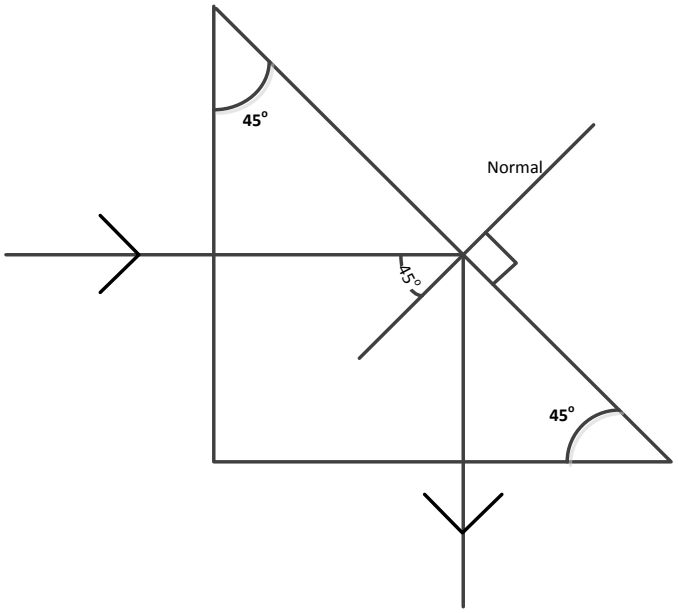
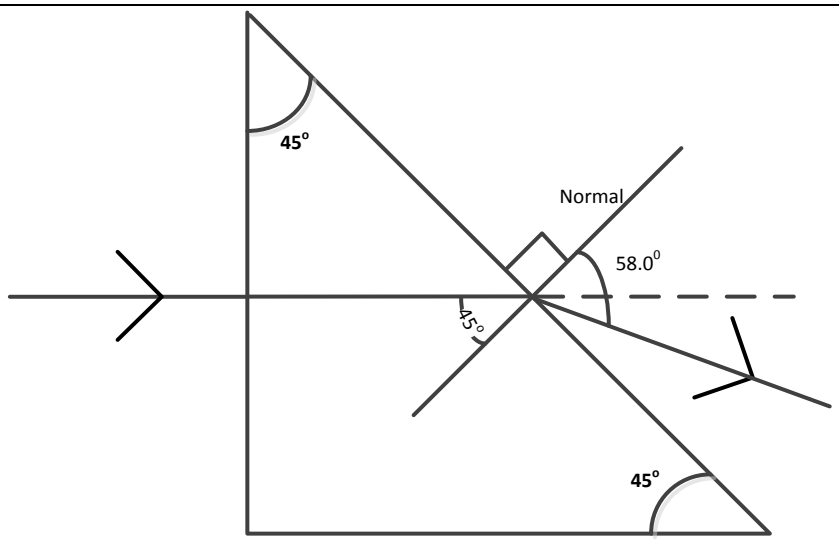
SMJK YU HUA KAJANG
MARKING SCHEME
PEPERIKSAAN AKHIR TAHUN TAHUN 2014
PHYSICS PAPER 2 FORM 5

NO	MARKING CRITERIA	MARKS	
No 1	**Measurement**	**SUB**	**TOTAL**
1 (a)	Ratchet	1	
(b)	- 0.03 mm	1	
(c)	Diameter of copper wire: Reading : 0.77 mm – (-0.03mm) = 0.80 mm	2	
		TOTAL	**4**

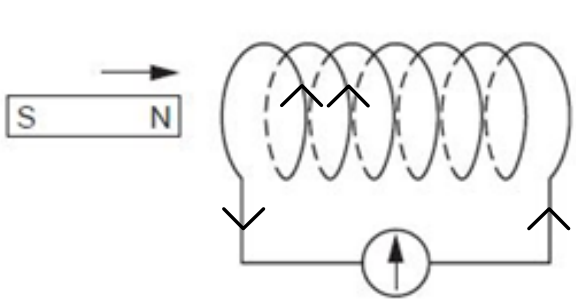
No 2	**Wave**	SUB	MARKS
(a)	Amplitude: a = 1.5 m	1	
(b)	Damped oscillation	1	
(c)	B C B A B	2	
(d)	T = 2 s	1	
		TOTAL	**5**

