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C/Pintor Gumbau 13, E7
Vila-real

28/ | 0'4 L, 1'125 g/ml, 25'22% HCl | + | 100 cm³, 1'165 g/ml, 33'16% HCl |

a) % pes = masa HCl / masa ds

b) M = mol HCl / L ds

$0'4\ L\ ds \cdot \frac{1000\ ml\ ds}{1\ L\ ds} \cdot \frac{1'125\ g\ ds}{1\ ml\ ds} = 450\ g\ ds \cdot \frac{25'22\ g\ HCl}{100\ g\ ds} = 113'49\ g\ HCl$

$100\ cm^3_{ds} \cdot \frac{1'165\ g\ ds}{1\ ml\ ds} = 116'5\ g\ ds \cdot \frac{33'16\ g\ HCl}{100\ g\ ds} = 38'6314\ g\ HCl$

g ds = 450 + 116'5 = 566'5 g ds

g HCl = 113'49 + 38'6314 = 152'12 g HCl

% = 152'12 / 566'5 · 100 = 26'85 %

$152'12\ g\ HCl \cdot \frac{1\ mol\ HCl}{36'5\ g\ HCl} = 4'168\ mol\ HCl$

$M = \frac{4'168\ mol}{0'4 + 0'1} = 8'34\ M$

29/ $2\ KClO_3 \rightarrow 2KCl + 3O_2$

0'685 g — 113 ml CN

$\% = \frac{0'412}{0'685} \cdot 100 = 60'19\ \%$

$113\ ml\ O_2 \cdot \frac{1\ L\ O_2}{1000\ ml\ O_2} \cdot \frac{1\ mol\ O_2}{22'4\ L\ O_2} \cdot \frac{2\ mol\ KClO_3}{3\ mol\ O_2} = \frac{122'6\ g\ KClO_3}{1\ mol\ KClO_3} = 0'412\ g\ KClO_3\ puros$

30/ $4FeS_2$ (75%) $+ 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

$SO_2 + NO_2 + H_2O \rightarrow NO + H_2SO_4$ (1 T)

$1\ T\ H_2SO_4 \cdot \frac{1000000\ g\ H_2SO_4}{1\ T\ H_2SO_4} \cdot \frac{1\ mol\ H_2SO_4}{98\ g\ H_2SO_4} \cdot \frac{1\ mol\ SO_2}{1\ mol\ H_2SO_4} \cdot \frac{8\ mol\ SO_2}{8\ mol\ SO_2} \cdot \frac{4\ mol\ FeS_2}{8\ mol\ SO_2} \cdot \frac{119'85\ g\ FeS_2}{1\ mol\ FeS_2} \cdot \frac{100\ g\ FeS_2}{75\ g\ FeS_2} \cdot \frac{1\ kg}{1000\ g} = 815'3\ kg\ FeS_2$

31/

$$4NH_3 + SO_2 \xrightarrow{5\,T} 6H_2O + 4NO$$

21%, 27°C, 1 atm

$$2NO + O_2 \rightarrow 2NO_2$$

$$5\,T\,NH_3 \cdot \frac{10^6\,g\,NH_3}{1\,T\,NH_3} \cdot \frac{1\,mol\,NH_3}{17\,g\,NH_3} \cdot \frac{5\,mol\,O_2}{4\,mol\,NH_3} = 367647\,mol\,O_2 +$$

$$5\,T\,NH_3 \cdot \frac{10^6\,g\,NH_3}{1\,T\,NH_3} \cdot \frac{1\,mol\,NH_3}{17\,g\,NH_3} \cdot \frac{4\,mol\,NO}{4\,mol\,NH_3} \cdot \frac{1\,mol\,O_2}{2\,mol\,NO} = 147058\,mol\,O_2$$

$$514706\,mol\,O_2$$

$$PV = nRT \Rightarrow 1 \cdot V = 514706 \cdot 0'082 \cdot (27+273)$$

$$V = \frac{12661763'100}{21} = 6 \cdot 10^7\,L\ aire$$

32/

$$2\,C_4H_{10} + 13\,O_2 \rightarrow 8\,CO_2 + 10\,H_2O$$

12 kg — ¿aire?? CN, 21% — V?? CO_2, 0'8 atm, 20°C — g??

