6 (a) State how a line emission spectrum may be explained on the basis of the existence of discrete electron energy levels in atoms.

....

....

....

....

....[3]

(b) The lowest six discrete energy levels for a hydrogen atom are shown in Fig. 6.1. The diagram is drawn to scale and the ground state is at -13.6 eV.
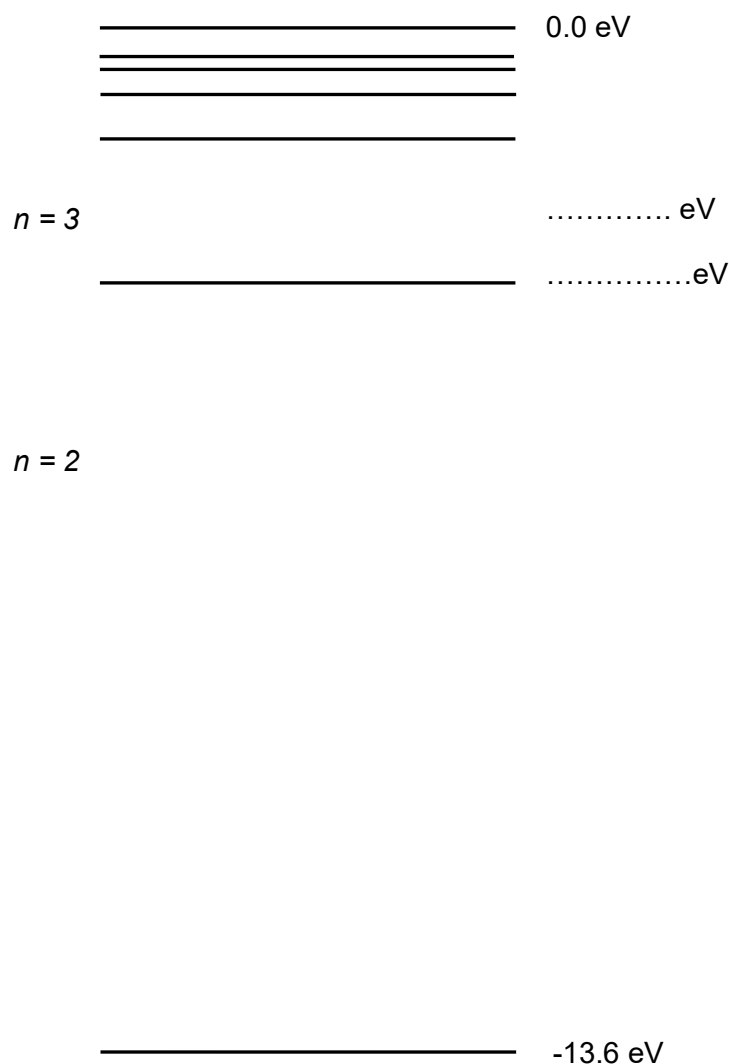

0.0 eV

$n = 3$ .... eV

..............eV

$n = 2$

-13.6 eV

Fig. 6.1

(i) On Fig. 6.1, label the values for energy at energy levels $n = 2$ and $n = 3$. [1]

(ii) Calculate the wavelength of the light emitted when an electron falls from $n = 3$ energy level to the $n = 2$ energy level.

wavelength = ……………………... m   [3]

(iii) Electromagnetic radiation is emitted when an electron falls to the ground state from any of the other energy levels. State the region of the electromagnetic spectrum in which the radiation lies.

electromagnetic radiation is …………………………   [1]

(iv) Describe one way by which an electron in gaseous hydrogen can be raised from a lower energy level to a higher energy level.

....

....   [1]

[Total: 9]