(1) $\text{Masa} = 1'191 \times 10^{57}\ \text{átomos} \cdot \frac{1'670 \times 10^{-24}\ g}{\text{átomo}} \cdot \frac{1\ Kg}{1000\ g} = \boxed{1'989 \times 10^{30}\ Kg}$

(2) $P = \frac{4.500 \times 10^{6}\ \text{años}}{4.508} = \boxed{9'98 \times 10^{5}\ \text{veces}}$

(3) $T = 1'2 \times 10^{11}\ \text{estrellas} \cdot \frac{1\ sg}{1\ \text{estrella}} \cdot \frac{1\ min}{60\ sg} \cdot \frac{1\ h}{60\ min} \cdot \frac{1\ \text{día}}{24\ h} \cdot \frac{1\ \text{año}}{365\ \text{días}} =$

$= \boxed{3'805 \times 10^{3}\ \text{años}}$

(4) $D = 299792.458\ \frac{m}{sg} \cdot 1\ \text{año} \cdot \frac{365\ \text{días}}{1\ \text{año}} \cdot \frac{24 h}{1\ \text{día}} \cdot \frac{60\ min}{1 h} \cdot \frac{60\ sg}{1\ min} \cdot \frac{1\ Km}{1000\ m} =$

$= \boxed{9'45 \times 10^{12}\ Km} = \boxed{1\ \text{año-luz}}$

(5) $C_f = C_0 \left(1 + \frac{r}{100}\right)^t$

a) $C = 12000 \left(1 + \frac{3}{100}\right)^4 = \boxed{13506,11\ €}$

b) $2899,23 = C_0 \left(1 + \frac{2'5}{100}\right)^6 \longrightarrow C_0 = \frac{2899,23}{1'025^6} = \boxed{2500\ €}$

c) $1689,24 = 1500 \left(1 + \frac{r}{100}\right)^3 \longrightarrow \frac{r}{100} = \sqrt[3]{\frac{1689'24}{1500}} - 1 = 0'04 = \boxed{4\%}$

d) $2016 = 1500 \left(1 + \frac{3}{100}\right)^t \longrightarrow t = \frac{\log(2016/1500)}{\log 1'03} = \boxed{10\ \text{años}}$

(6) $B = 10 \cdot \log \left(\frac{I}{10^{-16}}\right)$

a) $I = 10^{-14}\ W/m^2 \longrightarrow B = 10 \log \frac{10^{-14}}{10^{-16}} = \boxed{20\ \text{decibelios}}$

b) $110 = 10 \cdot \log \left(\frac{I}{10^{-16}}\right) \longrightarrow I = 10^{-6} \cdot 10^{11} = \boxed{10^{-5}\ W/m^2}$

(7) $M = \frac{2}{3} \log \left(\frac{E}{2'5 \cdot 10^4}\right)$

a) $E = 3 \cdot 10^6\ \text{julios} \longrightarrow M = \frac{2}{3} \log \left(\frac{3 \cdot 10^6}{2'5 \cdot 10^4}\right) = \boxed{1'39\ ^\circ\ \text{Richter}}$

b) $8'25 = \frac{2}{3} \log \left(\frac{E}{2'5 \cdot 10^4}\right) \longrightarrow E = 2'5 \cdot 10^4 \cdot 10^{\frac{3 \cdot 8'25}{2}} = \boxed{5'93 \times 10^{16}\ \text{julios}}$

(8) a) $E_A = |14,48 - 14,39| = 0'09 \qquad E_R = \frac{0'09}{14'39} = 6'25 \times 10^{-3} = 0'63\%$

$E_A = |7'85 - 7'92| = 0'07 \qquad E_R = \frac{0'07}{7'92} = 8'84 \times 10^{-3} = 0'88\%$

b) Es más preciso el primer telémetro porque el error relativo es más pequeño.

(9) $2'318\ mm \longrightarrow$ Error Absoluto $\leq \boxed{0'0005\ mm}$

Error Relativo $\leq \frac{0'0005}{2'318 - 0'0005} = 0'0002 = \boxed{0'02\%}$

(10)

a) $\dfrac{3\sqrt{512}+5\sqrt{32}}{\sqrt{50}-\sqrt{18}} = \dfrac{3\cdot 16\sqrt{2}+20\sqrt{2}}{5\sqrt{2}-3\sqrt{2}} = \dfrac{68\sqrt{2}}{2\sqrt{2}} = \boxed{34}$

b) $2\sqrt{75}+3\sqrt{45}-\sqrt{5^5}-5\sqrt{3^5} = 10\sqrt{3}+9\sqrt{5}-25\sqrt{5}-45\sqrt{3} = \boxed{-35\sqrt{3}-16\sqrt{5}}$

(11)

a) $\dfrac{\sqrt{18}}{\sqrt{5}-\sqrt{2}} = \dfrac{\sqrt{18}\,(\sqrt{5}+\sqrt{2})}{(\sqrt{5}-\sqrt{2})\,(\sqrt{5}+\sqrt{2})} = \dfrac{\sqrt{90}+\sqrt{36}}{5-2} = \dfrac{3\sqrt{10}+6}{3} = \boxed{\sqrt{10}+2}$

b) $\dfrac{\sqrt{18}}{\sqrt[3]{4}} = \dfrac{\sqrt{18}\cdot\sqrt[3]{2}}{\sqrt[3]{2^2}\,\sqrt[3]{2}} = \dfrac{3\sqrt{2}\cdot\sqrt[3]{2}}{2} = \dfrac{3\cdot 2^{5/6}}{2} = \boxed{\dfrac{3\sqrt[6]{2^5}}{2}}$

(12)

$\sqrt[4]{9}+\sqrt{\dfrac{1}{3}}-\sqrt{\dfrac{4}{27}} = \sqrt{3}+\dfrac{\sqrt{3}}{3}-\dfrac{2}{3\sqrt{3}} = \sqrt{3}+\dfrac{\sqrt{3}}{3}-\dfrac{2\sqrt{3}}{9} =$

$= \dfrac{9\sqrt{3}+3\sqrt{3}-2\sqrt{3}}{9} = \boxed{\dfrac{10\sqrt{3}}{9}}$

(13)

$279'91 = P\cdot\dfrac{116}{100} \longrightarrow P = 241'30\ € \Longrightarrow IVA = 279'91 - 241'30 = \boxed{38'61\ €}$

(14)

$19'99 = P\cdot\dfrac{80}{100} \longrightarrow \boxed{P = 24'99\ €}$

(15)

a) $\boxed{x = -6}$

b) $81 = x^4 \longrightarrow \boxed{x = 3}$

c) $x = 5^{-2} = \boxed{\dfrac{1}{25}}$

d) $\log 4 + 2\log 3 - \dfrac{1}{2}\log 9 = \log\dfrac{4\cdot 3^2}{\sqrt{9}} = \log 12 \longrightarrow \boxed{x=12}$