

**PRESBYTERIAN HIGH SCHOOL
SCIENCE DEPARTMENT
SUGGESTED ANSWERS**

Subject: SCIENCE (PHYSICS)
 Setter: MS MICHELLE GOH
 Level: SEC 4 EXP / 5 NA

Exam: PRELIM
 Year: 2020

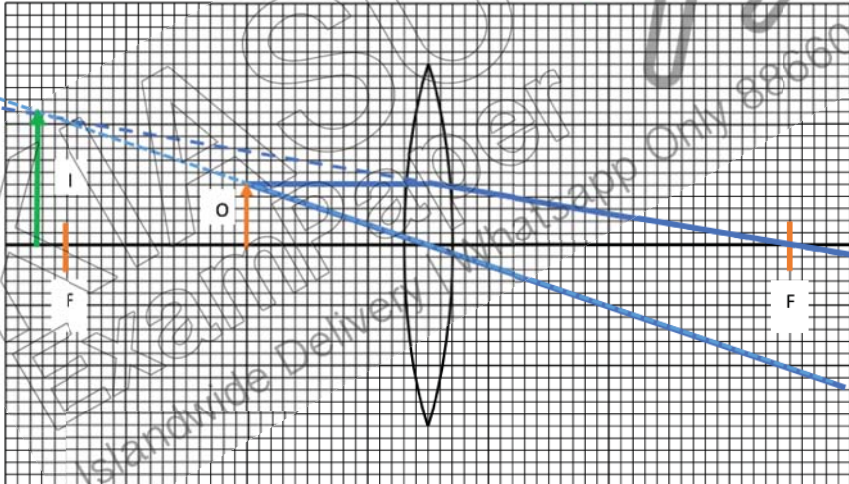
PAPER 1 (20 marks)			
Q/N	Answer	Q/N	Answer
1	A	11	D
2	D	12	D
3	B	13	D
4	B	14	B
5	D	15	D
6	A	16	C
7	C	17	A
8	B	18	D
9	B	19	B
10	D	20	B

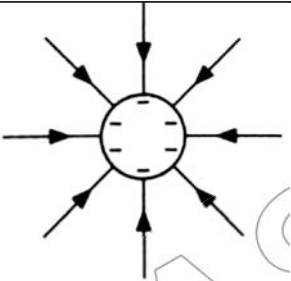
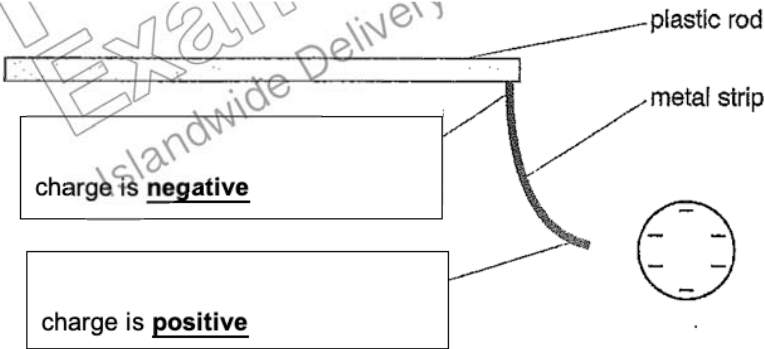
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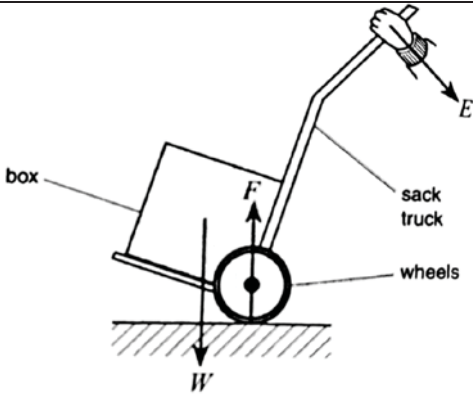
SECTION A (45 marks)			
Q/N	Suggested Answer	Sub Total	Total
1a	Any of the following: - Mass is a scalar that has a magnitude with no direction while weight is a vector with magnitude and direction. - Mass stays constant while weight changes with gravitational field strength.	1	5
1bi	$F_R = ma$ $(2.5 - 1.2) \times 10^5 = (1.5 \times 10^6) a$ $a = \frac{1.3 \times 10^5}{1.5 \times 10^6}$ $= 0.0867 \text{ m/s}^2$	1	
1bii	Resultant force decreases, So acceleration decreases.	1	
2a	Racing car has greater stability. Lower centre of gravity / wider base area.	1	
2b	Racing car's tyres have <u>wider surface area of contact</u> with the ground.	1	
2c	$P = \frac{F}{A}$ $= \frac{960 \times 10}{0.012 \times 4}$ $= 200\,000 \text{ Pa}$	1	4
3ai	The particle vibration is perpendicular to the wave motion.	1	
3aaii	$v = f\lambda$ $f = \frac{v}{\lambda}$ $= \frac{3.2}{1.2}$	1	6
3aiii	$f = 2.67 \text{ Hz}$ Frequency is the number of complete waves / oscillations per unit time.	1	

