Textbook Solutions

Page 72 - 73

20. $d = 4.12 \times 10^{16}\ m$
$V = 3.00 \times 10^{8}\ m/s$

$V = \frac{d}{t} \Rightarrow Vt = d \Rightarrow t = \frac{d}{V}$

$t = \frac{4.12 \times 10^{16}\ m}{3.00 \times 10^{8}\ m/s} = 1.37 \times 10^{8}\ s$

1 year = 31536000 seconds.

$1.37 \times 10^{8}\ s * \frac{1\ year}{31536000\ s} = 4.34$ years.

See last page for solutions of # 23.

24. $V_i = 14\ m/s \quad V_f = 0.0\ m/s$
$t = 5.0\ s \quad a = ?$

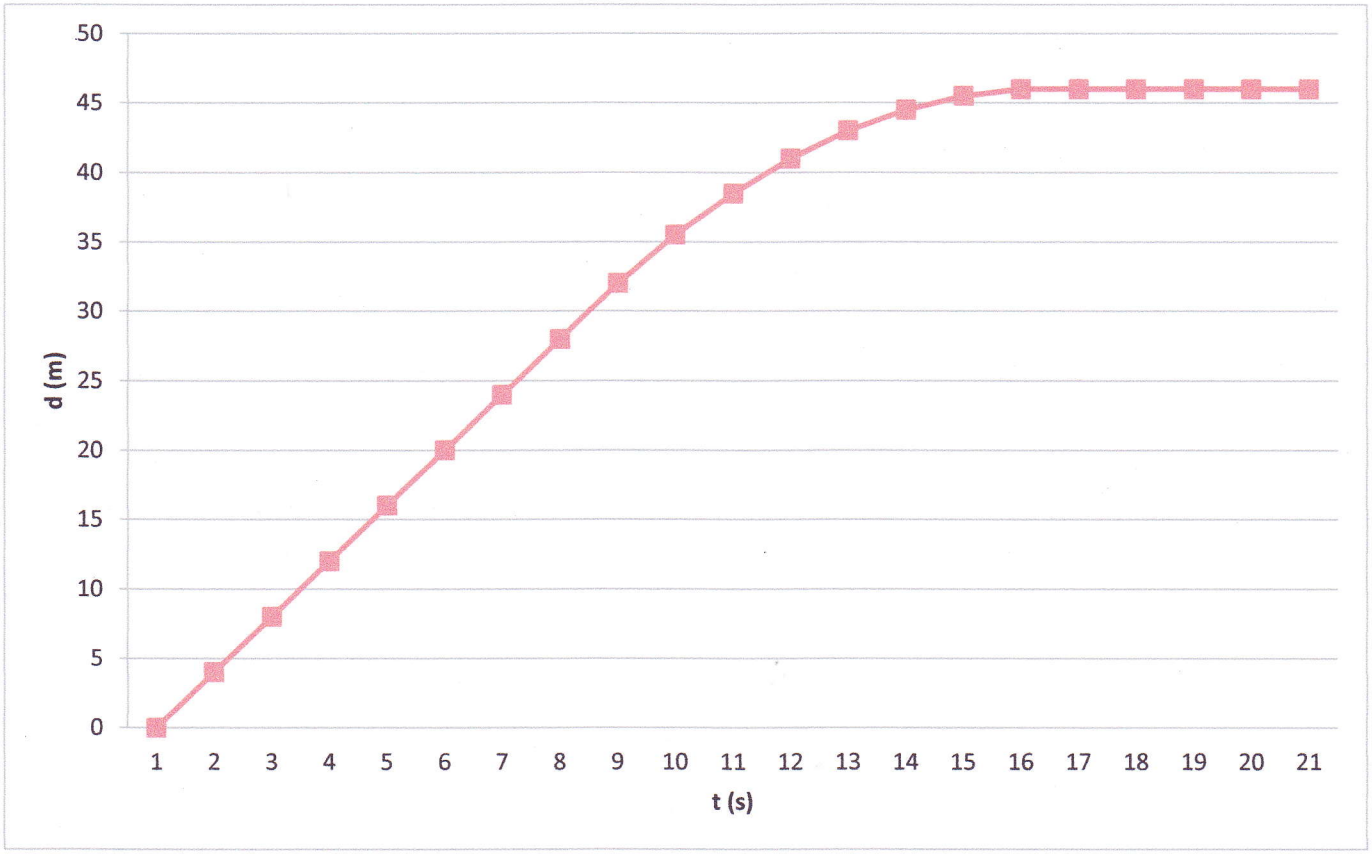
$V_f = V_i + at$
$0.0\ m/s = 14\ m/s + a(5.0\ s)$
$-14\ m/s = (5.0\ s)a$
$a = -2.8\ m/s^2$

