

叶茂林 2021155015

11-1 B

11-10

$$x = \frac{d'}{d} (2k+1) \frac{\lambda}{2}$$

$$x = \frac{1}{2} \times 22.78 \text{ mm}$$

$$k = 4$$

$$d = 0.30 \text{ mm}$$

$$d' = 1.20 \text{ m}$$

$\therefore \lambda = 632.8 \text{ nm}$, 是红光。

11-14

记插入玻璃片前两相干光到达O点的光程为 D'

插入后有 $D_1 = n_1 d + D' - d$

$$D_2 = n_2 d + D' - d$$

$$\Delta = D_1 - D_2$$

$$\Delta = k\lambda$$

$$k = 5$$

$$n_1 = 1.40$$

$$n_2 = 1.70$$

$$\lambda = 480 \text{ nm}$$

$$\therefore d = 8.0 \mu\text{m}$$

11-15

反射光加强 $\Delta = 2nd + \frac{\lambda}{2} = k\lambda$

白光 $k=2, 3$

$$\therefore \lambda = \begin{cases} 668.8 \text{ nm} & k=2 \quad \text{红光} \\ 401.3 \text{ nm} & k=3 \quad \text{紫光} \end{cases}$$

\therefore 正面呈红紫色

透射光减弱 $\Delta = 2nd + \frac{\lambda}{2} = (2k+1)\frac{\lambda}{2}$

白光 $k=1$

$$\therefore \lambda = 501.6 \text{ nm} \quad \text{绿光}$$

背面呈绿色。

11-2 B

11-3 C

11-18

$$2nd + \frac{\lambda}{2} = (2k+1)\frac{\lambda}{2}$$

$k=10$

$$\therefore d = 1.4 \times 10^{-6} \text{ m}$$

11-21

$$\Delta L = N \frac{\lambda}{2}$$

$$\Delta L = \alpha L \Delta T$$

$$\therefore \alpha = 1.51 \times 10^{-5} \text{ K}^{-1}$$

11-4 C

11-24

(1) 油膜周边是明环。

$$(2) 2nd_m = (2k+1)\frac{\lambda}{2}$$

$$\therefore k \approx 3$$

\therefore 可以看到4个完整暗环。

11-5 B

11-27

$$(1) b \sin \theta = (2k+1) \frac{\lambda}{2} \quad k=1, 2, 3, \dots$$

$$\sin \theta \approx \frac{x}{f}$$

$$400 \text{ nm} < \lambda < 750 \text{ nm}$$

$$\therefore k=3 \text{ 或 } k=4$$

$$\text{当 } k=3 \text{ 时, } \lambda = 600 \text{ nm}$$

$$\text{当 } k=4 \text{ 时, } \lambda = 466.7 \text{ nm}$$

$$(2) \text{ 当 } \lambda = 600 \text{ nm 时, } k=3.$$

$$\text{当 } \lambda = 466.7 \text{ nm 时, } k=4.$$

$$(3) \text{ 当 } \lambda = 600 \text{ nm 时, } k=3, 2k+1=6, \text{ 半波带数目为 } 6.$$

$$\text{当 } \lambda = 466.7 \text{ nm 时, } k=4, 2k+1=9, \text{ 半波带数目为 } 9.$$

11-28

$$(1) b \sin \theta = 2k \cdot \frac{\lambda}{2}$$

$$\sin \theta \approx \frac{x}{f}$$

$$k=1$$

$$\therefore x = 1.47 \times 10^{-3} \text{ m}$$

$$(2) b \sin \theta = (2k+1) \frac{\lambda}{2}$$

$$\sin \theta \approx \frac{x}{f}$$

$$k=2$$

$$\therefore x = 3.68 \times 10^{-3} \text{ m}$$

$$(3) \textcircled{1} b(\sin \theta - \sin 30^\circ) = 2k \cdot \frac{\lambda}{2}$$

