June 2013

Grade 12 P1 memo

Question 1

1.1 normal

1.2 inelastic

1.3 Watt

1.4 acceleration

1.5 ohm

Question 2

2.1 B

2.2 D

2.3 C

2.4 D

2.5 D

QUESTION 3

3.1 $v_f^2 = v_i^2 + 2a\Delta y$ ✓
0^2 ✓ $= v_i^2 + 2(-9,8)(33,78)$ ✓
$= 25,73\ m{\cdot}s^{-1}$, upwards ✓ (4)

3.2 equal to ✓ (1)

3.3 final velocity is always zero at the maximum height ✓
acceleration due to gravity is a constant 9,8 $m{\cdot}s^{-2}$ ✓
in this case the displacement is also constant (33,78 m) ✓ (3)

Or

The mass of the object does not influence the velocity√, as the mass does not feature in the equations of motion.√√

or

since g remains constants at 9,8 $m.s^{-2}$ √the velocity will remain the same, √ √

3.4 $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= (0)(3,2)$ ✓ + ½(- 9,8) $(3,2^2)$ ✓
= - 50,18 m ✓

Height of point P = 50,18 - 33,78 ✓ (for subtraction)
= 16,40 m. ✓ (6)

3.5 $v_f = v_i + a\Delta t$ ✓
$= 0$ ✓ + $(-9,8)(3,2)$ ✓
= - 31,36
vf = 31,36 $m.s^{-1}$, downwards ✓ (4)

Or

$V_f^2 = vi^2 + 2a\Delta y$

$= 0^2 + 2(-9.8)(-50,18)$

$= \pm 31,36 m.s^{-1}$

= <u>31,36 $m.s^{-1}$ downwards √</u>

3.6 $V_f = v_i + a\Delta t$ √

$0 = 25{,}73 + (-9.8)\,\Delta t$ √

$\Delta t = 2{,}63$ s √ (3)

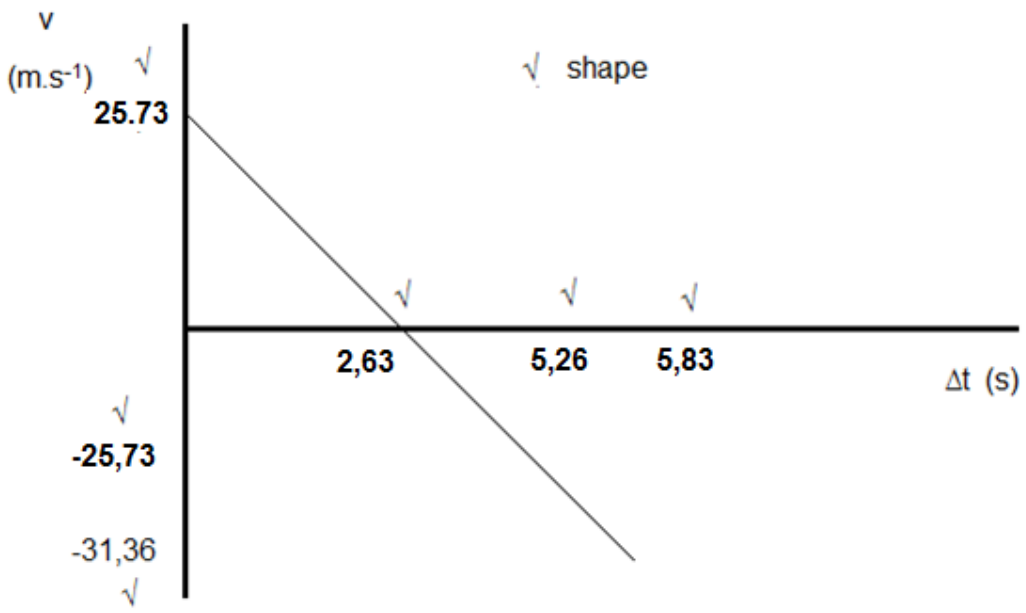
Or

$\Delta y = \frac{V_f + V_i}{2}\,\Delta t$ √

$33{,}78 = \frac{(0 + 25{,}73)}{2}\,\Delta t$ √

$\Delta t = 2{,}63$ s √

3.7



(7)

QUESTION 4

4.1 $(U+K)_{Top} = (U+K)_{Bottom}$

$mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2$ ✓

$(0,11 \times 9,8 \times 0,33)$ ✓ $+ 0$ ✓ $= 0 + \frac{1}{2}(0,11)v^2$ ✓

$v = 2,54 \text{ m.s}^{-1}$ ✓ (5)

