11 An electron, at rest, has mass m_e and charge $-q$.

A positron is a particle that, at rest, has mass m_e and charge $+q$.

A positron interacts with an electron. The electron and the positron may be considered to be at rest.
The outcome of this interaction is that the electron and the positron become two gamma-ray (γ-ray) photons, each having the same energy.

(a) Calculate, for one of the γ-ray photons:

(i) the photon energy, in J

energy = ... J [2]

(ii) its momentum.

momentum = ... N s [2]

(b) State and explain the direction, relative to each other, in which the γ-ray photons are emitted.

....

....

....

.... [2]

[Total: 6]