Universidad Autónoma de Nuevo León

Facultad de Ingeniería Mecánica y Eléctrica

FISICA IV

Grupo: 022

ING. NORMA ESTHELA FLORES MORENO

Problemas resueltos de efecto fotoeléctrico y rayos x

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Las respuestas se han enviado correctamente.
Algo importante que puede hacer a continuación
Guardar mi respuesta
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Microsoft Forms
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Registro de eventos

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Problema 1 $E = \frac{hc}{\lambda}$

a) $\lambda = 2650 \text{ Å} = 2.65 \times 10^{-7} \text{ m}$

$I = 5 \text{ W}$

$E_c = 3.9 \text{ eV} = 3.9 \times 1.602 \times 10^{-19} = 6.25 \times 10^{-19} \text{ J}$

$$E = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34})(3 \times 10^{8})}{2.65 \times 10^{-7}} = 7.5057 \times 10^{-19} \text{ J}$$

$$\phi = E_{fotón} - E_c = 7.5057 \times 10^{-19} - 6.25 \times 10^{-19} = \underline{1.2557 \times 10^{-19} \text{ J}}$$

Cuando $E_c = 0$

b) $$\lambda = \frac{hc}{\phi} = \frac{(6.626 \times 10^{-34})(3 \times 10^{8})}{1.2557 \times 10^{-19}} = \underline{1.58 \times 10^{-6} \text{ m}}$$

c) $\lambda = 5300 \text{ Å} \therefore 5.3 \times 10^{-7} \text{ m}$

$$E'_f = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34})(3 \times 10^{8})}{5.3 \times 10^{-7}} = 3.75 \times 10^{-19} \text{ J}$$

$$E'_c = E'_f - \phi = 3.75 \times 10^{-19} - 1.2557 \times 10^{-19}$$

$$= \underline{2.4943 \times 10^{-19} \text{ J}}$$

$$V_f = \frac{E_c}{e} = \frac{2.4943 \times 10^{-19}}{1.602 \times 10^{-19}} = \underline{1.56 \text{ V}}$$

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Problema 2:

$\phi = 2.46\,eV$

$E = 4.17\,eV$

a) $\phi = 2.46\,eV = (2.46)(1.602\times10^{-19}\,J) = 3.941\times10^{-19}\,J$

$h = 6.626\times10^{-34}\,J$, $c = 3\times10^{8}\,m/s$

$$\lambda_c = \frac{(6.626\times10^{-34})(3\times10^{8})}{3.941\times10^{-19}} = 5.046\times10^{-7}\,m = 504.6\,nm$$

b) $$f = \frac{E}{h} = \frac{3.941\times10^{-19}}{6.626\times10^{-34}} = 5.95\times10^{14}\,Hz$$

c) $E_c = E_{cuton} - \phi = 4.17\,eV - 2.46\,eV = 1.71\,eV$

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Problema 3:

a) $\theta_r = \theta_e \quad \theta = 60° \quad \theta_r = \theta_e = 60°$

b) $E_r = 0.660 MeV$
$mec^2 = 0.511 MeV$
$\theta = 60° \therefore \cos(60) = 0.5$

$$\frac{1}{E'r} - \frac{1}{Er} = \frac{1-\cos\theta}{mec^2}$$

$$\frac{1}{E'r} - \frac{1}{0.66} = \frac{1-0.5}{0.511} = \frac{0.5}{0.511} = 0.9785$$

$$\frac{1}{E'r} = \frac{1}{0.66} + 0.9785 = 1.5152 + 0.9785 = 2.4937$$

$$E'r = \frac{1}{2.4937} = 0.401 MeV$$

b) $p = \frac{E}{c}$ $\quad Pr = \frac{0.401 MeV}{3 \times 10^8} = 2.14 \times 10^{-22} Kg\,m/s$

c) $E_e = E_r - E'_r = 0.66 - 0.401 = 0.259 MeV$

c) $p = \frac{\sqrt{E^2 - (mec^2)^2}}{c}$

$E = Ke + mec^2 = 0.259 + 0.511 = 0.77 MeV$

$$pe = \frac{\sqrt{0.77^2 - 0.511^2}}{c} = \frac{\sqrt{0.5929 - 0.2611}}{c}$$

$$= \frac{\sqrt{0.3318}}{3 \times 10^8} = 3.08 \times 10^{-22} Kg\,m/s$$

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Problema 4

$\lambda = 2.45 \times 10^{-2}\ \text{Å} = 2.45 \times 10^{-12}\ m$

$\theta = 45°$

$\lambda c = 2.426 \times 10^{-12}\ m$

a) $\sin\theta e = \frac{p'r \sin\theta r}{pe}$ $\quad Ke = 1.82 \times 10^{-14}\ J$

$E = Ke + mec^2 = 1.82 \times 10^{-14} + 8.19 \times 10^{-14} = 1.001 \times 10^{-13}\ J$

$pc = \frac{\sqrt{E_c^2 - (mec^2)^2}}{c}$

$pc = \frac{\sqrt{(1.001 \times 10^{-3})^2 - (8.19 \times 10^{-14})^2}}{3 \times 10^8}$

$pc = \frac{\sqrt{3.31 \times 10^{-27}}}{3 \times 10^8} = 1.92 \times 10^{-22}\ kg\ m/s$

$\sin\theta e = \frac{p'r \sin\theta r}{pe} = \frac{2.1 \times 10^{-27} \cdot \text{Sen}(45)}{1.92 \times 10^{-22}} = \frac{(2.1)(0.7071)}{1.92}$

$= 0.774 \quad \therefore \arcsin(0.774) = 50.7°$

b) $\frac{h}{mec} = 2.43 \times 10^{-12}\ m$

$\Delta\lambda = 2.43 \times 10^{-12}(1 - \cos 45) = 2.43 \times 10^{-12} \times (1 - 0.7071)$

$= (2.43 \times 10^{-12})(0.2929) = 7.12 \times 10^{-13}\ m$

$Ei = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{2.45 \times 10^{-12}} = 8.11 \times 10^{-14}\ J$

$\lambda' = 2.45 \times 10^{-12} + 7.12 \times 10^{-13} = 3.16 \times 10^{-12}\ m$

$Ef = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{3.16 \times 10^{-12}} = 6.29 \times 10^{-14}\ J$

$Ke = 8.11 \times 10^{-14} - 6.29 \times 10^{-14} = 1.82 \times 10^{-14}\ J$