



Gr 12 Physics Prelim

September 2018

Memo

1.1 C

1.2 A

1.3 D

$$a = \frac{F_{\text{net}}}{m}$$

1.4 C

1.5 B

1.6 B

1.7 C

1.8 C

1.9 A

1.10 C

2.1.1 path length traveled. ✓

2.1.2. change in position ✓✓

2.1.2. $v_i = 4,75$

$$v_f = 8,25$$

$$\Delta x = 30$$

$$\Delta t = ?$$

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

$$30 = \left(\frac{4,75 + 8,25}{2} \right) \Delta t \quad \checkmark$$

$$\Delta t = 4,62 \text{ s} \quad \checkmark$$

2.1.3 $v_i = 8,25$

$$v_f = 0$$

$$a = -7,54$$

$$\Delta x = ?$$

$$v_f^2 = v_i^2 + 2a\Delta x \quad \checkmark$$

$$0 = (8,25)^2 + 2(-7,54)\Delta x \quad \checkmark$$

$$\Delta x = 4,518 \text{ m}$$

$$\therefore \text{thinking distance} = 6 - 4,51375 \\ = 1,487 \text{ m}$$

$$\Delta x = v \Delta t \quad \checkmark$$

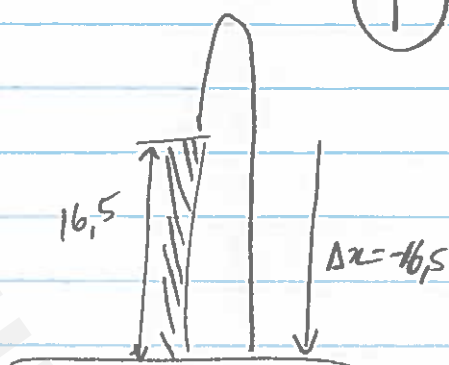
$$1,487 = 8,25 \Delta t \quad \checkmark$$

$$\Delta t = 0,180 \text{ s} \quad \checkmark$$



2.1.5 $29,7 \text{ km} \cdot \text{h}^{-1} \quad \checkmark$

3.1



$$\Delta t = 4,784$$

$$g = -9,8$$

$$\Delta x = -16,5$$

3.1.1 rate of change in position ✓✓

3.1.2 $v_i = ?$

$$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2 \quad \checkmark$$

$$-16,5 = v_i (4,784) + \frac{1}{2} (-9,8) (4,784)^2$$

$$v_i = 19,99 \text{ m.s}^{-1} \text{ upwards.}$$

3.1.3 $v_i = 19,99$

$$v_f = 0$$

$$g = -9,8$$

$$\Delta x = ?$$

$$v_f^2 = v_i^2 + 2 a \Delta x \quad \checkmark$$

$$0 = (19,99)^2 + 2 (-9,8) \Delta x \quad \checkmark$$

$$\Delta x = 20,39 \text{ m}$$

$\therefore$ height = 36,89 m ✓ above the ground.

3.2.1 Upwards ✓

$$\begin{aligned} 3.2.2. \quad \Delta x &= \text{area under graph} \quad \checkmark \\ &= \frac{1}{2}bh \\ &= \frac{1}{2}(2)(19,6) \quad \checkmark \\ &= 19,6 \text{ m upwards.} \quad \checkmark \end{aligned}$$

3.2.3 $\Delta x = ?$

$$v_i = 19,6$$

$$v_f = -24,5$$

$$g = -9,8$$

$$v_f^2 = v_i^2 + 2a\Delta x \quad \checkmark$$

$$(-24,5)^2 = (19,6)^2 + 2(-9,8)\Delta x \quad \checkmark$$

$$\Delta x = -11,025$$

$\therefore$ Ball was 11,03 m above the ground at $t = 0$. ✓

OR.

$$v_i = 0$$

$$v_f = -24,5$$

$$g = -9,8$$

$$\Delta x = ?$$

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

$$(-24,5)^2 = 0 + 2(-9,8)\Delta x$$

$$\Delta x = -30,625$$

$$19,6 - 30,625 = 11,025$$

3.2.4 twice ✓
(or 2)