$$12\,kg\,C_4H_{10} \cdot \frac{1000\,g\,C_4H_{10}}{1\,kg} \cdot \frac{1\,mol\,C_4H_{10}}{58\,g\,C_4H_{10}} \cdot \frac{13\,mol\,O_2}{2\,mol\,C_4H_{10}} \cdot \frac{22'4\,L\,O_2}{1\,mol\,O_2} \cdot \frac{100\,L\ aire}{21\,L\,O_2} =$$

$$= 143448\,L\ aire = 143'4\,m^3$$

$$\cdot \frac{8\,mol\,CO_2}{2\,mol\,C_4H_{10}} = 827'6\,mol \quad PV = nRT \quad V = 24855\,L$$

$$\cdot \frac{10\,mol\,H_2O}{2\,mol\,C_4H_{10}} \cdot \frac{18\,g\,H_2O}{1\,mol\,H_2O} = 18621\,g\,H_2O$$

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33/ $5L\ O_2$ $\quad 2KClO_3 \rightarrow 2KCl + 3O_2$

$15°C$ $\quad g\ ??$

$725\ mmHg$ $\quad 96'5\ \%$

$PV = nRT \rightarrow \frac{725}{760} \cdot 5 = n \cdot 0'082 \cdot (15+273) \rightarrow n = 0'2\ mol$

$0'2\ mol\ O_2 \ \frac{2\ mol\ KClO_3}{3\ mol\ O_2} \ \frac{122'6\ g\ KClO_3}{1\ mol\ KClO_3} \cdot \frac{100}{96'5} = 17'1\ g$

34/ $C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_6O$

$1620\ g$ $\quad$ masa ??

$1620\ g\ C_6H_{12}O_6 \ \frac{1\ mol\ C_6H_{12}O_6}{180\ g\ C_6H_{12}O_6} \ \frac{2\ mol\ C_2H_6O}{1\ mol\ glucosa} \ \frac{46\ g\ etanol}{1\ mol\ etanol} = 828\ g\ etanol$

35/ $2N_2H_4 + N_2O_4 \rightarrow 3N_2(g) + 4H_2O(g)$ $\quad V\ gases\ ??$

$1000\ kg$ $\quad 100°C \quad 1\ atm$

a) $1000\ kg\ N_2H_4 \ \frac{1000\ g\ N_2H_4}{1\ kg} \ \frac{1\ mol\ N_2H_4}{32\ g\ N_2H_4} \ \frac{3\ mol\ N_2}{2\ mol\ N_2H_4} = 46875\ mol\ N_2$

$+$

$\frac{4\ mol\ H_2O}{2\ mol\ N_2H_4} = 62500\ mol\ H_2O$

$109375\ mol\ totales$

$PV = nRT \Rightarrow 1 \cdot V = 109375 \cdot 0'082 \cdot (100+273)$

$V = 3345343\ L = 3345'34\ m^3$

$\frac{1000\ kg\ N_2H_4}{1437'5\ g\ N_2O_4} = d$

b) $1000\ kg\ N_2H_4 \ \frac{1000\ g\ N_2H_4}{1\ kg} \ \frac{1\ mol\ N_2H_4}{32\ g\ N_2H_4} \ \frac{1\ mol\ N_2O_4}{2\ mol\ N_2H_4} \ \frac{92\ g\ N_2O_4}{1\ mol\ N_2O_4} \ \frac{1\ kg}{1000\ g} = 1437'5\ kg$

36/

$CO + Cl_2 \rightarrow COCl_2$		
14g	35'5g	40g

$14g\ CO \cdot \frac{1mol\ CO}{28g\ CO} \cdot \frac{1mol\ Cl_2}{1mol\ CO} \cdot \frac{71g\ Cl_2}{1mol\ Cl_2} = 35'5g\ Cl_2$ reacciona todo de los dos reactivos.

