

Physics hour 9

1) Linse $\frac{1}{f} = (n-1) \cdot \left(\frac{1}{r_1} + \frac{1}{r_2} \right) = \underbrace{(1,5-1)}_{0,5} \cdot \left(\frac{1}{200 \text{ mm}} + \underbrace{\frac{1}{\infty}}_{=0} \right)$

$$\frac{1}{f} = 0,5 \cdot \frac{1}{200 \text{ mm}} = \frac{1}{400 \text{ mm}} \Rightarrow f = 400 \text{ mm}$$

2) Abbildung I

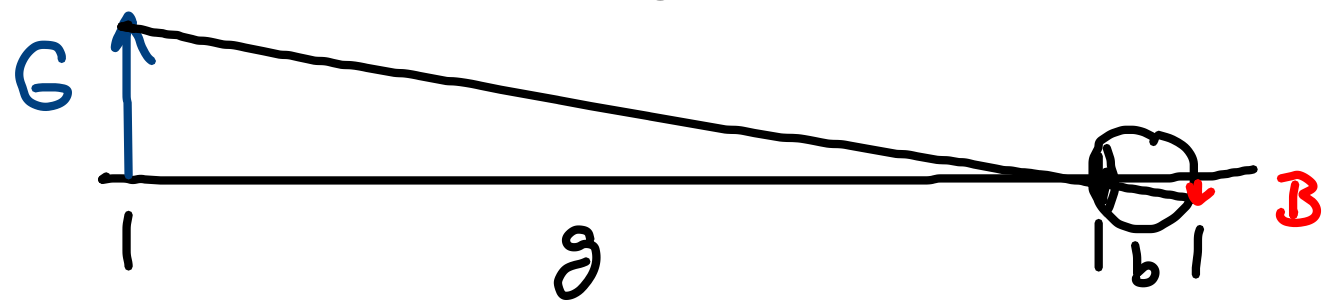
$$\frac{1}{f} = \frac{1}{g} + \frac{1}{b} \rightarrow \frac{1}{b} = \frac{1}{f} - \frac{1}{g} = \frac{g-f}{f \cdot g} \Rightarrow b = \frac{f \cdot g}{g-f} = \frac{f \cdot 2f}{2f-f}$$

$$g = 2f \Rightarrow b = 2f$$

$$b = \frac{2f^2}{f} = 2f$$

$$\Rightarrow V = \frac{B}{G} = \frac{b}{g} = \frac{2f}{2f} = 1$$

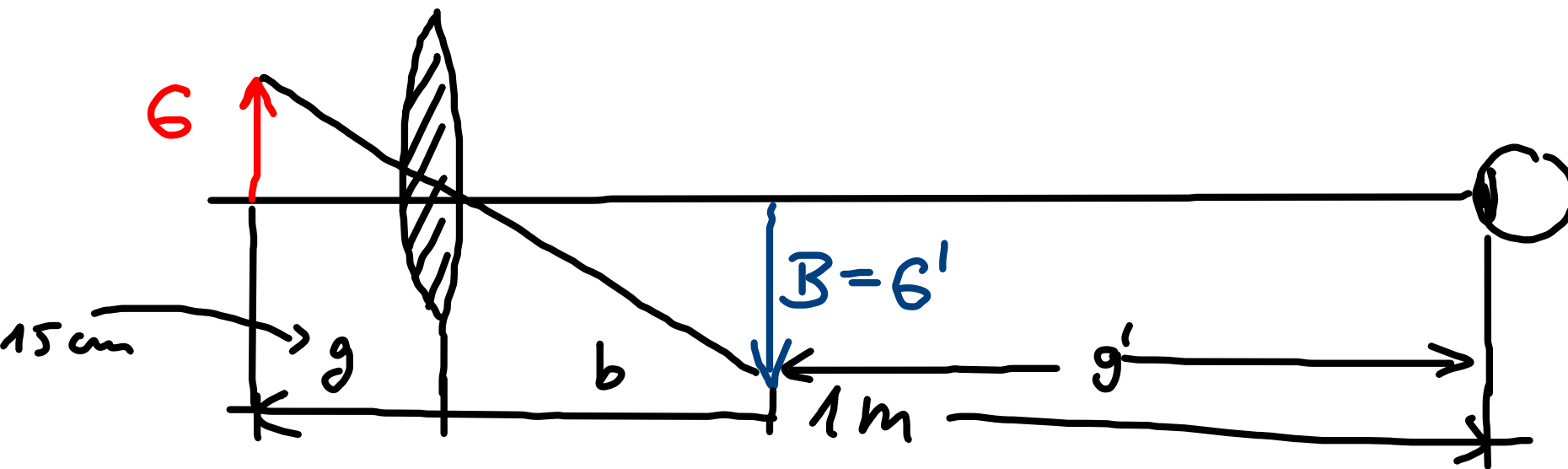
3) Abbildung II



$$\frac{B}{G} = \frac{b}{g}$$

$$\rightarrow B = G \cdot \frac{b}{g} = 5 \text{ cm} \cdot \frac{2,2 \text{ cm}}{100 \text{ cm}} = 1,1 \text{ mm}$$

