Problemas resueltos de Cinemática

(11) $t = 2\,s$

¿h?

$v_s = 340\ \frac{m}{s}$

$g = 9'8\ \frac{m}{s^2}$

a) $e = \frac{1}{2} \cdot g \cdot t^2 =$

$= \frac{1}{2} \cdot 9'8 \cdot 2^2 = \boxed{19'6\ m}$

b) $t_T = t_1 + t_2 = 2$

$e = \frac{1}{2} \cdot 9'8 \cdot t_1^2 = 4'9 \cdot t_1^2$

$e = 340 \cdot t_2$

$4'9 \cdot t_1^2 = 340 \cdot t_2$

$t_1 + t_2 = 2$

$t_2 = \frac{4'9 \cdot t_1^2}{340} =$

$= 0'0144 \cdot t_1^2$

$t_1 + 0'0144 \cdot t_1^2 = 2 \Rightarrow 0'0144 \cdot t_1^2 + t_1 - 2 = 0$

$$t_1 = \frac{-1 \pm \sqrt{1^2 + 4 \cdot 0'0144 \cdot 2}}{2 \cdot 0'0144} = 1'945\ s$$

$e = 4'9 \cdot t_1^2 = 4'9 \cdot 1'945^2 = \boxed{18'55\ m}$

(12) $d_0 = 1000$ km

12 PM

$v_A = 80 \frac{km}{h}$

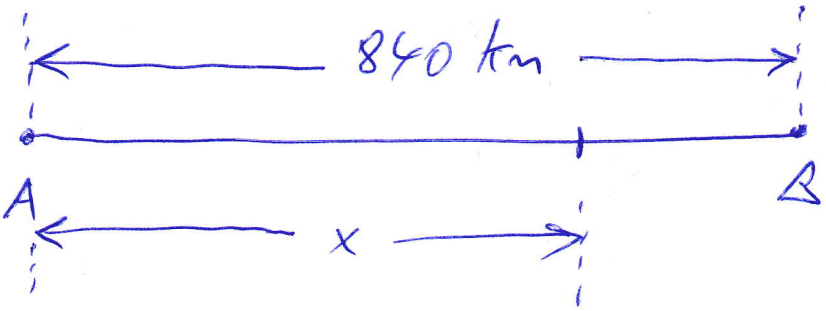
$t = 2$ h

$v_B = 100 \frac{km}{h}$

* Distancia recorrida por A en 2 h:

$e = v_A \cdot t = 80 \cdot 2 = 160$ km

$d = d_0 - e = 1000 - 160 = 840$ km



$e = v \cdot t$

A: $x = 80 \cdot t$

B: $840 - x = 100 \cdot t$

$840 - 80 \cdot t = 100 \cdot t$

$840 = 180 \cdot t$

$t = \frac{840}{180} = 4'67$ h ; $x = 80 \cdot t = 80 \cdot 4'67 = 374$ km

* Distancia recorrida por A:

$e = 160 + 374 =$ **534 km**

* Distancia recorrida por B:

$e = 840 - x = 840 - 374 =$ **466 km**

* Hora a la que se encuentran:

$12 + 4'67 = 16'67$ h $_{(2)}$ = **16 h 40 min**

(13) $v_0 = 0$

$v = 100 \frac{km}{h} = 27'8 \frac{m}{s}$

$t = 12\ s$

a) ¿a?

b) ¿e?

$t = 20\ s$

c) ¿t?

$v = 200 \frac{km}{h} = 55'6 \frac{m}{s}$

$t = \frac{55'6}{2'32} = \boxed{24\ s}$

a) $a = \frac{\Delta v}{\Delta t} = \frac{27'8 - 0}{12 - 0} = \boxed{2'32 \frac{m}{s^2}}$

b) $e = v_0 \cdot t + \frac{1}{2} \cdot a \cdot t^2 =$

$= 0 + \frac{1}{2} \cdot 2'32 \cdot 20^2 = \boxed{464\ m}$

c) $v = v_0 + a \cdot t$

$55'6 = 0 + 2'32 \cdot t$

(14) $v_0 = 60 \frac{km}{h} = 16'7 \frac{m}{s}$

$e = 52\ m$

$t = 2'5\ s$

a) ¿a?

b) ¿v?

a) $v^2 = v_0^2 + 2 \cdot a \cdot e$

$e = v_0 \cdot t + \frac{1}{2} \cdot a \cdot t^2$

$52 = 16'7 \cdot 2'5 + \frac{1}{2} \cdot a \cdot 2'5^2$

$52 = 41'7 + 3'12 \cdot a$

$52 - 41'7 = 3'12 \cdot a$

$10'3 = 3'12 \cdot a\ ;\ a = \frac{10'3}{3'12} = \boxed{3'3 \frac{m}{s^2}}$

b) $v = v_0 + a \cdot t = 16'7 + 3'3 \cdot 2'5 =$

$= \boxed{25 \frac{m}{s}}$

(15) $v_0 = 54 \frac{km}{h} = 15 \frac{m}{s}$

$v = 72 \frac{km}{h} = 20 \frac{m}{s}$

$e = 175\ m$

¿t?

¿a?

$v^2 = v_0^2 + 2 \cdot a \cdot e$

$20^2 = 15^2 + 2 \cdot a \cdot 175$

$400 = 225 + 350 \cdot a$

$400 - 225 = 350 \cdot a$

$175 = 350 \cdot a$

$a = \frac{175}{350} = \boxed{0'5 \frac{m}{s^2}}$

$v = v_0 + a \cdot t$; $20 = 15 + 0'5 \cdot t$; $20 - 15 = 0'5 \cdot t$

$5 = 0'5 \cdot t$; $t = \frac{5}{0'5} = \boxed{10\ s}$

(16) $v_2 = 25 \frac{km}{h} = 6'94 \frac{m}{s}$

$e = 2\ km$

$v_3 = 40 \frac{km}{h} = 11'1 \frac{m}{s}$

¿a?

¿t?

$v_3^2 = v_2^2 + 2 \cdot a \cdot e$

$11'1^2 = 6'94^2 + 2 \cdot a \cdot 2000$

$123 = 48'2 + 4000 \cdot a$

$123 - 48'2 = 4000 \cdot a$

$74'8 = 4000 \cdot a$

$a = \frac{74'8}{4000} = \boxed{0'0187 \frac{m}{s^2}}$

$v_2 = v_1 + a \cdot t$; $6'94 = 0 + 0'0187 \cdot t$

$t = \frac{6'94}{0'0187} = \boxed{371\ s}$

(17) $v_0 = 300 \frac{km}{h} = 83'3 \frac{m}{s}$

a) ¿ $h_{máx.}$?

b) ¿ v ?

$t = 3$ s

c) ¿ t ?

a) $v^2 = v_0^2 - 2 \cdot g \cdot e$

$0 = 83'3^2 - 2 \cdot 10 \cdot e$

$0 = 6939 - 20 \cdot e$

$20 \cdot e = 6939$

$e = \frac{6939}{20} = \boxed{347 \text{ m}}$

b) $v = v_0 - g \cdot t = 83'3 - 10 \cdot 3 = \boxed{53'3 \frac{m}{s}}$

c) $v = v_0 - g \cdot t \Rightarrow 0 = 83'3 - 10 \cdot t \Rightarrow 10 \cdot t = 83'3 \Rightarrow$

$\Rightarrow t = \frac{83'3}{10} = \boxed{8'33 \text{ s}}$

(18) a) $t = 10$ s

¿ h ?

b) ¿ t ?

$v_0 = 80 \frac{km}{h} = 22'2 \frac{m}{s}$

a) $e = \frac{1}{2} \cdot g \cdot t^2 =$

$= \frac{1}{2} \cdot 10 \cdot 10^2 = 5 \cdot 100 = \boxed{500 \text{ m}}$

b) $e = v_0 \cdot t + \frac{1}{2} \cdot g \cdot t^2$; $500 = 22'2 \cdot t + \frac{1}{2} \cdot 10 \cdot t^2$

$5 \cdot t^2 + 22'2 \cdot t - 500 = 0$

$t = \frac{-22'2 \pm \sqrt{22'2^2 + 4 \cdot 5 \cdot 500}}{2 \cdot 5} = \boxed{8'02 \text{ s}}$

(19) $h_0 = 15\ m$

$v_0 = 12\ \frac{m}{s}$

¿ $h_{máx.}$?

¿ t_T ?

¿ v ?

