Câu 1:

$i = \dfrac{dq}{dt} = -5 \cdot 10^{-3} \sin 2000 t$

$\omega = \dfrac{1}{\sqrt{LC}} = 2000$

Câu 2:

$\Delta L = 2 n' d = (k + 0,5) \lambda$

$\Rightarrow d = \dfrac{(k + 0,5) \lambda}{2 n'}$

$\Rightarrow d_{min} = 1,07 \cdot 10^{-7}$ m

Câu 3:

$2 \lambda_2 = 3 \lambda_1$

$\Rightarrow \lambda_2 = 690$ nm

4) $\sin i_{gh} = \dfrac{1,5}{1,6} \Rightarrow i_{gh} = 69,64°$

5) $l = \dfrac{l_0}{1,5} = l_0 \sqrt{1 - \left(\dfrac{u}{c}\right)^2}$

$\Rightarrow \dfrac{u}{c} = \dfrac{\sqrt{5}}{3}$

$E_đ = E - E_0$

$\Rightarrow e U = m_0 c^2 \left(\dfrac{1}{\sqrt{1 - \left(\dfrac{u}{c}\right)^2}} - 1 \right) \Rightarrow V = 255937$

6)

$$E_d = \frac{1}{2} m_e u^2 = \frac{p^2}{2 m_e}$$

$$\Rightarrow p = \sqrt{2 m E_d} = 1,7 . 10^{-24}$$

$$\Delta x \cdot \Delta p \geq \hbar$$

$$\Delta x \, \text{min} \iff \Delta p \, \text{max} \Rightarrow \Delta p = p$$

$$\Rightarrow \Delta x = \frac{\hbar}{p} = 6,2 . 10^{-11}$$

7)

8)

$$\omega = \frac{1}{\sqrt{LC}} = 6278$$

$$i = -\frac{dq}{dt} = -0,0157 \sin 6278 t$$

9)

$$\Delta L = 2 n d - 0,5 \lambda = k \lambda$$

$$\Rightarrow \lambda = \frac{2 n d}{h + 0,5}$$

$$\Rightarrow \lambda = 0,48 \, \mu m$$

10) $\lambda_2 = 440 \, nm$

11) $E_d = E - E_0 = 3 E_0 \Rightarrow E = 4 E_0$

$$\Rightarrow m = 4 m_0$$

$$2,6 . 10^{-31} \, kg$$

+c quét b

12) $\dfrac{h}{\lambda} = \dfrac{m_0 \alpha}{\sqrt{1 - (\frac{\alpha}{c})^2}}$ m

$\Rightarrow \lambda = 2{,}71 \cdot 10^{-12}$ m

13)

$\omega = \dfrac{1}{\sqrt{LC}} \Rightarrow C = 6{,}25 \cdot 10^{-7}$ F

$\dfrac{1}{2} L I_0^2 = \dfrac{1}{2} C U_0^2$

$\Rightarrow U_0 = I_0 \sqrt{\dfrac{L}{C}} = 25{,}3$ V

$W_{t_0} = \dfrac{1}{2} L I_0^2 = 2 \cdot 10^{-4}$ (J)

14) $i = 1\,mm$

$\alpha = \dfrac{1}{60} \cdot \dfrac{\pi}{180} = \dfrac{\lambda}{z_i}$

$\Rightarrow \lambda = 5{,}82 \cdot 10^{-7}$ m

15) $\dfrac{\lambda}{a} = \dfrac{L_{12}}{j} \Rightarrow j = 1\,m$

16) $\Delta \ell = \dfrac{(2k+1)\lambda}{4} = \Delta n d$

$\Rightarrow d_{max} = 0{,}147\,mm$

17)

$$\frac{hc}{\varepsilon'} - \frac{hc}{\varepsilon} = 2\lambda_c \sin^2 \frac{\theta}{2}$$