4) Abbildung III

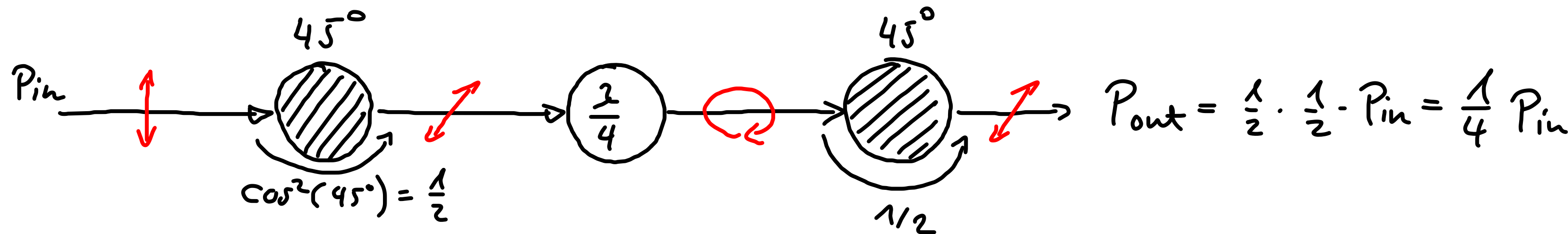


$$b = \frac{f \cdot g}{g - f} = \frac{10 \text{ cm} \cdot 15 \text{ cm}}{(15 - 10) \text{ cm}} = \frac{150 \text{ cm}}{5} = 30 \text{ cm}$$

$$g' = 1 \text{ m} - g - b = 1 \text{ m} - 15 \text{ cm} - 30 \text{ cm} = \underline{\underline{55 \text{ cm}}}$$

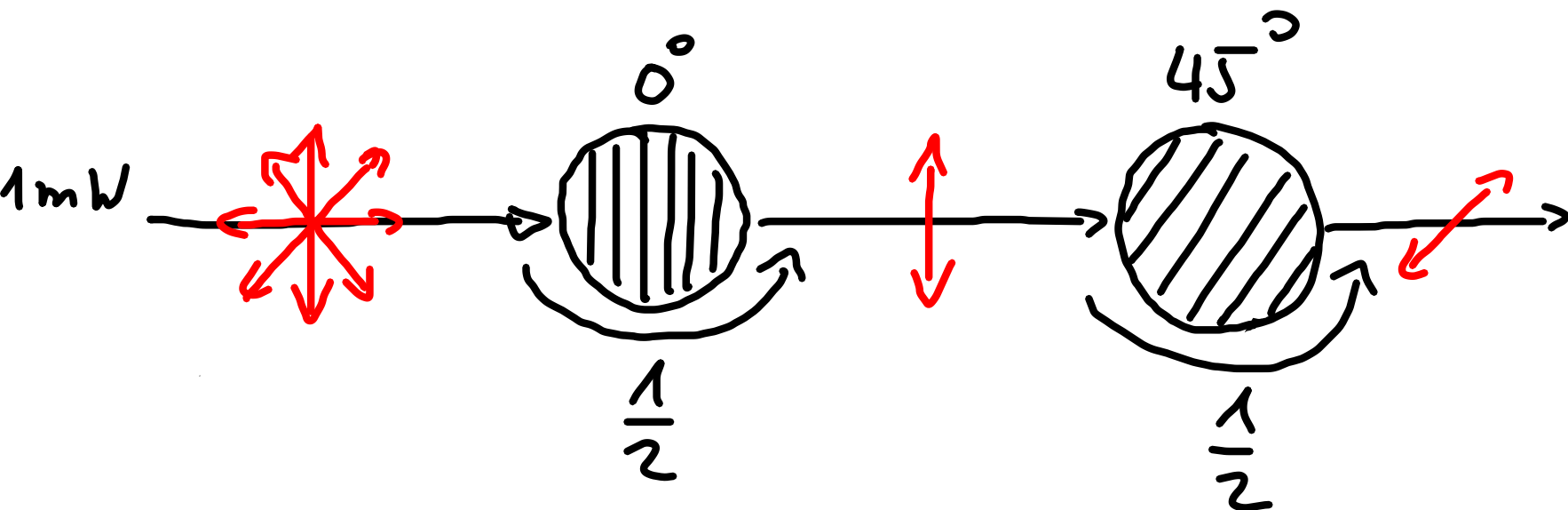
$$G' = B = G \frac{b}{g} = 5 \text{ cm} \cdot \frac{30 \text{ cm}}{15 \text{ cm}} = \underline{\underline{10 \text{ cm}}}$$