3.2.6

$$\Delta t = 0,04$$

$$v_i = -14,7$$

$$v_f = 10,8$$

$$m = 0,0025$$



$$F_{\text{net}} = \frac{\Delta p}{\Delta t} \quad \checkmark$$

$$= \frac{m \Delta v}{\Delta t}$$

$$= \frac{m(v_f - v_i)}{\Delta t}$$

$$= \frac{0,0025(10,8 - (-14,7))}{0,04} \quad \checkmark$$

$$= 1,59 \text{ N, upwards} \quad \checkmark$$

OR

$$v_f = v_i + a \Delta t$$

$$10,8 = -14,7 + a(0,04) \quad \checkmark$$

$$a = 637,5 \text{ m} \cdot \text{s}^{-2}, \text{ up}$$

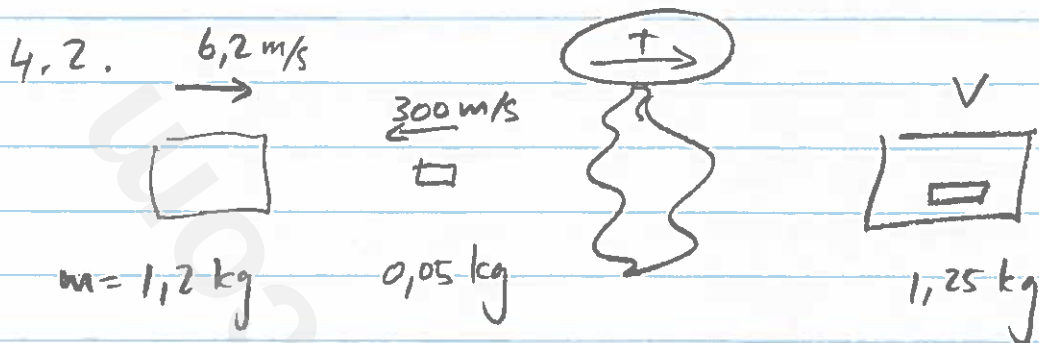
$$F_{\text{net}} = ma$$

$$= (0,0025)(637,5) \quad \checkmark$$

$$= 1,59 \text{ N, up} \quad \checkmark$$



4.1 No air resistance & } ✓
 Surface is frictionless } ∴ no horizontal
 external forces. ✓



$$P_{\text{tot } i} = P_{\text{tot } f}$$

$$Mv_i + mv_i = (M+m)v_f$$

$$1.2(6.2) + 0.05(-300) = 1.25 v_f$$

$$v_f = -6.05$$

$$\therefore v_f = 6.05 \text{ m.s}^{-1}, \text{ left}$$

4.3

$$\begin{aligned} \Delta p &= m\Delta v = m(v_f - v_i) \\ &= 1.2(-6.05 - 6.2) \\ &= -14.7 \end{aligned}$$

$$\therefore \text{impulse on block} = 14.7 \text{ kg.m.s}^{-1}, \text{ left}$$

4.4.1 No change ✓

4.4.2 Increase / deeper ✓

4.4.3 decrease / less. ✓

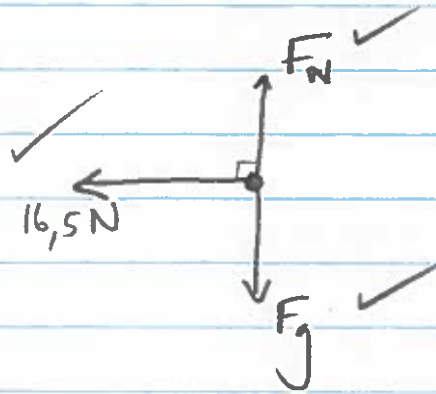
4.5 Softer wood causes a longer contact time ✓

Δp of the bullet the same as for hard wood. ✓

$$F_{\text{net}} = \frac{\Delta p}{\Delta t}$$

$$F_{\text{net}} \propto \frac{1}{\Delta t} \quad \checkmark \quad (\Delta p \text{ constant}).$$

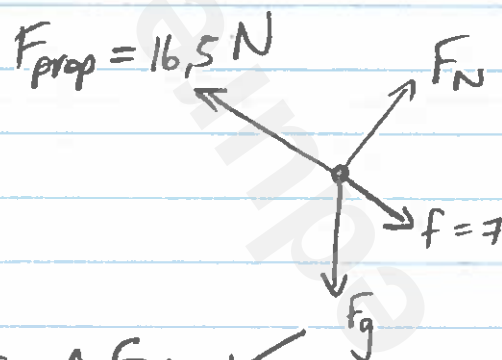
5.1



5.2. The product of the displacement and the component of the force parallel to the displacement. ✓

5.3 The work done by a net force on an object is equal to the change in kinetic energy of the object. ✓

5.4.



