Stopping Distance

1. $d = kv^2$ $k = 0.06$

10 km/h = 2.78 m/s $d = 0.06(2.78)^2 = 0.46$ m

20 km/h = 5.56 m/s $d = 0.06(5.56)^2 = 1.85$ m

30 km/h = 8.33 m/s $d = 0.06(8.33)^2 = 4.16$ m

60 km/h = 16.67 m/s $d = 0.06(16.67)^2 = 16.67$ m

90 km/h = 25 m/s $d = 0.06(25)^2 = 37.5$ m

2. It takes 4 times the distance to stop when the speed in doubled.

3. 60 km/h = 16.67 m/s

reaction

$V = \frac{d}{t}$

$16.67\ m/s = \frac{d}{1.5s}$

$d = 25$ m

braking

$d = kv^2$

$= (0.1)(16.67)^2$

$= 27.8$ m

Total stopping distance = 25 m + 27.8 m = 52.8 m

4. You should be traveling 52.8 m behind the other car.

5. Stopping Distance = Reaction Distance + Braking distance.

35 m.

Reaction distance: $d = vt$, $t = 1.5\,s$

$d = 1.5v$

Braking distance: $d = kv^2$, assume $k = 0.06$

$d = 0.06v^2$

$35 = 1.5v + 0.06v^2$

$0.06v^2 + 1.5v - 35 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$v = \frac{-1.5 \pm \sqrt{(1.5)^2 - 4(.06)(-35)}}{2(0.06)}$$

$v = 14.7$ m/s or 52.9 km/h

6. Answers will vary. Answers should discuss braking distance and reaction time as well as how road conditions affect braking distance.