

H W 5

① $e^- + e^+ \rightarrow \text{photon}$

*note: actually 2 photons are produced in a physical electron positron annihilation. So if you found E, P for 2 photons that is OK.

$$m_{e^-} = m_{e^+} = 9 \times 10^{-31} \text{ Kg}$$

$$\text{Energy released} = 2 m_e c^2 = (18 \times 10^{-31} \text{ Kg}) \left(9 \times 10^{16} \frac{\text{m}^2}{\text{s}^2} \right)$$

$$\approx 10^{-13} \text{ Kg} \frac{\text{m}^2}{\text{s}^2} = \boxed{10^{-13} \text{ Joules}}$$

~~It might be~~

Or, if you like electron volts

$$\left(10^{-13} \text{ J} \right) \left(\frac{1 \text{ eV}}{10^{-19} \text{ J}} \right) \approx 10^6 \text{ eV} = \boxed{1 \text{ MeV}}$$

The momentum is $\bar{E} = pc$

$$\text{So } p = \frac{1 \text{ MeV}}{c}$$

Or in MKS units

$$p = \frac{10^{-13} \text{ J}}{3 \times 10^8 \text{ m/s}}$$

$$\approx \boxed{3 \times 10^{-22} \text{ Kg} \frac{\text{m}}{\text{s}}}$$