$v^2 = v_0^2 - 2 \cdot g \cdot e_1$

$0 = 12^2 - 2 \cdot 10 \cdot e_1 \ ; \ 0 = 144 - 20 \cdot e_1 \ ;$

$20 \cdot e_1 = 144 \ ;$

$e_1 = \frac{144}{20} = 7'2\ m$

$h_{máx} = h_0 + e_1 = 15 + 7'2 = \boxed{22'2\ m}$

$v = v_0 - g \cdot t_1 \ ; \ 0 = 12 - 10 \cdot t_1 \ ; \ 10 \cdot t_1 = 12 \Rightarrow t_1 = 1'2\ s$

$e = v_0 \cdot t + \frac{1}{2} \cdot g \cdot t_2^2 \ ; \ 22'2 = 0 + \frac{1}{2} \cdot 10 \cdot t_2^2 \ ;$

$22'2 = 5 \cdot t_2^2 \ ; \ t_2^2 = \frac{22'2}{5} = 4'44 \ ; \ t_2 = \sqrt{4'44} = \boxed{2'11\ s}$

$t_T = t_1 + t_2 = 1'2 + 2'11 = \boxed{3'31\ s}$

$v = v_0 + g \cdot t_2 = 0 + 10 \cdot 2'11 = \boxed{21'1\ \frac{m}{s}}$

(20) $v_0 = 30\ \frac{m}{s}$

a) ¿ h, v ?

$t = 2\ s$

b) ¿ $h_{máx.}$?

¿ t ?

c) ¿ v ?

$h = 10\ m$

d) ¿ v ?

$t = 5\ s$

a) $v^2 = v_0^2 - 2 \cdot g \cdot e \ ; \ v = v_0 - g \cdot t$

$v = 30 - 10 \cdot 2 = \boxed{10\ \frac{m}{s}}$

$e = v_0 \cdot t - \frac{1}{2} \cdot g \cdot t^2 = 30 \cdot 2 - \frac{1}{2} \cdot 10 \cdot 2^2 =$

$= 60 - 20 = \boxed{40\ m}$

b) $v^2 = v_0^2 - 2 \cdot g \cdot e \ ; \ 0 = 30^2 - 2 \cdot 10 \cdot e \Rightarrow$

$\Rightarrow 20 \cdot e = 900 \Rightarrow e = \frac{900}{20} = \boxed{45\ m}$

$v = v_0 - g \cdot t \Rightarrow 0 = 30 - 10 \cdot t \Rightarrow \boxed{t = 3\ s}$

c) $v^2 = v_0^2 - 2 \cdot g \cdot e = 30^2 - 2 \cdot 10 \cdot 10 \Rightarrow v = \boxed{26'5\ \frac{m}{s}}$

d) $v = v_0 + g \cdot t = 0 + 10 \cdot 2 = \boxed{20\ \frac{m}{s}}$

(21) $h_0 = 60\ m$

¿h, e?

$t = 3\ s$

¿v?

¿t?

¿v?

$e = v_0 \cdot t + \frac{1}{2} \cdot g \cdot t^2 = 0 + \frac{1}{2} \cdot 10 \cdot 3^2 = \boxed{45\ m}$

$h = h_0 - e = 60 - 45 = \boxed{15\ m}$

$v = v_0 + g \cdot t = 0 + 10 \cdot 3 = \boxed{30\ \frac{m}{s}}$

$e = v_0 \cdot t + \frac{1}{2} \cdot g \cdot t^2$

$60 = 0 + \frac{1}{2} \cdot 10 \cdot t^2\ ;\ 60 = 5 \cdot t^2\ ;$

$t^2 = \frac{60}{5} = 12\ ;\ t = \sqrt{12} = \boxed{3'46\ s}$

$v = v_0 + g \cdot t = 0 + 10 \cdot 3'46 = \boxed{3'46\ \frac{m}{s}}$

(22) $h_0 = 10\ m$

$v_0 = 40\ \frac{km}{h} = 11'1\ \frac{m}{s}$

¿$h_{máx.}$?

¿v?

¿t_T?

$v^2 = v_0^2 - 2 \cdot g \cdot e$

$0 = 11'1^2 - 2 \cdot 10 \cdot e$

$0 = 123 - 20 \cdot e\ ;\ 20 \cdot e = 123$

$e = \frac{123}{20} = 6'15\ m$

$h_{máx.} = h_0 + e = 10 + 6'15 = \boxed{16'15\ m}$

$v^2 = v_0^2 + 2 \cdot g \cdot e = 0 + 2 \cdot 10 \cdot 16'15 = 323\ ;\ v = \sqrt{323} = \boxed{18\ \frac{m}{s}}$

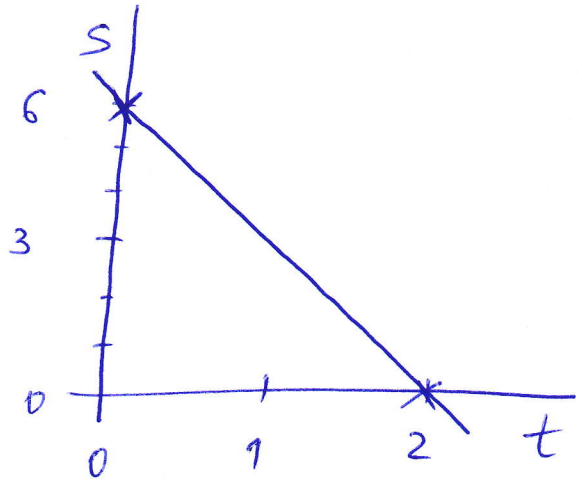
$t_T = t_1 + t_2\ ;\quad v = v_0 - g \cdot t_1 = 11'1 - 10 \cdot t_1 \Rightarrow t_1 = 1'11\ s$

$v = v_0 + g \cdot t_2 \Rightarrow 18 = 0 + 10 \cdot t_2 \Rightarrow t_2 = 1'8\ s$

$t_T = t_1 + t_2 = 1'11 + 1'8 = \boxed{2'91\ s}$

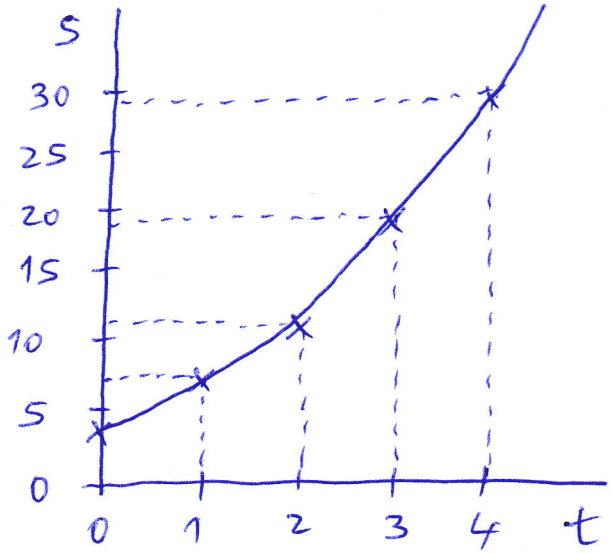
23

t	s
0	$-3\cdot 0+6=6$
2	$-3\cdot 2+6=0$



24

t	s
0	4
1	$1^2+2\cdot 1+4=7$
2	$2^2+2\cdot 2+4=12$
3	$3^2+2\cdot 3+4=19$
4	$4^2+2\cdot 4+4=28$



25 $s = -m\cdot t + n$

$n = 30$

$$m = \frac{\Delta s}{\Delta t} = \frac{30-20}{20-0} = \frac{10}{20} = 0'5$$

$$\boxed{s = -0'5\cdot t + 30}$$

(26) * Primer método: cálculo gráfico de aceleraciones:

$$a_1 = \frac{\Delta v}{\Delta t} = \frac{15-5}{20-0} = \frac{10}{20} = 0'5 \ \frac{m}{s^2}$$

$$a_3 = \frac{\Delta v}{\Delta t} = \frac{25-15}{70-40} = \frac{10}{30} = 0'333 \ \frac{m}{s^2}$$

$$a_4 = \frac{\Delta v}{\Delta t} = \frac{25-0}{90-70} = \frac{25}{20} = 1'25 \ \frac{m}{s^2}$$

$$e_1 = v_0 \cdot t + \frac{1}{2} \cdot a_1 \cdot t^2 = 5 \cdot 20 + \frac{1}{2} \cdot 0'5 \cdot 20^2 = 200 \ m$$

$$e_2 = v \cdot t = 15 \cdot 20 = 300 \ m$$

$$e_3 = v_0 \cdot t + \frac{1}{2} \cdot a_3 \cdot t^2 = 15 \cdot 30 + \frac{1}{2} \cdot 0'333 \cdot 30^2 = 600 \ m$$

$$e_4 = v_0 \cdot t - \frac{1}{2} \cdot a_4 \cdot t^2 = 25 \cdot 20 - \frac{1}{2} \cdot 1'25 \cdot 20^2 = 250 \ m$$

$$e_T = 200 + 300 + 600 + 250 = \boxed{1350 \ m}$$

* Segundo método: las áreas:

$$e_T = S_1 + S_2 + S_3 + S_4 + S_5 + S_6 =$$

$$= \frac{10 \cdot 20}{2} + 5 \cdot 20 + 15 \cdot 20 + \frac{10 \cdot 30}{2} + 15 \cdot 30 + \frac{25 \cdot 20}{2} =$$

$$= 100 + 100 + 300 + 150 + 450 + 250 =$$

$$= \boxed{1350 \ m}$$

(27) $D = 0'30\ m$

$\omega = 45\ rpm$

a) ¿ω?

b) ¿v?

