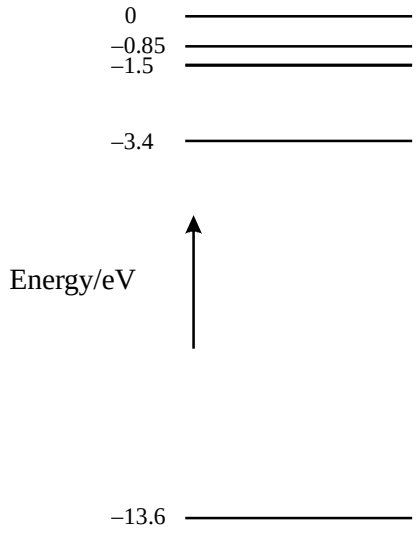
Energy Levels Questions

1. The diagram shows some of the energy levels for atomic hydrogen.



For each of the statements below, indicate whether the statement is true (✓) or false (✗).

Statement	True/False
The single electron of a hydrogen atom normally occupies the –13.6 eV energy level.	
An electron of energy 10 eV colliding with a hydrogen atom in its ground state could have an energy of 0.2 eV after the collision.	
An electron moving from the –3.4 eV to the –0.85 eV level gives out a photon of energy 2.55 eV.	
Light of wavelength 650 nm has sufficient energy to excite an electron from the –3.4 eV to the –1.5 eV energy level.	

Use this space for any calculations.

(4)
(Total 4 marks)

2. Listed below are four types of wave:

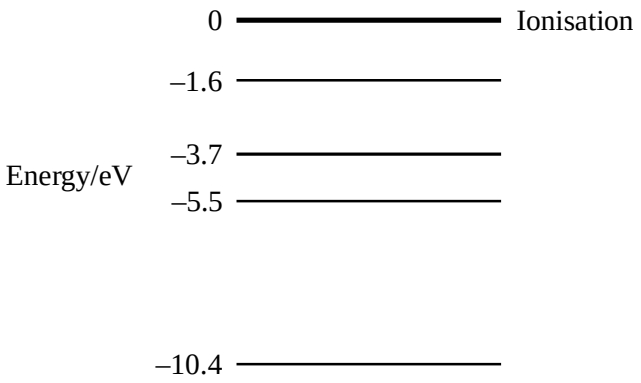
microwave sound ultraviolet infrared

From this list, choose the wave which matches each description in the table below, and write it in the space provided. (You may choose a type of wave once, more than once or not at all.)

Description	Type of wave
A wave capable of causing photoelectric emission of electrons	
A wave whose vibrations are parallel to the direction of propagation of the wave	
A transverse wave of wavelength 5×10^{-6} m	
The wave of highest frequency	

(Total 4 marks)

3. The diagram shows some of the outer energy levels of the mercury atom.



Calculate the ionisation energy in joules for an electron in the -10.4 eV level.

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Ionisation energy = ...

(2)

An electron has been excited to the -1.6 eV energy level. Show on the diagram all the possible ways it can return to the -10.4 eV level.

(3)

Which change in energy levels will give rise to a yellowish line (λ = 600 nm) in the mercury spectrum?

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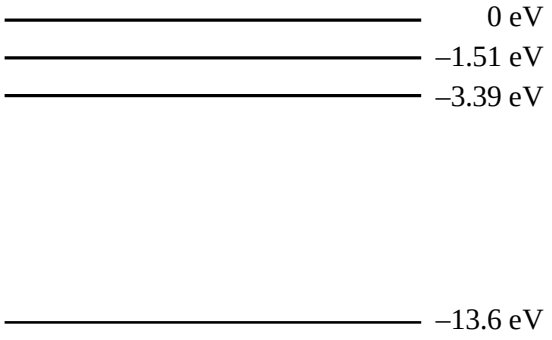
(4)

(Total 9 marks)

4. The diagram shows some of the energy levels for atomic hydrogen.



Add arrows to the diagram showing all the single transitions which could ionise the atom.

(2)

Why is the level labelled –13.6eV called the ground state?

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(1)

Identify the transition which would result in the emission of light of wavelength 660 nm.

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Transition = ...

(4)

(Total 7 marks)