Question 15 (18 marks)
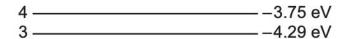
Below are some of the energy levels of an element used to produce light, which is then shone onto a sodium cathode in a photoelectric cell.

$$
\begin{array}{lll}
4 & \text{———————} & -3.75\ \text{eV} \\
3 & \text{———————} & -4.29\ \text{eV} \\
\\
\\
2 & \text{———————} & -7.59\ \text{eV} \\
\\
\\
\\
1 & \text{———————} & -18.00\ \text{eV}
\end{array}
$$

The light produced by the downward transition from level 3 to 2 is shone onto the sodium plate. Sodium has a work function of 2.28 eV.

(a)   Calculate the wavelength of the light produced by the downward transition from level 3 to level 2. (4 marks)

Answer: _____ m

(b)   Calculate the maximum speed of a liberated electron when this wavelength of light is incident on the sodium plate in the photoelectric cell. (4 marks)

The stopping voltage is the minimum reverse voltage required to stop photocurrent.

(c)   Calculate the stopping voltage for the electron produced in part (b) on page 20. (2 marks)

Answer: _____ V

(d)   Explain why increasing the brightness of the incident light will not affect the stopping voltage.   (4 marks)

_____

_____

_____

_____

_____

_____

_____

(e)   (i)   Identify which transition would require the stopping voltage to be the largest.
                                                                                                                    (1 mark)

        Transition: from _____ to _____

        (ii)   Explain your answer to part (e)(i).   (3 marks)

        _____

        _____

        _____

        _____