

**Question 16**

(8 marks)

- (a) Explain briefly the difference between the terms *energy level* and *quantum state*.
- (b) Calculate the frequency of electromagnetic radiation emitted when an electron in a hydrogen atom makes a transition from its first excited energy level to its lowest energy level.
- (c) The spectral line associated with the transition discussed in part (b) splits when the atom is placed in a strong external magnetic field. Explain why this happens, specifying the quantum states that are involved in the transition. (You may ignore the effects of electron spin.)