$$W_{\text{net}} = \Delta E_k \quad \checkmark$$

$$W_{F_{\text{prop}}} + W_{F_N} + W_f + W_{F_g} = E_{kf} - E_{ki}$$

$$\begin{aligned} F_{\text{prop}} \cdot \Delta x \cos \theta + 0 + f \Delta x \cos \theta + -\Delta E_p &= E_{kB} - 0 \\ 16,5 (11,7) \cos 0^\circ + 7 (11,7) \cos 180^\circ - E_{Pf} + E_{Pi} &= E_{kB} \\ 193,05 - 81,9 - mgh_B + 0 &= E_{kB} \\ 111,15 - 2(9,8)(4) &= E_{kB} \\ 32,75 \text{ J} &= E_{kB} \quad \checkmark \end{aligned}$$

$$5.5 \quad W_{\text{net}} = \Delta E_{K_{B \rightarrow D}} \quad \checkmark$$

$$W_{F_{\text{prop}}} + W_N + W_{F_g} = E_{K_D} - E_{K_B} \quad \textcircled{+}$$

$$F_{\text{prop}} \Delta x \cos \theta + 0 + \Delta E_p = \frac{1}{2} m v_D^2 - E_{K_B}$$

$$16,5(5+x) \checkmark - E_{PD} + E_{PB} \checkmark = \frac{1}{2} m v_D^2 - E_{K_B}$$

$$16,5(5+x) - mgh_D + mgh_B = \frac{1}{2} m v_D^2 - 32,75$$

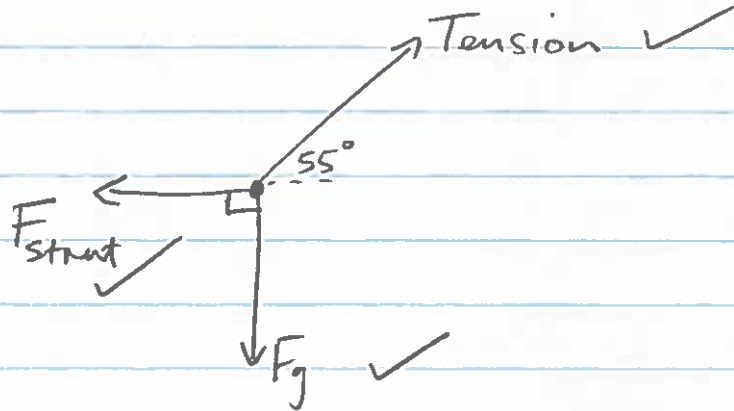
$$82,5 + 16,5x - \underbrace{2(9,8)(1,5) + 2(9,8)(4)}_{\checkmark} = \frac{1}{2}(2)(16,71)^2 - 32,75$$

$$82,5 + 16,5x - 21,4 + 78,4 = 279,224 - 32,75$$

$$x = 6,97 \text{ m} \quad \checkmark$$



6.1

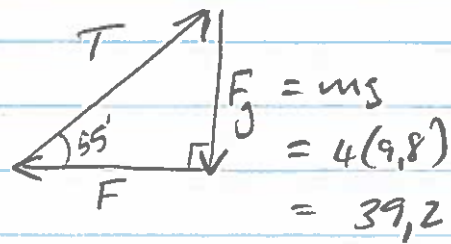


6.2 An object continues in a state of rest or uniform velocity unless acted upon by a net force. ✓✓

6.3 The gravitational force the Earth exerts on the sign while on or near its surface. ✓✓

6.4 The gravitational force that the sign exerts on the Earth. ✓
Upwards. ✓

6.5

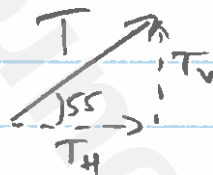


$$\sin 55^\circ = \frac{F_g}{T} \quad \checkmark$$

$$T = \frac{39.2}{\sin 55^\circ} \quad \checkmark$$

$$= 47.85 \text{ N} \quad \checkmark$$

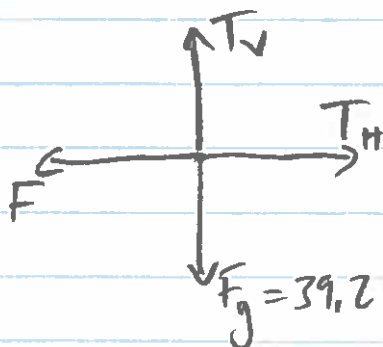
OR.



$$\cos 55^\circ = \frac{T_H}{T}$$

$$T_H = T \cos 55^\circ$$

$$T_V = T \sin 55^\circ \quad \checkmark$$

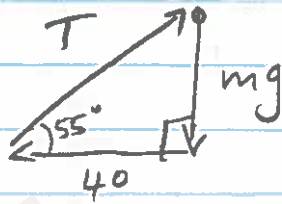


$$T_V = 39.2 \text{ N}$$

$$39.2 = T \sin 55^\circ \quad \checkmark$$

$$T = 47.85 \text{ N} \quad \checkmark$$

6.6.

