BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020

MARKING SCHEME

SUBJECT : SCIENCE (PHYSICS)	**LEVEL : Sec 4E/5N**
PAPER : 5076 / 1 & 2	**SETTER : Mrs Seah-Pay Ling Ling**

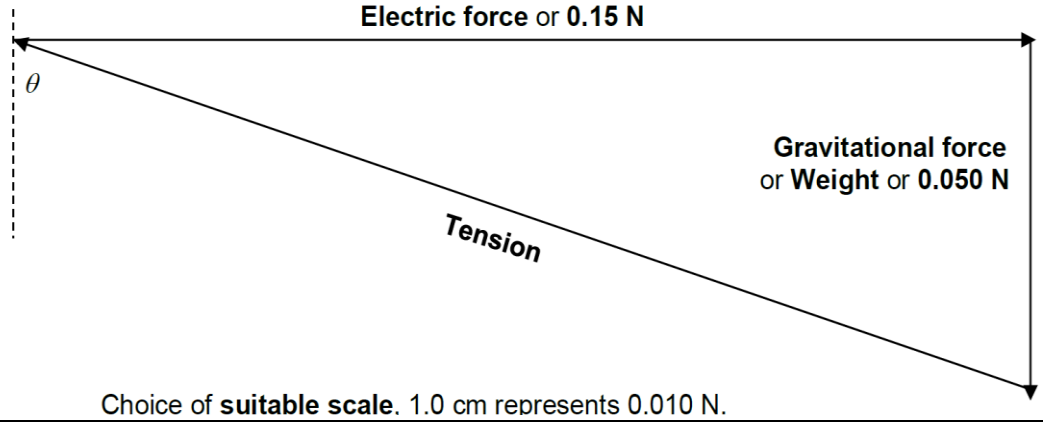
PAPER 1 [40 marks] (Q1-20 for science physics)

1	2	3	4	5	6	7	8	9	10
C	B	D	B	D	A	D	B	C	B
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
D	D	B	B	B	D	D	C	D	B

PAPER 2 [65 marks]

- *Deduct ½ mark for wrong units from overall score (max 1 mark)*
- *Deduct ½ mark for wrong significant figures from overall score (max 1 mark)*

Section A [45 marks]

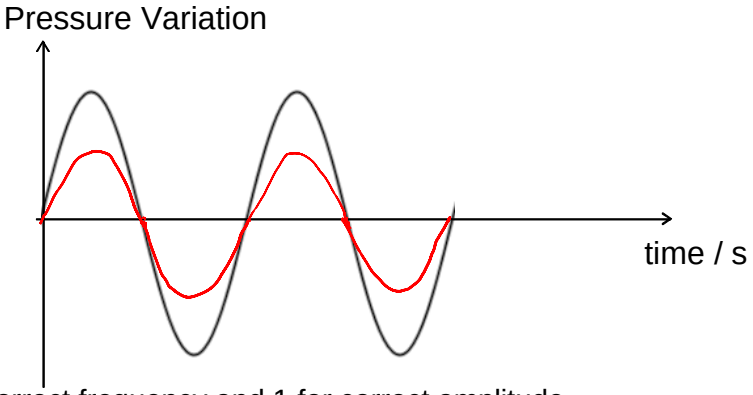
			marks	*Remarks*
1				
		Choice of **suitable scale**, 1.0 cm represents 0.010 N. This mark to be awarded only if students proceed to draw a diagram. Smallest diagram acceptable: 1.0 cm rep 0.0125N	1	
		Both magnitude and direction of **Electric force** and **Weight** are correctly drawn	1	
		Tension in the acceptable range of **0.158 N** +/1 mm of students' scales	1	
		θ in the acceptable range from **70° to 73°** and recorded to the nearest degrees to be measured not calculated • ***If all wrong but the general shape of right-angled triangle drawn – 1m***	1	
			4	

