Answer on Question#61365 – Physics – Electromagnetism

15) An RLC circuit is used to tune a radio set to receive NOUN RADIO broadcasting at 105.9MHz in the FM band. The resistance and the inductance of the circuit of the radio set are 12Ê and 1.4ÖH respectively. What capacitance should the circuit have?
a) 1.64pF
b) 1.51ÖF
c) 1.33mF
d) 2.11pF

Solution. Using formula for resonant frequency $f = \frac{1}{2\pi\sqrt{LC}}$, where L – inductance, C – capacitance. According to the condition of the problem $f = 105.9 \cdot 10^6 Hz$, $L = 1.4 \cdot 10^{-6} H$. Hence $f = \frac{1}{2\pi\sqrt{LC}} \to C = \frac{1}{4\pi^2 f^2 L} = \frac{1}{4\pi^2 (105.9 \cdot 10^6)^2 \cdot 1.4 \cdot 10^{-6}} \approx 1.61 \cdot 10^{-12} F = 1.61 pF$.

Answer. a) 1.64pF

16) The work function of a metal is 3.45eV. Calculate th maximum wavelength of a photon that can eject photelectrons from the metal
a) 1:6Â10À6 m
b) 3:6Â10À7 m
c) 2:4Â10À8 m
d) 3:4Â10À7 m

Solution. Einstein described the photoelectric effect using a formula that relates the maximum kinetic energy (K_{max}) of the photoelectrons to the energy of the absorbed photons (E) and the work function (φ): $K_{max} = E - \varphi$. According to the condition of the problem photon that can eject photelectrons from the metal. Hence $0 = E - \varphi \to E = \varphi$. The energy of the photon can be found using the formula $E = \frac{hc}{\lambda}$ (where $h = 6.63 \cdot 10^{-34} J \cdot c$ – Planck's constant; λ – wavelength; $c = 3 \cdot 10^8 \frac{m}{s}$ – velocity of light). Therefore $\frac{hc}{\lambda} = \varphi \to \lambda = \frac{hc}{\varphi}$

$\lambda = \frac{6.63 \cdot 10^{-34} \cdot 3 \cdot 10^8}{3.45 \cdot 1.6 \cdot 10^{-19}} = 3.6 \cdot 10^{-7} m$

Answer. b) $3.6 \cdot 10^{-7} m$