Assessment Schedule – 2021

Science: Demonstrate understanding of aspects of mechanics (90940)

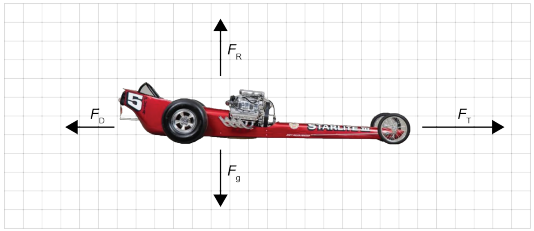
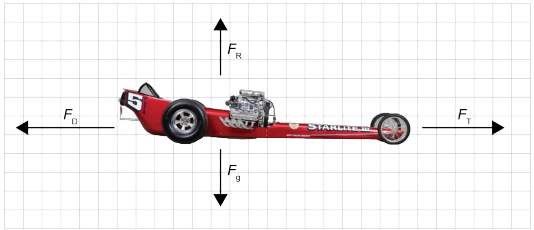
Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Section A: Accelerating / speeding up Section B: Constant speed Section C: Decelerating / slowing down Section D: Stopped	• Three correctly described sections.		
(b)	240 s from graph.	• Correct answer.		
(c)	Section B: $v = \frac{d}{t}$ $= \frac{2200 - 300}{220 - 40}$ $= 10.55 \text{ m s}^{-1}$	• Correct equation is used.	• Correct answer and unit.	• Correct answer and unit with calculation.
(d)	$v = \frac{d}{t}$; therefore $t = \frac{d}{v}$ $= \frac{3000}{5}$ $= 600$ seconds	• Correct equation rearrangement is used.	• Correct answer and unit.	• Correct answer and unit with calculation.
(e)	For snowshoe, the pressure $P = \frac{F}{A} = \frac{570}{0.15} = 3800$ Pa For walking shoe, the pressure $P = \frac{F}{A} = \frac{570}{0.03} = 19000$ Pa (or Nm^{-2}) Since the weight force remains the same and there is a greater surface area for the snowboard, there is less pressure, and the snowboard does not sink into the snow as much.	• Correct equation. • Larger surface area for snowshoe. • Same weight/force. *Accept mass for Achieved.* • Less pressure for snowshoe OR doesn't sink as far.	• TWO correct answers. • Links greater surface area to less pressure OR Links less pressure to not sinking into the snow as far OR Links same weight/force over a greater surface area	• TWO correct calculations. Links **greater surface area** to **less pressure** with **same weight force** and means that Zoi **sinks less**.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	TWO Merit points.	THREE Merit points.	TWO Excellence points.	THREE Excellence points.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i)	Pete's weight = 80 × 10 = 800 N	• Correct calculation. *Unit not required.*		
(ii)	The mass is the amount of material in an object, i.e. Pete's mass is 80 Kg, where the weight is the force on a mass. For Pete this is 800 N.	• Definition of mass OR weight.	• Links of mass AND weight to Pete.	
(b)(i)	$E_p = mgh = 1 \times 10 \times 100 = 1000$ J	• Correct equation.	• Correct answer and unit.	
(ii)	Torch gains kinetic energy.	• Identifies E_k.		
(iii)	$E_k = ½mv^2$ $1000 = ½mv^2$ $v = \sqrt{2 \times 1000} = 44.7$ m s^{-1}	• Correct equation.	• Correct answer and unit.	• Correct answer and unit with calculation.
(c)(i)	Pete's work = $F \times d = 80 \times 10 \times 170 = 136\,000$ J Manaia's work = 75 × 10 × 170 = 127 500 J	• Correct equation for work. • Correct equation for power. • One correct statement in (iii) E.g. Pete is heavier/weighs more. E.g. Manaia is faster/takes less time. *Accept mass for Achieved.*	• Correct answer for work AND power for one person. OR Correct explanation of work OR power using a wrong calculation. E.g. Pete has more weight so does more work despite taking more time. E.g. Manaia uses more power because she covers the same distance/does more work in less time.	• Correct calculations for both climbers for work AND power. • Correct explanation for work AND power related to the climbers.
(ii)	Pete's power = $\frac{136000}{2200}$ = 61.8 Watts Manaia's power = $\frac{127500}{2000}$ = 63.7 W			
(ii)	Pete does more work because he has more weight force; however Manaia uses more power, as she does her work in much less time.			

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	TWO Merit points.	THREE Merit points.	TWO Excellence points.	THREE Excellence points.

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	200 m s^{-1} from graph.	• Correct answer.		
(b)(i)	This is a show question. $a = \frac{v}{t} = \frac{200}{4} = 50 \text{ m s}^{-2}$	• Correct equation. • *Accept evidence shown on graph*		
(ii)	$F = ma = 1050 \times 50 = 52\,500$ N	• Correct equation.	• Correct answer.	• Correct calculation.
(iii)(iv)	 	• One force labelled and correctly drawn for either diagram. • Thrust arrow longer than drag arrow in first diagram. • Thrust arrow shorter than drag arrow in second diagram.	• **Horizontal** forces are labelled and drawn correctly in both diagrams, showing correct arrow length.	• **All** forces are labelled and drawn correctly in the first diagram. • **All** forces are labelled and drawn correctly in the second diagram. Thrust could equal zero.
(c)	The slope of the graph in section A is steeper than the slope in section C. This is because there is a larger net force in A compared to the net force in C. The acceleration in Section A is greater than the acceleration (deceleration) in Section C. In section A there is a net force forward and in section C it is net force backward. This means that the net forces are in opposite directions.	• Slope in Section C is less steep than section A. OR net force in Section A is greater than Section C. • Acceleration in Section A and deceleration in Section C. • OR net forces are in opposite directions.	• Links slope/gradient of graph to size of net force in both sections. • Links sections of the graph to direction of net force in both sections.	• Complete answer.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	TWO Merit points.	THREE Merit points.	THREE Excellence points.	FOUR Excellence points.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 – 14	15– 19	20– 24