5) Polarisation I



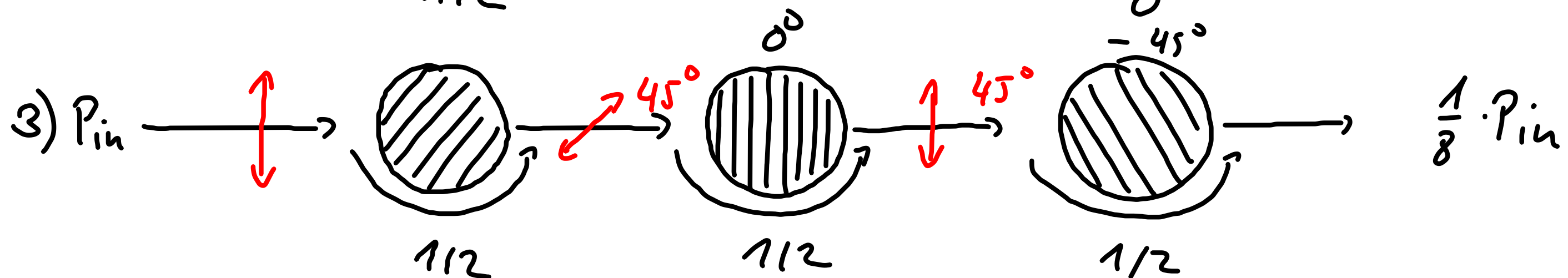
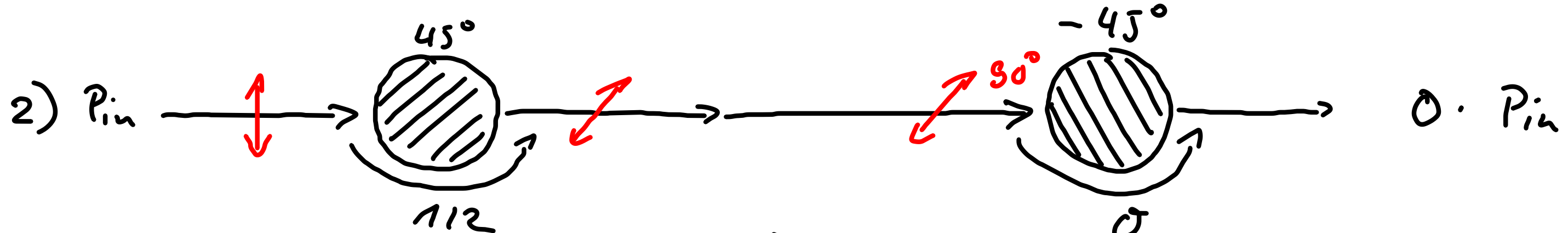
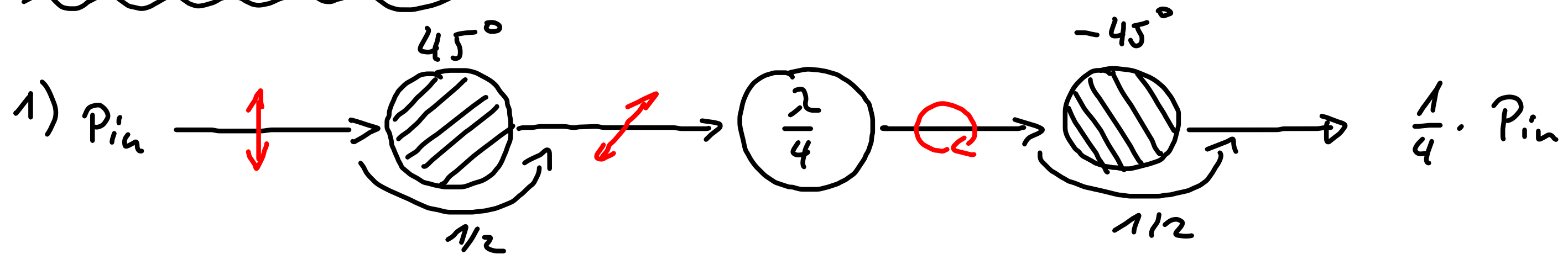
$$P_{out} = \frac{1}{2} \cdot \frac{1}{2} \cdot P_{in} = \frac{1}{4} P_{in}$$

6) Polarisation II



$$1\text{ mW} \cdot \frac{1}{2} \cdot \frac{1}{2} = 0,25\text{ mW}$$

7) Polarisation III



8) Brewster-Reflexion

$$\tan(\alpha_B) = \frac{n_2}{n_1} \rightarrow \alpha_B = \arctan\left(\frac{1,33}{1}\right) = 53^\circ$$

9) Polarimetrie

$$\alpha = \alpha_s \cdot c \cdot l$$

$$\rightarrow c = \frac{\alpha}{\alpha_s \cdot l} = \frac{7^\circ \cdot g}{52,5^\circ \cdot \text{cm}^2 \cdot 10 \text{ cm}} = 13,3 \cdot 10^{-3} \frac{g}{\text{cm}^3} = 13,3 \frac{\text{mg}}{\text{cm}^3}$$