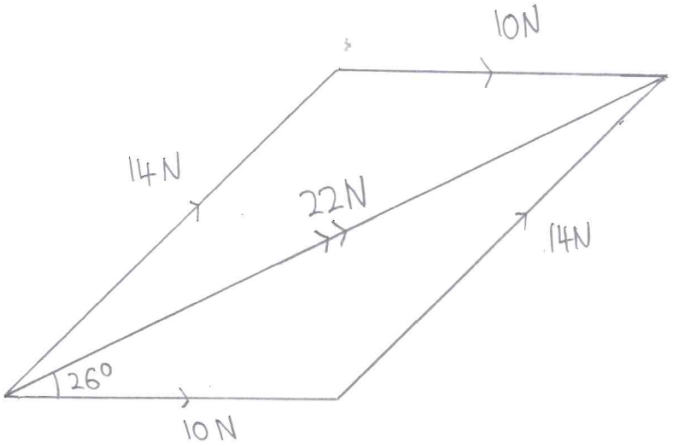
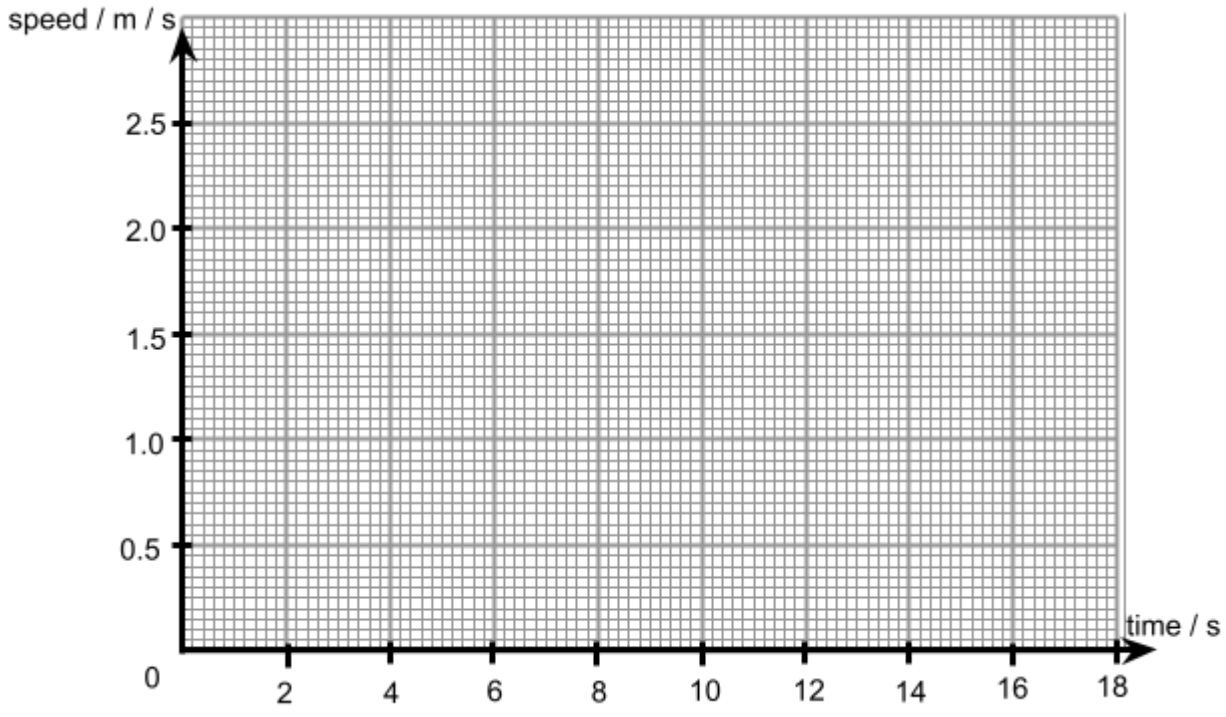
Bedok South Secondary School
Sec 4Exp/ 5NA Science (Physics) Prelim Exam 2020 Marking scheme