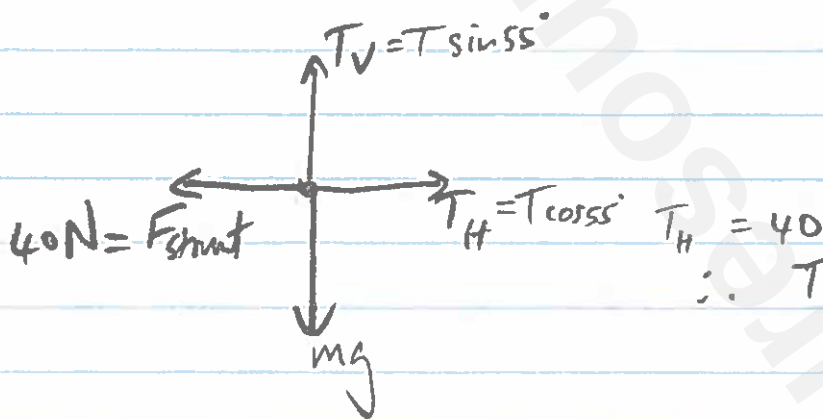


$$\tan 55 = \frac{mg}{40} \quad \checkmark$$

$$40 \tan 55 = m(9,8) \quad \checkmark$$

$$m = 5,83 \text{ kg} \quad \checkmark$$

OR.



$$\therefore T \cos 55 = 40$$

$$T = 69,738 \text{ N} \quad \checkmark$$

$$T_V = T \sin 55$$

$$mg = 69,738 \sin 55$$

$$m(9,8) = 57,126$$

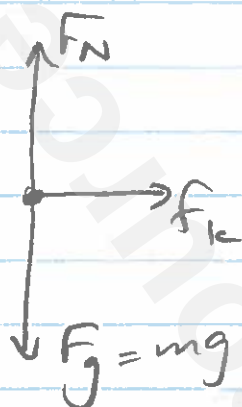
$$m = 5,83 \text{ kg} \quad \checkmark$$

7.1 When a net force is applied to an object, it accelerates in the direction of the net force. ✓

The acceleration is directly proportional to the net force and inversely proportional to the mass. ✓

7.2 The perpendicular force exerted by a surface on an object in contact with it. ✓✓

7.3



$$F_{\text{net}} = f_k$$

$$v_i = 5 \quad \left(\overleftarrow{+} \right)$$

$$\Delta x = 2$$

$$v_f = 3$$

$$a = ?$$

$$v_f^2 = v_i^2 + 2a\Delta x \quad \checkmark$$

$$3^2 = 5^2 + 2a(2) \quad \checkmark$$

$$a = -4$$

$$= 4 \text{ m.s}^{-2} \text{ right}$$

$$\therefore F_{\text{net}} = f_k \quad \checkmark$$

$$ma = \mu mg$$

$$4 = \mu(9.8) \quad \checkmark$$

$$\mu = 0.408 \quad \checkmark$$

8.1 Every particle in the universe attracts every other particle with a force which is ✓

directly proportional to the product of their masses ✓

and inversely proportional to the square of the distance between their centres. ✓

8.2 $F_g = mg$ ✓

$1008 = m(14)$ ✓

$m = 72 \text{ kg}$ ✓

8.3 $g = \frac{GM}{r^2}$ ✓

$14 = \frac{(6.7 \times 10^{-11})(10^{23})}{r^2}$ ✓

$r = 691\,788,57 \text{ m}$ ✓

$(6,92 \times 10^5 \text{ m})$

OR $F = \frac{GMm}{r^2}$

$$\begin{aligned}
 8.4. \quad F_{A \text{ on ship}} &= \frac{GMm}{r^2} \checkmark \\
 &= \frac{(6,7 \times 10^{-11})(4,5 \times 10^5)(2,2 \times 10^{10})}{(400)^2} \checkmark \\
 &= 4,146 \text{ N, left.} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 F_{B \text{ on ship}} &= \frac{GMm}{r^2} \\
 &= \frac{(6,7 \times 10^{-11})(4,5 \times 10^5)(6,5 \times 10^{10})}{(800)^2} \checkmark \\
 &= 30,621 \text{ N, right} \checkmark
 \end{aligned}$$

