

Kinematics 1

① $v_i = 15 \text{ m/s}$
 $a = 8 \text{ m/s}^2$
 $t = 12 \text{ s}$
 $d = ?$

$$d = v_i t + \frac{1}{2} a t^2$$
$$= (15)(12) + \frac{1}{2}(8)(12)^2$$
$$d = 756 \text{ m}$$

② $v_i = 0.2 \text{ m/s}$
 $d = 4.5 \text{ m}$
 $t = 10 \text{ s}$
 $a = ?$

$$d = v_i t + \frac{1}{2} a t^2$$
$$4.5 = 0.2(10) + \frac{1}{2} a (10)^2$$
$$4.5 = 2 + 50a$$
$$2.5 = 50a$$
$$a = \frac{2.5}{50}$$
$$a = 0.05 \text{ m/s}^2$$

③ $v_i = 108 \text{ km/h} = 30 \text{ m/s}$
 $a = -2 \text{ m/s}^2$
 $d = 225 \text{ m}$
 $v_f = 0$
 $t = ?$

$$v_f = v_i + at$$
$$0 = 30 - 2t$$
$$t = \frac{30}{2} = 15 \text{ s}$$

④ $v_i = 10 \text{ m/s}$
 $a = 4 \text{ m/s}^2$
 $t = 40 \text{ s}$

a) $v_f = v_i + at$
 $= (10) + (4)(40)$

$$v_f = 170 \text{ m/s}$$

b) $d = v_i t + \frac{1}{2} a t^2$
 $= (10)(40) + \frac{1}{2}(4)(40)^2$

$$d = 3600 \text{ m}$$

$$\textcircled{5} \quad v_i = 250 \text{ km/h} = 69.4 \text{ m/s}$$

$$d = 750 \text{ m}$$

$$v_f = 22 \text{ km/h} = 6.1 \text{ m/s}$$

$$a = ?$$

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

$$(6.1)^2 = (69.4)^2 + 2a(750)$$

$$37.346 = 4822.531 + 1500a$$

$$-4785.185 = 1500a$$

$$a = \frac{-4785.185}{1500} = -3.19 \text{ m/s}^2$$

$$\textcircled{6} \quad v_i = 33 \text{ m/s}$$

$$v_f = 0$$

$$a = -11 \text{ m/s}^2$$

$$d = ?$$

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

$$0 = 33^2 + 2(-11)(d)$$

$$0 = 1089 - 22d$$

$$22d = 1089$$

$$d = \frac{1089}{22} = 49.5 \text{ m [E]}$$

$$\textcircled{7} \quad a = 3.2 \text{ m/s}^2$$

$$d = 620 \text{ m}$$

$$v_i = 0$$

$$v_f = ?$$

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

$$= 0 + 2(3.2)(620)$$

$$v_f^2 = 3968$$

$$v_f = 63 \text{ m/s}$$

⑧

Part 1

$$d = 402 \text{ m}$$

$$a = 17 \text{ m/s}^2$$

$$v_i = 0$$

$$v_f = ?$$

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

$$= 0 + 2(17)(402)$$

$$v_f^2 = 13668$$

$$v_f = 116.910 \text{ m/s}$$

v_f from part 1 becomes v_i for part 2

Part 2

$$v_i = 116.910 \text{ m/s}$$

$$a = -6.10 \text{ m/s}^2$$

$$d = 350 \text{ m}$$

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

$$= (116.910)^2 + 2(-6.1)(350)$$

$$v_f^2 = 9397.948$$

$$v_f = 96.9 \text{ m/s}$$