WGS sec 4 NA Prelim 2022
Science Physics (5105)
Answer Scheme

Paper 1

Q1	**B**	Q6	**B**	Q11	**C**	Q16	**D**
Q2	**C**	Q7	**D**	Q12	**A**	Q17	**A**
Q3	**C**	Q8	**B**	Q13	**A**	Q18	**B**
Q4	**A**	Q9	**D**	Q14	**A**	Q19	**C**
Q5	**D**	Q10	**D**	Q15	**B**	Q20	**B**

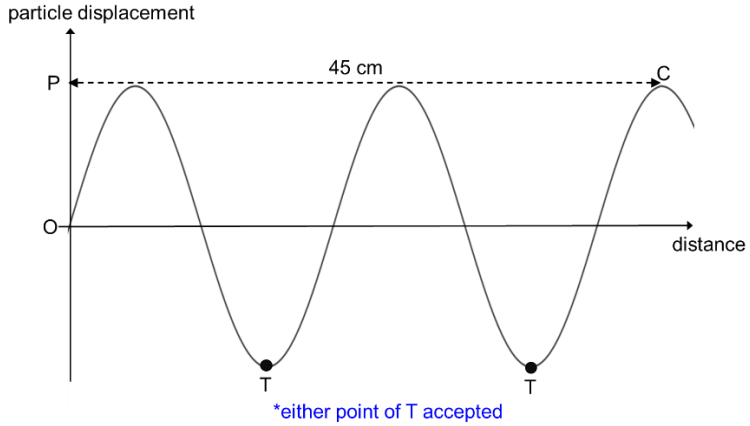
Paper 2

Section A (16 marks)

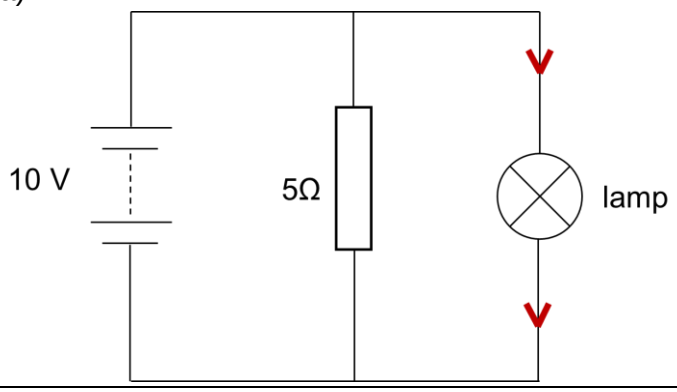
Note: Answers in fractions: - 1 m for whole paper
NO half marks to be awarded

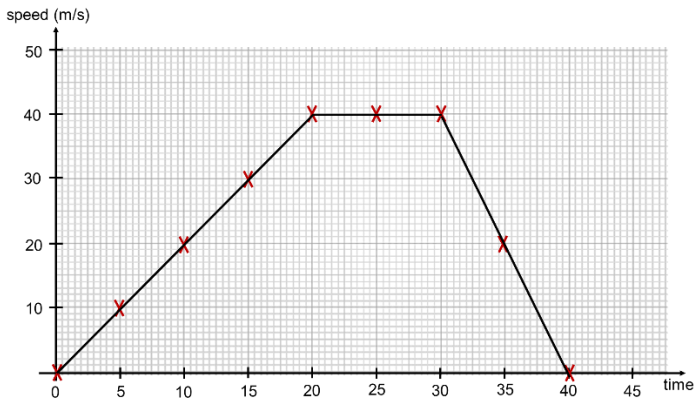
<table>
<tr><th>Q</th><th>Answers</th><th>Marks</th><th>Remarks</th></tr>
<tr><td>1</td><td>
<table>
<tr><th>quantity</th><th>unit</th></tr>
<tr><td>mass</td><td>kilogram</td></tr>
<tr><td>resistance</td><td>ohm</td></tr>
<tr><td>weight</td><td>newton</td></tr>
<tr><td>electromotive force</td><td>joule per column</td></tr>
</table>
</td><td>[2]</td><td>[2] all 4 correct answers

[1] any 2 correct answers

[0] 1 or 0 correct answer</td></tr>
<tr><td>2</td><td>(a)
 

*either point of T accepted</td><td>[1]</td><td>Acept either point of trough, labelled correctly and clearly with letter T.</td></tr>
<tr><td></td><td>(b)
Wavelength = $\frac{45}{9} \times 4 = 20$ cm</td><td>[1]</td><td></td></tr>
</table>