No 3	**Force and Motion**	**SUB**	**TOTAL**
(a)(i)	A to B : Uniform velocity // Zero acceleration // Constant velocity	1	1
(ii)	C to D: Uniform deceleration // constant deceleration	1	1
(b)	a = 5/50 = 1/10 ms^{-2} = 0.1 ms^{-2}	1	1
(c)	Distance BD: BC: ½ (5+10)30 = 225m CD: ½ (30) (10) = 150m Total: 225 + 150 = 375m	1 1	2
(d)	Point B to the starting point: OB : ½ (120 + 70) 5 = 475 m	1	1
		TOTAL	**6**

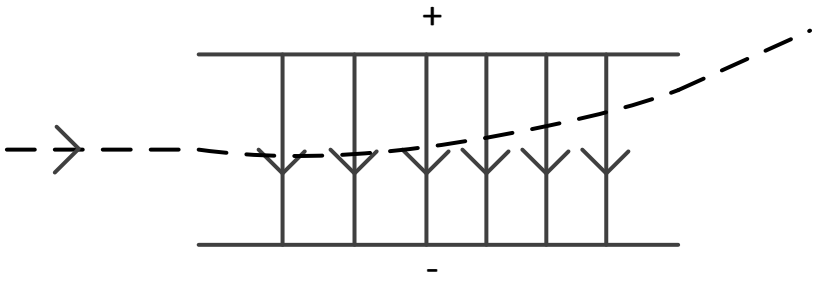
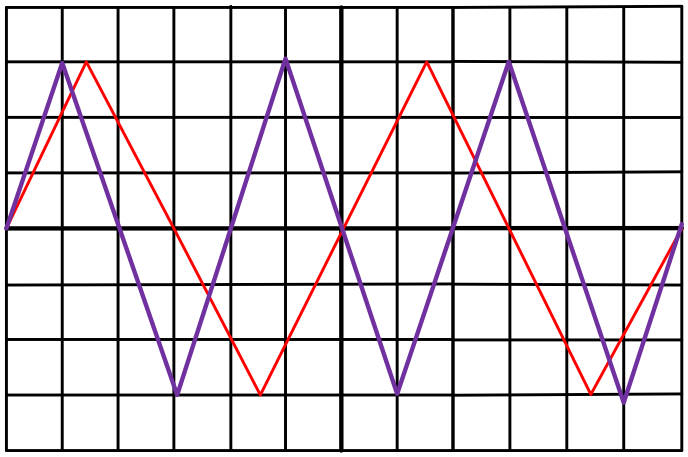
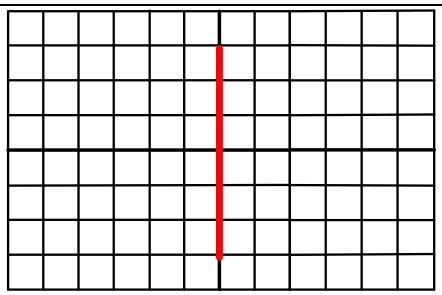
No 4	**Force and Pressure**	**SUB**	**TOTAL**
(a) (i)	Buoyant force in water: 0.2N	1	
(ii)	Buoyant Force in Oil: 0.1 N	1	
(b)	Density of water is more than the density of oil	1	
(c)	When the density of liquid increases, the buoyant force increase // or Buoyant force is directly proportional to the density of liquid	1	
(d)	Weight of the water displaced is more than the weight of oil displaced	1	
(e) (i)	Zero reading // 0 N	1	
(ii)	Buoyant force is the same	1	
		TOTAL	**7**

