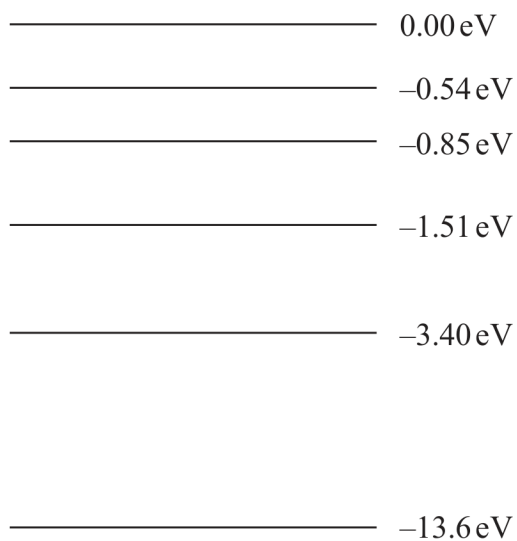


17 The diagram shows the energy levels for an atom of hydrogen.



An electron is in the  $-13.6\text{ eV}$  (ground state) level of this atom.

(a) A photon interacts with this electron.

Explain why this interaction causes the emission of another photon.

(2)

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(b) A photon has a wavelength of 218 nm.

(i) Determine the energy, in eV, of this photon.

(4)

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Photon energy = ..... eV

(ii) Explain whether the atom of hydrogen could emit a photon with this energy.

(2)

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- (c) Photons with energy  $1.63 \times 10^{-18} \text{ J}$  are incident upon the surface of a metal plate. The metal surface releases electrons due to the photoelectric effect.

- (i) Calculate the maximum possible speed of the electrons.

$$\text{work function} = 5.89 \times 10^{-19} \text{ J}$$

(3)

Maximum possible speed of the electrons = .....

- (ii) Explain why the photoelectric effect demonstrates light behaving as a particle, rather than a wave.

(3)