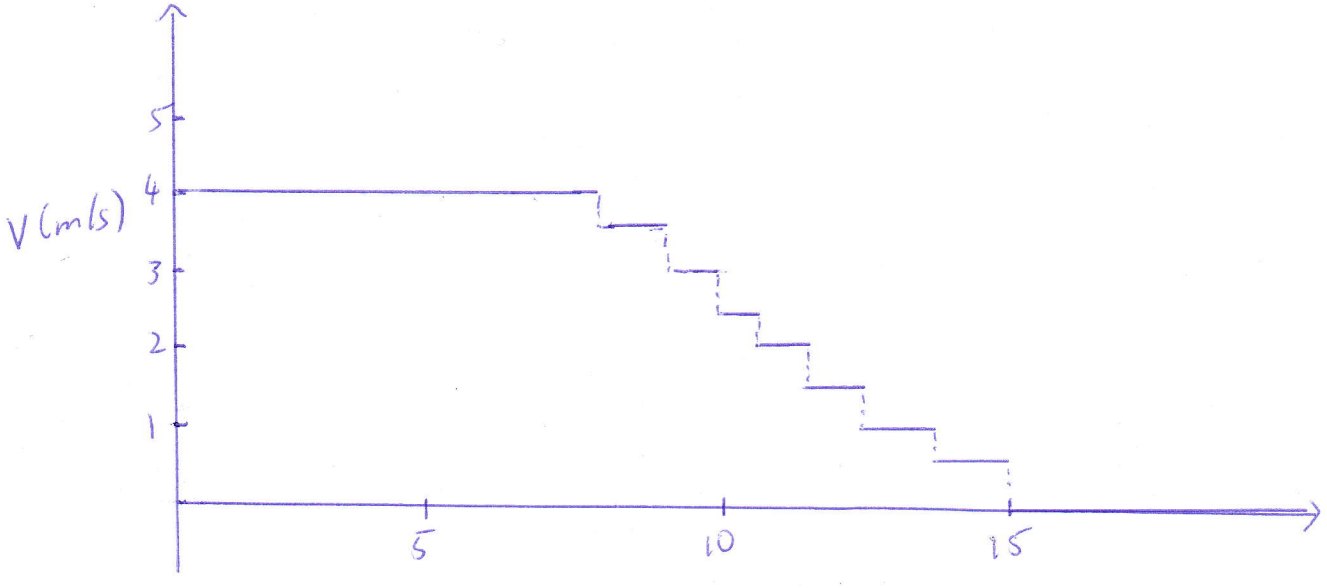
25. $V_i = 0.0\ m/s$, $V_f = 5.4\ m/s$
$t = 12\ s$; $a = ?$

Average velocity $= \frac{1}{2}(V_f + V_i) = \frac{1}{2}(0.0\ m/s + 5.4\ m/s)$
$= 2.7\ m/s$

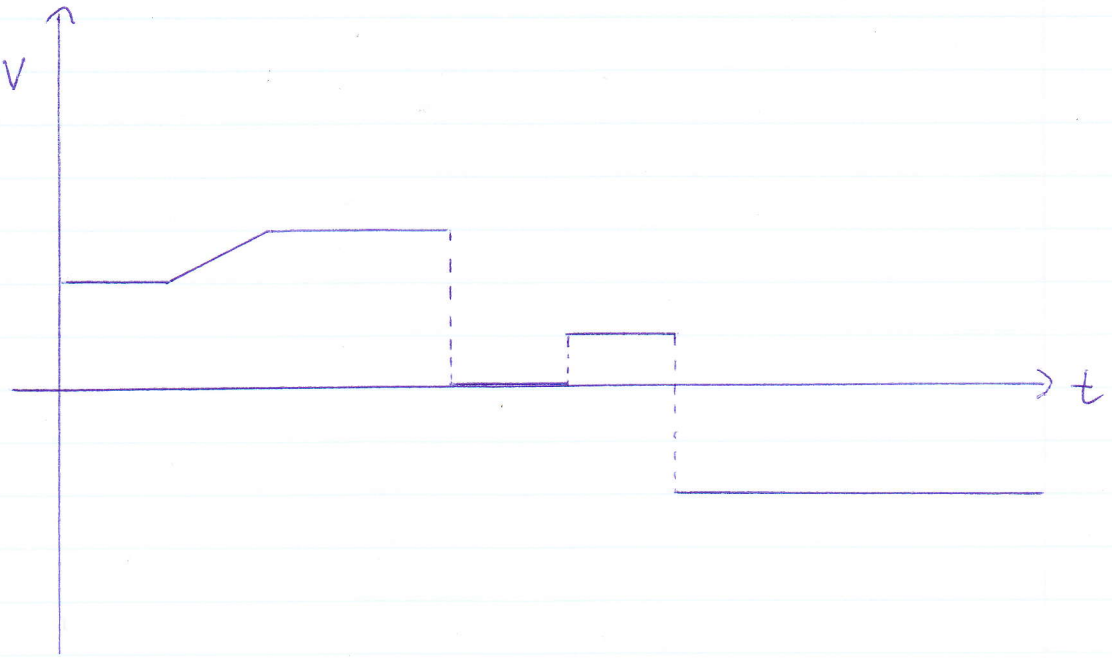
$V_f = V_i + at$
$5.4\ m/s = 0.0\ m/s + a(12\ s)$
$a = 0.45\ m/s^2$