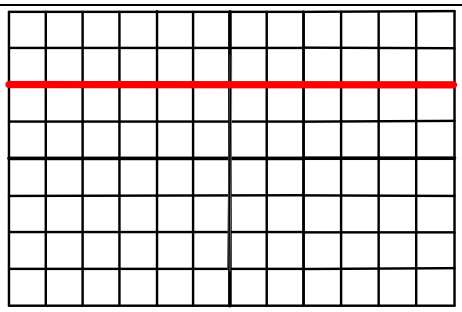
No 5	Light	SUB	TOTAL
(a)(i)	 ***Show incident angle = 45°***	1 1	2
(ii)	Refraction angle = 45^0	1	1
(iii)	Critical angle, c Sin c = 1/n = 1/1.5 c = 41.8^o	 1 1	 2
(iv)	Total internal reflection	1	1
(b)	 ***Refracted angle shown to get full 2 marks***	1 1	2
		TOTAL	**8**

No 6	Electromagnetism	SUB	TOTAL

(a)(i)	Move the wire XY downwards fast	1	1
(ii)	Current induced at X and Y flows in the opposite direction Therefore net induced current through XY is zero No induced emf and therefore no induced current	2	2
(b) (i)	Wire moved upwards: Y to X	1	1
(ii)	Lenz Law	1	1
(c)(i)	 ***Show at least one arrow on the circuit***	1	1
(c) (ii)	1. Move the magnet faster into the coil 2. Use a stronger magnet 3. Increase the number of turns in the coil ***Any 2 is correct***	1 1	2
		TOTAL	**8**

No 7	**Heat**	**SUB**	**TOTAL**
(a)	Specific Heat Capacity of a material is the heat required or released when 1 kg of material is heated through 1 ^{o}C	1	1
(b)	Thermal equilibrium is reach when the net rate of heat transfer between the aluminium block and thermometer is zero. The length of the mercury column will stop rising.	2	2
(c)	$Pt = m\,c\,(\theta_2 - \theta_1)$ $50 \times (12 \times 60) = 0.974\,(c)\,(61-33)$ $C = 1320\ J\ Kg^{-1}\ {}^{o}C^{-1}$	1 1	2
(d) (i)	Use felt jacket To prevent heat lost to the surrounding	1 1	2
(ii)	Oil is added to make a **good thermal** contact between the thermometer and the aluminium block and also between the heater and block	1	1
(e)	Physical quantity that will change: temperature Time will be shortened. // Less time to heat aluminium block	1 1	2
		TOTAL	**10**

No 8	Electronic	SUB	TOTAL
(a)(i)	To release electrons	1	1
(ii)	To accelerate the electrons // to pull the electrons	1	1
(iii)		2	2
(b)(i)	Peak Voltage = 9 V	1	1
(ii)	Period T = 60 ms = 0.06 s	1	1
(iii)	 Period of new waveform : T = 60ms/1.4 = 40ms One full oscillation must show 40 ms Amplitude no change	1 1 1	3
(c)		1	1

(d)		2	2
		TOTAL	**12**

<table>
<tr><th>No 9</th><th>Electromagnets</th><th>SUB</th><th>TOTAL</th></tr>
<tr><td>(a)</td><td>24V, 36W mean when a 24 V power source is used to light up the bulb, the power consumed or output is 36W.
Bulb will be in normal brightness</td><td>2</td><td>2</td></tr>
<tr><td>b(i)</td><td>Brightness of the bulb in Diagram 9.2 is higher than Diagram 9.1</td><td>1</td><td>3</td></tr>
<tr><td>(ii)</td><td>Transformer in Diagram 9.1: Step-down transformer
Transformer in Diagram 9.2: Step up transformer</td><td>1
1</td><td></td></tr>
<tr><td>(c)</td><td>When an ac current flow in the primary coil, an alternating magnetic field is set up inside the iron core

