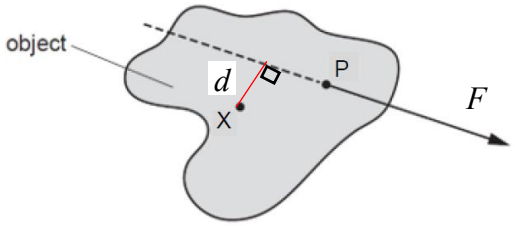
ANG MO KIO SECONDARY SCHOOL
EOY 2025
SECONDARY THREE EXPRESS SC PHYSICS
ANSWER SCHEME

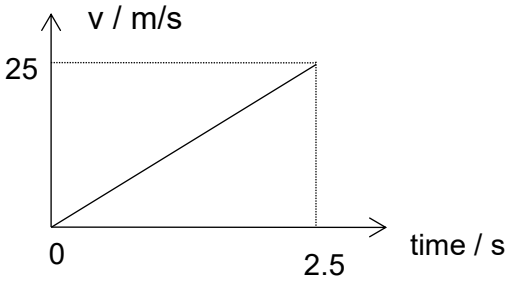
Paper 2

<table>
<tr><th>No.</th><th>Answer</th><th>Marks</th><th>Total Marks</th><th>Remarks</th></tr>
<tr><td colspan="5">Section A (55 marks)</td></tr>
<tr><td>1(a)</td><td>
<table>
<tr><td>prefix</td><td>symbol</td><td>value</td></tr>
<tr><td>kilo</td><td>k</td><td>10^3</td></tr>
<tr><td>giga</td><td>G</td><td>10^9</td></tr>
<tr><td>micro</td><td>μ</td><td>10^{-6}</td></tr>
<tr><td>mega</td><td>M</td><td>10^6</td></tr>
</table>
</td><td>1
1
1</td><td>4</td><td></td></tr>
<tr><td>1(b)</td><td>time density energy pressure</td><td>1</td><td></td><td></td></tr>
<tr><td>2(a)</td><td>Average diameter of one golden sphere
= $\frac{(4.5-1)}{5}$
= 0.70 cm
(2 s.f.)</td><td>1
1</td><td>4</td><td></td></tr>
<tr><td>2(b)</td><td>He should be using a <u>digital micrometer screw gauge</u> as it is <u>more precise</u> or it can measure up to <u>0.01 mm</u> or <u>0.001 cm</u>.
Or
He can also use a <u>digital calipers</u> as it is <u>more precise</u> or can measure up to <u>0.01 cm</u>.</td><td>1
1</td><td></td><td></td></tr>
<tr><td>3(a)</td><td>Friction exerted by road
Air resistance</td><td>1
1</td><td>10</td><td></td></tr>
<tr><td>3(b)(i)</td><td>The speed of the car is <u>increasing [1]</u> at a <u>decreasing rate</u>.[1]</td><td>2</td><td></td><td></td></tr>
<tr><td>3(b)(ii)</td><td>The speed of the car is <u>constant</u>.</td><td>1</td><td></td><td></td></tr>
<tr><td>3(c)(i)</td><td>As <u>speed increases, air resistance increases</u>. Hence, resultant force <u>decreases</u>.</td><td>1</td><td></td><td></td></tr>
</table>

3(c)(ii)	t = 10 to 14 s Since the <u>resultant force is zero</u>, the <u>maximum value of resistive force is equal to the driving force</u>.	1 1		
3(d)	$F_{\text{resultant}} = F_{driving} - F_{resistive}$ $= 2500 - 700$ $= 1800$ N From the graph, when the resultant force is 1800 N, the time is at 2.8 s.	1 1		
4(a)	Pressure is the **<u>force acting per unit area in contact</u>**.	1	**10**	
4(b)(i)	Force exerted by **each** wheel = Pressure $\times$ Area in contact with ground = 199 kPa $\times$ 0.04 m^2 = 199 $\times$ 1000 $\times$ 0.04 = 7 960 N = 7.96 kN	1 1		**Formula/ Working**
4(b)(ii)	Total weight = 7.96 kN $\times$ 6 = 47.76 kN = 47.8 kN (3 s.f.)	1 1		**With ecf** **With ecf and 3 sf**
4(c)(i)	Pressure = $\frac{weight}{area\ in\ contact}$ $= \frac{850}{5 \times 10^{-4}}$ = 1 700 000 **N/m²** <u>or</u> 1 700 000 **Pa**	1 1		**With unit**
4(c)(ii)	Pressure exerted by his boots = 1 700 000 N/m^2 = 1700 kPa. Pressure exerted by vehicle = 6 $\times$ 199 kPa = 1194 kPa. **<u>Pressure exerted by his boots on the ground is greater</u>** than that from the vehicle. The farmer is more likely to sink into the soft marshy ground.	1 1		
4(c)(iii)	• Place two wooden pranks on the soft ground to increase contact area; • Increase the contact area of the sole of his boots.	1		