$$F_{\text{net on ship}} = 26,48 \text{ N, right} \checkmark$$

$$8.5 \quad v_i = 0$$

$$\Delta x = 800 \text{ m}$$

$$a = 5,883 \times 10^{-5}$$

$$\Delta t = ?$$

$$F_{\text{net}} = ma$$

$$26,48 = 4,5 \times 10^5 a \checkmark$$

$$a = 5,883 \times 10^{-5} \text{ m.s}^{-2} \text{ right.}$$

$$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$800 = \frac{1}{2} (5,883 \times 10^{-5}) \Delta t^2 \checkmark$$

$$\Delta t = 5,21 \times 10^3 \text{ s} \checkmark$$

$$(1,45 \text{ h})$$

9.1.1 0 V ✓

9.1.2 15 V ✓

9.2.1 Total energy supplied per coulomb of charge by the cell ✓✓

9.2.2 The rate of flow of charge. ✓

9.3 $V_1 = 11,01$
 $R = 32\ \Omega$

$$I = \frac{V}{R} \quad \checkmark$$

$$= \frac{11,01}{32} \quad \checkmark$$

$$= 0,344\text{ A} \quad \checkmark$$

9.4. $V_{\text{int}} = 15 - 12,97$

$I \cdot r = 2,03 \quad \checkmark$

$1,72 \cdot r \quad \checkmark = 2,03$

$r = 1,18\ \Omega \quad \checkmark$

$$I = \frac{V}{R}$$

$$= \frac{11,01}{8} \quad \checkmark$$

$$= 1,37625$$

$$I_T = 1,37625 + 0,344$$

$$= 1,72$$

$$9.5 \quad V_R = 12,97 - 11,01 \quad \checkmark$$

$$I \cdot R = 1,96 \quad \checkmark$$

$$1,72 R = 1,96 \quad \checkmark$$

$$R = 1,14 \, \Omega \quad \checkmark$$

$$9.6 \quad W = ?$$

$$\Delta t = 60$$

$$R = 8 \, \Omega$$

$$V = 11,01$$

$$W = \frac{V^2}{R} \Delta t \quad \checkmark$$

$$= \frac{(11,01)^2}{8} (60) \quad \checkmark$$

$$= 909,15 \, J \quad \checkmark$$

9.7.1 increase. $\checkmark$

9.8 R_{ext} increases. $\checkmark$

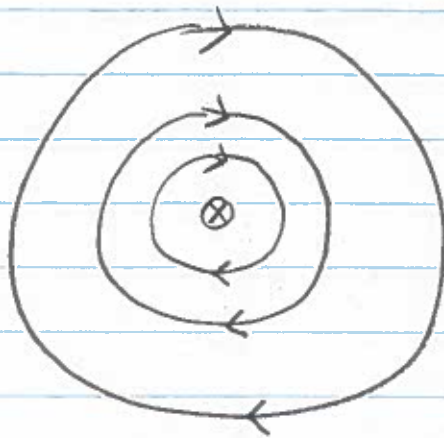
I_T decreases. $\checkmark$

$\therefore V_{int}$ decrease $V_{int} = I r \quad \checkmark (r \text{ const})$

$\therefore V_{ext} = \text{emf} - V_{int} \quad (\text{emf const}) \quad \checkmark$

V_{ext} increase

10.1



direction ✓
cross + circles ✓
spacing ✓

10.2 Downwards. ✓✓

10.3 The product of the number of turns on the coil and the flux through the coil. ✓✓

10.4. the emf induced is directly proportional to the rate of change of magnetic flux ✓✓