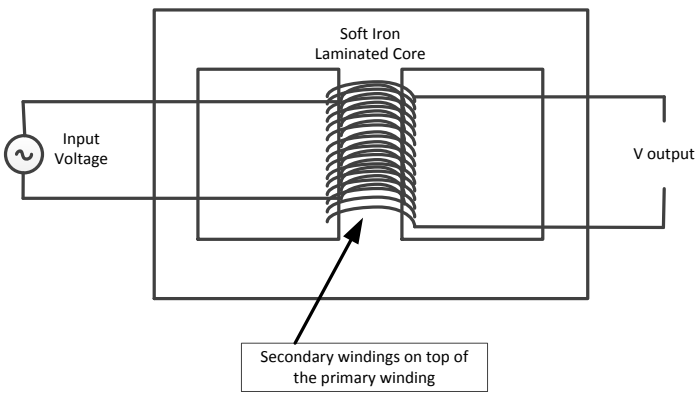
The alternating magnetic field lines in the primary coil cuts the secondary coil. An emf is induced in the secondary coil.

The induced emf will produce an induced current at the secondary coil</td><td>1

1

1</td><td>3</td></tr>
<tr><td>(d)</td><td>Diagram 9.2: Bulb at normal brightness

Current through bulb P = IV ➔ I = P/V = 36/24 = 1.5A</td><td>1

1</td><td>2</td></tr>
<tr><td>(e)</td><td>
<table>
<tr><th></th><th>Aspects</th><th>Modification</th><th>Reason</th></tr>
<tr><td>1</td><td>Type of wires used</td><td>Copper wire that have large diameter</td><td>Lower the resistance of the transformer</td></tr>
<tr><td>2</td><td>Material used</td><td>Core of transformer must be soft iron</td><td>Easily magnetise and demagnetize.
Magnetic fields can be concentrated inside the core</td></tr>
<tr><td>3</td><td>Core design</td><td>Laminated soft iron core</td><td>Reduce eddy current that will heat up the core to a very high temperature and reduce efficiency</td></tr>
<tr><td>4</td><td>Coil arrangement</td><td>Use a modified design of the core whereby the secondary coil is would on top of the primary coil</td><td>To reduce magnetic field leakage from the primary coil</td></tr>
</table>


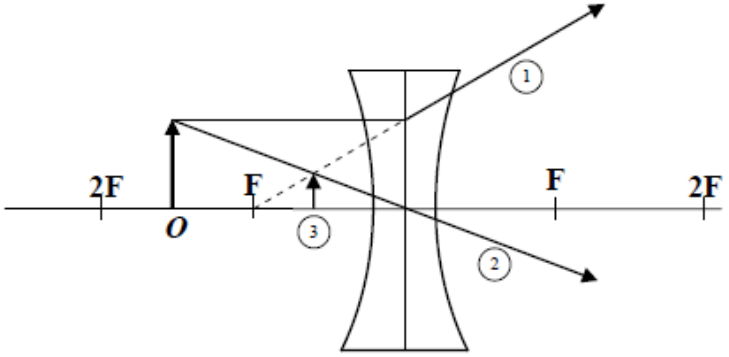
Drawing of the modified core</td><td>2

2

2

2

2</td><td>10</td></tr>
<tr><td colspan="2"></td><td>TOTAL</td><td>20</td></tr>
</table>

<table>
<tr><th>No 10</th><th>Light - Optics</th><th>SUB</th><th>TOTAL</th></tr>
<tr><td>(a)</td><td>Focal length is the distance between the pocus point and the optical center of the lens</td><td>1</td><td>1</td></tr>
<tr><td>b (i)</td><td>Same</td><td>1</td><td>1</td></tr>
<tr><td>(ii)</td><td>$u_2 > u_1$. // Focal length of lens in diagram 10.2 is longer than the focal length of lens in diagram 10.1</td><td></td><td>1</td></tr>
<tr><td>(iii)</td><td>$h_1 > h_2$.</td><td></td><td>1</td></tr>
<tr><td>c(i)</td><td>The longer the object distance u, the smaller is the image height h. // As the object distance increases, the height of image decreases</td><td></td><td>1</td></tr>
<tr><td>(ii)</td><td>Refraction</td><td></td><td>1</td></tr>
<tr><td>d (i)</td><td> 

