}{m} = \dfrac{200000}{13300}$ *Correct answer with unit* $a = 15.03 \text{ m s}^{-2}$	1 1	2		
	ii.	*Conversion of unit for v (km h^{-1} to m s^{-1})* $v = 79.17 \text{ m s}^{-1}$ *Substitution of value correctly* $v^2 = u^2 + 2as$ $79.17^2 = 0 + 2(15.03)\,s$ *Correct answer with unit* $s = 208.5 \text{ m}$	1 1 1	3		
c.		<table><tr><td>**Suggestion**</td><td>**Reason**</td></tr><tr><td>Body made of carbon fibre</td><td>- Lighter - Strong</td></tr><tr><td>Aerofoil shape</td><td>Reduce air friction</td></tr><tr><td>Smaller mass</td><td>Lighter</td></tr><tr><td>Narrow tyre without thread</td><td>Decrease friction</td></tr><tr><td>S</td><td>Body made of carbon fibre, aerofoil shape, Smaller mass, Narrow tyre without thread</td></tr></table>	2 2 2 2 2	10		
		Total		**20**		

QUESTION 12

Question		Answer	Mark Dist.	Total Mark	Students' Common Mistakes	Note
a.	i	Sound wave with frequency exceeding 20 kHz	1	1		
b.	ii	1. An ultrasonic transmitter will send the pulse to the obstacle 2. A receiver will detect the reflected pulse. 3. The time taken between sending and receiving pulse is noted 4. The distance can be calculated	1 1 1 1	4		
c.	i	$v = f\lambda$ ***Substitution of value correctly*** $v = (3000)(0.52)$ ***Correct answer with unit*** $v = 1560$ m s^{-1}	1 1	2		

	ii	***Conversion of prefixes to SI unit***
		5000 ms = 5000 x 10^{-3} s
		      = 5 s
		
		Substitution of value correctly
		$d = vt/2$
		  = 1560 x (5) / 2
		Correct answer with unit
		  = 3900 m
			1
			
			1
			
			1
				3		

d.		<table><tr><th>Suggestion</th><th>Reason</th></tr><tr><td>Type of wave: Ultrasonic wave</td><td>- high penetrating power - non-destructive method - non-hazardous to operate - no effect on equipment</td></tr><tr><td>Speed in metal: High</td><td>- can detect more flaw in industry and construction - shorter time</td></tr><tr><td>Frequency: High</td><td>- can detect small flaws - allows the detection of internal flaws</td></tr><tr><td>Type of transducer: Contact transducer</td><td>Can locate void, porosity and cracks easily</td></tr><tr><td>Q</td><td>Ultrasonic wave, high speed in metal, high frequency and contact transducer</td></tr></table>	2 2 2 2 2	10		
			Total	20		

PENTAKSIRAN DIAGNOSTIK AKADEMIK (FIZIK KERTAS 3)
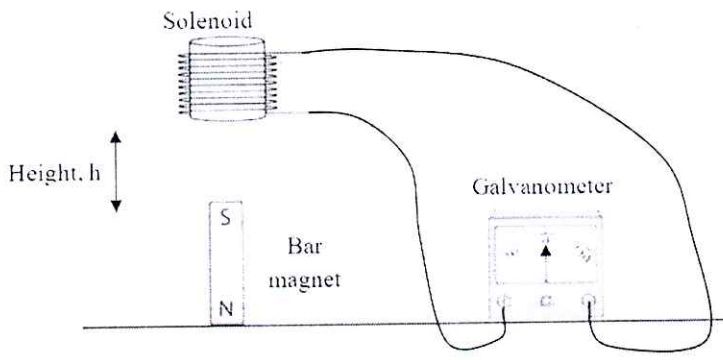
SBP 2020
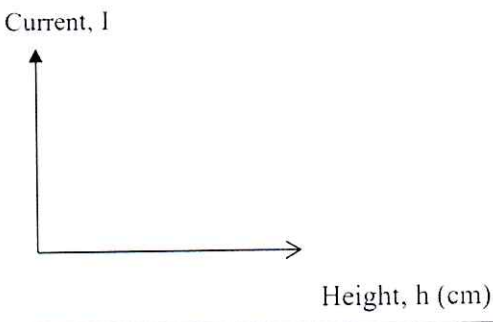
Marking Scheme Paper 3 (4531/3)

Question		Answer	Mark	Total Mark
1	(a)(i)	Manipulated variable: Distance between screen and double slit // D	1	
	(ii)	Responding variable: Distance between two consecutive bright fringe // x	1	
	(iii)	Constant variable = Distance between two slit // wavelength	1	
	(b)(i)	x_1 = 4.6, 4.5, 4.2, 4.0, 3.6	1	
		x_2 = 5.4, 5.8, 6.0, 6.4, 6.4	1	
	(ii)	x = 0.8, 1.3, 1.8, 2.4, 2.8 *All correct: 2 marks* *At least 3 correct: 1 mark*	2	
	(iii)	<table><tr><td>D / cm</td><td>x_1 / cm</td><td>x_2 / cm</td><td>x / cm</td></tr><tr><td>20.0</td><td>4.6</td><td>5.4</td><td>0.8</td></tr><tr><td>30.0</td><td>4.5</td><td>5.8</td><td>1.3</td></tr><tr><td>40.0</td><td>4.2</td><td>6.0</td><td>1.8</td></tr><tr><td>50.0</td><td>4.0</td><td>6.43</td><td>2.43</td></tr><tr><td>60.0</td><td>3.6</td><td>6.4</td><td>2.8</td></tr></table> *1 mark – 4 columns for D, x_1, x_2 and x* *1 mark – correct units for each D, x_1, x_2 and x* *1 mark - all values of x_1, x_2 and x are consistent 1 d.p*	3	

