FIVE EQUATIONS PRACTICE

SOLUTIONS

Q1)

G

$\Delta t = 6.2\ s$

* $v_f = 160\ km/h\ [N]$
$= 44.4\ m/s\ [N]$

$\Delta d = 220\ m\ [N]$

R

$a = ?$

A

USE EQUATION #4

S

$\Delta d = v_f \Delta t - \frac{1}{2} a (\Delta t)^2$

$220 = (44.4)(6.2) - \frac{1}{2} a (6.2)^2$

$220 = 275.3 - 19.2a$

$-55.3 = -19.2a$

$a = 2.88$

P

$a = 2.9\ m/s^2\ [N]$

(2 sig digs)

Q2)

G

$v_i = 6.0\ m/s\ [N]$

$v_f = 8.0\ m/s\ [N]$

$a = 0.50\ m/s^2\ [N]$

R

$\Delta d = ?$

A

USE EQUATION #5

S

$v_f^2 = v_i^2 + 2a\Delta d$

$(8.0)^2 = (6.0)^2 + 2(0.5)\Delta d$

$64 = 36 + \Delta d$

$29 = \Delta d$

P

$\Delta d = 29\ m\ [N]$

(2 sig Digs)

G. R. A. S. P.

G - GIVEN
R - REQUIRED
A - ANALYSIS
S - SOLUTION
P - PARAPHRASE.

Q3) G

$v_i = 0.00$

$\Delta d = 17\ m\ [E]$

$\Delta t = 3.8\ s$

R

$v_f = ?$

A

USE EQUATION #2.

S

$\Delta d = \left(\frac{v_f + v_i}{2}\right)\Delta t$

$17 = \left(\frac{v_f}{2}\right)(3.8)$

$v_f = \frac{2 \times 17}{3.8}$

$v_f = 8.95$

P

$v_f = 9.0\ m/s\ [E]$

(2 sig figs).

Q4) G

$v_i = 0.00$

$\Delta d = 70.0\ m\ [D]$

$\Delta t = 5.3\ s$

R

$a = ?$

A

USE EQUATION #3.

S

$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$

$70.0 = 0 + \frac{1}{2} a (5.3)^2$

$70. = + 14 a$

$a = 5.0$

P

$a = 5.0\ m/s^2\ [D]$

(2 sig figs).

Q5)

G

$v_i = 15 m/s\ [W]$

* $a = 7.0 m/s^2\ [E]$
$= -7.0 m/s^2\ [W]$

$\Delta t = 4.0 s.$

R

$v_f = ?$

A

USE EQUATIONS #1

S

$v_f = v_i + a\,dt.$

$v_f = 15 + (-7.0)(4.0).$

$v_f = 15 - 28$

$v_f = -13$

P

$v_f = -13 m/s\ [W]$

OR $13 m/s\ [E]$

Q6)

G

$v_i = 5.0 m/s.$

$v_f = 7.5 m/s.$

$\Delta d = 50.0 m.$

R

$a = ?$

A

USE EQUATION #5.

S

$v_f^2 = v_i^2 + 2ad\,d.$

$(7.5)^2 = (5)^2 + 2a(50).$

$56.25 = 25 + 100a.$

$31.25 = 100a$

$a = 0.3125.$

P

$a = 0.31 m/s^2$

(2-sig-Digs).

Q7)

G

$v_i = 50 \text{ km/h}$
$= 13.9 \text{ m/s}$

$v_f = 100 \text{ km/h}$
$= 27.8 \text{ m/s}$

$a = 3.8 \text{ m/s}^2$

R

$\Delta d = ?$

A

USE EQUATION #5

S

$v_f^2 = v_i^2 + 2a\Delta d$

$(27.8)^2 = (13.9)^2 + 2(3.8)\Delta d$

$772.84 = 193.21 + 7.6\Delta d$

$579.63 = 7.6\Delta d$

$\Delta d = 76.267$

P

$\Delta d = 76 \text{ m}$
(2 Sig Digs).