$$\Rightarrow \theta = 76,59^{\circ}$$

18) $$E_d = \frac{p^2}{2m} = \frac{h^2}{2m\lambda^2}$$

$$\Rightarrow \lambda = \frac{h}{\sqrt{2mE_d}} = 11^{\circ}$$

19) $$x = (2\pi\sqrt{LC}$$

$$\Rightarrow \frac{\lambda_1}{\lambda_2} = \sqrt{\frac{C_1}{C_2}}$$

$$\Rightarrow \frac{C_2}{C_1} = \frac{\lambda_2^2}{\lambda_1^2} = 100$$

20) $$\Delta L = 2nd = (h+0,5)\lambda$$

$$\Rightarrow d = \frac{(h+0,5)\lambda}{2n}$$

$$\lambda_h = \sqrt{2Rd_k} = \sqrt{\frac{(h+0,5)\lambda R}{nn}}$$

$$h = 4 \Rightarrow \lambda_h = 1,17 \, mm$$

21)

$$-1 < \frac{h\lambda}{p} < 1 \Rightarrow -4 \le h \le 4$$

$$h \in \mathbb{Z}, h \neq 0$$

+c quét b

22)
$$\lambda = \frac{hc}{\sqrt{eU(eU + 2m_0 c^2)}} \quad (m)$$
$$= 3,17 \cdot 10^{-11} \quad (m)$$

23)
$$N_{max} = \frac{-13,5 eV}{\infty^2} + \frac{13,5 eV}{2^2} \cdot 2$$
$$\rightarrow N_{max} = 8,15 \cdot 10^{17}$$

24)

25)
$$\frac{-13,5 eV}{(3 - 1,37)^2}$$

26) $\lambda_h = \sqrt{Rh\lambda}$.
$$r_{h+1}^2 - r_h^2 = (3,38 \cdot 10^{-3})^2 - (4 \cdot 10^{-3})^2$$
$$= R(h+1)\lambda - Rh\lambda = R\lambda$$
$$\Rightarrow \lambda = 0,5 \mu m$$

27)
$$\cdots < \frac{k\lambda}{b} < 1 \quad , \quad h \in \mathbb{Z}, \quad h \neq 0$$

28)
$$\psi_1 = \alpha d_1$$
$$\psi_2 = 90° = \alpha d_2$$
$$\Rightarrow d_2 = \frac{\psi_2 d_1}{\psi_1} = 3,05 mm$$

+c quét b

29) $\lambda - \dfrac{hc}{e} = 2\lambda_c \sin^2\dfrac{\theta}{2}$

$\Rightarrow \theta = 50,7°$

$\varepsilon' = \dfrac{hc}{\lambda_c}$

30) $eU = \dfrac{h^2}{2m\lambda^2}$

$\Rightarrow \lambda = \dfrac{h}{\sqrt{2meU}} = 1,23 . 10^{-10} \cancel{\#}$

31) $\beta = \beta T = \dfrac{RT}{2L} = 0,028$

$T = \dfrac{2\pi}{\sqrt{\dfrac{1}{LC} - \left(\dfrac{R}{2L}\right)^2}} = 1,7156 (s)$

$1,088 . 10^{-4} (s)$

32)

$\Lambda_3 = \sqrt{R \, 3\lambda} = 2,32 . 10^{-3} \, m$

33)

$\Lambda = \sqrt{\dfrac{R \, b \, 2\lambda}{R + b}} \Rightarrow b = 0,4 \, (m)$

34)

$I_1 = 0,9 . 0,5 . I_0$

$\Rightarrow \dfrac{I_0}{I_1} = 2,2$

+c quét b

35)