	(c)	**Draw the graph of D against x.**
		 A - Label y-axis and x-axis correctly✓
		 B -States the unit at the axis correctly✓
		 C -Both axes with the even and uniform scale ✓
		 D -5 points correctly plotted: ✓✓
		     - at least 3 points correctly plotted ✓
		 E -a smooth best straight line✓
		 F -minimum size of the graph is 5 x 4 squares of 2 cm x 2cm. ✓
		        7 ✓ - 5 marks
		       6-5 ✓ - 4 marks
		       3-4 ✓ - 3 marks
		       2 ✓ - 2 marks
		       1 ✓ - 1 marks
			5	

	(d)	x is directly proportional to D	1	
		Total		16

Question		Answer	Mark	Total Mark
2	(a)(i)	a is directly proportional to $\dfrac{1}{m}$	1	1
	(ii)	Extrapolate the graph $\dfrac{1}{m} = 1.75$ kg^{-1} m = 0.57 kg	1 1 1	3
	(iii)	The gradient of graph a against $\dfrac{1}{m}$ Draw a big triangle (4 x 4 blocks)(2 cm x 2 cm) $k = \dfrac{4 - 0 \text{ m s}^{-2}}{2.0 - 0.0 \text{ kg}^{-1}}$ $= 2$ kg m s^{-2}	1 1 1 (answer and correct unit)	3
	(b)(i)	*Show* $k = F$ $F = 2$ kg m s^{-2}	1 1 (answer and correct unit)	2
	(ii)	Increases $k \: \alpha \: F$	1 1	2
	(c)	The position of the eye is perpendicular to the reading scale of metre rule.	1	1
		Total		12

No		Answer	Marks	
3	(a)	**Write a suitable inference** The object distance affects the height// size of the image	1	1
	(b)	**Write a suitable hypothesis** The greater the object distance, the smaller the height of the image	1	1
	(c) (i)	**State the aim of the experiment** To investigate the relationship between the object distance and the height of the image	1	1
	(ii)	**State the manipulated variable and responding variable** Manipulated variable : object distance, u Responding variable : height of the image, H	1	2
		State the fixed variable Focal length of the lens / power of lens	1	
	(iii)	**State the list of apparatus and materials** Convex lens with holder, light bulb with power supply, screen, metre rule	1	1
	(iv)	**Draw a functional arrangement of the apparatus** Light bulb in holder connected to power supply// Cross-wire as the object in front of the bulb, convex lens in holder and screen – all align.	1	1
	(v)	**State how the manipulated variable is controlled** The convex lens is placed at distance of, $u = 15$ cm from the object	1	3
		State how the responding variable is measured The screen is adjusted until a sharp image is formed on it. The height of the image, H is measured.	1	
		State how the procedure is repeated to obtain at least 5 sets of results The procedure is repeated with values of $u = 20$ cm, 25 cm, 30 cm, 35 cm and 40 cm.	1	
	(vi)	**State how the data is tabulated** 	u / cm	H / cm
---	---
15	
20	
25	
30	
35	
40			1	
	(vii)	**State how the data is analysed** A graph of H against u is drawn	1	

No		Answer	Marks	
4	(a)	**State a suitable inference** Current induced/produced depends on the speed//height//compression	1	1
	(b)	**State a relevant hypothesis** The greater the height//compression, the greater the current induced	1	1
	(c) (i)	**State the aim of experiment** To investigate the relationship between the height//compression and the current induced	1	1
	(ii)	**State the manipulated variable and the responding variable** Manipulated variable: the height//compression Responding variable: magnitude of current induced, I **State ONE variable that kept constant** Fixed variable : strength of bar magnet // the number of turns/// Resistance/diameter of wire	1 1	2
	(iii)	**Complete list of apparatus and materials** Microammeter/galvanometer, retort stand, copper wire, connecting wire	1	1
	(iv)	**Arrangement of apparatus :**	1	1
	(v)	**State the method of controlling the manipulated variable** 1. Set-up the apparatus as shown in figure above. 2. Start the experiment with h = 30.0 cm. Drop the solenoid into the magnet at height of h=30.0 cm. **State the method of measuring the responding variable** 3. Record the magnitude of induced current, I shown on the galvanometer. **Repeat the experiment at least 4 times** 4. Repeat the steps by using h = 40.0 cm, 50.0 cm, 60.0 cm and 70.0 cm.	1 1 1	3

No	Answer	Marks	
(vi)	<table><tr><td>Height,h (cm)</td><td>Induced current, I (μA)</td></tr><tr><td>30.0</td><td></td></tr><tr><td>40.0</td><td></td></tr><tr><td>50.0</td><td></td></tr><tr><td>60.0</td><td></td></tr><tr><td>70.0</td><td></td></tr></table>	1	1
(vii)	A graph of *I* against *h* is drawn Current, I Height, h (cm)	1	1
	TOTAL	12	12

PERATURAN PEMARKAHAN TAMAT