	(c) Frequency of wave $f = \frac{1}{T}$ $f = \frac{1}{10} = 0.10$ s	[1]	
	(d) Speed of wave $v = f\lambda$ $v = 0.1 \times 20 = 2$ m/s Unit : m / s (also accept metres per second)	[1] [1]	
3	(a) Method 1 – shift the small rock closer to the big rock. Method 2 – apply the force further away from the small rock, shift point A backward towards end of metal rod.	[1]	Accept either one of the two methods.
	(b) Method 1 and 2 – shift the small rock closer to the big rock OR apply the force further away from the small rock This will **<u>increase the moment or turning effect of the force</u>,** thus reducing the minimum force required.	[1]	Minimum force is reduced BECAUSE **the moment of a force increases**.
4	(a)  	[1]	At least <u>one arrow</u> of conventional current must indicate clearly passing through from top to bottom of diagram.
	(b) Current through resistor $I = \frac{V}{R}$ $I = \frac{10}{5}$ I = 2A	[1] [1]	Apply formula correctly I = V/R

	(c) Effective resistance = 0.25Ω $\frac{1}{R_{effective}} = \frac{1}{R_{resistor}} + \frac{1}{R_{lamp}}$ $\frac{1}{4} = \frac{1}{5} + \frac{1}{R}$ $\frac{1}{20} = \frac{1}{R}$ $R = 20\ \Omega$		[1] [1]	Apply effective resistance
	Section B **Answer any two questions in the spaces provided.**			
5	**(a)**		[1] [1]	Correctly plotting of all points with a cross (x) Correct straight lines connected all the correct crosses.
	(b)	(i) acceleration = (change in speed) / time $= \frac{40-0}{20} = 2\ \text{m/s}^2$	[1]	
		(ii) The car is travelling at **constant speed** from time 20s to time 30s.	[1]	
		(iii) Total distance travelled = total area under speed - time graph $= \frac{1}{2}(10+40)40$ $= 1000\text{m}$	 [1] [1]	Award mark if student show correctly the method calculating total area. E.g. using trapezium or triangle, rectangle areas
	(c)	(i) Possible answers • Road conditions (wet or dry, smooth or rough),	[1]	Any reasonable answer that will affect the braking

		• tyres grip on the group, • Mass of the car		time. Do not accept answer to increase the braking force, brake harder.
		(ii) • The time for the car to come to a stop after brakes is applied is dependable on the amount of **friction force** between the road and the tyres of the car. • Another possible answer is the mass of the car, if the **mass of the car** is increased/decreased, due to inertia force, the time needed for the car to stop will also change.	[1]	The explanation must be link to answer in (i).
6	**(a)**	(i) Conduction - Heat is transferred from the hotplate to the metal pot and to the water through the **vibration of particles** (and free electron diffusion). Convection - As the water **nearer to bottom gets heated up, its density decreases and it rises. The cooler water at the top then sink to the bottom as its denser**. This creates a convection current that transferred heat energy from bottom to the	[1] [1]	Student explained the process of conduction through vibration of particles Student describe the movement of fluid in convection process.
		(ii) **Radiation** / infrared **radiation /** thermal **radiation**	[1]	
		(iii) **Metal contains free electrons** that enable higher rate of heat conduction.	[1]	
	(b)	(i) $P = I\,V$ $I = \frac{P}{V}$ $I = \frac{1560}{240} = 6.5A$	[1]	
		(ii) **8A** fuse, the **selected fuse rating should be slightly higher** than the normal operation current.	[1]	Accept ecf based on answer in part (i)
		(iii) Total power used		

		$P = \frac{E}{t}$ $E = 1.56kW \times \frac{40}{60} = 1.04kWh$ Cost of electricity $1.04kWh \times 0.25$ =\$0.26	[1] [1]	[1] 1.04 kWh
7	**(a)**	(i) Stability refers to the **ability of an object to return to its original position** after it has been tilted or displaced slightly	[1]	
		(ii) Neutral equilibrium	[1]	
7	**(b)**	(i) gravitational potential energy GPE = mgh $GPE = 0.6 \times 10 \times 10$ GPE = 60J	 [1] [1]	Apply GPE = mgh
		(ii) KE = 60 J	[1]	Accept ecf, from part (i)
		(ii) $KE = \frac{1}{2}mv^2$ $60 = \frac{1}{2}(0.6)v^2$ v =14.14 v =14.1 m/s	 [1] [1]	Accept ecf, from part (i) Apply correctly KE formula
		(iv) **Energy is lost to the surrounding** after the first bounce. (air resistance, sound and heat energy lost during energy conversion)	[1]	