ANG MO KIO SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024 SECONDARY FOUR EXPRESS
MARKER REPORT

Ques	Answer	Marks
1(a)	**(FAN SPEED = 5)** T_A is measured to 1 dp in °C. (Range: 29.5 – 31.5 °C)	1
	T_B is measured to 1 dp in °C. (Range: 29.5 – 31.5 °C)	1
	Common errors are 1 dp not written and missing or incorrect unit Deduction of only 1 mark if both sets have the above error	
1(b)	$T_{A\ (MAX)}$ is measured to 1 dp in °C (-1 from **(b)** if below 60 °C)	1
	$T_{B\ (MAX)}$ is measured to 1 dp in °C **(81)**	1
	Common error is T_A is recorded less than 60 °C	
1(c)	**3.5 - 4.4 min (4 mins)** *t* is measured to 1 dp in s. **AND** between 209.5 – 264.4 s Common error to 1 dp not written as qns already stated 4 mins so allowance of few seconds is expected due to human reaction.	1
1(d)	$T_{A\ (4MIN)}$ is measured to 1 dp in °C. (Range: Drop of about 9.5 °C)	1
	$T_{B\ (4MIN)}$ is measured to 1 dp in °C. (Range: Drop of about 15 °C)	1
	Mark according to students' answer. (A or B) Common errors - answer was written as T_B or T_A instead of A or B - answer was not tailored to the lower temperature drop Diligent pupils showed the difference in drop for both thermometers as a form of checking.	1
1(e)	**If B drops less:** **(1)** A cool down more due to the cooling effect brought upon by evaporation near the surface of water in test tube. **(2)** Since the bulb is below water, the water at the bottom loss energy slowly due to the insulating effect of water. So, B cools down less. **(3)** Since the hot water is poured into A first, A has more time to cool, hence, B drop less (or A drop more) **If A drops less:** **(1)** The warmer water with lower density will float to the top where the bulb of the thermometer is. Hence, A will measure a higher temperature and hence, lower temperature drop. **(2)** As one could not read two thermometers at the same time, B is allowed to cool for a longer time. Hence, B drops more. **(3)** Thermometer B is fully submerged; more energy will conduct to bulb of thermometer. Hence, the temperature in B will cool down more. **(4)** Condensation of steam vapour around bulb A and releasing energy to the bulb. Hence, A drop less. Many pupils did not indicate the **specific thermometer** for explanation. Answers written not close to above ans key will not be given any marks.	2

<table>
<tr><th>Qns 2</th><th>Answers & Remarks</th><th>Marks</th></tr>
<tr><td>(ai)</td><td>I = 0.14 A (2 d.p.) , 0.13, 0,10</td><td>1</td></tr>
<tr><td>(aii)</td><td>V = 1.65 V (2 d.p.) , 1.70, 1.50</td><td>1</td></tr>
<tr><td>(aiii)</td><td>R = V /I = 1.65 / 0.14 = 11.8 Ω Accepted Range: 11 to 15 Ω
Any range not within accepted values will not be given any mark
Few pupils even subtracted 1 Ω in the final answer.</td><td>1</td></tr>
<tr><td>(bi)</td><td>D = (0.285+ 0.285) /2 = 0.285 mm
No records of more than one reading will not be given any mark</td><td>1</td></tr>
<tr><td>(bii)</td><td>ρ = $\pi RD^2 / 4L$
= π × (13.6) × (0.29 ×10^{-3}) ^{2} / 4 × 0.800 m
= 1.12 × 10^{-6} Ω m
(actual = 1.10 × 10^{-6} Ω m for nichrome wire swg32) must have unit Ω m
- Disappointing presentation as many pupils put inconsistent units (mm, cm, m)
- Few pupils even put R as radius of wire instead of resistance value
- Many pupils also indicated incorrect or no unit for resistivity</td><td>1</td></tr>
<tr><td>(biii)</td><td>Independent variables: diameter, D Dependent variables: voltage, V
• the <u>quantities that you should keep constant</u>, (either two of the following)
- the length of the resistance wires, L, to be connected across the circuit PQ are the same,
-the type of material of the wires of different diameters are the same,
-the emf of power supply and resistance of fixed resistor used are the same.

• a <u>detailed description</u> of how you will perform the experiment,
1. Set up the circuit as shown in Fig. 2. 1.
2. Connect the wire with the smallest diameter, D, across PQ, keeping length of wire and fixed resistor constant.
3. With the switch closed, record the voltmeter reading V.
4. Using the digital micrometer screw gauge, record the average diameter D of the wire PQ.
5. Calculate the values of 1/V and 1/ D^2.
6. Repeat steps (2) to (5) using 6 different diameters of wires connected across PQ. Record your results for V, D, 1 / V and 1/ D^2 in a table.

