

An object starts at rest and accelerates at 3.0 m/s^2 .

- a) How long does it take the object to reach a speed of 20 m/s ?
- b) After reaching a speed of 20 m/s , the object travels at a constant speed in the same direction for 8.0 s . What is the total displacement of the object (from when it started moving)?
- c) The object then slows down with a constant acceleration of -5.0 m/s^2 . How far does it travel before coming to rest?

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a)

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

b) PART 1: ACCELERATION

$$v_i = 0$$
$$a = 3.0 \text{ m/s}^2$$
$$v_f = 20 \text{ m/s}$$
$$t = 6.67 \text{ s}$$
$$d = ?$$
$$v_f^2 = v_i^2 + 2ad$$
$$d = \frac{v_f^2}{2a} = \frac{20^2}{2(3.0)} = 66.7 \text{ m}$$

PART 2: UNIFORM MOTION

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

$$t = 8.0 \text{ s}$$

$$d = ?$$

$$d = v t$$

$$= (20)(8.0)$$

$$= 160 \text{ m}$$

$$d_T = d_1 + d_2$$

$$= 66.7 + 160$$

$$= \boxed{227 \text{ m}}$$

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

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

$$v_f = 0$$

$$d = ?$$

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

$$d = \frac{-v_i^2}{2a} = \boxed{40 \text{ m}}$$