$14g\ CO \cdot \frac{1mol\ CO}{28g\ CO} \cdot \frac{1mol\ COCl_2}{1mol\ CO} \cdot \frac{99g\ COCl_2}{1mol\ COCl_2} = 49'5g\ COCl_2$

$\% = \frac{40}{49'5} \cdot 100 = 80'8\%$

37/

RL

$N_2 + 3H_2 \rightarrow 2NH_3$	
10g	1g
	2'12g

$10g\ N_2 \cdot \frac{1mol\ N_2}{28g\ N_2} \cdot \frac{3mol\ H_2}{1mol\ N_2} \cdot \frac{2g\ H_2}{1mol\ H_2} = 2'14g\ H_2$ me falta hidrógeno para que reaccione todo el N_2 (tengo N_2 de sobra).

↓

Reactivo limitante H_2

$1g\ N_2 \cdot \frac{1mol\ H_2}{2g\ H_2} \cdot \frac{2mol\ NH_3}{3mol\ N_2} \cdot \frac{17g\ NH_3}{1mol\ NH_3} = 5'66g\ NH_3$

$R = \frac{2'12}{5'66} \cdot 100 = 37'41\%$

38/ $Fe_2O_3 + 3CO \xrightarrow{75\%} 2Fe + 3CO_2$

1000kg 80% kg?

$1000kg_p \cdot \frac{1000g_p}{1kg_p} \cdot \frac{80g\ Fe_2O_3}{100g\ p} \cdot \frac{1mol\ Fe_2O_3}{159'7g\ Fe_2O_3} \cdot \frac{2mol\ Fe}{1mol\ Fe_2O_3} \cdot \frac{55'85g\ Fe}{1mol\ Fe} \cdot \frac{75g\ reals}{100g\ teoric.} \cdot \frac{1kg}{1000g} = 419'66kg\ Fe$

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39/ $CO_2 + Ba(OH)_2 \rightarrow BaCO_3 + H_2O$

$\%\ CO_2$ — $0'296\ g$

100 L

20°C 740 mm Hg

$0'296\ g\ BaCO_3 \cdot \frac{1\ mol\ BaCO_3}{197'327\ g} \cdot \frac{1\ mol\ CO_2}{1\ mol\ BaCO_3} = \boxed{1'5 \cdot 10^{-3}\ mol\ CO_2}$

$PV = nRT \rightarrow \frac{740}{760} \cdot V = 1'5 \cdot 10^{-3}\ 0'082\ (20+273)$

$V = 0'037\ L \qquad \% = \frac{0'037}{100} \cdot 100 = 0'037\ \%$

40/ x $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

y $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

16 g

4°C

25'2 cm³

$PV = nRT$

$1 \cdot \frac{25'2}{1000} = n\,R \cdot (4+273) \rightarrow n = 0'0011\ mol\ H_2O$

$x + y = 16$

$0'067x + 0'091y = 0'0011$

$0'067x + 0'067y = 0'072$

$0'067x + 0'091y = 0'0011$

$-0'024y =$

$x\ g\ C_4H_{10} \cdot \frac{1\ mol\ C_4H_{10}}{74\ g\ C_4H_{10}} \cdot \frac{10\ mol\ H_2O}{2\ mol\ C_4H_{10}} = 0'0067\ x\ mol\ H_2O$

$y\ g\ C_3H_8 \cdot \frac{1\ mol\ C_3H_8}{44\ g\ C_3H_8} \cdot \frac{4\ mol\ H_2O}{1\ mol\ C_3H_8} = 0'091\ y\ mol\ H_2O$