Check all 3 lines for full marks.</td><td></td><td>3</td></tr>
<tr><td>d (ii)</td><td>Upright, virtual and smaller than object (diminished)</td><td></td><td>1</td></tr>
<tr><td>(e)</td><td>
<table>
<tr><th>Aspects</th><th>Design</th><th>Reasons</th></tr>
<tr><td>Objective Lens to be used</td><td>Convex Lens</td><td>Enable light to be focussed to form a diminised image</td></tr>
<tr><td>Focal length of objective lens compared to eyepiece M</td><td>Focal length of objective lens is longer than focal length of eye piece M</td><td>To produce a smaller image in front of the eyepiece M</td></tr>
<tr><td>Magnitude of linear magnification</td><td>Large linear magnification</td><td>To get the entire image of a very distant object</td></tr>
<tr><td>Distance between objective lens and M</td><td>f_o and f_e must be on the same point. Distance between the 2 lens $D = f_o + f_e$</td><td>To produce a final image at infinite and of high clarity</td></tr>
<tr><td>Diameter of objective lens</td><td>Use a large diameter objective lens</td><td>To capture as much light as possible from the distance object to enter telescope</td></tr>
</table>
</td><td>1+1
1+1
1+1
1+1
1+1</td><td>10</td></tr>
<tr><td colspan="2"></td><td>TOTAL</td><td>20</td></tr>
</table>

<table>
<tr><th>No 11</th><th>Force & Pressure – Bernoulli's Principle</th><th>SUB</th><th>TOTAL</th></tr>
<tr><td>(a)</td><td>Aerofoil</td><td>1</td><td>1</td></tr>
<tr><td>b (i)</td><td>• The aerofoil shaped of the cross section of the wing causes the speed of airflow above the wings to be greater than the speed of air flow below the wings.

• The higher the speed of air flow, the lower is the pressure. Pressure above the aerofoil is less than the pressure below the aerofoil

• Hence the difference in pressure between the top and bottom of the aerofoil creates a net force directed towards the top. This causes the the wings to be lifted upwards</td><td>1

1

1</td><td>3</td></tr>
<tr><td>(ii)</td><td>Bernoulli's principle</td><td>1</td><td>1</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Aspect/Specifications</th><th>characteristic</th><th>Reasons</th></tr>
<tr><td>Shape of cross section of wings</td><td>Shape of cross section of wings must be an aerofoil</td><td>To produce airflow speed to be higher above the wings than below the wings</td></tr>
<tr><td>Total area of wings span</td><td>Larger area of wing span</td><td>To produce a larger lift force based on formula F = PA</td></tr>
<tr><td>Density of wings material</td><td>Low density</td><td>Makes it lighter. Can produce more upward force</td></tr>
<tr><td>Ration of speed above and below the wings</td><td>Higher difference in air speed</td><td>To produce a bigger difference in pressure</td></tr>
</table>
P is chosen because
i. shape of the wings is an aerofoil
ii. Has a large area of wings
iii. Low density wings material
iv. Ratio of speed above and below the wings is the highest</td><td>1+1