• <u>a suitable table</u> in which to display your measurements and calculated values (you do not need to enter any data into the table),
<table><tr><td>V / V</td><td>D / m</td><td>$\frac{1}{V}$ / V^{-1}</td><td>$\frac{1}{D^2}$ / m^{-2}</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table></td><td>1

1</td></tr>
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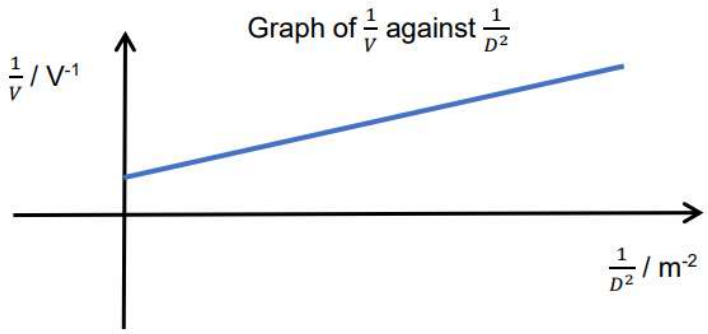
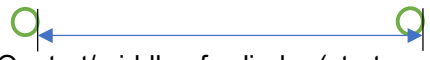
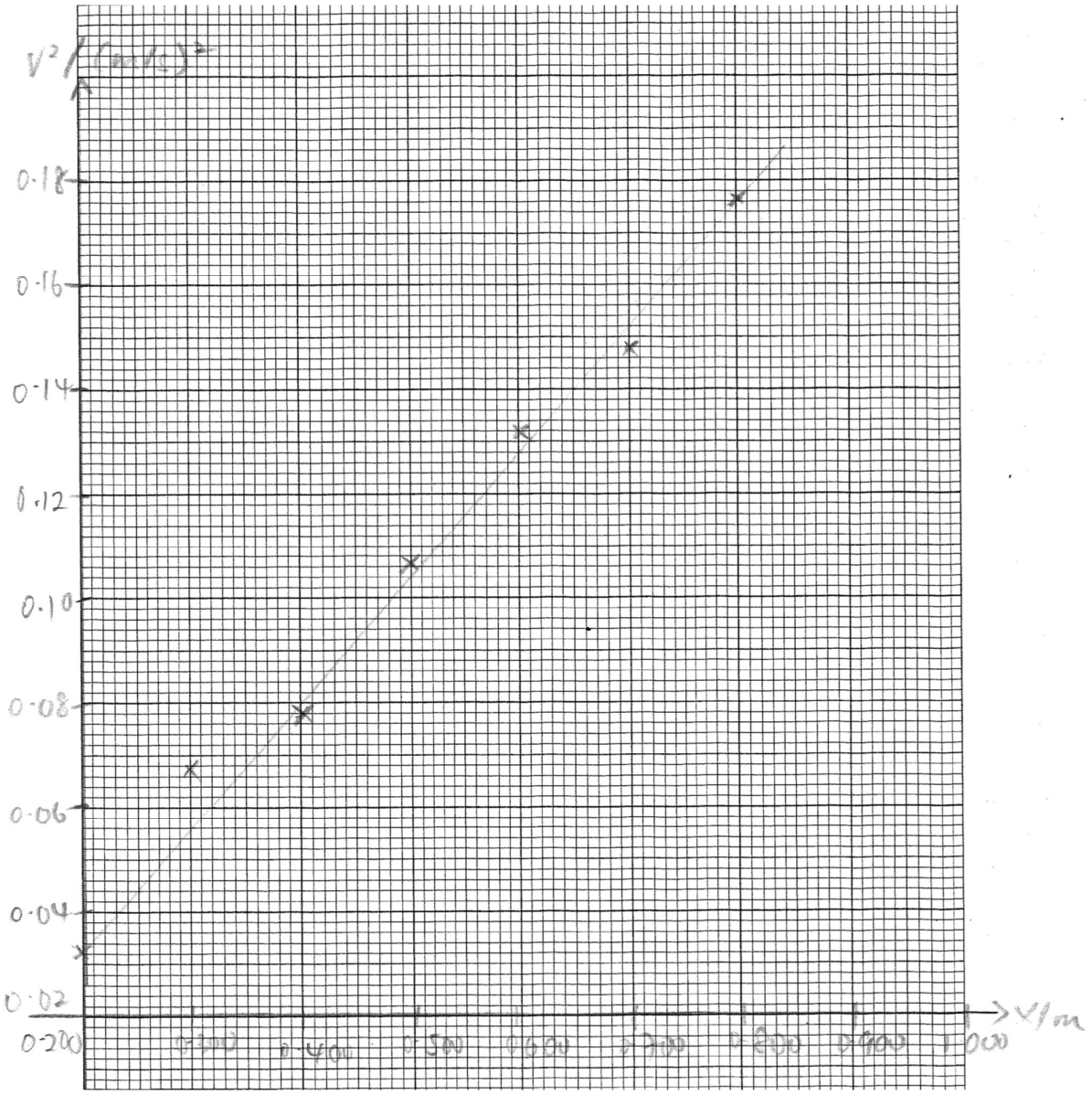
	7. Precaution: Do not leave the circuit closed for long as the temperature of the wire will increase, and its resistance will vary as a result. Do not touch the bare wire PQ as it may be very hot to touch.	
	• a **statement** of the graph that you would plot to test the relationship, Plot a graph of 1/ V against 1/ D^2 • If the relationship is valid, the graph will be a straight line with 1 / V linearly related to 1 / D^2 with a **positive gradient a** and **y-intercept b**. • a **sketch of the graph** that you would obtain if the suggested relationship is correct,  • an explanation of how you would obtain a value of the constant b from your graph. **b is the value of 1 / V when the value of 1/ D^2 = 0 m^{-2}.**	1 1 1
	Comment on planning -Some pupils did not understand that constant variables were supposedly to be measurable (eg length of wire, emf of battery) not apparatus in use. -The concept of general equation of straight line was not clearly understood by many pupils and utilised in this planning question. $\frac{1}{V} = \frac{a}{D^2} + b$ - Many pupils **lose marks right** from procedure description from getting 1/V and 1/D^2 till suitable tabulation to be given. Even units are totally ignored and not written properly. -Some pupils even sketch a linear graph and state as directly proportional graph. -Again, pupils did not connect the general equation of straight line that was given to give a proper valid straight line and some ended with negative gradient sketch and description. -Last part of vertical intercept, b, was also not clearly stated.	

