Chapter 2 Inclined planes. Revision Questions page 89-91 – Multiple Choice Answers

Q	Ans	Explanation
1	B	The net force on the cart down the incline = mg sin θ. The value of sinθ equals height divided by the length (hypotenuse) of the ramp. Hence the net force is proportional to height. By Newton's 2nd law acceleration is proportional to (F_{net} = ma), thus the acceleration is proportional to the net force which is proportional to the height. That means acceleration is directly proportional to height, which will give a linear graph passing through the origin.
2	A	The equation $v^2 = u^2 + 2as$ shows that velocity squared is proportional to acceleration when the object starts from rest and the displacement (length of the incline) is constant. That is $v^2 \propto a$ ($\propto F_{net} \propto$ height). Hence, $v^2 \propto h$, or $v \propto \sqrt{h}$. The graph shape for $y \propto \sqrt{x}$ is Graph A.
3	D	The component of the weight of the mass *m* will be 0.5*m* N down the incline as sin 30° is 0.5. The weight of mass *M* will be *m* N, which is greater than the force down the incline. There will be a net force up the incline of (0.5*m* N) so m will accelerate up the incline with a value of $a = 0.5m/(2m) = 0.25$ m s^{-2}.
4	A	To accelerate down the incline the force down the incline ($F_{\parallel}$) must be greater than friction which acts up the incline. If they were equal the block would travel at constant speed (or stay at rest).
5	C	The net force down the incline equals *mg* sin θ and according to Newton's 2nd law this equals *ma*. Hence $a = mg \sin\theta/m = g \sin\theta$