$R = 0'05\ m$

c) ¿v?

d) ¿N?

$t = 2\ min\ 47\ s$

e) ¿T?

f) ¿f?

a)

$$\omega = 45 \frac{\cancel{rev}}{\cancel{min}} \cdot \frac{2\pi\ rad}{1\ \cancel{rev}} \cdot \frac{1\ \cancel{min}}{60\ s} =$$

$$= \boxed{4'71\ \frac{rad}{s}}$$

b) $v = \omega \cdot R = 4'71 \cdot 0'05 = \boxed{0'236\ \frac{m}{s}}$

c) $v = \omega \cdot R = 4'71 \cdot 0'15 = \boxed{0'706\ \frac{m}{s}}$

d) $\varphi = \omega \cdot t = 4'71 \cdot 167 = 787\ rad$

$$N = \frac{\varphi}{2\pi} = \frac{787}{2\pi} = \boxed{125\ vueltas}$$

e) $$T = \frac{2\pi}{\omega} = \frac{2\pi}{4'71} = \boxed{1'33\ s}$$

$$f = \frac{1}{T} = \frac{1}{1'33} = \boxed{0'752\ Hz}$$

(28) $R = 6370\ km = 6'37 \cdot 10^6\ m$

¿ω, v?

$$\omega = \frac{\varphi}{T} = \frac{2\pi\ rad}{24\ h} = \frac{2 \cdot \pi\ rad}{24 \cdot 3600\ s} = \boxed{7'27 \cdot 10^{-5}\ \frac{rad}{s}}$$

$$v = \omega \cdot R = 7'27 \cdot 10^{-5} \cdot 6'37 \cdot 10^6 = 463\ \frac{m}{s} =$$

$$= 463 \cdot 3'6 = \boxed{1667\ \frac{km}{h}}$$

(29) $D_1 = 1'8\ m$

$D_2 = 70\ cm$

$e = 100\ m$

$t = 2\ min$

¿ω_1, ω_2?

¿v_1, v_2?

¿N_1, N_2?

$$v = v_1 = v_2 = \frac{e}{t} = \frac{100}{2 \cdot 60} = \boxed{0'833\ \frac{m}{s}}$$

$$v = \omega \cdot R \Rightarrow \omega = \frac{v}{R}$$

$$\omega_1 = \frac{v_1}{R_1} = \frac{0'833}{0'9} = \boxed{0'926\ \frac{rad}{s}}$$

$$\omega_2 = \frac{v_2}{R_2} = \frac{0'833}{0'35} = \boxed{2'38\ \frac{rad}{s}}$$

$$\varphi_1 = \omega_1 \cdot t = 0'926 \cdot 120 = 111\ rad$$

$$\varphi_2 = \omega_2 \cdot t = 2'38 \cdot 120 = 286\ rad$$

$$N_1 = \frac{\varphi_2}{2\pi} = \frac{111}{2\pi} = \boxed{17'7\ vueltas}$$

$$N_2 = \frac{\varphi_2}{2\pi} = \frac{286}{2\pi} = \boxed{45'5\ vueltas}$$

(30) $v = 50 \frac{km}{h} = 13'9 \frac{m}{s}$

$D = 0'70\ m$

a) ¿ω?

b) ¿N?

$e = 20\ km$

c) ¿e?

a) $v = \omega \cdot R$

$\omega = \frac{v}{R} = \frac{13'9}{0'35} = \boxed{39'7 \frac{rad}{s}}$

b) $v = \frac{e}{t} \Rightarrow t = \frac{e}{v} = \frac{20000}{13'9} =$

$= 1439\ s$

$\varphi = \omega \cdot t = 39'7 \cdot 1439 = 5'71 \cdot 10^4\ rad$

$N = \frac{\varphi}{2\pi} = \frac{5'71 \cdot 10^4}{2 \cdot \pi} = \boxed{9088\ vueltas}$

c) $e = \varphi \cdot R = 5'71 \cdot 10^4 \cdot 0'35 = \boxed{2 \cdot 10^4\ m}$

(31) ¿ω, T, f?

* Segundos: $\boxed{T = 60\ s}$ $f = \frac{1}{T} = \frac{1}{60} = \boxed{0'0167\ Hz}$

$\omega = \frac{2\pi}{T} = \frac{2 \cdot \pi}{60} = \boxed{0'105 \frac{rad}{s}}$

* Minutos: $T = 1\ h = \boxed{3600\ s}$ $f = \frac{1}{T} = \frac{1}{3600} = \boxed{2'78 \cdot 10^{-4}\ Hz}$

$\omega = \frac{2\pi}{T} = \frac{2 \cdot \pi}{3600} = \boxed{1'75 \cdot 10^{-3} \frac{rad}{s}}$

* Horas: $T = 12\ h = 12 \cdot 3600 = \boxed{4'32 \cdot 10^4\ s}$

$f = \frac{1}{T} = \frac{1}{4'32 \cdot 10^4} = \boxed{2'31 \cdot 10^{-5}\ Hz}$ $\omega = \frac{2\pi}{T} = \frac{2\pi}{4'32 \cdot 10^4} = \boxed{1'45 \cdot 10^{-4} \frac{rad}{s}}$

(32) $D_1 = 0'20\ m$

$D_2 = 0'15\ m$

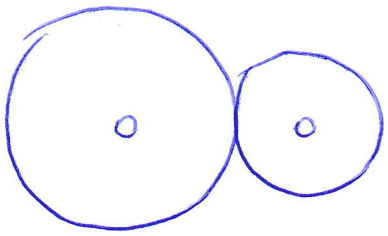
a) ¿ N_2 ?

$N_1 = 50$

b) ¿ ω_2 ?

$\omega_1 = 40\ \frac{rad}{s}$

b)



$v_1 = v_2 \Rightarrow \omega_1 \cdot R_1 = \omega_2 \cdot R_2$

$\omega_2 = \omega_1 \cdot \frac{R_1}{R_2} = 40 \cdot \frac{0'10}{0'075} = \boxed{53'3\ \frac{rad}{s}}$

a) $N = \frac{\varphi}{2\pi}$; $\varphi = 2 \cdot \pi \cdot N$

$\varphi_1 = 2 \cdot \pi \cdot N_1 = 2 \cdot \pi \cdot 50 = 314\ rad$

$v_1 = v_2 \Rightarrow \omega_1 \cdot R_1 = \omega_2 \cdot R_2 \Rightarrow \frac{\varphi_1}{t} \cdot R_1 = \frac{\varphi_2}{t} \cdot R_2 \Rightarrow$

$\Rightarrow 2 \cdot \pi \cdot N_1 \cdot R_1 = 2 \cdot \pi \cdot N_2 \cdot R_2 \Rightarrow$

$\Rightarrow N_2 = N_1 \cdot \frac{R_1}{R_2} = 50 \cdot \frac{0'10}{0'075} = \boxed{66'7\ vueltas}$

(33) $e = 200\ m$

$v_1 = 1'4\ \frac{m}{s}$

$t = 2\ min$

$v_3 = 1'8\ \frac{m}{s}$

a) ¿v_m?

b) ¿desplazamiento?

c) ¿e?

d) ¿v-t?

e) ¿s-t?

