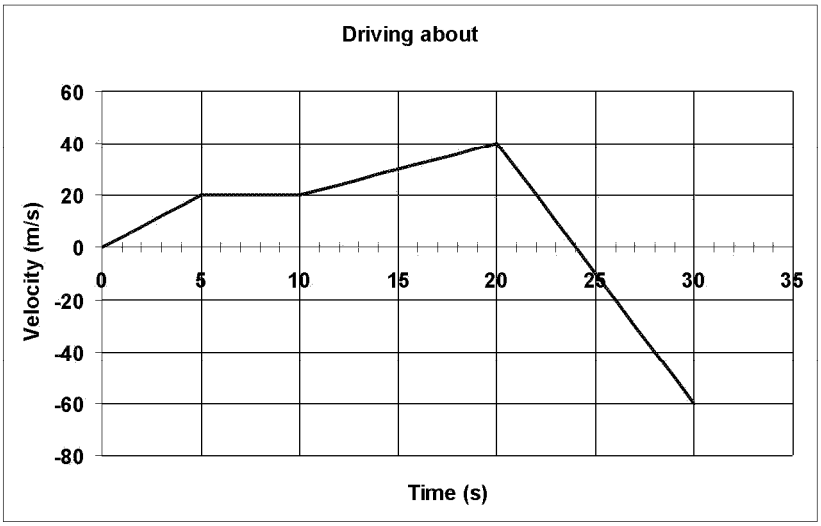
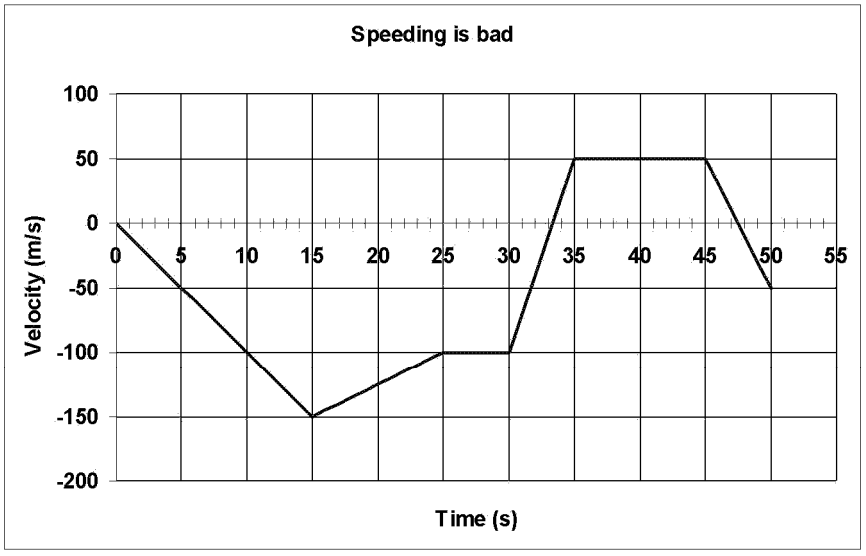
Physics 112

Acceleration



1. Refer to the above image for the following v-t graph questions. **a)** What was the acceleration during the first five seconds? **b)** At what time(s) was there a change in direction? **c)** What was the displacement and distance after thirty seconds? **d)** What was the average speed for the entire trip? **e)** How long did it take to travel 275 m from the starting point?



2. Refer to the above image for the following v-t graph questions. **a)** What was the greatest acceleration? **b)** What distance was traveled between 10 and 30 seconds? **c)** What was the displacement after five seconds? **d)** How long did it take to travel the first 1.0 km?

3. A car undergoes a constant acceleration from rest to 28 m/s in 9.5 s. What distance was covered in that time?

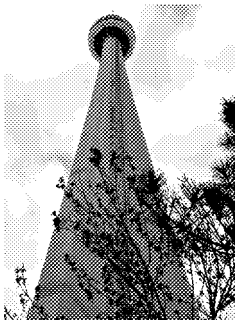
4. Not noticing a red light a drivers slams on the brakes squeeling to a halt in 3.75 s. Just before hitting the brakes the car was traveling 17 m/s and was 30 m from the light. **a)** What was the average acceleration of the car? **b)** Determine if the driver able to stop before reaching the traffic light by finding the distance required to stop.

5. An airplane lands with a speed of 70 m/s. After 3.5 s the airplane is traveling 17.5 m/s. **a)** What was the average acceleration of the airplane? **b)** What distance does the airplane need to stop?

6. During take off a Boeing 747 airplane accelerates at a constant $39\frac{km/h}{s}$. The airplane accelerated, from rest, for 7.8 s before it left the ground. **a)** With what speed did the airplane leave the ground? **b)** What distance was required for take-off? (look at your units carefully)

7. A ball is thrown upwards, on the Earth ($a_{gravity} = -9.8\,\mathrm{m/s^2}$, with an initial speed of 17 m/s. **a)** How long will the ball be traveling upwards? **b)** How high up will the ball travel?

8. A loonie dropped from the observation deck on the CN Tower in Toronto takes 8.35 s to hit the ground. **a)** Assuming no air resistance, with what speed is the loonie striking the ground? **b)** How high is the observation deck from the ground? (take $a_{gravity} = +9.8\,\mathrm{m/s^2}$)



9. During its fall to Earth, hail stones from cumulonimbus clouds reach a terminal velocity (a constant speed) because of air resistance. **a)** Calculate at what speed a hail stone would strike the Earth if it continued to accelerate at $a_{gravity} = +9.8\,\mathrm{m/s^2}$ during its 20.2 s fall to the ground. **b)** Convert your answer into km/h (for a reference the take-off speed of a Boeing 737 is around 250 km/h).

Physics 112 Acceleration Mr. P. MacDonald 1/31/2010

Answer List

1. **a)** $4.0\,\mathrm{m/s^2}$ **b)** $t = 24\,\mathrm{s}$ **c)** $disp = 350\,\mathrm{m}$, $dist = 710\,\mathrm{m}$ **d)** $24\,\mathrm{m/s}$ **e)** $t = 15\,\mathrm{s}$
2. **a)** $30\,\mathrm{m/s^2}$ **b)** $2.4 \times 10^3\,\mathrm{m}$ **c)** $-125\,\mathrm{m}$ **d)** $14\,\mathrm{s}$
3. $\Delta d = 133\,\mathrm{m}$
4. **a)** $a_{avg} = -4.5\,\mathrm{m/s^2}$, **b)** No, the driver needed 32 m to stop so the car ended up 2 m into the intersection.
5. **a)** $a_{avg} = -15\frac{m/s}{s}$ **b)** $\Delta d = 163\,\mathrm{m}$
6. **a)** $v_f = 304\,\mathrm{km/h}$ **b)** $\Delta d = 0.330\,\mathrm{km}$
7. **a)** $\Delta t = 1.73\,\mathrm{s}$; **b)** $\Delta d = 15\,\mathrm{m}$
8. **a)**$v_f = 82\,\mathrm{m/s}$; **b)**$\Delta d = 342\,\mathrm{m}$
9. **a)**$v_f = 198\,\mathrm{m/s}$; **b)**$v_f = 713\,\mathrm{km/h}$