No es pot fer falta la presió de l'aigua

41/ x $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

y $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

z $C_2H_2 + 5/2\ O_2 \rightarrow 2CO_2 + H_2O$

$18'4\ cm^3$ $100\ cm^3$ $85'2 - 31'4 = 53'8\ cm^3$

$V_{final\ gases} = 85'2\ cm^3$ — KOH →

$V_{final} = 31'4\ cm^3$

$2KOH + CO_2 \rightarrow K_2CO_3 + H_2O$

$x + y + z = 18'4$

$2x + 3y + \frac{5}{2}z = 100$

$x + 2y + 2z = 53'8$

$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 18'4 \\ 0 & -1 & -1/2 & -63'2 \\ 0 & -1 & -1 & -35'4 \end{array}\right) \quad \left(\begin{array}{ccc|c} 1 & 1 & 1 & 18'4 \\ 0 & -1 & -1/2 & -63'2 \\ 0 & 0 & 1/2 & \cdots \end{array}\right)$

En el examen no

42/ $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

3'8 g
100 cm³
↓
20 cm³ ds

1'722 g

% pureza

~~1'722 g 58'5 g NaCl~~

$1'722\,g\ AgCl \cdot \frac{1\,mol\ AgCl}{143'3\,g\ AgCl} \cdot \frac{1\,mol\ NaCl}{1\,mol\ AgCl} \cdot \frac{58'5\,g\ NaCl}{1\,mol\ NaCl} \cdot \frac{100\,cm^3}{20\,cm^3}$

$= 3'51\,g$ puros

$\% = \frac{3'51}{3'8} \cdot 100 = 92'497\%$

impurezas $= 100 - 92'497 = 7'5\%$

43/ $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

0'350 g impurs
% pureza??

83'2 cm³
22°C
750 mm Hg

$PV = nRT \rightarrow \frac{750}{760} \cdot \frac{83'2}{1000} = n \cdot 0'082\,(22+273)$

$n = 0'0034$ mol CO_2

$\% = \frac{0'34}{0'350} \cdot 100 = 97\%$

$0'0034\ mol\ CO_2 \cdot \frac{1\,mol\ CaCO_3}{1\,mol\ CO_2} \cdot \frac{100\,g\ CaCO_3}{1\,mol\ CaCO_3} = 0'34\,g$ puros

44/ $CaCO_3 + 2HCl \xrightarrow{80\%} CaCl_2 + CO_2 + H_2O$ No es esta reacción

1 T
90%
x g??

$1\,T\ CaCO_3 \cdot \frac{10^6\,g\ CaCO_3}{1\,T\ CaCO_3} \cdot \frac{90\,g\ CaCO_3}{100\,g} \cdot \frac{1\,mol\ CaCO_3}{100\,g\ CaCO_3} \cdot \frac{1\,mol\ CaCl_2}{1\,mol\ CaCO_3} \cdot \frac{80}{100} \cdot \frac{111\,g\ CaCl_2}{1\,mol\ CaCl_2}$

=

$CaCO_3 \xrightarrow{80\%} CaO + CO_2$
1 T
90%
g??

$1\,T \cdot \frac{10^6\,g}{1\,T} \cdot \frac{90\,g\ CaCO_3}{100\,g} \cdot \frac{1\,mol\ CaCO_3}{100\,g\ CaCO_3} \cdot \frac{1\,mol\ CaO}{1\,mol\ CaCO_3} \cdot \frac{80}{100} \cdot \frac{56\,g\ CaO}{1\,mol\ CaO} \cdot \frac{1\,kg}{10^3\,g} = 403'2\,kg$

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45/ $C_6H_6 + \frac{15}{2}O_2 \rightarrow 6CO_2 + 3H_2O$

$878\ kg/m^3$

$50\ cm^3$

21%.

vaie??

20°C

1atm

$50\ cm^3 \cdot \frac{1\ m^3}{10^6\ cm^3} \cdot \frac{878\ kg\ C_6H_6}{1\ m^3} \cdot \frac{10^3\ g\ C_6H_6}{10^{-3}\ kg\ C_6H_6} \cdot \frac{1\ mol\ C_6H_6}{78\ g\ C_6H_6} \cdot \frac{15/2\ mol\ O_2}{1\ mol\ C_6H_6}$

$\frac{100\ aire}{21\ O_2} = 20'100\ mol\ aire$ $\quad PV = nRT$ $\quad V = 482\ L$