Paper 2 Section A

No.	Answers	Marks
1	 scale: 1 cm represents 2.0 N [1] resultant force = 22 N [2] direction = 26° from 10 N / 19° from 14 N [1] **Markers' comments:** ● Most candidates are able to give an appropriate scale. ● A number constructed parallelogram without indicating the direction of forces. ● Some drew the resultant force incorrectly and many were unable to state the direction.	
2a		

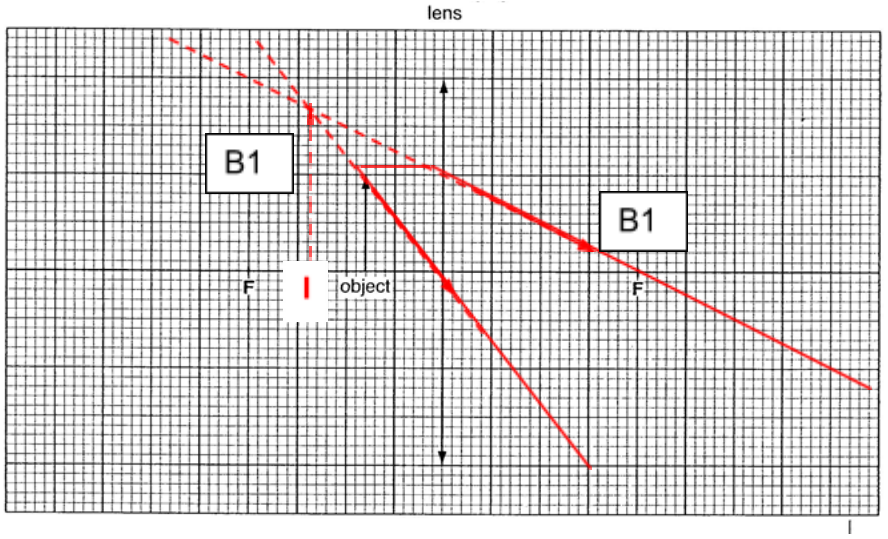
Correct time period and line drawn (B1) for each line.

Markers' comments:

- This question is well attempted.

2b	Distance travelled = $\frac{1}{2}(9 + 17)(2.5) = 32.5$ m Average speed = 32.5 / 17 = 1.91 m/s [Allow **error carry forward** from the diagram, as long as student display understanding in how to calculate the total distance based on the graph drawn.] **Markers' comments:** ● Generally well attempted. ● Weaker ones still continue to assume that distance = speed x time.	**B1** **B1**
2c	Acceleration = $\frac{0-2.5}{5} = -0.50$ m/s^2 Deceleration = 0.50 m/s^2 **Markers' comments:** ● Some left answer as -0.50 m/s^2 which shows that candidates were unable to the differenc between acceleration & deceleration.	**B1** **B1**
3a	10 m/s^2 or 9.8 m/s^2 or 9.81 m/s^2 **Markers' comments:** ● Candidates were unable to distinguish between velocity & acceleration as many stated 0.	**B1**
3b(i)	2000 – 800 = 1200 N	**B1**
3b(ii)	1200 / 80 [C1] = 15 m/s^2 [A1]	**C1** **A1**
4a	$P = \frac{F}{A} = \frac{14\,000\ N}{500\ cm^2}$ [C1] = 28 N/cm^2 [A1]	**C1** **A1**
4b	$P_{larger} = P_{smaller}$ $\frac{F_{Larger}}{A_{Larger}} = \frac{F_{Smaller}}{A_{Smaller}}$ [B1] $\frac{F_{Larger}}{F_{Smaller}} = \frac{A_{Larger}}{A_{Smaller}} = \frac{1440\ cm^2}{500\ cm^2} > 1$ Therefore $F_{larger} > F_{smaller}$. [B1]	**B1** **B1**

