

ANSWERS AND SOLUTIONS

Lesson 5 - Freely Falling Objects

1.

v_0	v_f	a	d	t
0	?	9.80 m/s^2	15.0 m	X

$$v_f^2 = v_0^2 + 2ad$$

$$= 2(9.80 \text{ m/s}^2)(15.0 \text{ m})$$

$$v_f = 17.1 \text{ m/s}$$

2.

v_0	v_f	a	d	t
0	X	9.80 m/s^2	?	0.50 s

$$d = v_0 t + \frac{1}{2} a t^2$$

$$= \frac{1}{2} (9.80 \text{ m/s}^2)(0.50 \text{ s})^2$$

$$= 1.2 \text{ m}$$

3.

v_0	v_f	a	d	t
0	X	9.80 m/s^2	1.75 m	?

$$d = v_0 t + \frac{1}{2} a t^2$$

$$1.75 \text{ m} = \frac{1}{2} (9.80 \text{ m/s}^2) t^2$$

$$t = \sqrt{\frac{2(1.75 \text{ m})}{9.80 \text{ m/s}^2}}$$

$$= 0.598 \text{ s}$$

4.

v_0	v_f	a	d	t
0	?	9.80 m/s^2	9.50 m	X

$$v_f^2 = v_0^2 + 2ad$$

$$= 2(9.80 \text{ m/s}^2)(9.50 \text{ m})$$

$$v_f = 13.6 \text{ m/s}$$

5.

v_0	v_f	a	d	t
0	?	9.80 m/s^2	X	2.5 s

$$a = \frac{v_f - v_0}{t}$$

$$9.80 \text{ m/s}^2 = \frac{v_f - 0}{2.5 \text{ s}}$$

$$v_f = 25 \text{ m/s down}$$

6.

v_0	v_f	a	d	t
?	X	9.80 m/s^2	11.2 m	0.550 s

$$d = v_0 t + \frac{1}{2} a t^2$$

$$11.2 \text{ m} = v_0(0.550 \text{ s}) + \frac{1}{2} (9.80 \text{ m/s}^2)(0.550 \text{ s})^2$$

$$v_0 = \frac{11.2 \text{ m} - \frac{1}{2} (9.80 \text{ m/s}^2)(0.550 \text{ s})^2}{0.550 \text{ s}}$$

$$= 17.7 \text{ m/s down}$$

7.

v_0	v_f	a	d	t
10.0 m/s	25.0 m/s	9.80 m/s^2	X	?

$$a = \frac{v_f - v_0}{t}$$

$$9.80 \text{ m/s}^2 = \frac{25.0 \text{ m/s} - 10.0 \text{ m/s}}{t}$$

$$t = \frac{25.0 \text{ m/s} - 10.0 \text{ m/s}}{9.80 \text{ m/s}^2}$$

$$= 1.53 \text{ s}$$

8.

v_0	v_f	a	d	t
5.0 m/s	15.0 m/s	9.80 m/s^2	?	X

$$v_f^2 = v_0^2 + 2ad$$

$$(15.0 \text{ m/s})^2 = (5.0 \text{ m/s})^2 + 2(9.80 \text{ m/s}^2)d$$

$$d = \frac{(15.0 \text{ m/s})^2 - (5.0 \text{ m/s})^2}{2(9.80 \text{ m/s}^2)}$$

$$= 1.0 \times 10^1 \text{ m}$$

9.

v_0	v_f	a	d	t
?	10.0 m/s	9.80 m/s^2	X	0.880 s

$$a = \frac{v_f - v_0}{t}$$

$$9.80 \text{ m/s}^2 = \frac{10.0 \text{ m/s} - v_0}{0.880 \text{ s}}$$

$$v_0 = 1.38 \text{ m/s down}$$