2	**(a)**	a = (18-10)/(12-5) = 1.14 m/s^2	1 1	
	(b)	Total distance = (10)(5) + (0.5)(10+18)(7) +(18)(6) = 256 m Average speed = 256/18 = 14.2 m/s	 1 1	
	(c)	From *t* = 5 to 9.4 s, distance between lorry and car increases (since the car is slower). From *t* = 9.4 s to 12 s, distance between lorry and car decreases. (since the car is now faster than lorry). Note: Car is still behind lorry.	 1 1	
			6	

3	**(a)**	The particles in the steel nearer to the heat source gained **kinetic energy and vibrate more vigourously. The free electrons gained kinetic energy and moved more quickly.** They **collide with adjacent particles** and pass their kinetic energy to them.	 1 1	
	(b)	**(i)** $4.0 \times 10^5 = \frac{F}{2.0 \times 10^{-4}}$ F= 80 N	 1 1	
		(ii) weight = 12.5 N	1	
		(iii) (M x 10 x 0.8) + (12.5 x 0.5) = 80 x 0.3 M = 2.22 kg Ecf from 4ci and 4cii.	1 1	
			7	

4	**(a)**	As air is bubbled into the beaker, it causes the alcohol to evaporate. Energy is absorbed from the water on the table for the alcohol to change into gaseous state. So the water loses energy and start to freeze.	1 1	
	(b)	Energy is absorbed to overcome the intermolecular forces of attraction. It is not used to increase kinetic energy / molecular speed thus temperature remains constant.	1 1	
			4	

5	**(a)**	v = f × λ 300,000,000 = 2500,000,000 × λ λ = 0.120 m	 1 1	
	(b)	Satellite communication / weather radar / long distance telecommunication / GPS / mobile phoes (* accept any of the application if it is in the communication field.	1 1	
	(c)	Microwave is a transverse wave but ultrasound is a longitudinal wave. Microwave does not need a medium to transmit but ultrasound requires a medium. (accept any reasonable difference.)		
			4	

6	**(a)**	$\lambda = v / f = 330 / 220 = 1.5$ m number of complete cycles in 21 m = 21 / 1.5 **= 14** OR Time taken to for sound to reach A = 21 / 330 = 0.06 s Period = 1 / 220 = 4.55×10^{-3} s Number of complete cycles in 21 m = $0.06/(4.55 \times 10^{-3})$ = **14**	1 1 1	
	(b)	 1 mark for correct frequency and 1 for correct amplitude	2	
			5	

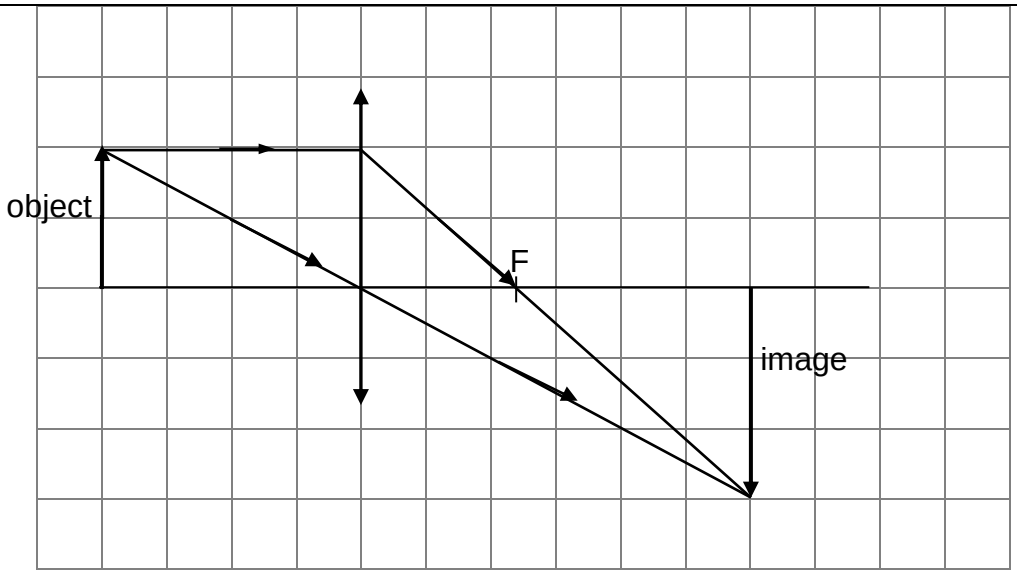
7	**(a)**	**(i)**	Negative charges on the right side of **A**, positive charges on the left side of **P**. (Note: equal number of charges on the left of sphere P and right side of sphere A)	1 1	
		(ii)	The positive charges in **B** attract the negative charges to the right-hand side of **A**, as unlike charges attract. leaving behind positive charges in the left-hand side of **P**.	1 1	
	(b)	**(i)**	The rubbing friction between fuel and the hose causes the fuel to lose electrons to the hose, thus the fuel becomes positively charged.	1	
		(ii)	When there is a sudden discharge of the charges, it produces sparks that can ignite the fuel.	1	
		(iii)	The wire allows electrons to flow from the ground to the aircraft body, reducing the building up of positive charges on the aircraft.	1	
				7	

