Assessment Schedule – 2008

Physics: Demonstrate understanding of mechanics in one dimension (90183)

Evidence Statement

Note: Minor computational errors will not be penalised. A wrong answer will be accepted as correct provided there is sufficient evidence that the mistake is not due to a lack of understanding. Such evidence includes:

- the last written step before the answer is given has no unexpanded brackets or terms and does not require rearranging.
- the power of any number that is multiplied by a power of 10 is correct.

Correct units and significant figures are required only in the questions that specifically ask for them.

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	The distance moved in a certain direction.	[1] Correct description. Accept shortest distance from starting point.		
(b)	Stopped / no motion for the first 2 hours. Steady speed / uniform velocity for the next 5 hours.	[1] Correct description. Must have both times or one time plus 40 km/h.		
(c)	Travels 200 km in 7 hrs. $v = \frac{d}{t} = \frac{200}{7} = 28.6$ km h^{-1} East	[2] Correct answer only. (Unit not essential.) Accept 40km/h OR 25 km/h East.	[2] Correct answer with direction. (Unit not essential.) Accept 40 km/h East.	
(d)	$E_p = mgh = 0.020 \times 10 \times 2.8$ $= 0.56$ J $E_k = ½ mv^2 = 0.56$ J $v^2 = \frac{2 \times 0.56}{0.020} = 56$ $v = 7.48 = 7.5$ m s^{-1}	[2] Correct calculation of E_p.	[2] Incorrect calculation of E_p using mass as 20 g (= 560 J). Then used 560 J to calculate v as 7.5 ms^{-1}. OR if states v = √2gh with correct working and answer but no reasoning.	[2] Correct working and answer. Calculation shows correct understanding of conservation of energy.
(e)	As they move down, there is **friction** with the air (drag). This **reduces acceleration**. **As speed increases air resistance increases.** Eventually they reach a **terminal velocity** / speed at which the **drag equals their weight** and they fall at a **constant** speed. OR Air **resistance** produces an upward force. **As speed increases air resistance increases.** When the air resistance equals the weight of the drop, it reaches the **terminal velocity**. So the total **force** (acceleration) is zero, and they move at a **constant speed**.	[1] Mentions that air friction prevents them from continuing to speed up. Two valid ideas (e.g **air friction** acts and **causes a to be less,** air friction acts against gravity, terminal velocity occurs when the forces are balanced)	[1] Mentions the ideas but does not link them effectively. Names forces and links ideas well.	[1] Correct explanation, linking all ideas effectively, including the reason for constant speed. Ideas fully explained (must have the idea that as speed increases air resistance increases).
TWO (a)	Stationary for the first second, acceleration for 0.5 s then constant velocity of 1.2 m s^{-1}.	[1] Describes any two stages correctly.	[1] Describes all stages correctly.	

(b)	Acc = *gradient* = $\frac{1.2}{0.50}$ = 2.4 m s^{-2} $F = ma = 80 \times 2.4 = 192$ N	[2] Correct calculation of acceleration shown.	[2] Correct working and answer.	
(c)	Zero force. Because she is going at a steady speed in a straight line there is no force / Newton's first law of motion. / Because the resultant force is zero, there is no acceleration.	[1] Mentions zero force.	[1] Correct answer with explanation.	
(d)	During acceleration, distance = ½ × 1.2 × 0.5 = 0.30 m. During steady movement = 0.50 × 1.2 = 0.60 m. Total = 0.90 m.	[2] Distance in one part of the journey correct and shows an addition (if incorrect).	[2] Correct working and answer.	
(e)	$t = \frac{d}{v} = \frac{75}{1.2}$ = 62.5 = 63 s	[2] Correct answer.		
(f)	6.5 + 1.2 = 7.7 m s^{-1} down slope	[2] Correct answer only.	[2] Correct answer and direction.	
(g)	E_p gained = $mgh = 80 \times 10 \times 3.8$ = 3040 J $P = \frac{W}{t} = \frac{3040}{1.5 \times 60} = 33.77$ = 33.8 W	[2] Correct answer for E_p.	[2] Correct process but used t =1.5 and got the answer 2026 W.	[2] Correct working and answer.
(h)	The velocity decreases and at the maximum height it is zero. This is because the gravitational force is decelerating the ball at a constant rate.	[1] Mentions that the velocity decreases as it moves upwards.	[1] Mentions that the velocity decreases and at the maximum height it is zero. OR velocity decreases because there is a constant force of gravity downwards.	[1] Mentions constant force of gravity causes a decrease in velocity and at maximum height it has zero velocity.
THREE (a)	$E_K = \frac{1}{2}mv^2$ = ½ × 80 × 6^2 = 1440 J	[2] Correct working to get the value 1440 J.		
(b)	Some of the kinetic energy is converted into heat due to friction.	[1] Mentions loss of energy to heat / sound or any other relevant forms.	[1] Makes clear link to heat due to friction.	
(c)	E_p lost = $mgh = 80 \times 10 \times 4.8$ = 3 840 J Work done by friction = 3 840 – 1 440 = 2 400 $w = F \times d = F \times 110$ $F = \frac{w}{d} = \frac{2\,400}{110} = 21.81$ = 21.8 N	[2] Correct calculation of loss of potential energy only. OR Calculation of v = 6 m s^{-1} at bottom using E_k.	[2] Correct calculation of work done by friction	[2] Correct working and answer.

(d)	Force is Jan's weight $= 80 \times 10 = 800$ N Area of ski $= (1.60 \times 0.10) \times 2$ $= 0.32$ m^2 Pressure $= \frac{F}{A} = \frac{800}{0.32}$ $= 2\ 500$ Pa	[2] Correct working and answer for weight Accept working for total area.	[2] Correct process but failed to multiply by 2.	[2] Correct working and answer.
(e)	Ron 1. The skis have a much bigger area than the shoes. 2. $P = \frac{F}{A}$ so if A is bigger, P is smaller. 3. Even though Jan is heavier than Ron, her weight is applied on a bigger area, while Ron's lesser weight is applied on a smaller area. So he puts more pressure on the ground and so sinks more.	[1] Correct person PLUS links to area or pressure.	[1] Achieved PLUS clearly links smaller area to greater pressure. (or vice versa).	[1] Achieved plus correct explanation with ideas logically linked. Must link to Jan being heavier.

Total opportunities	**criterion 1: 8** **criterion 2: 10**	**criterion 1: 6** **criterion 2: 8**	**criterion 1: 3** **criterion 2: 4**

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence	
$4 \times$ A1	$3 \times$ M1 + $3 \times$ A1	1 x E1 + $3 \times$ M1 + $3 \times$ A1	+ $1 \times$ E from either category
$4 \times$ A2	$4 \times$ M2 + $3 \times$ A2	$1 \times$ E2 + $3 \times$ M2 + $3 \times$ A2	