Q8)

G

$v_i = 10 \text{ m/s [R]}$

$v_f = 30 \text{ m/s [R]}$

$\Delta t = 5.0 \text{ s}$

R

$\Delta d = ?$

A

USE EQUATION #2

S

$\Delta d = \left(\frac{v_f + v_i}{2}\right)\Delta t$

$\Delta d = \left(\frac{30 + 10}{2}\right)(5.0)$

$\Delta d = \left(\frac{30}{2}\right)(5.0)$

$\Delta d = 75.0$

P

$\Delta d = 75 \text{ m [R]}$
(2 Sig Digs).

Q9)

G

$v_i = 0.000$

$a = 3.75\ m/s^2\ [F]$

$\Delta t = 5.65\ s$

R

$\Delta d = ?$

A

USE EQUATION #3

S

$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$

$\Delta d = 0 + \frac{1}{2}(3.75)(5.65)^2$

$\Delta d = 59.855$

P

$\Delta d = 59.9\ m\ [F]$

(3 sig Digs)

Q10)

G

$v_i = 0$

$v_f = 460\ m/s\ [F]$

$\Delta t = 2.75 \times 10^{-3}\ s$

R

$a = ?$

A

USE EQUATION #1

S

$v_f = v_i + a \Delta t$

$460 = 0 + a(2.75 \times 10^{-3})$

$a = \frac{460}{2.75 \times 10^{-3}}$

$a = 167272.7273$

P

$a = 1.67 \times 10^5\ m/s^2\ [F]$

OR

$1.7 \times 10^5\ m/s^2\ [F]$

(2 sig Digs)

Q 11)

G

$v_i = 0$

$a = 42.5 \text{ m/s}^2$

$\Delta d = 2.6 \text{ km}$

$= 2600 \text{ m}$

R

$\Delta t = ?$

A

USE EQUATION #3

S

$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$

$2600 = 0 + \frac{1}{2}(42.5)(\Delta t)^2$

$2600 = 21.25 (\Delta t)^2$

$(\Delta t)^2 = 122.35$

$\Delta t = 11.06$

P

$\Delta t = 11 \text{ s}$

(2 S.F Digits)

Q 12)

G

$v_i = 14.0 \text{ m/s}$

$v_f = 0 \text{ m/s}$ (STOP)

$\Delta t = 5.60 \text{ s}$

R

$\Delta d = ?$

A

USE EQUATION # 2

S

$\Delta d = \left(\frac{v_f + v_i}{2}\right) \Delta t$

$\Delta d = \left(\frac{14}{2}\right)(5.60)$

$\Delta d = 39.2$

P

$\Delta d = 39.2 \text{ m}$

(3 S.F Digits)

(Q13)

G

$v_f = 30\ km/h.$
$= 8.33\ m/s.$

$\Delta d = 150\ m$

$v_i = 50\ km/h$
$= 13.9\ m/s.$

R

$a = ?$

A

USE EQUATION #5

S

$v_f^2 = v_i^2 + 2a\Delta d.$

$(8.33)^2 = (13.9)^2 + 2a(150)$

$69.4 = 193.2 + 300a.$

$-123.8 = 300a.$

$a = -0.4127.$

P

$a = -0.4\ m/s^2.$
(SLOWING DOWN).
(1 SIG DIG)

(Q14)

G

$v_i = 350\ m/s\ [E]$

$\Delta t = 0.0050\ s.$

$v_f = 0$ (REST).

REQUIRED

a) ACCELERATION
b) $\Delta d.$

A

a) FIRST USE EQUATION #1
b) THEN USE EQUATION #2

Sa

$v_f = v_i + a\Delta t.$

$0 = 350 + (0.0050)a$

$-350 = 0.0050a.$

$a = -70000$

Sb

$\Delta d = \left(\frac{v_f + v_i}{2}\right)\Delta t.$

$\Delta d = \left(\frac{350}{2}\right)(0.0050)$

$\Delta d = 0.875$

P

$\Rightarrow$ OR $a = 7.0 \times 10^5\ m/s^2\ [W]$

$a = -70 \times 10^5\ m/s^2\ [E]$

$\Delta d = 0.88\ m.$
(2 SIG DIGS)