$\lambda' = \dfrac{hc}{\varepsilon} = 2\lambda_0 \sin\dfrac{\theta}{2}$

$\Rightarrow \lambda' = 1,48.10^{-11}$

$\Rightarrow \varepsilon = 1,34.10^{-14}$

36) $\dfrac{h}{\lambda} = \dfrac{m_0 u}{\sqrt{1 - \left(\dfrac{u}{c}\right)^2}}$

37) $\lambda = c\,2\pi\sqrt{LC}$

$\Rightarrow \dfrac{C_1}{C_2} = \dfrac{\lambda_1^2}{\lambda_2^2} = \dfrac{1}{9}$

$\Rightarrow \lambda_2 = 9$

$f = \dfrac{c}{\lambda} \Rightarrow \dfrac{c}{\lambda_2} \leq f \leq \dfrac{c}{\lambda_1}$

$\Rightarrow 0,37.10^{7} \leq f \leq 0,33.10^{8}$

38) $\Delta L = 2nd + 0,5\lambda = (k + 0,5)\lambda$

$\Rightarrow d = \dfrac{k\lambda}{2n}$

$r_k = \sqrt{2R d_k} = \sqrt{\dfrac{R\,k\lambda}{n}}$

$\Rightarrow r_3 = 2,577.10^{-3} \ (m)$

+c quét b

39)

$$\frac{\lambda}{b} = \frac{L/2}{D} \Rightarrow L = 4,8 \cdot 10^{-3} \, m$$

40)

$$I_1 = 0,95 \cdot 0,5 \, I_0$$

$$\Rightarrow \frac{I_1}{I_0} = 2,1$$

$$I_2 = 0,95^2 \cdot 0,5 \cdot \cos^2 30 \cdot I_0$$

$$\Rightarrow \frac{I_2}{I_0} = 2,95$$

41)

$$\lambda' = \frac{hc}{\cancel{\mathcal{E}}} \Rightarrow 2 \lambda_c \sin^2 30$$

$$\Rightarrow \lambda' = 2,6 \cdot 10^{-11} \, m$$

$$\Rightarrow \mathcal{E}' = 7,64 \cdot 10^{-15}$$

$$\Rightarrow E\alpha = \mathcal{E} - \mathcal{E}' = 0,36 \cdot 10^{-15} \, m$$

$$\Rightarrow \frac{E\alpha}{\mathcal{E}} = 4,5\%$$

42)

$$\Delta p = 0,01 p \Rightarrow 0,01 \, h/\lambda \Rightarrow \lambda = 0,01 h/\Delta p$$

$$\Delta x = \frac{h}{2\pi \Delta p}$$

$$\frac{\lambda}{\Delta x} = \frac{0,01 \, h/\Delta p}{h/(2\pi \Delta p)} = \frac{1}{200\,\pi}$$

+c quét b

43) $\omega t = \omega \cdot \frac{T}{8} = \frac{\pi}{4}$

$\therefore \cos \omega t = \sin \omega t$

$\therefore \omega t = \omega_1$

44) $x = \frac{\lambda}{2i}$

45) $-1 < \frac{k\lambda}{b} < 1$

46) $I_1 = 0,9 \cdot 0,5 \, I_0$

$\Rightarrow \frac{I_1}{I_0} = 2,2$

47)

$$E_đ = m_0 c^2 \left(\frac{1}{\sqrt{1-(v/c)^2}} - 1 \right)$$

$\Rightarrow E_đ = 1,267 \cdot 10^{-13}$

$\xi = 6,625 \cdot 10^{-14}$

$\Rightarrow \xi' = 5,358 \cdot 10^{-14}$

$\Rightarrow \gamma' = 3,7 \cdot 10^{-12} \, m$

$\Rightarrow d \lambda = 0,7 \cdot 10^{-12} \, m$

$\Rightarrow \theta = \cdots$

48) $\gamma = \frac{h}{\sqrt{2eVm}} = 1,72 \, A^\circ$

49.

$$e^{\beta \Delta t} = e \longrightarrow \Delta t = \frac{2L}{R} = \frac{2\pi}{25}$$

50)

$$5 \cdot 0,55 = h \cdot \lambda$$

$$\Longrightarrow \begin{cases} \lambda = 0,458 \ \mu m \\ \lambda = 0,6875 \ \mu m \end{cases}$$