10.5.1 ~~DC~~ AC ✓

10.5.2 mechanical energy ✓ → electrical energy ✓

10.5.3. right ✓

10.5.4⁵ (a) a component that only allows current to flow in one direction ✓✓

10.5.6 half-wave rectification ✓

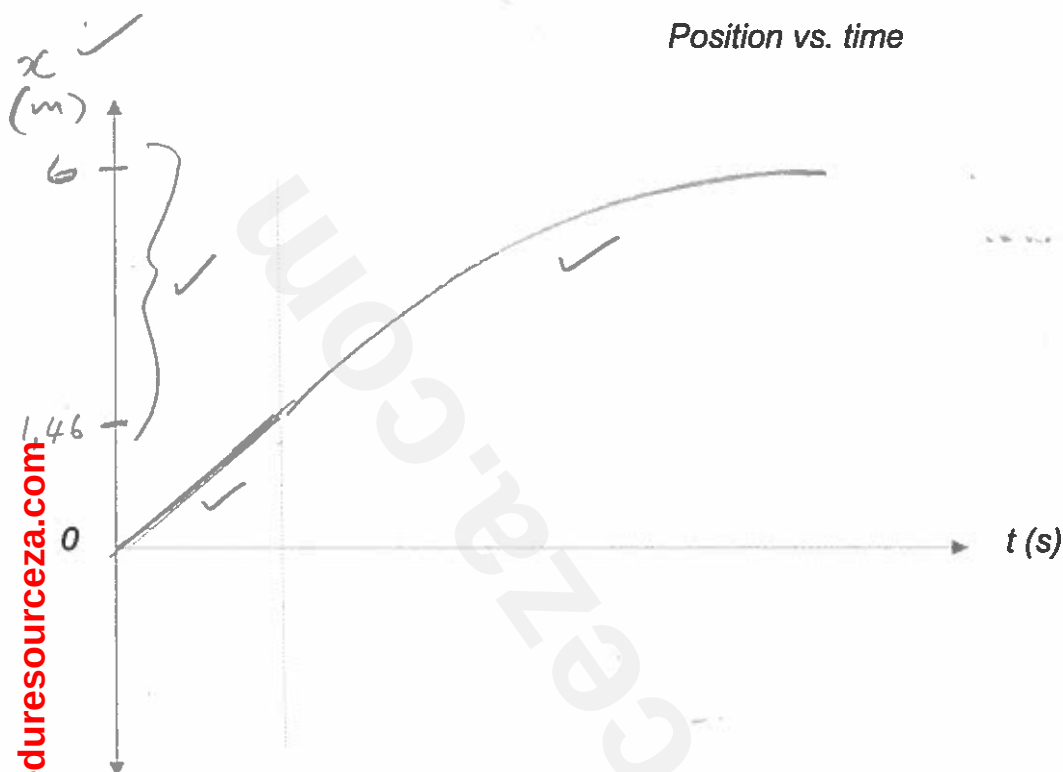
Non-sensical
2 marks for a

ANSWER SHEET

NAME: _____

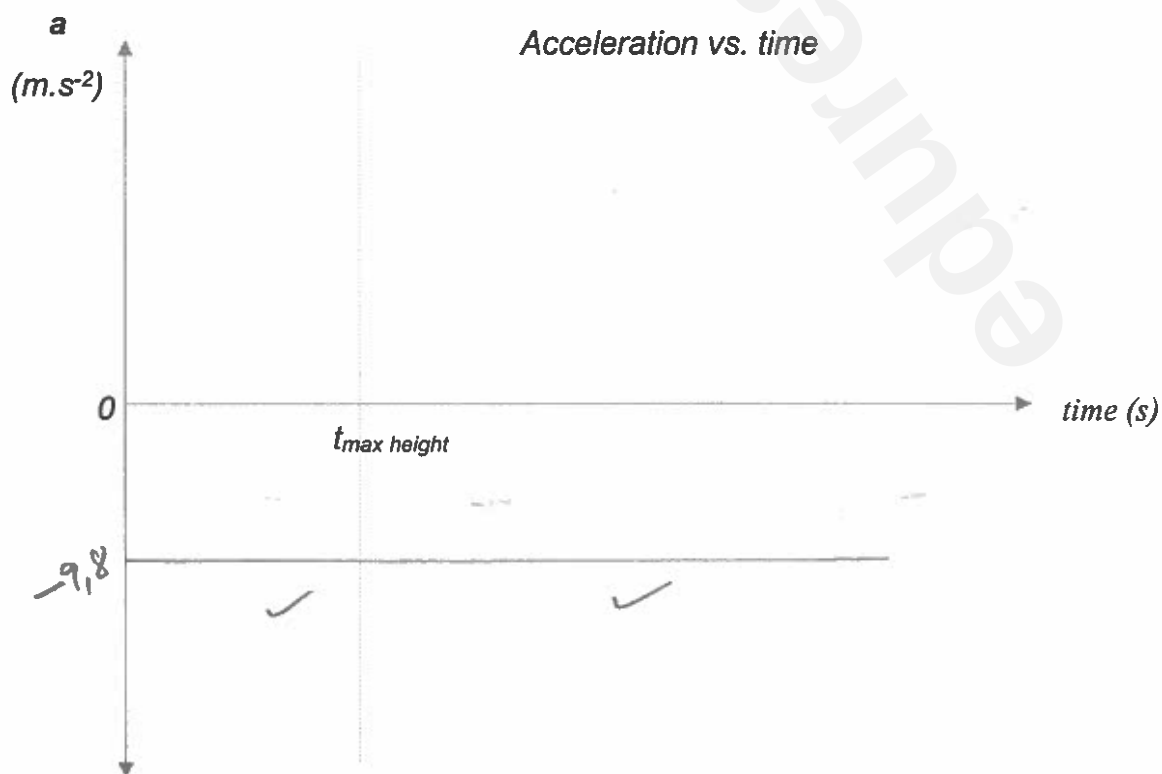
QUESTION 2.4

Position vs. time



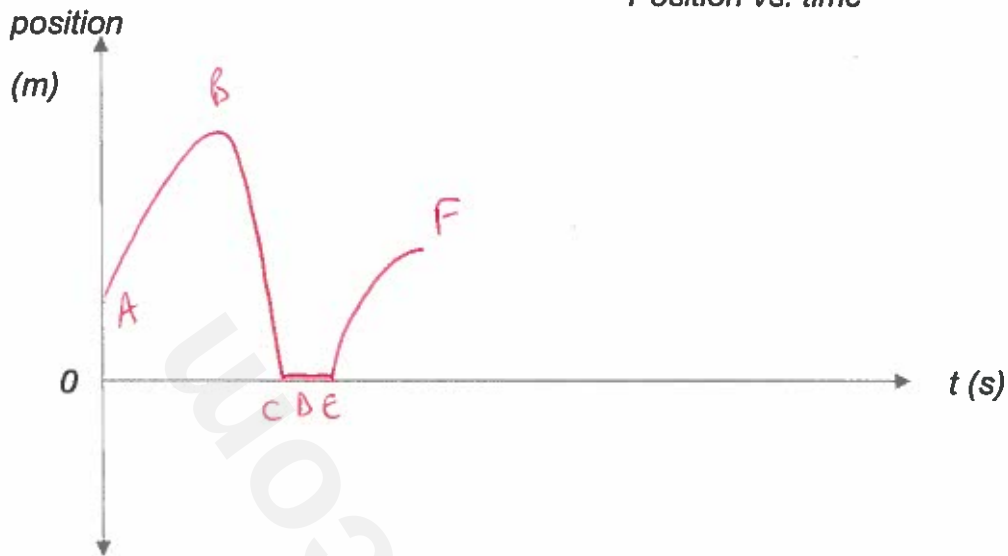
QUESTION 3.1.4

Acceleration vs. time

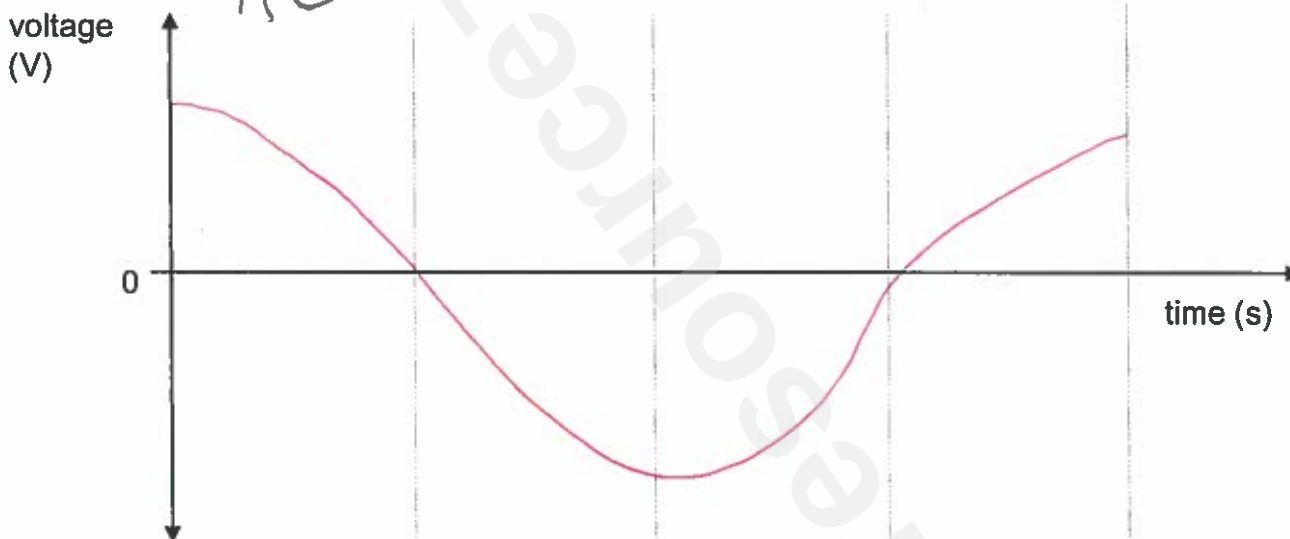


Question 3.2.5

