Préparation industrielle du dihydrogène.

1)

Ptot=cste T=cste	$CH_4(g)$ +	$H_2O(g)$ =	$3H_2(g)$ +	$CO(g)$	n tot gaz
$\xi=0$	$2n_0$	$6n_0$	$3n_0$	n_0	$12n_0$
ξ	$2n_0-\xi$	$6n_0-\xi$	$3n_0+3\xi$	$n_0+\xi$	$12n_0+2\xi$

2) $K_{eq}(T) = \dfrac{\frac{(p_{CO})_{eq}}{p^0} \times \left(\frac{p_{H_2}}{p^0}\right)^3_{eq}}{\frac{(p_{CH_4})_{eq}}{p^0} \times \frac{(p_{H_2O})_{eq}}{p^0}}$ avec $p_i = \dfrac{n_i RT}{V} = \dfrac{n_i}{n_{tot\,gaz}} \times P_{tot}$

3) $Q_r = \dfrac{\frac{p_{CO}}{p^0} \times \left(\frac{p_{H_2}}{p^0}\right)^3}{\frac{p_{CH_4}}{p^0} \times \frac{p_{H_2O}}{p^0}} = \dfrac{n_{CO} \times n_{H_2}{}^3}{n_{CH_4} \times n_{H_2O}} \times \left(\dfrac{P_{tot}}{n_{tot\,gaz}\, p^0}\right)^2$

$Q_r(\xi=0) = \dfrac{n_0 \times 27 n_0^3}{2n_0 \times 6n_0} \times \left(\dfrac{P_{tot}{}^2}{p^0{}^2} \times \dfrac{1}{144 n_0^2}\right)$

$Q_r(\xi=0) = \dfrac{27}{12 \times 144} \times 10^2$ car $P_{tot} = 10\,bar = 10\,p^0$

$\boxed{Q_r(\xi=0) = 1{,}56.}$

4) $Q_r(\xi=0) < K_{eq}(T) = 15 \Rightarrow$ déplacement dans le sens direct

5)

6)

	$CH_4(g)$ +	$H_2O(g)$ =	$3H_2(g)$ +	$CO(g)$	n tot gaz
$\xi=0$	n_0	n_0	0	0	$2n_0$
ξ	$n_0-\xi$	$n_0-\xi$	3ξ	ξ	$2n_0+2\xi$

7) A l'équilibre $K_{eq}(T) = \dfrac{\xi_{eq} \times (3\xi_{eq})^3}{(n_0-\xi_{eq}) \times (n_0-\xi_{eq})} \times \left(\dfrac{P_{tot}}{p^0}\right)^2 \times \dfrac{1}{(2n_0+2\xi_{eq})^2}$

$= \dfrac{27\,\xi_{eq}{}^4}{4[(n_0-\xi_{eq})(n_0+\xi_{eq})]^2} \times \left(\dfrac{P_{tot}}{p^0}\right)^2$

$= \dfrac{27\,\xi_{eq}{}^4}{4(n_0^2-\xi_{eq}{}^2)^2} \times \left(\dfrac{P_{tot}}{p^0}\right)^2$

d'où $\dfrac{\xi_{eq}{}^2}{n_0^2-\xi_{eq}{}^2} = \sqrt{K_{eq}(T) \times \dfrac{4}{27}} \times \dfrac{p^0}{P_{tot}}$

$= \left(15 \times \dfrac{4}{27}\right)^{1/2} \times \dfrac{1}{10} = 0{,}15.$

d'où $\xi_{eq}^2 = (n_0^2 - \xi_{eq}^2) \times 0,15$

$$\xi_{eq}^2 = \frac{0,15\, n_0^2}{1,15.}$$

$$\xi_{eq} = \sqrt{\frac{0,15}{1,15}}\, n_0 \quad \text{avec} \quad n_0 = 10 \text{ moles.}$$

AN $\boxed{\xi_{eq} = 3,6 \text{ moles.}}$