3b	$v = \frac{2d}{t}$ $d = \frac{vt}{2}$ $= \frac{1500 \times 54 \times 10^{-3}}{2}$ d = 40.5 m	1	
4a	Microwaves	1	
4bi	Radiowaves	1	
4bii	Infra-red radiation	1	
4biii	Microwaves	1	5
4c	Any one of the following: Ultrasound is not a transverse wave / Ultrasound cannot pass through vacuum / Ultrasound does not travel at 3×10^8 m/s in vacuum.	1	
5a	 one ray through centre of lens – 1 one horizontal ray through focal point – 1 Image – 1	3	
5b	Magnifying glass	1	
5c	Any two of the following: Real, Inverted, same size as object..50 V	1 1	
6a	Medium Y represents the glass. Light <u>bends away from normal</u> as it passes from Y to X, as <u>air is less dense than glass</u>.	1 1	7

6b	$\frac{1}{n} = \frac{\sin i}{\sin r}$ $n = \frac{\sin r}{\sin i}$ $= \frac{\sin 55}{\sin 35}$ $n = 1.43$	1	1	
6c	$\sin c = \frac{1}{n}$ $c = \sin^{-1}\left(\frac{1}{1.428}\right)$ $c = 44.4^\circ$ Angle of incidence is greater than the critical angle of 44.4°. Light ray will undergo total internal reflection.	1	1	1
7ai	 straight lines – 1 arrows point inwards – 1	2		
7aii	The direction of the electric field shows the <u>direction of movement of a positive charge</u> placed at that point.	1		
7bi	 plastic rod metal strip charge is <u>negative</u> charge is <u>positive</u>	1		5
7bii	The bottom of the metal strip is nearer to the sphere than the top of the strip. Hence attraction force greater than repulsion force.	1		
8a	$R = \left(\frac{1}{60} + \frac{1}{40}\right)^{-1}$ $R = 24.0 \, \Omega$	1	1	7
8b				

	$I = \frac{V}{R}$	1	
	$I = \frac{6}{24}$	1	
	$= 0.250 \Omega$		
8ci		1	
	Since the <u>two resistors along the branch have the same resistance</u> , the e.m.f of 6 V will be shared equally; 3 V each.		
8cii		1	
	$p.d \text{ (between C \& D)} = \frac{30}{40} \times 6$	1	
	$= 4.50 \text{ V}$		

SECTION B (20 marks)			
Qn	Suggested Answer	Sub-total	Total
9ai	Gradient of v-t graph is constant	1	10
9aii	$a = \frac{36 - 0}{48}$	1	
	$= 0.750 \text{ m/s}^2$	1	
9bi		1 1	
9bii	Total distance travelled = area under graph $= \frac{1}{2} \times 48 \times 36 + 32 \times 36 + \frac{1}{2} \times 20 \times 36$ $= 864 + 1152 + 360$ $= 2376 \text{ m}$ No acceleration	1 1 1	

9c	No resultant force Train engine force is equals to frictional force	1 1	
10ai	 Any correct – 1m	1 1	10
aii	The principle of moments states that for an object in equilibrium , The sum of clockwise moments about a pivot is equals to the sum of anti-clockwise moments about the same pivot .	1 1	
aiii	The perpendicular distance from the line of action of the effort to the pivot is large , Hence a smaller effort is required to produce a clockwise moment to lift the load.	1 1	
b	Total moment = $140 \times 0.8 \times 2$ = 224 Nm (anti-clockwise)	1 1	
c	anti-clockwise moment by W = 180×0.8 = 144 Nm sum of cw moment = sum of acw moment $R \times 1.2 = 144$ $R = 120 \text{ N}$	1 1	
11ai	$R = \frac{V}{I}$ $= \frac{1}{10 \times 10^{-3}}$ $= 100 \Omega$	1 1	10
11aii	$R = \frac{V}{I}$ $= \frac{6}{35 \times 10^{-3}}$ $= 171 \Omega$	1	
11b	As current increases, <u>temperature of the filament increases</u> . Hence, resistance increases.	1	

11ci	Total current in the lighting circuit $= 26 \times \frac{12}{230} + 4 \times \frac{40}{230}$ $= 2.05 \text{ A}$	1 1	
11cii	Current of 2.05 A exceeds fuse rating of 3 A. Fuse will blow when all lights are turn on. Open circuit, lights will not work.	1 1 1	
11ciii	To cut the lamps off the high voltage source from mains.	1	

