A car capable of a constant acceleration of $= 2.5 \text{ m/s}^2$, is stopped at a traffic light. When the light turns green, the car starts from rest with this acceleration. Also, as the light turns green, a truck traveling with constant velocity of $u = 40 \text{ km/hr}$ passes the car. Clearly, the car will eventually travel faster than the truck and will overtake it. At what distance will the car catch up with the truck?

Solution:

The displacement of the car

$$S = \frac{at^2}{2}.$$

The displacement of the truck

$$S = ut.$$

So, at the point where the car catch up with the truck

$$\frac{at^2}{2} = ut.$$

$$t = \frac{2u}{a}.$$

Finally, the distance

$$S = \frac{2u}{a}u = \frac{2 \times (40/3.6)^2}{2.5} = 98.8 \text{ m}.$$

Answers: 98.8 m.