$$\sin \theta \approx \frac{x}{f}$$

$$k=1$$

$$\therefore x = 0.580 \text{ m}$$

$$\textcircled{2} b(\sin \theta - \sin 30^\circ) = (2k+1) \frac{\lambda}{2}$$

$$\sin \theta \approx \frac{x}{f}$$

$$k=2$$

$$\therefore x = 0.583 \text{ m}$$

11-6 D

11-30

①单缝

$$b \sin \theta = (2k+1) \frac{\lambda}{2}$$

$$k=1$$

$$\sin \theta \approx \frac{x}{f}$$

$$\lambda_1 = 400 \text{ nm}, x_1 = 3.0 \times 10^{-3} \text{ m}$$

$$\lambda_2 = 760 \text{ nm}, x_2 = 5.7 \times 10^{-3} \text{ m}$$

$$\Delta x = x_2 - x_1 = 2.7 \times 10^{-3} \text{ m}$$

②光栅

$$d = \frac{10^{-2}}{10^3} \text{ m} = 10^{-5} \text{ m}$$

$$d \sin \theta = k \lambda$$

$$\sin \theta \approx \frac{x}{f}$$

$$k=1$$

$$\lambda_1 = 400 \text{ nm}, x_1 = 2.0 \times 10^{-2} \text{ m}$$

$$\lambda_2 = 760 \text{ nm}, x_2 = 3.8 \times 10^{-2} \text{ m}$$

$$\Delta x = x_2 - x_1 = 1.8 \times 10^{-2} \text{ m}$$

11-34

$$(1) d = \frac{10^{-3}}{500} \text{ m} = 2.0 \times 10^{-6} \text{ m}$$

$$d \sin \theta = k \lambda$$

$$\sin \theta \leq 1$$

$$\therefore k \leq 3.39$$

\therefore 最多能看到第3级光谱。

$$(2) d(\sin 30^\circ \pm \sin \theta) = \pm k \lambda$$

$$\sin \theta \leq 1$$

$$\therefore k_{\max 1} = 5, k_{\max 2} = 1$$

\therefore 在两侧最多能看到的光谱级数为5和1。

$$(3) d \sin \theta = k \lambda$$

$$k=1$$

$$\sin \theta \approx \frac{x}{f}$$

$$\lambda_1 = 400 \text{ nm}, x_1 = 0.2 \text{ m}$$

$$\lambda_2 = 760 \text{ nm}, x_2 = 0.41 \text{ m}$$

$$\Delta x = x_2 - x_1 = 0.21 \text{ m}$$

11-35

$$(1) d \sin \theta = k \lambda$$

$$k=2$$

$$\sin \theta = 0.2$$

$$\therefore d = 6 \times 10^{-6} \text{ m}$$

$$(2) (b+b') \sin \theta = \pm k \lambda \quad k=0, 1, 2, \dots$$

$$b \sin \theta = \pm k' \lambda \quad k'=1, 2, 3$$

$$\frac{k}{k'} = 4$$

$$\therefore b = 1.5 \times 10^{-6} \text{ m}$$

$$(3) d \sin \theta = k \lambda$$

$$\sin \theta < 1$$

$$\therefore k < 10$$

\therefore 实际呈现的全部级数为 $0, \pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 6, \pm 7, \pm 8, \pm 9$.

11-7 C

11-8 B

11-38

$$I_1 = \frac{I_0}{2} \cos^2 60^\circ$$

$$I_2 = \frac{1}{2} I_0 \cdot \cos^2 30^\circ$$

$$I_3 = I_2 \cdot \cos^2 30^\circ$$

$$\therefore I_3 = \frac{9}{4} I_1$$

11-39

设入射光总强度为 I , 线偏振光强为 xI

$$xI + \frac{(1-x)I}{2} = \frac{5(1-x)I}{2}$$

$$\therefore x = \frac{2}{3}$$

\therefore 偏振光占 $\frac{2}{3}$, 自然光占 $\frac{1}{3}$.