a) $v = \frac{e}{t} \Rightarrow t_1 = \frac{e}{v_1} = \frac{200}{1'4} = 143\ s$

$t_3 = \frac{e}{v_2} = \frac{200}{1'8} = 111\ s$

$v_m = \frac{e_T}{t_T} = \frac{e_1 + e_2 + e_3}{t_1 + t_2 + t_3} =$

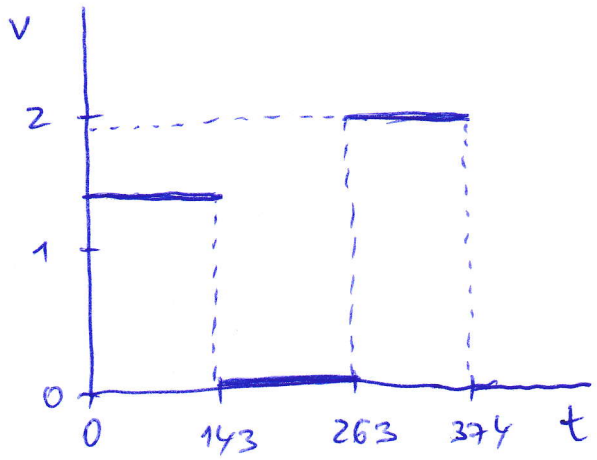
$= \frac{200 + 0 + 200}{143 + 120 + 111} = \frac{400}{374} = \boxed{1'07\ \frac{m}{s}}$

b) Desplazamiento = $\boxed{0}$

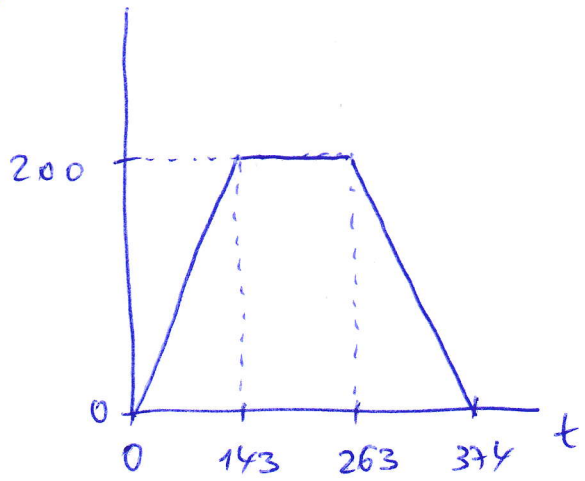
Es la distancia entre el punto inicial y el final.

c) $e = e_1 + e_2 + e_3 = 200 + 0 + 200 = \boxed{400\ m}$

d)



e)



(34) $v = 100 \frac{km}{h} = 27'8 \frac{m}{s}$

$d = 200\ m$

$t_R = 0'9\ s$

$a = 2 \frac{m}{s^2}$

Hay dos tramos:
MRU + MRUR

$e_T = e_1 + e_2$

$e_1 = v \cdot t = 27'8 \cdot 0'9 = 25\ m$

e_2 // $v^2 = v_0^2 - 2 \cdot a \cdot e_2 \Rightarrow 0 = 27'8^2 - 2 \cdot 2 \cdot e_2 \Rightarrow$

$\Rightarrow 0 = 773 - 4 \cdot e_2 \Rightarrow 4 \cdot e_2 = 773 \Rightarrow e_2 = \frac{773}{4} = 193\ m$

$e_T = e_1 + e_2 = 25 + 193 = 218\ m > 200\ m \Rightarrow$ **Sí**

Problemas resueltos de Dinámica

(11) a) $F_E = k \cdot x$

Para $F_E = 25\ N$, $x = 0'14\ m \Rightarrow$

$$\Rightarrow x = \frac{F_E}{k} = \frac{25}{0'14} = \boxed{179\ \frac{N}{m}}$$

b)

$$F_E = P \Rightarrow k \cdot x = m \cdot g \Rightarrow$$

$$\Rightarrow x = \frac{m \cdot g}{k} = \frac{0'2 \cdot 10}{179} =$$

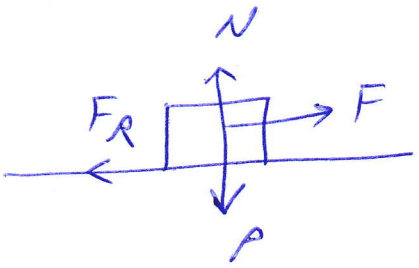
$$= 0'0112\ m = \boxed{1'12\ cm}$$

(12) $m = 50\ kg$

$v = 20\ \frac{km}{h} = 5'56\ \frac{m}{s}$

¿ F ?

$\mu = 0'4$



$N = P$

$v = cte \Rightarrow F = F_R$

$$F = F_R = \mu \cdot m \cdot g = 0'4 \cdot 50 \cdot 10 = \boxed{200\ N}$$

(13) $m = 70\ kg$

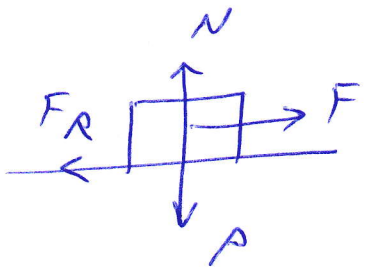
$v_0 = 0$

$v = 100\ \frac{km}{h} = 27'8\ \frac{m}{s}$

$t = 14\ s$

¿ F ?

$\mu = 0'3$



$F - F_R = m \cdot a$

$F_R = \mu \cdot m \cdot g = 0'3 \cdot 70 \cdot 10 = 210\ N$

$a = \frac{\Delta v}{\Delta t} = \frac{27'8 - 0}{14 - 0} = 1'99\ \frac{m}{s^2}$

$F = F_R + m \cdot a = 210 + 70 \cdot 1'99 = \boxed{349\ N}$

(14) $m = 60\ kg$

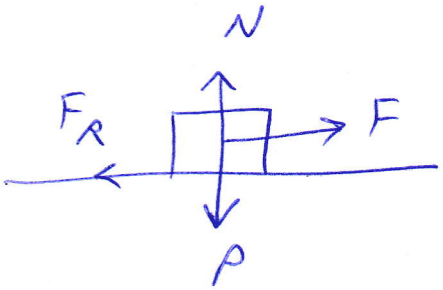
$\mu = 0'7$

$v_0 = 0$

¿ F ?

$e = 100\ m$

$t = 14\ s$



$F - F_R = m \cdot a$

$F_R = \mu \cdot m \cdot g = 0'7 \cdot 60 \cdot 10 = 420\ N$

$e = \frac{1}{2} \cdot a \cdot t^2$

$a = \frac{2 \cdot e}{t^2} = \frac{2 \cdot 100}{14^2} = 1'02\ \frac{m}{s^2}$

$F = F_R + m \cdot a = 420 + 60 \cdot 1'02 = \boxed{481\ N}$

(15) $m = 2000\ kg$

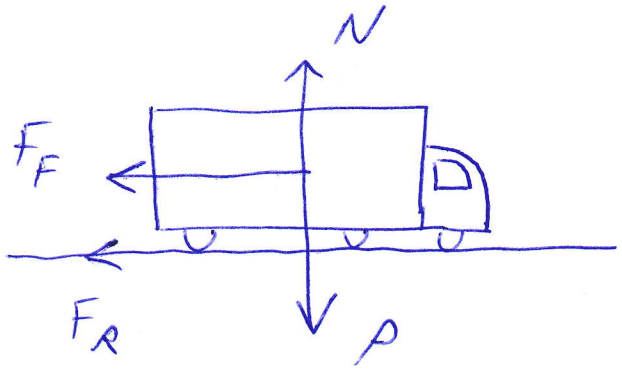
$v = 120\ \frac{km}{h} = 33'3\ \frac{m}{s}$

$\mu = 0'3$

¿ F_F ?

a) $t = 6\ s$

b) $e = 50\ m$



$F_F + F_R = m \cdot a$

a) $a = \frac{\Delta v}{\Delta t} = \frac{33'3 - 0}{6 - 0} = 5'55\ \frac{m}{s^2}$

$F_R = \mu \cdot m \cdot g = 0'3 \cdot 2000 \cdot 10 = 6000\ N$

$F_F = m \cdot a - F_R = 2000 \cdot 5'55 - 6000 = \boxed{5100\ N}$

b) $v^2 = v_0^2 - 2 \cdot a \cdot e$

$0 = 33'3^2 - 2 \cdot a \cdot 50 \Rightarrow 0 = 1109 - 100 \cdot a \Rightarrow$

$\Rightarrow 100 \cdot a = 1109 \Rightarrow a = \frac{1109}{100} = 11'1\ \frac{m}{s^2}$

$F_F = m \cdot a - F_R = 2000 \cdot 11'1 - 6000 = \boxed{1'62 \cdot 10^4\ N}$

(16) $m = 75\ kg$

$v = 36\ \frac{km}{h} = 10\ \frac{m}{s}$

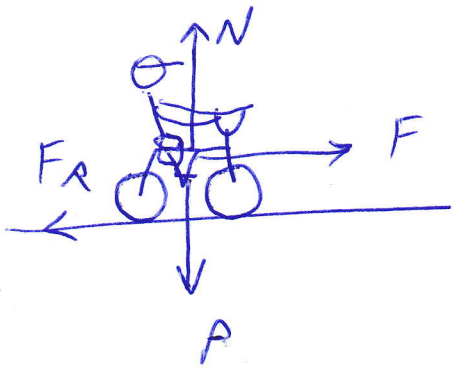
$t = 60\ s$

$v_0 = 0$

$\mu = 0'08$

a) ¿ F ?

