35. We establish a coordinate system with the origin at the position of initial nucleus of mass $m_{m\,i}$ (which was stationary), with the electron momentum $\vec{p}_e$ in the $-x$ direction and the neutrino momentum $\vec{p}_\nu$ in the $-y$ direction. We will use unit-vector notation, although the problem does not specifically request it.

(a) We find the momentum $\vec{p}_{n\,r}$ of the residual nucleus from momentum conservation.

$$\begin{aligned}\vec{p}_{n\,i} &= \vec{p}_e + \vec{p}_\nu + \vec{p}_{n\,r} \\ 0 &= -1.2 \times 10^{-22}\,\hat{\imath} - 6.4 \times 10^{-23}\,\hat{\jmath} + \vec{p}_{n\,r}\end{aligned}$$

Thus, $\vec{p}_{n\,r} = 1.2 \times 10^{-22}\,\hat{\imath} + 6.4 \times 10^{-23}\,\hat{\jmath}$ in SI units (kg·m/s). Its magnitude is

$$|\vec{p}_{n\,r}| = \sqrt{(1.2 \times 10^{-22})^2 + (6.4 \times 10^{-23})^2} = 1.4 \times 10^{-22}\ \text{kg·m/s}\ .$$

(b) The angle measured from the $+x$ axis to $\vec{p}_{n\,r}$ is

$$\theta = \tan^{-1}\left(\frac{6.4 \times 10^{-23}}{1.2 \times 10^{-22}}\right) = 28^\circ\ .$$

Therefore, the angle between $\vec{p}_e$ (which is in the $-x$ direction) and $\vec{p}_{n\,r}$ is $180^\circ - 28^\circ \approx 150^\circ$.

(c) Measuring clockwise (but not using the "traditional" minus sign with that sense) we find the angle between $\vec{p}_{n\,r}$ and $\vec{p}_\nu$ (which points in the $-y$ direction) is $90^\circ + 28^\circ \approx 120^\circ$.

(d) Combining the two equations $p = mv$ and $K = \frac{1}{2}mv^2$, we obtain (with $p = p_{n\,r}$ and $m = m_{n\,r}$)

$$K = \frac{p^2}{2m} = \frac{\left(1.4 \times 10^{-22}\right)^2}{2\left(5.8 \times 10^{-26}\right)} = 1.6 \times 10^{-19}\ \text{J}\ .$$