A car starts at rest and accelerates at 3.0 m/s².

a) How long does it take the car to reach a speed of 20 m/s?

b) After reaching a speed of 20 m/s, the car travels at a constant speed in the same direction for 8.0 s. What is the total displacement of the car (from when it started moving)?

c) The car then slows down with a constant acceleration of −5.0 m/s². How far does it travel before coming to rest?

A car starts at rest and accelerates at 3.0 m/s².
a) How long does it take the car to reach a speed of 20 m/s?

$$v_i = 0$$
$$a = 3.0 \text{ m/s}^2$$
$$v_f = 20 \text{ m/s}$$
$$t = ?$$

$$v_f = v_i + at$$
$$t = \frac{v_f}{a} = \frac{20}{3.0} = \boxed{6.67 \text{ s}}$$

b) After reaching a speed of 20 m/s, the car travels at a constant speed in the same direction for 8.0 s. What is the total displacement of the car (from when it started moving)?

PART 1 : ACCELERATION

$$v_i = 0$$
$$a = 3.0 \text{ m/s}^2$$
$$v_f = 20 \text{ m/s}$$
$$t = 6.67 \text{ s}$$
$$d = ?$$

$$v_f^2 = \cancel{v_i^2} + 2ad$$
$$d = \frac{v_f^2}{2a} = \frac{20^2}{2(3.0)}$$
$$= 66.7 \text{ m}$$

PART 2 : UNIFORM MOTION

$$v = 20 \text{ m/s}$$
$$t = 8.0 \text{ s}$$
$$d = ?$$

$$d = vt$$
$$= (20)(8.0)$$
$$= 160 \text{ m}$$

$$d_T = d_1 + d_2 = 66.7 + 160 = \boxed{227 \text{ m}}$$

c) The car then slows down with a constant acceleration of
    –5.0 m/s². How far does it travel before coming to rest?

$v_i = 20 \text{ m/s}$

$a = -5.0 \text{ m/s}^2$

$v_f = 0$

$d = ?$

$v_f^2 = v_i^2 + 2ad$

$d = \dfrac{-v_i^2}{2a} = \dfrac{-(20)^2}{2(-5.0)}$

$= \boxed{40 \text{ m}}$