**2023 Sec 3 Physics**

**Answers to AS 5.3**

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1 a) Sign convention: A towards B is positive
$v = u + at$
$25.0 = u + (0.670)(12.0)$
$u = 16.96 \text{ m s}^{-1} =$ **$17.0 \text{ m s}^{-1}$ (to 3 s.f.)**

b) $s = ut + \frac{1}{2} at^2$
$s = (16.96)(12.0) + \frac{1}{2} (0.670)(12.0)^2$
$s = 251.76 =$ **252 m (to 3 s.f.)**

2 a) Sign convention: downhill is positive
$s = ut + \frac{1}{2} at^2$
$s = (3.0)(8.0) + \frac{1}{2} (1.5)(8.0)^2$ = **72 m (to 2 s.f.)**

b) $v^2 = u^2 + 2as$
$7.0^2 = 3.0^2 + 2(1.5)(s)$
$s = 13.33 =$ **13 m (to 2 s.f.)**

3
**Note**: Good to sketch a diagram to illustrate the known and unknown quantities.
a) Sign convention: A towards B is positive
$s = ut + \frac{1}{2} at^2$
$30 = (14)(2.5) + \frac{1}{2} (a)(2.5)^2$
**$a = -1.6 \text{ m s}^{-2}$**

b) $v = u + at$
$v = 14 + (-1.6)(2.5) =$ **$10 \text{ m s}^{-1}$ (to 2 s.f.)**

c) $v = u + at$
$0 = 14 + (-1.6)(t)$
$t = 8.75 =$ **8.8 s (to 2 s.f.)**

4 a) Sign convention: upwards is positive
$v^2 = u^2 + 2as$
$0 = 40^2 + 2(-10)(s)$
$s =$ **80 m (to 2 s.f.)**

height = 80 m

b) $s = ut + \frac{1}{2} at^2$
$0 = (40)t + \frac{1}{2}(-10)t^2$
$t =$ **8.0 s**

5 Sign convention: downwards is positive
(a) $s = ut + \frac{1}{2} at^2$
$80 = (0)\, t + \frac{1}{2} (10)t^2$
**$t = 4.0$ s**

(b) $v = u + at$

v = 0 + 10 (4.0)
**v = 40 m $s^{-1}$**

(c) s = ut + ½ $at^2$
30 = (40)t + ½ (-20)$t^2$
**t = 1.0 s** (reject *t* = 3.0 s as acceleration is -20 m $s^{-2}$ only before hitting the seabed)

(d) v = u + at
v = 40 + (-20)(1.0)
**v = 20 m $s^{-1}$**