$1 \cdot V = 20'100 \cdot 0'082\ (20+273)$

46/ 2atm, 2L, 20°C $\rightarrow$ 120°C $\quad H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

H_2 | N_2 | $+ O_2$

60% | 40%

$PV = nRT$

$2 \cdot 2 = n \cdot 0'082\ (20+273)$

$n = 0'166$ moles totales $\cdot \frac{60\ mol\ H_2}{100} \cdot \frac{1\ mol\ H_2O}{1\ mol\ H_2} \cdot \frac{18\ g\ H_2O}{1\ mol\ H_2O} = 1'8\ g\ H_2O$

$0'0996\ mol\ H_2O$

$0'166$ moles totales $\cdot \frac{40}{100} = 0'0664\ mol\ N_2$ $\Big\rangle$ $0'166\ mol$ totales

$PV = nRT \rightarrow P_T \cdot 2 = 0'166 \cdot 0'082\ (120+273) \rightarrow P_T = 2'67\ atm$

$P_{N_2} = X_{N_2} \cdot P_T = \frac{0'0664\ mol\ N_2}{0'166\ mol\ totales} \cdot 2'67 = 1'07\ atm$

$P_{H_2O} = X_{H_2O} \cdot P_T = 1'6\ atm$

47// $TiO_2 + 2C + 2Cl_2 \rightarrow TiCl_4 + 2CO$

500g, 85'3%. $2Cl_2$: 426'6g. $TiCl_4$: g ??. 125L, 800°C, P = ??

$$500g \frac{85'3g\ TiO_2}{100g} \frac{1mol\ TiO_2}{79'867g\ TiO_2} \frac{2mol\ Cl_2}{1mol\ TiO_2} \frac{71g\ Cl_2}{1mol\ Cl_2} = 758'3g\ Cl_2$$

No tengo suficiente Cl_2 para que reaccione todo el TiO_2

$RL \rightarrow Cl_2$

$$426'6g\ Cl_2 \frac{1mol\ Cl_2}{71g\ Cl_2} \frac{1mol\ TiCl_4}{2mol\ Cl_2} \frac{189'867g\ TiCl_4}{1mol\ TiCl_4} = 570'4g\ TiCl_4$$

3 mol $TiCl_4$ → $PV = nRT$ → $P_{TiCl_4} = 2'11$ atm

$$426'6g\ Cl_2 \frac{1mol\ Cl_2}{71g\ Cl_2} \frac{2mol\ CO}{2mol\ Cl_2} = 6\ mol\ CO$$

$PV = nRT$

$P \cdot 125 = 6 \cdot 0'082\ (800+273)$

$P_{CO} = 4'23$ atm

$P_T = 4'23 + 2'11 = 6'34$ atm

48// 11'11% H_2 7g H_2 $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$ $6g\ H_2 + 48g\ O_2 = 54g\ H_2O$

88'89% O_2 48g

$$7g\ H_2 \frac{88'89g\ O_2}{11'11g\ H_2} = 56g\ O_2 \quad RL\ O_2 \quad 48g\ O_2 \frac{11'11g\ H_2}{88'89g\ O_2} = 6g\ H_2$$

49/x $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

y $KCl + AgNO_3 \rightarrow AgCl + KNO_3$

2g, 50ml, 0'6M

$x + y = 2$

$28'49x + 22'37y = 50$

$28'49x + 28'49y = 56'98$

$28'49x + 22'37y = 50$

$6'12y = 6'98$

$x = 0'86g \quad y = 1'14g$

$$xg\ NaCl \frac{1mol\ NaCl}{58'5g\ NaCl} \frac{1mol\ AgNO_3}{1mol\ NaCl} \frac{1L\ AgNO_3}{0'6mol\ AgNO_3} \frac{1000ml\ AgNO_3}{1L\ AgNO_3} = 28'49x\ ml\ AgNO_3$$

$$yg\ KCl \frac{1mol\ KCl}{74'5g\ KCl} \frac{1mol\ AgNO_3}{1mol\ KCl} \frac{1L}{0'6mol\ AgNO_3} \frac{1000ml}{1L} = 22'37y\ ml\ AgNO_3$$