5(a)	 • perpendicular distance from line of action of force to pivot/point X • correct perpendicular distance drawn	1	**10**	
5(b)(i)	The ladder is not uniform/ mass of the ladder not evenly distributed.	1		
5(b)(ii)	For an object to be in <u>equilibrium</u>, the <u>sum of clockwise moments is equal to the sum of anticlockwise moments</u> about the <u>same pivot</u>.	1 1		
5(b)(iii)	M = F x d = 90 x 1.0 = 90 Nm (clockwise)	1 1		
5(b)(iv)	Moment due to the bucket = 100 x 1.4 = 140 Nm (anticlockwise) Since anticlockwise moment > clockwise moment, the worker needs to apply a downward force to create a clockwise moment. Clockwise moment (M) + 90 = 140 M = 50 Nm F x d = 50 F = 50 / 0.60 = 83 N or 83.3 N Direction of force = downward	1 1 1		Allow ecf fr 6c(i)
5(b)(v)	Position the shoulder nearer to bucket. Or Position the hand further away from the pivot	1		
6(a)(i)	At 81 °C, substance X particles are packed very closely together and are packed regularly. At 880 °C, substance X particles are very far apart and packed randomly.	1 1	**7**	
6(a)(ii)	At 81 °C, the particles are vibrating about their fixed positions. At 880 °C, the molecules are moving about randomly at high speeds	1 1		
6(b)(i)	Z, X, Y	1		
6(b)(ii)	Density of Y = mass / volume = 23.8 / (75 – 50) = 0.952 = 0.95 g / cm^3	 1 1		
7 (a)	Conduction occurs in <u>solid, liquid and gas</u> Convection occurs only in <u>liquid and gas</u>	1	**10**	

7 (b)(i)	Sensor A rises more in temperature in the same time period.	1		
7 (b)(ii)	Heated water near the heater is less dense and it rises. The cooler surrounding water is denser and it sinks. This sets up a convection current.	1 1		
7(b)(iii)	Convection currents only occur above the heater Sensor B is not heated as water is a poor conductor (heat takes a long time to be conducted downwards from A to B.	1 1		
7 (c)	When the inside of the wall is heated, atoms gain kinetic energy and vibrates vigorously. They collide with the neighbouring particles and kinetic energy is transferred from the hot end to the cold end (from inside to outside). In metal, free electrons gains kinetic energy and move at greater speed. They diffuse into the cooler end and transfer kinetic energy when they collide with the atoms.	1 1		
7 (d)	Silver / white Poor emitter of infrared radiation thus it reduces rate of heat transfer from the hot container to surrounding.	1 1		

No.	Answer	Marks	Total Marks	Remarks
Section B (10 marks)				
8(a)(i)	a=(v-u)/t v= 0 + 10 (2.5) = 25 m/s (2 s.f.)	1 1	**10**	
8(a)(ii)	 Straight line, positive gradient Labeled 25 m/s, 2.5 s	 1 1		
8(a)(iii)	Distance = Area under graph = 0.5 x 25 x 2.5 = 31.25 m (or 3 s.f.)	 1		

8(b)	Air resistance reduces the speed and the distance travelled. OR Some energy was transferred mechanically to the internal store of the man, and lost in the form of sound waves.	1		
8(c)(i)	The downward force (weight) was equal to upward force (elastic tension), such that resultant force is zero/ there is no net force, therefore acceleration becomes zero	1 1		
8(c)(ii)	In this mechanical pathway, energy is transferred from an elastic potential store to a kinetic store, and then to the gravitational potential store as he rises	 1 1		
9(a)	Energy cannot be created or destroyed. Energy can be transferred from one store to another. The total energy of an isolated system is constant.	1 1	**10**	
9(b)	Energy is transferred from the gravitational potential store at Point P to the kinetic store of the carriage and passengers at Point Q	1		
9(c)(i)	$GPE = 3500 \times 10 \times 30$ $= 1\,050\,000$ J or 1.05 c 10^6 J	1 1		
9(c)(ii)	$power = \frac{1050000}{120}$ $= 8750\ W$	1 1		
9(d)(i)	$gain\ in\ KE = loss\ in\ GPE$ $\frac{1}{2} \times 3500 \times v^2 = 1050\,000$ $v = 24.5$ m/s	1 1		Allow ecf fr 9c(i)
9(d)(ii)	There is energy loss/transfer to the thermal store of surroundings due to air resistance/friction.	1		