Young's Experiment

① distance from 1st to 8th line = 7x distance from 1st to 2nd line (Δx)

$$\therefore \Delta x = \frac{8.25}{7} = 1.179 \text{ cm} \text{ or } 0.01179 \text{ m}$$

$$\Delta x = \frac{\lambda L}{d}$$

$$\lambda = \frac{\Delta x \cdot d}{L}$$

$$= \frac{(0.01179)(0.00015)}{3}$$

$$\lambda = 5.89 \times 10^{-7} \text{ m} \text{ or } \boxed{589 \text{ nm}}$$

② $$\Delta x = \frac{\lambda L}{d}$$

$$= \frac{(632.8 \times 10^{-9})(2.5)}{(43 \times 10^{-6})}$$

$$\Delta x = 0.0368 \text{ m} \text{ or } \boxed{3.68 \text{ cm}}$$

③ a) $\Delta x = \frac{10.2 \text{ cm}}{7} = \boxed{1.457 \text{ cm}}$ or 0.01457 m

(same reasoning as #1)

b) $\Delta x = \frac{\lambda L}{d}$

$d = \frac{\lambda L}{\Delta x}$

$= \frac{(525 \times 10^{-9})(1.75)}{(0.01457)}$

$d = 6.31 \times 10^{-5} \text{ m}$ or $\boxed{63.1 \ \mu\text{m}}$

④ $\lambda = \frac{\Delta x \cdot d}{L}$

$= \frac{(0.0132)(1.9 \times 10^{-5})}{0.6}$

$\lambda = 4.18 \times 10^{-7} \text{ m}$ or $\boxed{418 \text{ nm}}$

⑤ $\Delta x = \frac{\lambda L}{d} = \frac{(596 \times 10^{-9})(0.6)}{1.9 \times 10^{-5}}$

$\Delta x = 0.0188 \text{ m}$ or $\boxed{18.8 \text{ mm}}$

⑥ $d = \frac{\lambda L}{\Delta x}$

$= \frac{(632.8 \times 10^{-9})(1)}{(65.5 \times 10^{-3})}$

$d = 9.66 \times 10^{-6}$ m or **9.66 μm**

⑦ $\lambda = \frac{\Delta x \cdot d}{L}$

$= \frac{(55.8 \times 10^{-3})(15 \times 10^{-6})}{1.6}$

$\lambda = 5.23 \times 10^{-7}$ m or **523 nm**

⑧ $\lambda = \frac{\Delta x \cdot d}{L}$

$= \frac{(1.9 \times 10^{-4})(19 \times 10^{-6})}{(0.8)}$

$\lambda = 4.51 \times 10^{-7}$ m or **451 nm**

⑨ $d = \frac{\lambda L}{\Delta x} = \frac{(542 \times 10^{-9})(1.2)}{0.04}$

$d = 1.63 \times 10^{-5}$ m or **16.3 μm**