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50/x $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

y $2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$

0'156 g

114 ml
27 °C
725 mmHg
$\rightarrow PV = nRT \rightarrow n = 0'0044$ mol H_2

x g Zn $\rightarrow$ $0'016x$ mol H_2

y g Al $\rightarrow$ $0'056y$ mol H_2

$x + y = 0'156$
$0'016x + 0'056y = 0'0044$
$\rightarrow x = 0'1084$ g (69'5% Zn)
$y = 0'0476$ g (30'5% Al)

51/ $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

1'728 g

550 ml
750 mmHg
26 °C
$P_{H_2O} = 25'2$ mmHg

$PV = nRT$

$\frac{750 - 25'2}{760} \cdot \frac{550}{1000} = n \cdot 0'082 \cdot (26+273)$

$n_{H_2} = 0'021$ mol H_2

$0'021$ mol $H_2 \cdot \frac{1\text{ mol Zn}}{1\text{ mol } H_2} \cdot \frac{65'4\text{ g Zn}}{1\text{ mol Zn}} = 1'399$ g Zn

% = $\frac{1'399}{1'728} \cdot 100 = 80'9\%$

54// $CaCO_3 + 2HCl \xrightarrow{R??} CaCl_2 + CO_2 + H_2O$

a) 35 g — v?? — 1'5 M

b)

6'95 L
1 atm
20 °C

$35\text{ g } CaCO_3 \cdot \frac{1\text{ mol } CaCO_3}{100\text{ g } CaCO_3} \cdot \frac{2\text{ mol HCl}}{1\text{ mol } CaCO_3} \cdot \frac{1\text{ L HCl}}{1'5\text{ mol HCl}} = 0'47$ L HCl

$\cdot \frac{1\text{ mol } CO_2}{1\text{ mol } CaCO_3} = 0'35$ mol CO_2 $\quad PV = nRT \rightarrow V = 8'4$ L

$\% = \frac{6'95}{8'4} 100 = 82'65\%$

55) $2KClO_3 \rightarrow 2KCl + 3O_2$

x??

5L
20°C
2atm

a) $PV = nRT$

$n_{O_2} = 0'4162 \text{ mol } O_2 \cdot \frac{2 \text{ mol } KClO_3}{3 \text{ mol } O_2} \cdot \frac{122'5 \text{ g } KClO_3}{1 \text{ mol } KClO_3}$

$= 33'99 \text{ g } KClO_3$

b) 60g
83%.

b) $60 \text{ g } KClO_3 \cdot \frac{1 \text{ mol } KClO_3}{122'5 \text{ g } KClO_3} \cdot \frac{83}{100} \cdot \frac{2 \text{ mol } KCl}{2 \text{ mol } KClO_3} \cdot \frac{74'5 \text{ g } KCl}{1 \text{ mol } KCl} = 30'29 \text{ g } KCl.$

56) $4FeS_2 + 11O_2 \xrightarrow{80\%} 2Fe_2O_3 + 8SO_2$

85%. 0'9atm 80°C
500kg V_{aire}?? 21%.

kg??

$500 \text{ kg} \cdot \frac{85}{100} \cdot \frac{1000 \text{ g}}{1 \text{ kg}} \cdot \frac{1 \text{ mol } FeS_2}{119'85 \text{ g } FeS_2} = 3546 \cdot \frac{8 \text{ mol } SO_2}{4 \text{ mol } FeS_2} \cdot \frac{g \ SO_2}{1 \text{ mol } SO_2} \cdot \frac{1 \text{ kg}}{1000 \text{ g}} \cdot \frac{80}{100}$

$= 363'13 \text{ kg}$

$3546 \cdot \frac{11 \text{ mol } O_2}{4 \text{ mol } FeS_2} \cdot \frac{80}{100} = 7801 \text{ mol}$ $PV = nRT$

$V = 250921 \cdot \frac{100}{21} = 1'19 \cdot 10^6 \text{ L aire}$

57)