8	**(a)**	E.m.f. of 12 V is the amount of work done by an electrical energy source in driving a unit charge around a complete circuit is 12 J.	1	
	(b)	effective resistance of parallel resistors = $(1/5 + 1/20)^{-1} = 4.0\ \Omega$ effective resistance of circuit = 2.0 + 4.0 = 6.0 Ω	1 1	
	(c)	V = IR 12 = I x 6 I = 2 A	 1	
	(d)	Q = I t = 2 x (4 x 60) = 480 C	 1 1	

	(e)	V = emf of battery – p.d. across 2 Ω resistor = 12 – (2 x 2) = 8.0 V Or V = IR = 2 x 4 = 8 V	1 1	
			8	

Section B [20 marks]

9	**(a)**	Energy cannot be created or destroyed. Energy can only be transformed from one form to another. Total energy in an isolated system remains constant.	 1 1	
	(b)	Loss in GPE = 80 x 10 x (5-3) = 1600 J	1 1	
	(c)	Gain in KE = Loss in GPE ½ x 80 x v2 = 1600 v = 6.32 m/s	 1 1	*Allow* Ecf from 9b.
	(d)	There is **no friction on slope** hence no energy loss to the surrounding.	1	
	(e)	energy at B = energy at C $GPE_B + KE_B = KE_C$ + thermal energy $(80 \times 10 \times 3) + (½ \times 80 \times 6.32^2) = (½ \times 80 \times (6.32/2)^2$ + thermal energy Thermal energy = 3600 J	 2 1	*Allow* Ecf from 9c.
			10	

10	**(a)**	**(i)**	1.4 = sin 60° / sin θ_a θ_a = 38.2° θ_b = 90 – 38.2 = 51.8°	 1 1	
		(ii)	With a high refractive index, the <u>critical angle will be small</u>, thus it will be <u>easier for total internal reflection to take place</u>. **OR** So that θ is smaller and <u>α will be larger</u>, thus <u>easier for total internal reflection to take place</u>.	1 1	
	(b)	**(i)**	 Correct position of lens 2 correct rays Correct formation of image (at correct size and correct position)	 1 1 1	minus 1 m if image not label or > 2 arrows missing from rays
		(ii)	┐	1	

		(iii)	Shift the lens towards the screen until another sharp image is formed.	1	
		(iv)	The image will be smaller than the image formed in (b)(ii).	1	
				10	

11	**(a)**		fuse symbol in live wire before junction of two elements	1	
	(b)		The metal casing	1	
	(c)	**(i)**	The live wire touches metal case and the person touches the metal casing.	1	
		(ii)	When live wire touches the metal casing, a large current flows through the earth wire, which has lower resistance, rather than through the person who touches the metal casing. The large current in turns, melts the fuse and disconnects the metal casing from live terminal.	1 1	
	(d)	**(i)**	Maximum current = Maximum power/ voltage = 2100/240 = 8.75 A Fuse to be used is 13 A.	1 1	
		(ii)	E = Pt = 2.1 kW x 2.5 h x 30 days = 157.5 kWh cost = 157.5 x 0.25 = $39.38	1 1 1	
				10	

END OF PAPER