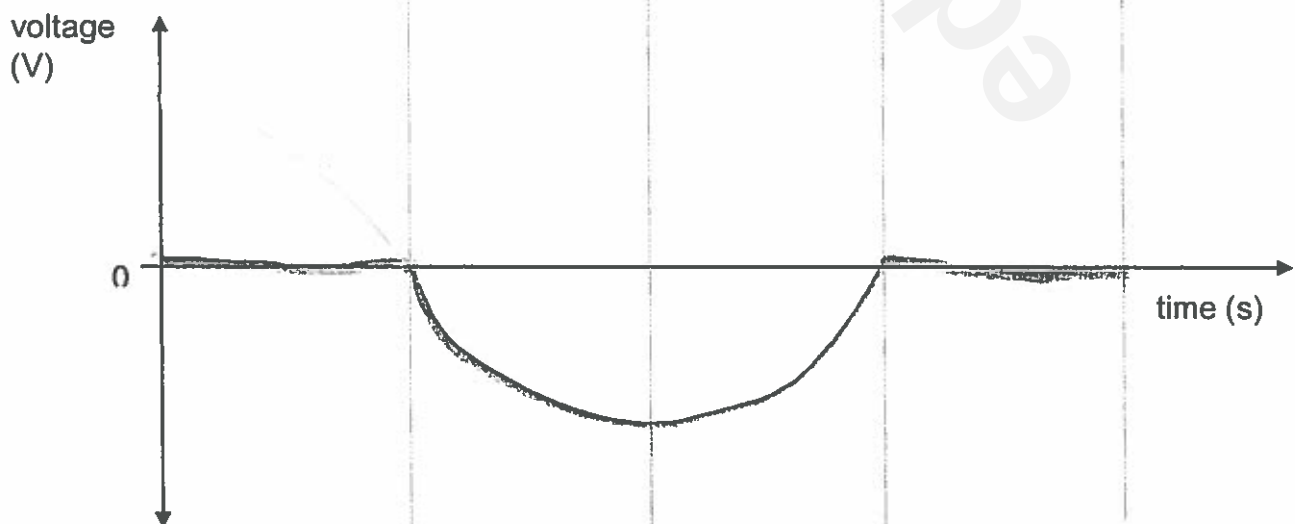
Position vs. time



Question 10.5.4



Question 10.5.5 (b)



$$\begin{aligned}
 11.1 \quad E &= \frac{hc}{\lambda} \quad \checkmark \\
 &= \frac{(6,6 \times 10^{-34})(3 \times 10^8)}{400 \times 10^{-9}} \quad \checkmark \\
 &= 4,95 \times 10^{-19} \text{ J} \quad \checkmark
 \end{aligned}$$

11.2 The minimum frequency of incident light at which electrons will be emitted from a particular metal. ✓✓

$$\begin{aligned}
 11.3 \quad W_0 &= hf_0 \quad \checkmark \\
 3 \times (6,6 \times 10^{-19}) &= 6,6 \times 10^{-34} f_0 \\
 4,8 \times 10^{-19} \checkmark &= 6,6 \times 10^{-34} \cdot f_0 \\
 f_0 &= 7,27 \times 10^{14} \text{ Hz} \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 11.4. \quad E &= W_0 + E_{k \max} \quad \checkmark \\
 4,95 \times 10^{-19} &= 4,8 \times 10^{-19} + E_{k \max} \quad \checkmark \\
 E_{k \max} &= 1,5 \times 10^{-20} \text{ J} \quad \checkmark
 \end{aligned}$$

11.5 The same ✓

11.6.1 INCREASES ✓

11.6.2 DECREASES ✓