7 **(a)** State three pieces of evidence provided by the photoelectric effect for a particulate nature of electromagnetic radiation.

1. .....

.....

2. .....

.....

3. .....

.....

[3]

(b) **(i)** Briefly describe the concept of a photon.

.....

.....

.....[2]

(ii) Explain how lines in the emission spectrum of gases at low pressure provide evidence for discrete electron energy levels in atoms.

.....

.....

.....[2]

(c) Three electron energy levels in atomic hydrogen are represented in Fig. 7.1.

For Examiner's Use

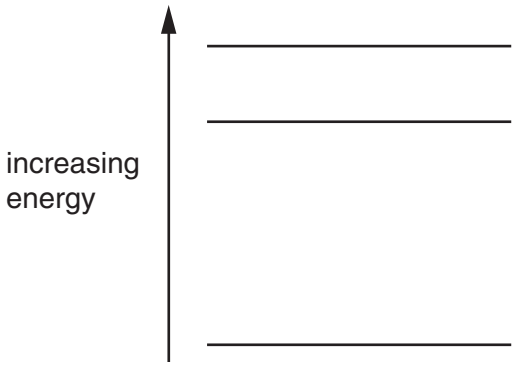

Fig. 7.1

The wavelengths of the spectral lines produced by electron transitions between these three energy levels are 486 nm, 656 nm and 1880 nm.

(i) On Fig. 7.1, draw arrows to show the electron transitions between the energy levels that would give rise to these wavelengths.
Label each arrow with the wavelength of the emitted photon. [3]

(ii) Calculate the maximum change in energy of an electron when making transitions between these levels.

energy = ... J [3]