1) A
2) C
3) D
4) D
5) B
6) A
7)

(a) constant gradient/straight line **B1 [1]**

(b) (i) 1.2 s **A1**

(ii) 4.4 s **A1 [2]**

(c) *either* use of area under line *or* h = average speed x time **C1**

h = ½ x (4.4 – 1.2) x 32 **C1**

= 51.2 m **A1 [3]**

(allow 2/3 marks for determination of h = 44 m or h =58.4 m
allow 1/3 marks for answer 7.2 m)

8)

(a) kg m s^{-2} B1 **[1]**

(b) kg m^{-1} s^{-1} B1 **[1]**

(c) (i) $v^2 = 2gs$
$= 2 \times 9.8 \times 4.5$ C1
$v = 9.4$ m s^{-1} A1 **[2]**

(ii) *either*
F $(= 3.2 \times 10^{-4} \times 1.2 \times 10^{-2} \times 9.4) = 3.6 \times 10^{-5}$ N M1
weight of sphere $(= mg = 15 \times 10^{-3} \times 9.8) = 0.15$ N M1
$3.6 \times 10^{-5} << 0.15$, so justified A1 **[3]**
or
$mg = crv_T$ (M1)
terminal speed $= 3.8 \times 10^4$ m s^{-1} (M1)
$9.4 << 3.8 \times 10^4$, so justified (A1)

9)

(a) 2.4 s ..... A1 [1]

(b) in **(b)** and **(c)**, allow answers as (+) or (–)
recognises distance travelled as area under graph line C1
height = (½ × 2.4 × 9.0) – (½ × 1.6 × 6.0) C1
= 6.0 m (*allow 6 m*) ..... A1 [3]
(*answer 15.6 scores 2 marks*
answer 10.8 or 4.8 scores 1 mark)

alternative solution: $s = ut - \frac{1}{2}at^2$
$= (9 \times 4) - \frac{1}{2} \times (9 / 2.4) \times 4^2$
$= 6.0$ m
(*answer 66 scores 2 marks*
answer 36 or 30 scores 1 mark)