Qns 3	Answers & Remarks	Marks
3(a)	h = 5.8 cm (with correct unit) **Accepted Range: 5.4 to 6.0 cm**	1
	Some pupils put answer in metre and ended up with wrong dp in presentation.	
3(b)(i)(1)	t_1 = 2.05 s (with correct unit)	1
	Answer less than 2.00 s will not be awarded any mark.	
3(b)(i)(2)	t_2 = 2.08 s (with correct unit) t_{ave} = (2.05 + 2.08)/2 = 2.07 s (with correct unit)	Ave reading with 2 sets of readings [1, 1]
	ECF was considered from (1)	
3(b)(ii)	Mark clearly the distance from start position to end position along the ramp (relative to where the distance is considered)  Or start/middle of cylinder (start position) to start/middle of cylinder (end position)	1
	Quite a number did not attempt this question at all.	
3(c)(i)	v = 0.800 / 2.07 = 0.386 m/s (3sf)	1
3(c)(ii)	$v = 0.386^2 = 0.149$ (m/s)^2 (3sf)	1
3(d)	**D** At least 5 sets of <u>data</u> with correct trend, x increases as v^2 increases A handful of pupils only attempt 3 to 4 data to plot a line.	1
	T <u>correct orientation Table</u> with quantities <u>x, t_{ave}, v and v^2</u> with correct units (allowing 1 error) A handful of pupils still did not indicate proper orientation in tabulation	1
	R All values of x to <u>0.001 m</u> ranging from 0.200 m to <u>0.800 m</u> A handful of pupils also did not follow instructions and ended up missing 0.800 m out of tabulation. Also, the concept of putting answers in metre in 3 dp was not related to answer in cm.	1
	dp All values of t to 0.01s A handful of pupils did not even include columns for any t values and only has <u>t_{ave}</u>	1
	sf All values of v^2 calculated to 3 s.f. A handful of pupils still has no concept of proper sf in place and end up with 2 sf	1
3(e)	**L** **axes labelled** with units and correct orientation, v^2 / (m/s)^2 against x/m	1
	S suitable **scale**, not based on 3, 6, 7, 12.5 **per large square**, with plotted data occupying ≥ half the page on both directions	1
	P **all points plotted correctly** (points must be ≤ ½ small square from the correct position), allow 1 error	1
	B **best fit** straight line	1

3(f)	**use of a triangle that uses more than half the drawn line with coordinates indicated at 2 points**, **** O level marking take into account of this mark scheme where coordinates and triangle must be presented before marks are awarded	1
	Correct calculation of gradient 0.0388 < *G* < 0.0548 [G= 0.0457] Range was totally not followed but working must be clearly shown	1
3(g)	-The cylinder may not roll down the ramp consistently in the straight path so distance x may be longer. -The end position of the cylinder may not be consistently time correctly that leads to inaccurate v values and thus v^2 value. -Human reaction is starting and stopping of the stopwatch leads to inaccurate t value and thus v and v^2 value. -Force exerted on cylinder to roll down the ramp is different that results in inaccurate t value and thus v and v^2 value. Sources of error must be clearly stated with reference to experiment skill that leads to second part of answer on variables that were found in the recording in tabulation.	1 1
		Total:

x /m	t_1 / s	t_2 / s	t_{av} / s	v / ms^{-1}	v^2 / $(ms^{-1})^2$
0.200	1.08	1.11	1.10	0.182	0.0331
0.300	1.13	1.17	1.15	0.261	0.0681
0.400	1.48	1.37	1.43	0.280	0.0782
0.500	1.54	1.52	1.53	0.327	0.107
0.600	1.60	1.69	1.65	0.364	0.132
0.700	1.76	1.87	1.82	0.385	0.148
0.800	2.05	2.08	2.07	0.386	0.149



End of Marking Scheme