

4. A free electron collides with a hydrogen atom which is in the ground state. After the collision, the hydrogen atom is excited and during the process of de-excitation, two photons are emitted. The wavelength of one of the photons emitted is 656.3 nm. The electron, after the collision, has de Broglie wavelength of 1.915 nm.
- (a) What is the wavelength of the other photon emitted during the de-excitation?
  - (b) What is the speed of the free electron before collision? [10 marks]