b) ¿ e ?



a) $N = P$; $F - F_R = m \cdot a$

$a = \frac{\Delta v}{\Delta t} = \frac{10-0}{60-0} = 0'167\ \frac{m}{s^2}$

$F_R = \mu \cdot m \cdot g = 0'08 \cdot 75 \cdot 10 = 60\ N$

$F = F_R + m \cdot a = 60 + 75 \cdot 0'167 = \boxed{72'5\ N}$

b) $R = F_R = 60\ N \Rightarrow a = \frac{R}{m} = \frac{60}{75} = 0'8\ \frac{m}{s^2}$

$v^2 = v_0^2 - 2 \cdot a \cdot e$

$0 = 10^2 - 2 \cdot 0'8 \cdot e$; $0 = 100 - 1'6 \cdot e$

$1'6 \cdot e = 100 \Rightarrow e = \frac{100}{1'6} = \boxed{62'5\ m}$

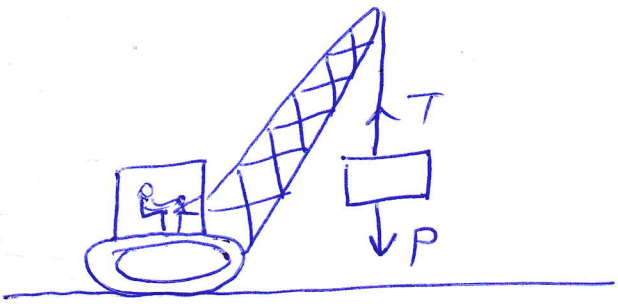
(17) $m = 800\ kg$

a) $v = 3\ \frac{m}{s}$

b) $a = 0{,}5\ \frac{m}{s^2}$

c) $d = ?$

$e = 10\ m$



a) $v = ct \Rightarrow R = 0 \Rightarrow T = P =$

$= m \cdot g = 800 \cdot 10 =$ **8000 N**

b) $a = ct \Rightarrow T - P = m \cdot a \Rightarrow$

$\Rightarrow T = P + m \cdot a = m \cdot g + m \cdot a = 800 \cdot 10 + 800 \cdot 0{,}5 =$ **8400 N**

c) * MRU: $v = \frac{e}{t} \Rightarrow t = \frac{e}{v} = \frac{10}{3} =$ **3,33 s**

* MRUA: $e = \frac{1}{2} \cdot a \cdot t^2$; $10 = \frac{1}{2} \cdot 0{,}5 \cdot t^2 \Rightarrow$

$\Rightarrow t^2 = \frac{2 \cdot 10}{0{,}5} = \frac{20}{0{,}5} = 40 \Rightarrow$

$\Rightarrow t = \sqrt{40} =$ **6,32 s**

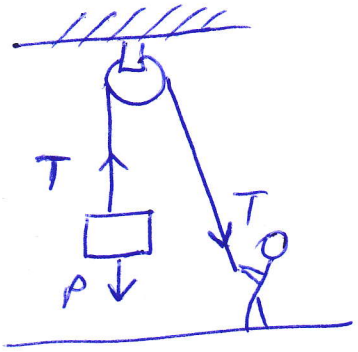
(18) $m = 20\ kg$

a) ¿F?

$v = cte$

b) ¿F?

$a = 0'2\ \frac{m}{s^2}$



a) $v = cte \Rightarrow R = 0 \Rightarrow$

$\Rightarrow T = P = m \cdot g = 20 \cdot 10 = \boxed{200\ N}$

b) $a = cte \Rightarrow T - P = m \cdot a \Rightarrow T = P + m \cdot a =$

$= m \cdot g + m \cdot a = 20 \cdot 10 + 20 \cdot 0'2 = \boxed{204\ N}$

(19) $m_1 = 20\ kg$

$m_2 = 25\ kg$

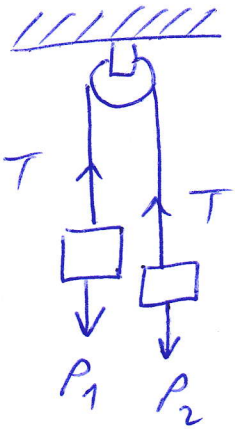
a) ¿t?

$h = 6\ m$

b) ¿T?

c) ¿t?

$e = 6\ m$



$P_1 = m_1 \cdot g = 200\ N$

$P_2 = m_2 \cdot g = 250\ N$

a) $P_2 - P_1 = m_T \cdot a$

$a = \frac{P_2 - P_1}{m_T} = \frac{250 - 200}{45} = 1'11\ \frac{m}{s^2}$

$e = \frac{1}{2} \cdot a \cdot t^2\ ;\ 6 = \frac{1}{2} \cdot 1'11 \cdot t^2 \Rightarrow t = \boxed{3'29\ s}$

b) $T - P_1 = m_2 \cdot a \Rightarrow T = P_1 + m_2 \cdot a = 200 + 20 \cdot 1'11 = \boxed{222\ N}$

c) Cada masa recorrería $3\ m \Rightarrow 3 = \frac{1}{2} \cdot 1'11 \cdot t^2 \Rightarrow \boxed{t = 2'33\ s}$

(20) $m = 80\ kg$

¿F?

$e = 10\ m$

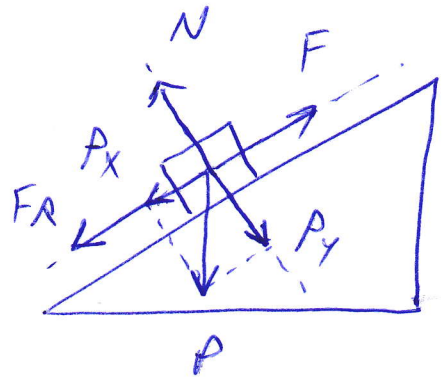
$t = 7\ s$

$v_0 = 0$

$\mu = 0'6$

$P_x = 514\ N$

$P_y = 613\ N$



$R = m \cdot a \Rightarrow F - P_x - F_R = m \cdot a$

$F_R = \mu \cdot N = \mu \cdot P_y = 0'6 \cdot 613 = 368\ N$

$e = \frac{1}{2} \cdot a \cdot t^2 \; ; \; 10 = \frac{1}{2} \cdot a \cdot 7^2 \Rightarrow$

$\Rightarrow a = \frac{2 \cdot 10}{49} = 0'408\ \frac{m}{s^2}$

$F = P_x + F_R + m \cdot a = 514 + 368 + 80 \cdot 0'408 = \boxed{915\ N}$

(21) ¿F?

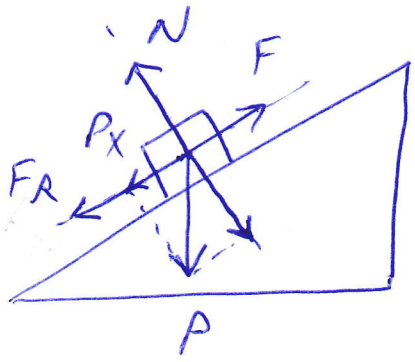
$m = 10\ kg$

$v = cte$

$\mu = 0'34$

$P_x = 766\ N$

$P_y = 643\ N$



$v = cte \Rightarrow R = 0 \Rightarrow F = P_x + F_R$

$F_R = \mu \cdot N = \mu \cdot P_y = 0'34 \cdot 643 = 219\ N$

$F = P_x + F_R = 766 + 219 = \boxed{985\ N}$

(22) $m = 180\ kg$

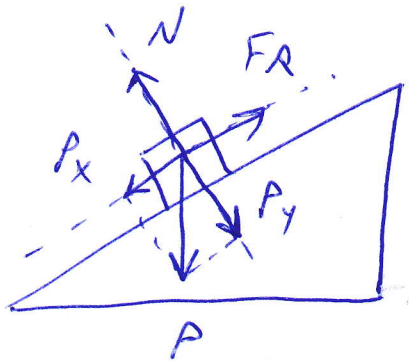
$e = 8\ m$

$P_x = 900\ N$

$P_y = 1559\ N$

$\hat{c}\ t\ ?$

$\mu = 0'25$



$N = P_y$

$R = m \cdot a \Rightarrow P_x - F_R = m \cdot a$

$F_R = \mu \cdot N = 0'25 \cdot 1559 = 390\ N$

$$a = \frac{P_x - F_R}{m} = \frac{900 - 390}{180} = 2'83\ \frac{m}{s^2}$$

$$e = \frac{1}{2} \cdot a \cdot t^2 \Rightarrow 8 = \frac{1}{2} \cdot 2'83 \cdot t^2 \Rightarrow t^2 = \frac{2 \cdot 8}{2'83} = 5'65 \Rightarrow$$