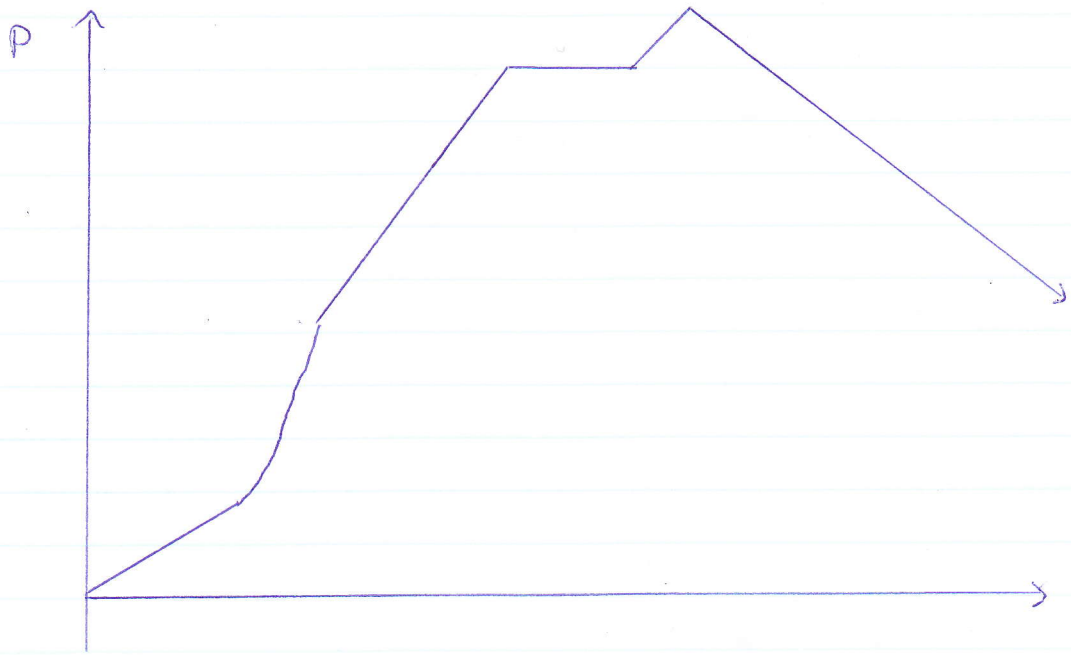
27.


50
45
40
35
30
25
20
15
10
5
0
d (m)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
t (s)


V (m/s)
5
4
3
2
1
5
10
15

29.





4. $V_i = 0.0\ m/s$, $V_f = 4.0\ m/s$, $t = 2.5\ s$

(a) $d = \frac{1}{2}(V_i + V_f)t$

$d = \frac{1}{2}(0.0\ m/s + 4.0\ m/s)(2.5\ s)$

$d = 5.0\ m$

(b) $V_f = V_i + at$

$4.0\ m/s = 0.0\ m/s + a(2.5\ s)$

$4.0\ m/s = (2.5\ s)a$

$a = 1.6\ m/s^2$

5. Michael is 75 m behind Robert and has an initial velocity that is 0.4 m/s slower. Set Robert as the reference frame.

$V_i = -0.4\ m/s$, $d = 75\ m$, $a = 0.15\ m/s^2$

$d = V_i t + \frac{1}{2}at^2$

$75 = -0.4t + \frac{1}{2}(0.15)t^2$

$0 = 0.075t^2 - 0.4t - 75$

$t = \frac{0.4 \pm \sqrt{(0.4)^2 - 4(0.075)(-75)}}{0.15}$

$t = \frac{0.4 \pm \sqrt{22.66}}{0.15} = 34\ s$

6. $V_i = 2.0 \times 10^2\ km/h$, $a = 5.0\ m/s^2$

$t = 8\ s$

$V_i = 2.0 \times 10^2\ km/h \times \frac{1000\ m}{1\ km} \times \frac{1\ h}{3600\ s} = 55.6\ m/s$

$d = V_i t + \frac{1}{2}at^2$

$d = (55.6\ m/s)(8\ s) + \frac{1}{2}(5.0\ m/s^2)(8\ s)^2$

$d = 444.8\ m + 160\ m = 604.8\ m = 600\ m$

7. $V_i = 20.0\ m/s$, $d = 150.\ m$, $t = 10.0\ s$
$V_f = ?$

$d = \frac{1}{2}(V_i + V_f)\,t$
$150.\ m = \frac{1}{2}(20.0\ m/s + V_f)(10.0\ s)$
$150.\ m = 100\ m + (10.0\ s)V_f$
$50.\ m = (10.0\ s)V_f$
$V_f = 5\ m/s = 5.00\ m/s$