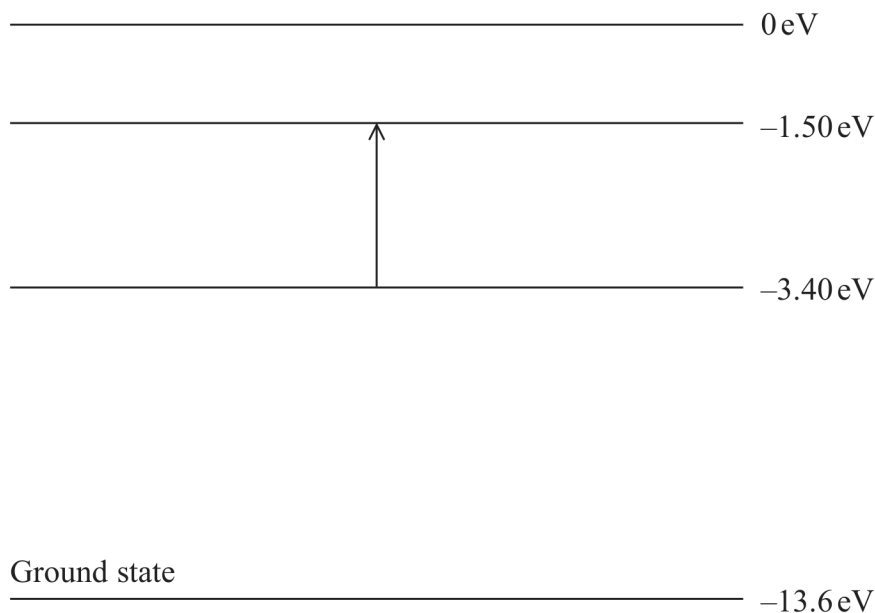**18** Sirius A is the brightest star in the night sky and is mostly composed of hydrogen.

(a) When light from Sirius A passes through the hydrogen in the outer layers of the star, some light is absorbed. This causes electrons in the hydrogen to be excited. The diagram shows an electron being excited from the –3.40 eV level to the –1.50 eV level.



The wavelengths of the different colours of visible light are shown in the table below.

| violet | blue | green | yellow | orange | red |
|---|---|---|---|---|---|
| 380–450 nm | 450–495 nm | 495–570 nm | 570–590 nm | 590–620 nm | 620–750 nm |

Deduce the colour of the visible light that caused the electron transition shown in the diagram.

(4)

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(b) A light year is the distance travelled by light in one year.

Sirius A is 8.60 light years from Earth. The intensity of radiation from Sirius A received on Earth is $1.17 \times 10^{-7}\,\text{Wm}^{-2}$.

Calculate the power of Sirius A.

(4)

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Power of Sirius A = .................................................

(c) When hydrogen gas is excited in the laboratory, only certain wavelengths of light are emitted.

Explain why.

(2)

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**(Total for Question 18 = 10 marks)**