$$\Rightarrow t = \sqrt{5'65} = \boxed{2'38\ s}$$

(23) $\hat{c}\ F\ ?$

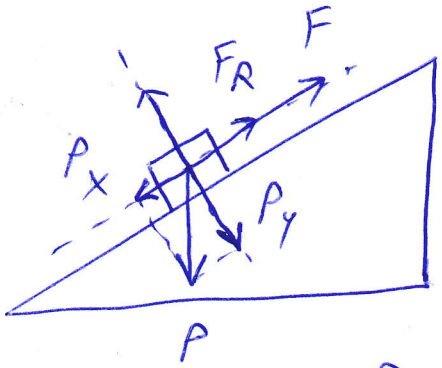
$m = 50\ kg$

$v = cte$

$\mu = 0'2$

$P_x = 321\ N$

$P_y = 383\ N$



$v = cte \Rightarrow R = 0 \Rightarrow P_x = F + F_R$

$F_R = \mu \cdot N = \mu \cdot P_y = 0'2 \cdot 383 = 76'6\ N$

$$F = P_x - F_R = 321 - 76'6 = \boxed{244\ N}$$

(24) $m = 70\ kg$

$F = 200\ N$

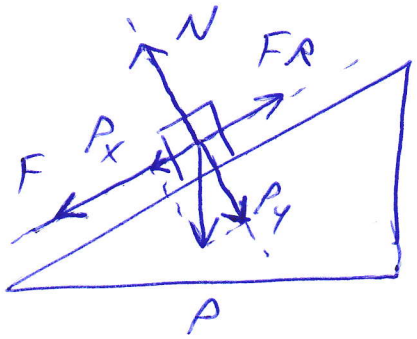
¿t?

$e = 15\ m$

$P_x = 239\ N$

$P_y = 658\ N$

$\mu = 0'22$



$F + P_x - F_R = m \cdot a$

$F_R = \mu \cdot N = \mu \cdot P_y = 0'22 \cdot 658 = 145\ N$

$$a = \frac{F + P_x - F_R}{m} = \frac{200 + 239 - 145}{70} = 4'2\ \frac{m}{s^2}$$

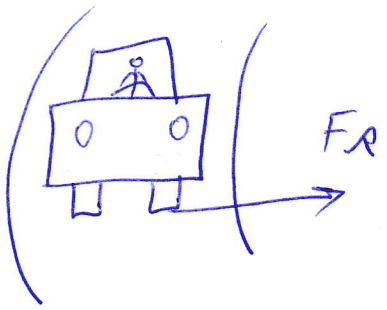
$$e = \frac{1}{2} \cdot a \cdot t^2 \Rightarrow 15 = \frac{1}{2} \cdot 4'2 \cdot t^2 \Rightarrow t^2 = \frac{15 \cdot 2}{4'2} = 7'14 \Rightarrow$$

$$\Rightarrow t = \sqrt{7'14} = \boxed{2'67\ s}$$

(25) $R = 40\ m$

¿v?

$\mu = 0'6$



$$R = F_R = F_c \Rightarrow \mu \cdot m \cdot g = \frac{m \cdot v^2}{R} \Rightarrow$$

$$\Rightarrow v^2 = \mu \cdot g \cdot R \Rightarrow v = \sqrt{\mu \cdot g \cdot R} =$$

$$= \sqrt{0'6 \cdot 10 \cdot 40} = \sqrt{240} = \boxed{15'5\ \frac{m}{s}}$$

(26) $m = 2000\ kg$

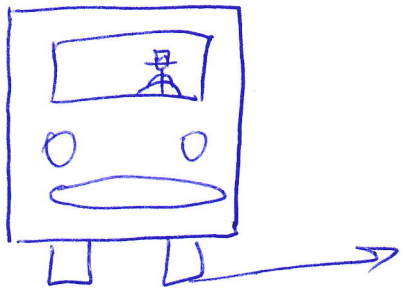
$v = 120\ \frac{km}{h} = 33'3\ \frac{m}{s}$

¿R?

$\mu = 0'4$

¿a_n?

¿F_c?



$R = F_R = F_c$

$\mu \cdot m \cdot g = \frac{m \cdot v^2}{R} \Rightarrow$

$\Rightarrow R = \frac{v^2}{\mu \cdot g} = \frac{33'3^2}{0'4 \cdot 10} = \boxed{277\ m}$

$a_n = \frac{v^2}{R} = \frac{33'3^2}{277} = \boxed{4\ \frac{m}{s^2}}$

$F_c = m \cdot a_n = 2000 \cdot 4 = \boxed{8000\ N}$

(27) $v = 60\ \frac{km}{h} = 16'7\ \frac{m}{s}$

$R = 70\ m$

$\mu = 0'5$

$R = F_R = F_c$

$\mu \cdot m \cdot g = \frac{m \cdot v^2}{R}$

$v^2 = \mu \cdot g \cdot R$

$v_{máx.} = \sqrt{\mu \cdot g \cdot R} = \sqrt{0'5 \cdot 10 \cdot 70} = \sqrt{350} = 18'7\ \frac{m}{s}$

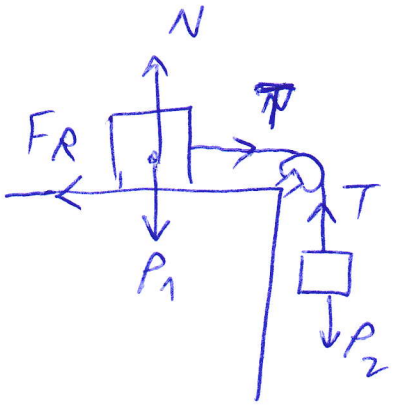
Al ser $16'7\ \frac{m}{s}$ menor que la velocidad máxima permitida, no se saldrá.

(28) $\dot{c}\,a?$

$m_1 = 2\ kg$

$m_2 = 5\ kg$

$\mu = 0'35$



$$R = m \cdot a \Rightarrow P_2 - F_R = m_T \cdot a$$

$$F_R = \mu \cdot P_1 = \mu \cdot m_1 \cdot g = 0'35 \cdot 2 \cdot 10 = 7\ N$$

$$a = \frac{P_2 - F_R}{m_T} = \frac{50 - 7}{7} = \frac{43}{7} = \boxed{6'14\ \frac{m}{s^2}}$$

PROBLEMAS RESUELTOS DE CÁLCULOS QUÍMICOS

(1) $M = 2 \cdot 14 + 8 \cdot 1 + 2 \cdot 52 + 7 \cdot 16 = 252 \ \frac{g}{mol}$

a)

$$n = \frac{m}{M} = \frac{378}{252} = \boxed{1'5 \text{ mol}}$$

b) N: $1'5 \cdot 2 = \boxed{3 \text{ mol}}$

H: $1'5 \cdot 8 = \boxed{12 \text{ mol}}$

Cr: $1'5 \cdot 2 = \boxed{3 \text{ mol}}$

O: $1'5 \cdot 7 = \boxed{10'5 \text{ mol}}$

c) N: $3 \cdot 14 = \boxed{42 \text{ g}}$

H: $12 \cdot 1 = \boxed{12 \text{ g}}$

Cr: $3 \cdot 52 = \boxed{156 \text{ g}}$

O: $10'5 \cdot 16 = \boxed{168 \text{ g}}$

d) $N = n \cdot N_A = 1'5 \cdot 6'022 \cdot 10^{23} = \boxed{9'03 \cdot 10^{23} \text{ moléculas}}$

e) N: $3 \cdot 6'022 \cdot 10^{23} = \boxed{1'81 \cdot 10^{24} \text{ átomos}}$

H: $12 \cdot 6'022 \cdot 10^{23} = \boxed{7'23 \cdot 10^{24}}$ "

Cr: $3 \cdot 6'022 \cdot 10^{23} = \boxed{1'81 \cdot 10^{24}}$ "

O: $10'5 \cdot 6'022 \cdot 10^{23} = \boxed{6'32 \cdot 10^{24}}$ "

(2) $M = 2 \cdot 55'85 + 3 \cdot 16 = 159'7 \ \frac{g}{mol}$

$m_{Fe} = 150 \ \cancel{g \ oligisto} \cdot \frac{75 \ \cancel{g \ Fe_2O_3}}{100 \ \cancel{g \ oligisto}} \cdot$