	OR F_{larger} = 28 N/cm^2 × 1440 cm^2 = 40 230 N [B1] Since $F_{smaller}$ = 14 000 N, $F_{larger} > F_{smaller}$ [B1] **Markers' comments:** ● Generally well attempted and for those who can recall the Pressure formula.	**B1** **B1**
5a	Elastic Potential Energy	**B1**
5b(i)	KE = ½ x m x v^2 1900 = ½ x 45 x v^2 [C1] v = 9.19 m/s [A1]	**C1** **A1**
5b(ii)	Loss in KE = Gain in GPE 1900 = m x g x h 1900 = 45 x 10 x h [C1] h = 4.22 m [A1] **Markers' comments:** ● Some candidates wrote KE = GPE which is not acceptable conceptually. You are supposed to write loss in KE = Gain in GPE.	**C1** **A1**
6a(i)	Foam-filled wall: It **traps air** which is a poor conductor of heat. It **reduces heat loss through conduction** **Markers' comments:** ● There is a need to identify air is trapped in the foam filled walls as a significant number of candidates just stated foam is a poor conductor of heat.	**B1** **B1**
6a(ii)	Shiny outer casing: A **shiny surface is a poor emitter of heat**. It **reduces heat loss by radiation**. **Markers' comments:** ● Some candidates stated that shiny surface is a poor absorber of heat which is not applicable in this situation. ● Some phrases their answer without clarity e.g. Shiny outer casing is a poor emitter of heat. This can be better with just "Shiny surface is a poor emitter of heat."	**B1** **B1**
6b	During evaporation, **the more energetic particles** at the surface of the liquid break the forces of attraction and **left the liquid**. Leaving behind particles with **lower kinetic energy** and thus, **lowering the temperature** of the liquid. **Markers' comments:** ● This question is badly attempted. Most answers did not use the ideas of molecules to explain evaporation.	**B1** **B1**

7a	 1 m for correct ray drawn 1m for image and labeling of Image (I) Max penalty of 1m for missing arrows or image is not dotted	**2**
7b	Real, inverted and same size as object Any 2 correct 1m All 3 correct 2m	**2**
8a	The **free moving negative charges** in the metal ball will be repelled by the negatively charged rod and **move to the metal thread.** The metal threads containing the excess negative charges will repel each other as **like charges repel**. **Markers' comments:** ● Not well attempted as many candidates assumed that the threads are negatively charged initially despite the question stated that the threads has no overall charge. ● Many were unable to explain the movement of free electrons due to the rod and them being evenly distributed to each threads.	**B1** **B1**
8b(i)	Q = I x t = (0.3 x 10^{-3}) x (50 x 10^{-6}) [C1] = 1.5 x 10^{-8} C [A1]	**C1** **A1**
8b(ii)	E = V x Q = 120000 x 1.5 x 10^{-8} = 1.8 x 10^{-3} J **Alternative method** (E = P x t) P = V x I = 120000 x 0.3 x 10^{-3} = 36 W E = P x t = 36 x 50 x 10^{-6} = 1.8 x 10^{-3} J **Markers' comments:** ● Both parts of Q8b were badly attempted due to the wrong prefixes recalled.	**C1** **A1** **C1** **A1**
9a	V = RI 6 = 8 I [C1] I = 0.75 A [A1]	**C1** **A1**

	Markers' comments: ● Many candidates were unable to determine that the effective resistance us 8 ohms.	
9b	Same brightness [B1] They are connected in series, current through both the bulb is the same. Resistance of the bulbs are also the same. [B1] **Markers' comments:** Many candidates has the misconceptions of current decreasing after passing through a component. Hence, mistakenly assumed that brightness of L2 will be decreased as compared to L1.	**B1** **B1**
9c	V = RI 6 = 6 I [M1] (Short circuit) I = 1 A [A1] **Markers' comments:** Many candidates were unable to apply the effect of short circuit.	**M1** **A1**