4.2

$\Delta p = m(v_f - v_i)$ ✓

$0,098 = 0,065(v_f - 0)$ ✓

$v_f = 1,51 \text{ m.s}^{-1}$

Total p before = Total p after

$mv_i + mv_i = mv_f + mv_f$ ✓

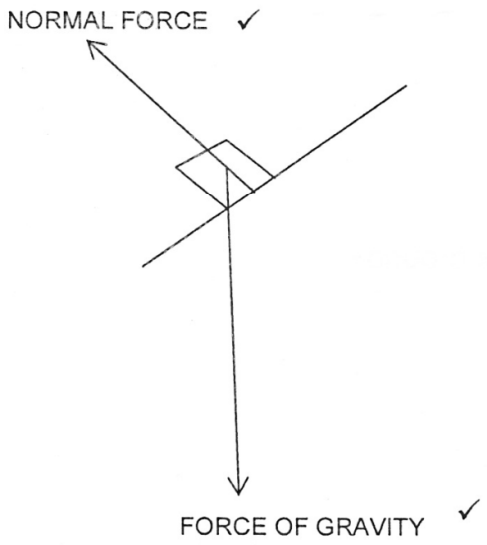
$(0,11)(2,54)$ ✓ $+ 0 = (0,11)(v_f)$ ✓ $+ (0,065)$ ✓ $(1,51)$

$v_f = 1,65 \text{m.s}^{-1}$ ✓ (7)

(12)

QUESTION 5

5.1



(2)

5.2 $W_{Fg} = Fg\cos\theta\ \Delta x$ ✓

$= mg\cos\theta\Delta x$

$= 90 \times 9{,}8 \times \cos 180^0$ ✓ $\times\ 2{,}75$ ✓

$= -2425{,}5J$ ✓

(4)

5.3 $W_{FRICTION} = Ff\cos\theta\ \Delta x$

-525 ✓ $= 35\cos 180^0\ \Delta x$ ✓

$\Delta x = 15\ m$ ✓

$$\sin\theta = \frac{0}{H}$$

$$= \frac{2{,}75}{15}$$ ✓

$$\theta = 10{,}56^0$$ ✓

(5)

(11)

Question 6

6.1 $W_{net} = \Delta K$✓
$= \frac{1}{2}mv^2_f - \frac{1}{2}mv^2_i$
$= \frac{1}{2}(32)(5^2)$ ✓ $- \frac{1}{2}(32)(1,5^2)$ ✓
$= 364$ J✓

(4)

6.2 $W_{friction} = F_{friction}\,\Delta x \cos\theta$✓
$= 12$ ✓ x 20 x cos 180°✓
$= -240$ J✓

(4)

6.3 Wnet $= W_{friction} + W_{Fhorizontal}$✓
364 $= -240 + W_{Fhorizontal}$

$W_{Fhorizontal} = 604$ J✓
$W_{Fhorizontal} = F_x \Delta x \cos\theta$
$604 = F_x$ x 20 x cos 0°✓
$F_x = 30,2$ N
$F_x = F\cos\theta$✓
30,2 ✓ = F x cos 45°
F = 42,71 N✓

Or Wnet = $F_{net}\Delta x \cos\theta$✓
364✓ = F_{net}x 20cos0^0

Fnet = 18, 2 N✓

Fnet = Fapp + F_f✓
18,2 = Fapp + (-240)✓
Fapp = 42, 71N✓

(6)

6.4 He would find it **easier to pull the cart** (1)

Question 7

7.1 Some work is done to overcome the internal resistance of the battery. ✓✓ (2)

7.2

$$I = \frac{V}{R} \checkmark$$
$$= \frac{12-10}{1}$$
$$= 2\ A \checkmark$$

$$V_2 = IR$$
$$= 2 \times 3 \checkmark$$
$$= 6\ V$$

$$V_{bulb} = 10 - 6 \checkmark$$
$$= 4\ V$$

$$I_{3\Omega+3\Omega} = \frac{V}{R} \checkmark$$
$$= \frac{4}{6}$$
$$= 0,67\ A \checkmark$$

$$I_{bulb} = 2 - 0,67$$
$$= 1,33\ A$$ (6)

7.3 Bulb will stop burning ✓
Decreases current to almost zero ✓ (2)

7.4 $W = VI\Delta t\surd$

$= 4(1,33)(120)\surd$

$= 638,4\ J\surd$ (3)

Question 8

8.1 1,5 V ✓ (1)

8.2 $\text{gradient/m} = \frac{\Delta V}{\Delta I}$

$= \frac{0,65 - 1,5 ✓}{1,0 - 0 ✓}$

$= - 0,85\ \Omega$ ✓ (3)

8.3 Internal resistance ✓✓ (2)