$\cdot \frac{2 \cdot 55'85 \ g \ Fe}{159'7 \ \cancel{g \ Fe_2O_3}} = \boxed{78'7 \ g \ Fe}$

(3) $m_{N_2} = 28 \ \frac{g}{\cancel{mol}} \cdot \frac{1 \ \cancel{mol}}{6'022 \cdot 10^{23} \ moléculas} = \boxed{4'65 \cdot 10^{-23} \ \frac{g}{molécula}}$

$m_H = 1 \ \frac{g}{\cancel{mol}} \cdot \frac{1 \ \cancel{mol}}{6'022 \cdot 10^{23} \ átomos} = \boxed{1'66 \cdot 10^{-24} \ \frac{g}{átomo}}$

(4) $M = 4 \cdot 12 + 10 \cdot 1 + 16 = 74 \ \frac{g}{mol}$

$m = d \cdot V = 0'713 \ \frac{g}{\cancel{cm^3}} \cdot 250 \ \cancel{cm^3} = \boxed{178 \ g}$

$n = \frac{m}{M} = \frac{178}{74} = \boxed{2'41 \ mol}$

$N = n \cdot N_A = 2'41 \cdot 6'022 \cdot 10^{23} = \boxed{1'45 \cdot 10^{24} \ moléculas}$

(5) $M = 2 \cdot 27 + 3 \cdot 16 = 102 \frac{g}{mol}$

a) $n_{Al} = 1 \text{ ton mineral} \cdot \frac{10^6 \text{ g mineral}}{1 \text{ ton mineral}} \cdot \frac{60 \text{ g } Al_2O_3}{100 \text{ g mineral}} \cdot \frac{1 \text{ mol } Al_2O_3}{102 \text{ g } Al_2O_3} \cdot \frac{2 \text{ mol } Al}{1 \text{ mol } Al_2O_3} =$

$= \boxed{1'18 \cdot 10^4 \text{ mol } Al}$

b) $m = n \cdot M = 1'18 \cdot 10^4 \cdot 27 = \boxed{3'18 \cdot 10^5 \text{ g } Al}$

c) $N = n \cdot N_A = 1'18 \cdot 10^4 \cdot 6'022 \cdot 10^{23} = \boxed{7'11 \cdot 10^{27} \text{ átomos } Al}$

(6) $M = 3 \cdot 55'85 + 2 \cdot 31 + 8 \cdot 16 = 357'6 \ \frac{g}{mol}$

a) $n = \frac{m}{M} = \frac{80}{357'6} = \boxed{0'224 \ mol}$

b) $N = n \cdot N_A = 0'224 \cdot 6'022 \cdot 10^{23} = \boxed{1'35 \cdot 10^{23} \text{ moléculas}}$

c) Fe: $0'224 \cdot 3 = \boxed{0'672 \ mol}$

P: $0'224 \cdot 2 = \boxed{0'448 \ mol}$

O: $0'224 \cdot 8 = \boxed{1'79 \ mol}$

d) Fe: $0'672 \cdot 55'85 = \boxed{37'5 \ g}$

P: $0'448 \cdot 31 = \boxed{13'9 \ g}$

O: $1'79 \cdot 16 = \boxed{28'6 \ g}$

e) Fe: $0'672 \cdot 6'022 \cdot 10^{23} = \boxed{4'05 \cdot 10^{23} \text{ átomos}}$

P: $0'448 \cdot 6'022 \cdot 10^{23} = \boxed{2'70 \cdot 10^{23} \text{ "}}$

O: $1'79 \cdot 6'022 \cdot 10^{23} = \boxed{1'08 \cdot 10^{24} \text{ "}}$

(7) $m_O = 1'07 - 0'36 - 0'16 = 0'55$ g O

Cu: $\frac{0'36}{63'54} = 5'67 \cdot 10^{-3} \rightarrow \frac{5'67 \cdot 10^{-3}}{5'67 \cdot 10^{-3}} = 1$

N: $\frac{0'16}{14} = 0'0114 \rightarrow \frac{0'0114}{5'67 \cdot 10^{-3}} \simeq 2$

O: $\frac{0'55}{16} = 0'0344 \rightarrow \frac{0'0344}{5'67 \cdot 10^{-3}} \simeq 6$

Fórmula: $\boxed{Cu\,N_2\,O_6}$

(8) H: $\frac{0'8}{1} = 0'8 \rightarrow \frac{0'8}{0'793} \simeq 1$

Na: $\frac{36'5}{23} = 1'58 \rightarrow \frac{1'58}{0'793} \simeq 2$

P: $\frac{24'6}{31} = 0'793 \rightarrow \frac{0'793}{0'793} = 1$

O: $\frac{38'1}{16} = 2'38 \rightarrow \frac{2'38}{0'793} \simeq 3$

Fórmula: $\boxed{Na_2\,H\,P\,O_3}$

(9) Fórmula semidesarrollada:

$CHO-CH_2-CO-CHNH_2-CHNH_2-COOH$

Fórmula molecular: $C_6H_{10}O_4N_2$

Fórmula empírica: $C_3H_5O_2N$

(10) Sb: $\frac{25'4}{121'76} = 0'209 \rightarrow \frac{0'209}{0'209} = 1 \xrightarrow{\times 2} 2$

Se: $\frac{41'2}{78'96} = 0'522 \rightarrow \frac{0'522}{0'209} \simeq 2'5 \xrightarrow{\times 2} 5$

O: $\frac{33'4}{16} = 2'09 \rightarrow \frac{2'09}{0'209} = 10 \xrightarrow{\times 2} 20$

Fórmula: $Sb_2Se_5O_{20}$

(11) $M = 3 \cdot 112'41 + 2 \cdot 31 + 8 \cdot 16 = 527'2 \frac{g}{mol}$

Cd: $\frac{3 \cdot 112'41 \cdot 100}{527'2} =$ 64 %

P: $\frac{2 \cdot 31 \cdot 100}{527'2} =$ 11'8 %

O: $100 - 64 - 11'8 =$ 24'2 %

(12) $M = 2 \cdot 58'69 + 3 \cdot 12 + 9 \cdot 16 = 297'4 \frac{g}{mol}$

Ni: $\frac{2 \cdot 58'69 \cdot 100}{297'4} = \boxed{39'5\ \%}$

C: $\frac{3 \cdot 12 \cdot 100}{297'4} = \boxed{12'1\ \%}$

O: $100 - 39'5 - 12'1 = \boxed{48'4\ \%}$

(13) Como no hay ningún dato de masa ni de volumen, hay que suponerlo:

$40\ \% \longrightarrow \begin{cases} 40\ g\ HClO_4 \\ 100\ g\ \text{disolución} \end{cases}$

$M = 1 + 35'5 + 16 \cdot 4 = 100'5 \frac{g}{mol}$

$n_s = \frac{m}{M} = \frac{40}{100'5} = 0'398\ mol$; $V_D = \frac{m_D}{d_D} = \frac{100}{1'2} = 83'3\ mL$

a) $c_M = \frac{n_s}{V_D} = \frac{0'398\ mol}{0'0833\ L} = \boxed{4'78\ M}$

b) $c = \frac{m_s}{V_D} = \frac{40\ g}{0'0833\ L} = \boxed{480\ \frac{g}{L}}$

(14) Como no hay ningún dato de masa ni de volumen, hay que suponerlo:

$$28\ \% \longrightarrow \begin{cases} 28\ g\ H_2SO_4 \\ 100\ g\ \text{disolución} \end{cases}$$

$$M = 2\cdot 1 + 32 + 4\cdot 16 = 98\ \frac{g}{mol}\ ;\quad n_s = \frac{m_s}{M_s} = \frac{28}{98} = 0'286\ mol$$

$$V_D = \frac{m_D}{d_D} = \frac{100}{1'25} = 80\ mL = 0'080\ L$$

a) $$c_M = \frac{n_s}{V_D} = \frac{0'286\ mol}{0'080\ L} = \boxed{3'57\ M}$$

b) $$c = \frac{m_s}{V_D} = \frac{28\ g}{0'080\ L} = \boxed{350\ \frac{g}{L}}$$

(15) a) $$m_s = n_s \cdot M_s = 0'5 \cdot 98 = 49\ g\ H_2SO_4$$

$$m_D = \frac{m_s \cdot 100}{\text{Porc.}} = \frac{49\cdot 100}{53} = 92'4\ g$$

$$V_D = \frac{m_D}{d_D} = \frac{92'4\ \cancel{g}}{1'1\ g/cm^3} = \boxed{84\ cm^3}$$

b) $$m_D = d_D \cdot V_D = 1'1\ \frac{g}{\cancel{cm^3}} \cdot 40\ \cancel{mL} = 44\ g\ \text{disolución}$$

$$m_s = \frac{\text{Porc.}\cdot m_D}{100} = \frac{53\cdot 44}{100} = \boxed{23'3\ g\ \text{soluto}}$$

