$$\bar{v} = \frac{d_{AB} + d_{BC}}{t_{AB} + t_{BC}} = \frac{(d \text{ km}) + (d \text{ km})}{\dfrac{d \text{ km}}{70\,\text{km/h}} + \dfrac{d \text{ km}}{90\,\text{km/h}}} = 78.75\,\text{km/h}$$. The average speed is 78.75 km/h.

16. The sounds will not occur at equal time intervals because the longer any particular nut falls, the faster it will be going. With equal distances between nuts, each successive nut, having fallen a longer time when its predecessor reaches the plate, will have a higher average velocity and thus travel the inter-nut distance in shorter periods of time. Thus the sounds will occur with smaller and smaller intervals between sounds.

    To hear the sounds at equal intervals, the nuts would have to be tied at distances corresponding to equal time intervals. Since for each nut the distance of fall and time of fall are related by $d_i = \frac{1}{2}gt_i^2$, assume that $d_1 = \frac{1}{2}gt_1^2$. If we want $t_2 = 2t_1$, $t_3 = 3t_1$, $t_4 = 4t_1$, $\cdots$, then $d_2 = \frac{1}{2}g(2t_1)^2 = 4d_1$, $d_3 = \frac{1}{2}g(3t_1)^2 = 9d_1$, $d_4 = \frac{1}{2}g(4t_1)^2 = 16d_1$, etc.

17. The elevator moving from the second floor to the fifth floor is NOT an example of constant acceleration. The elevator accelerates upward each time it starts to move, and it accelerates downward each time it stops.

    Ignoring air resistance, a rock falling from a cliff would have a constant acceleration. (If air resistance is included, then the acceleration will be decreasing as the rock falls.) A dish resting on a table has an acceleration of 0, so the acceleration is constant.

18. As an object rises WITH air resistance, the acceleration is larger in magnitude than g, because both gravity and air resistance will be causing a downward acceleration. As the object FALLS with air resistance, the acceleration will be smaller in magnitude than g, because gravity and resistance will be opposing each other. Because of the smaller acceleration being applied over the same distance, the return speed will be slower than the launch speed.

19. If an object is at the instant of reversing direction (like an object thrown upward, at the top of its path), it instantaneously has a zero velocity and a non-zero acceleration at the same time. A person at the exact bottom of a "bungee" cord plunge also has an instantaneous velocity of zero but a non-zero (upward) acceleration at the same time.

20. An object moving with a constant velocity has a non-zero velocity and a zero acceleration at the same time. So a car driving at constant speed on a straight, level roadway would meet this condition.

21. The object starts with a constant velocity in the positive direction. At about $t = 17$ s, when the object is at the 5 meter position, it begins to gain speed – it has a positive acceleration. At about $t = 27$ s, when the object is at about the 12 m position, it begins to slow down – it has a negative acceleration. The object instantaneously stops at about $t = 37$ s, reaching its maximum distance from the origin of 20 m. The object then reverses direction, gaining speed while moving backwards. At about $t = 47$ s, when the object is again at about the 12 m position, the object starts to slow down, and appears to stop at $t = 50$ s, 10 m from the starting point.

22. Initially, the object moves in the positive direction with a constant acceleration, until about $t = 45$ s, when it has a velocity of about 37 m/s in the positive direction. The acceleration then decreases, reaching an instantaneous acceleration of 0 at about $t = 50$ s, when the object has its maximum speed of about 38 m/s. The object then begins to slow down, but continues to move in the positive direction. The object stops moving at $t = 90$ s and stays at rest until about $t = 108$ s. Then the object begins to move to the right again, at first with a large acceleration, and then a lesser acceleration. At the end of the recorded motion, the object is still moving to the right and gaining speed.