1+1

1+1

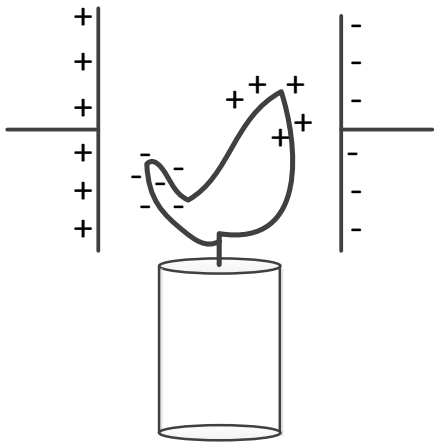
1+1

2</td><td>10</td></tr>
<tr><td>c(i)</td><td>Lift force, F_L

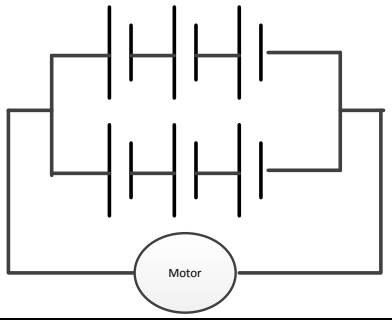
$P = F_L/A \rightarrow 500 = F_L/35$

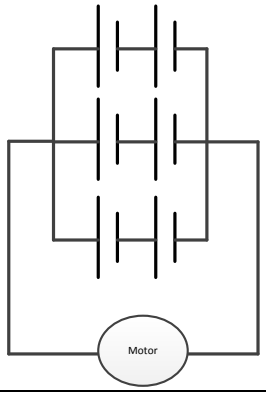
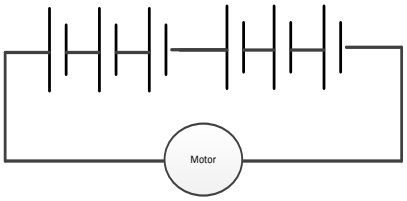
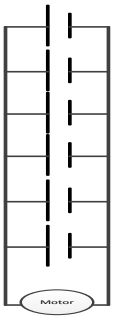
$F_L = PA = 500 \times 35.0 = 17{,}500$ N</td><td>1

1</td><td>2</td></tr>
<tr><td>(ii)</td><td>Resultance force on aeroplane
$F_R = mg - F_L = 1800\ (10) - 17500$
$= 18000 - 17500 = 500$ N
Aircraft cannot be lifted off because the weight exceeds the lift force</td><td>1
1
1</td><td>3</td></tr>
<tr><td colspan="2"></td><td>TOTAL</td><td>20</td></tr>
</table>

<table>
<tr><th>No 12</th><th>Electricity</th><th>SUB</th><th>TOTAL</th></tr>
<tr><td>(a) (i)</td><td>• An electric field is an area where a unit charge particle will experience a force.
Or
• Electric field is defined as electric force per unit charge experience by a charge particle
Or
• field of force surrounding a charged particle within which another charged particle experiences a force.</td><td>1</td><td>1</td></tr>
<tr><td>a (i)</td><td> 
• When switch is on, a very strong parallel electric field is formed between the 2 plate
• Flame from the candle will ionize the air
• Positive charges are pulled towards the negative plate while negative charges are pulled towards the positive plate
• Candle flame will break up into 2 parts as shown with larger part of flame pulled to the negative plate</td><td>

1

1
1
1</td><td>4</td></tr>
<tr><td>b(i)</td><td><table>
<tr><th>No</th><th>Arrangement of cell</th><th>Total R/Ω</th><th>Max Voltage V</th><th>Max Current I / A</th></tr>
<tr><td>1</td><td>  </td><td>3/4Ω</td><td>3V</td><td>4A</td></tr>
</table></td><td>2</td><td></td></tr>
</table>

	2		1/3 Ω	2V	6A	2	10
	3		3Ω	6V	2A	2	
	4		1/12 Ω	1 V	12 A	2	
	Arrangement **No1** should be used because i. The voltage 3V is in the applicable voltage range of the motor ii. Max. Current produced 4A will run the motor					2	
(b)(i)	4 V					2	2
(ii)	I = V/R = 4/5 = 0.8A					1	1
(iii)	R = V/I = 2/0.8 = 2.5 Ω					2	2
						TOTAL	**20**

Answers prepared by

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