(16) $m_D = m_s + m_d = 40 + 80 = 120\ g$ disolución

$$V_D = \frac{m_D}{d_D} = \frac{120\ g}{1'12\ g/mL} = 107\ mL = 0'107\ L$$

$$V_d = \frac{m_d}{d_d} = \frac{80\ g}{1\ g/mL} = 80\ mL$$

$$V_s = V_D - V_d = 107 - 80 = 27\ mL$$

$$M_s = 23 + 35'5 = 58'5\ \frac{g}{mol}$$

$$n_s = \frac{m_s}{M_s} = \frac{40\ g}{58'5\ \frac{g}{mol}} = 0'684\ mol$$

* Porcentaje en masa:

$$\text{Porc. masa} = \frac{m_s \cdot 100}{m_D} = \frac{40 \cdot 100}{120} = \boxed{33'3\ \%}$$

* Masa por unidad de volumen:

$$c = \frac{m_s}{V_D} = \frac{40\ g}{0'107\ L} = \boxed{373\ \frac{g}{L}}$$

* Porcentaje en volumen:

$$\text{Porc. volumen} = \frac{V_s \cdot 100}{V_D} = \frac{27 \cdot 100}{107} = \boxed{25'2\ \%}$$

* Molaridad:

$$c_M = \frac{n_s}{V_D} = \frac{0'684\ mol}{0'107\ L} = \boxed{6'38\ M}$$

(17) Como no tenemos datos de masa ni de volumen, hay que suponerlo:

$$2\,M \longrightarrow \begin{cases} n_S = 2\ mol\ H_2SO_4 \\ V_D = 1\ L\ disolución \end{cases}$$

$$M_S = 2\cdot 1 + 32 + 4\cdot 64 = 98\ \frac{g}{mol}$$

$$m_S = n_S \cdot M_S = 2\ \cancel{mol}\cdot 98\ \frac{g}{\cancel{mol}} = 196\ g$$

$$m_D = d_D \cdot V_D = 1'3\ \frac{kg}{L}\cdot 1\ L = 1'3\ kg = 1300\ g\ disolución$$

* Porcentaje en masa:

$$Porc.\ masa = \frac{m_S \cdot 100}{m_D} = \frac{196\cdot 100}{1300} = \boxed{15'1\ \%}$$

* Masa por unidad de volumen:

$$c = \frac{m_S}{V_D} = \frac{196\ g}{1\ L} = \boxed{196\ \frac{g}{L}}$$

(18) * Masa de disolución:

$$m_D = \frac{m_S \cdot 100}{\text{Porc.}} = \frac{50 \cdot 100}{60} = 83'3 \text{ g disolución}$$

* Volumen de disolución:

$$V_D = \frac{m_D}{d_D} = \frac{83'3 \text{ g}}{1'3 \frac{\text{g}}{\text{cm}^3}} = \boxed{64'1 \text{ cm}^3}$$

$1'3 \frac{\text{kg}}{\text{L}}$ es lo mismo que $1'3 \frac{\text{g}}{\text{cm}^3}$

(19) * Número de moles del gas:

$$n = 0'175 \text{ L} \cdot \frac{1 \text{ mol}}{22'4 \text{ L}} = 7'81 \cdot 10^{-3} \text{ mol}$$

* Masa molecular del gas:

$$n = \frac{m}{M} \Rightarrow M = \frac{m}{n} = \frac{0'625 \text{ g}}{7'81 \cdot 10^{-3} \text{ mol}} = \boxed{80 \frac{\text{g}}{\text{mol}}}$$

(20) $\frac{P_1 \cdot V_1}{T_1} = \frac{P_2 \cdot V_2}{T_2}$; $T = \text{cte} \Rightarrow T_1 = T_2 \Rightarrow P_1 \cdot V_1 = P_2 \cdot V_2 \Rightarrow$

$$\Rightarrow V_2 = \frac{P_1 \cdot V_1}{P_2} = \frac{1 \cdot 60}{5} = \boxed{12 \text{ L}}$$

(21) $P \cdot V = n \cdot R \cdot T \Rightarrow V = \dfrac{n \cdot R \cdot T}{P}$

$n = \dfrac{m}{M} = \dfrac{50}{32} = 1'56 \text{ mol}$; $T_K = T_c + 273 =$
$= -30 + 273 = 243 K$

$V = \dfrac{n \cdot R \cdot T}{P} = \dfrac{1'56 \cdot 0'082 \cdot 243}{2} = \boxed{156 \text{ L}}$

(22) $\dfrac{P_1 \cdot V_1}{T_1} = \dfrac{P_2 \cdot V_2}{T_2} \Rightarrow V_2 = \dfrac{P_1 \cdot V_1 \cdot T_2}{P_2 \cdot T_1} =$

$= \dfrac{3 \cdot 20 \cdot (273+40)}{1 \cdot (273+25)} = \dfrac{60 \cdot 313}{298} = \boxed{63 \text{ L}}$

(23) a)

$1s^2 2s^2 2p^6 = [He] 2p^6$

b) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} = [Ar] 4s^2 3d^{10}$

c) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$
$6s^2 4f^{14} 5d^{10} 5p^6 7s^2 5f^{12} = [Xe] 7s^2 5f^{12}$

(24) a) $\dot{R}b$ b) $\ddot{A}l$ c) $\cdot\ddot{A}s\cdot$

d) $\cdot\ddot{T}e\cdot$ e) $:\ddot{A}r:$

(25) $H-\bar{O}-H$ $|\bar{C}l-Be-\bar{C}l|$

$H-\underset{\displaystyle H}{\overset{\displaystyle |}{\bar{N}}}-H$ $\bar{O}=C=\bar{O}$ $|N\equiv N|$

$\bar{O}=\bar{O}$ $H-\overset{\displaystyle H}{\overset{\displaystyle |}{\overset{\displaystyle \oplus}{N}}}-H$ $\bar{O}=\bar{S}=\bar{O}$

$|\bar{C}l-\underset{\displaystyle |Cl|}{\overset{\displaystyle |}{\bar{N}}}-\bar{C}l|$

(26) $T_K = T_C + 273 = 20 + 273 = 293\ K$

$P = \frac{300}{760} = 0'395\ atm$

* Número de moles:

$n = \frac{P \cdot V}{R \cdot T} = \frac{0'395 \cdot 5}{0'082 \cdot 293} = 0'0822\ mol\ O_2$

* Número de moléculas de O_2:

$N = n \cdot N_A = 0'0822 \cdot 6'022 \cdot 10^{23} = 4'95 \cdot 10^{22}$ moléculas O_2

* Número de átomos de O:

$N = 4'95 \cdot 10^{22}$ ~~moléculas O_2~~ $\cdot \frac{2\ \text{átomos O}}{1\ \text{~~molécula~~} O_2} =$

$= \boxed{9'9 \cdot 10^{22}\ \text{átomos O}}$

(27) * Número de moles del compuesto:

$$n = \frac{P \cdot V}{R \cdot T} = \frac{1'5 \cdot 40}{0'082 \cdot 293} = 2'5 \text{ mol}$$

* Masa molecular:

$$n = \frac{m}{M} \Rightarrow M_{molecular} = \frac{m}{n} = \frac{345 \text{ g}}{2'5 \text{ mol}} = 138 \frac{\text{g}}{\text{mol}}$$

* Masa de la fórmula empírica:

$$M_{empírica} = 2 \cdot 12 + 6 + 16 = 46 \frac{\text{g}}{\text{mol}}$$

* Coeficiente por el que hay que multiplicar la fórmula empírica:

$$x = \frac{M_{molecular}}{M_{empírica}} = \frac{138}{46} = 3$$

Fórmula molecular: $\boxed{C_6 H_{18} O_3}$

(28) * Masas moleculares:

$M_{NaNO_3} = 23 + 14 + 16 \cdot 3 = 85 \frac{g}{mol}$

$M_{KNO_3} = 39'1 + 14 + 16 \cdot 3 = 101'1 \frac{g}{mol}$

* Porcentajes de N:

En el $NaNO_3$: $\frac{14 \cdot 100}{85} = 16'5\%$

En el KNO_3: $\frac{14 \cdot 100}{101'1} = 13'8\%$

Solución: $\boxed{NaNO_3}$