Section B

No.	Answers	Marks
10a	Centre of gravity is **a point on** an object where **the entire weight appears to act on**	**B1**
10b	W = mg = 50 kg × 10 N/kg = **<u>500 N</u>** [B1]	**B1**
10c	clockwise moment = 500 N × 0.90 m [C1] [allow e.c.f. from (b)] = 450 Nm [A1]	**C1** **A1**
10d	F × 1.4 m = 450 Nm [C1] [allow e.c.f. from (c)] F = **<u>321 N</u>** [A1]	**C1** **A1**
10e(i)	The additional weights positioned at the shoulders of the woman causes the centre of gravity of the woman to shift further away from the pivot O. Since moment = force x distance, as the distance increases, the clockwise moment increases. So, students need to actually talk about what the additional weights do, -Shifts the centre of gravity further from pivot O -Increase the weight of the setup.	**B1** **B1**
10e(ii)	Since **the total clockwise moments is increased, the total anti-clockwise moments increased too**. [B1] Hence **F increases**.[B1] [ECF] (If the students mentioned in 10e(i) that the clockwise moment decreases,) Since **the total clockwise moments is decreased, the total anti-clockwise moments decreased too**. [B1] Hence **F decreases**.[B1] Another method By the principle of moments, the sum of clockwise moment about a pivot is equal to the sum of anti-clockwise moment about the same pivot. [B1] Hence F increases. [B1]	**B1** **B1**
	Q10 Markers' comments: ● Only Q10b is well attempted.	

	● Q10c to 10d were badly done. Many were unable to explain clearly by using concepts of moments. E.g. When weights are strapped, weight increases hence F increases.	
11a(i)	Period = 2 ms = 0.002 s Frequency = 1 / 0.002 = 500 Hz	**B1** **B1**
11a(ii)	Same period but with twice the amplitude	**B1** **B1**
11a(iii)	The higher pressure is the compression region while the lower pressure region is the rarefaction region.	**B1**
11b(i)	Ultra-violet Alright to accept ultraviolet radiation, ultraviolet rays	**B1**
11b(ii)	Speed = $1.48 \times 10^{15} \times 2 \times 10^{-7}$ $= 2.96 \times 10^{8}$ m/s	**C1** **A1**
11b(iii)	Electromagnetic waves are transverse waves while sound waves are longitudinal waves. Electromagnetic waves can travel through vacuum but sound waves cannot travel through vacuum.	**B1** **B1**
	Markers' comments: ● Q11a(i) were done badly as many missed out the prefix milli- for the x axis. ● Rest of the question were generally well attempted.	
12 a(i)	It means that the appliance will function with a power of 2000 W when connected to a 240 V electrical source (normal operating conditions).	**B1**
12a(ii)	I = P/V = 2000/240 = 8.33 A	 **M1** **A1**
12a(iii)	The wire with diameter = 1mm It can accommodate up to 10 A safely and the operating current (8.33 A) is less than 10 A	**B1** **B1**
12a(iv)	As diameter increases, cross sectional area increases. Resistance decreases (R inversely proportional to A) $P = I^2R$. With **lower resistance**, power generated is lower with the same current of 8.33 A flowing through the wire, **less heat produced.** Hence overheating will not occur with the operational current.	 **B1** **B1**
12b(i)	P: live wire Q: neutral wire R: Earth wire Not all correct, cannot be full marks. If it is not all wrong, we can give one mark. - 1 or 2 out of 3 correct, we give one marks	**2 m**
12b(ii)	A fuse is a safety device used to limit the current flow in a circuit to prevent overheating.	**B1**
12b(iii)	If the appliance does not have a metal casing, the Earth wire is not required as the user has both an insulating case/cover as well as the wire insulation to protect against electrocution. Acceptable answers are "No **Metal Casing"** OR "Have **Double Insulation".**	 **B1**
	Markers' comments: ● Only Q12a(ii) & (iii) are well attempted. ● For Q12a(i), candidates were unable to explain what is voltage and power. Some were only able to relate the numbers to the respective physical quantities. ● For Q12a(iv), many were unable to relate this with constant current and a varying resistance value due to the thickness of wires.	

	● For Q12b, candidates were shown that they are not well-prepared to identify the wires and the recalling of purpose of fuse and reasons of no 3 pin plug.	