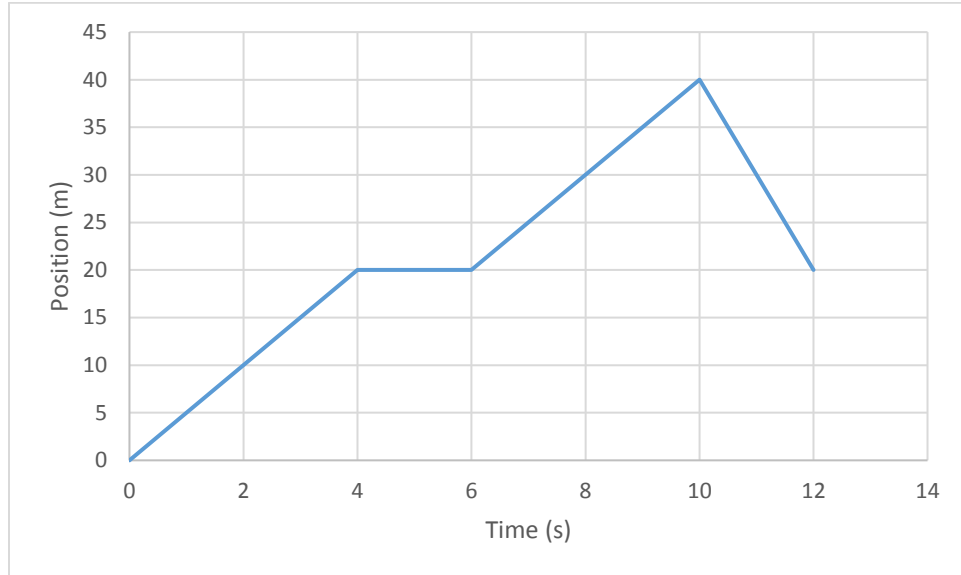


CW 1.4 – One-Dimensional Kinematics Summary Questions

Graphical Analysis



1. A Motion detector is used to measure the position of a physics trolley as a function of time. The data is shown above. Justify all answers.
 - a) Rank the speed of the object in each of the 4 labelled regions of the graph from fastest to slowest. If the objects has the same speed, indicate so in your ranking. (2)
(use the format $x > y = z$)
 - b) What was the total distance travelled in 12 seconds? (2)
 - c) What was the displacement at $t = 12$ seconds? Why are the answers to b) and c) different? (2)
 - d) Draw a $v-t$ graph for the trolley. (2)

Lab Work

2. Outline a method for measuring the position of a physics cart as a function of time in the lab. Ideally, you should be able to use the data to plot a position-time graph. (2)

Equations of Motion

3. A ball is dropped from rest at an unspecified height.
 - a) How far has the ball fallen after 5 seconds? (2)
 - b) How fast is it moving? (2)
 - c) If this experiment was repeated on the Moon ($g_{\text{moon}} = 1.6 \text{ m/s}^2$), what would the results be? (2)

4. A bike starts from rest and travels for 5.0 s with a uniform acceleration of $+1.5 \text{ m/s}^2$. The rider then applies the brakes, causing a uniform deceleration of -2.0 m/s^2 . If the brakes are applied for 3.0 s,
- How fast is the bike going at the end of the braking period (3)
 - How far has the bike travelled? (3)
5. Traumatic brain injury such as concussion results when the head undergoes a very large acceleration (or deceleration). Such accelerations are of the order of greater than 800 m/s^2 over a $1.0 \times 10^{-3} \text{ s}$ duration. Suppose a student falls off a lab stool (as s/he is rocking on it) onto a varnished wooden floor... The head is brought to rest over a distance of approximately 2.0 mm ($2.0 \times 10^{-3} \text{ m}$). *Data from internet...*
- How could this distance be determined experimentally? (2)
 - The student's head falls a distance of approximately 1.2 m. Calculate the speed of impact. (2)
 - Calculate the magnitude of the deceleration and determine whether Kirk will have been concussed? (2)
 - How could a concussion be prevented? Give two solutions. (2)
6. The Police are investigating a crash. A truck driver slams on the brakes when he sees a tree blocking the road. It is known from vehicle tests and the driver's phone (texting....) that the truck decelerated at a rate of 5.60 m/s^2 for 4.20 s. It made skid marks 62.4 m long that end at the tree. Calculate the speed of impact and the speed that the truck was travelling at before the crash. (3)
7. A stone is thrown vertically upwards at 10 m/s from a bridge, which is 15 m above a river.
- What is the speed of the stone as it hits the river? (2)
 - With what speed would it hit the river if it was thrown downwards at the same speed? (2)