Essential Pre-Uni Physics D6.3

A Level

Useful physical constants can be found in the hint tabs.

A material will not emit photoelectrons unless it is irradiated by light with a wavelength less than $380\,\mathrm{nm}$. Calculate its work function in electron volts to 2 significant figures.

Essential Pre-Uni Physics D7.3

A Level

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

When an electron annihilates a positron, two photons are produced, each with an energy of $511\,\mathrm{keV}$. Calculate the frequency of each photon.

Gameboard:

STEM SMART Physics 49 - Revision - Quantum Physics

Essential Pre-Uni Physics D6.5

A Level

A graph of stopping potential (y) against frequency of light (x) is plotted for zinc, and also for aluminium. Without knowing more information, answer the following questions:

Part A Linear graphs?

a) Are the lines straight or not?

- No
- Yes

Part B Sign of the y-intercepts

b) Are the y-intercepts positive, negative or zero?

- Positive
- Zero
- Negative

Part C Sign of the gradients

c) Are the gradients positive, negative or zero?

- Negative
- Positive
- Zero

Part D Comparing the gradients

d) Are the gradients of the two lines the same or different?

- Different
- Same

Part E Comparing the y-intercepts

e) Are the y-intercepts of the two lines the same or different?

- Different
- Same

Part F The x-intercept

f) What is the significance of the x-intercept?

- It is the frequency of the incident light.
- It is the threshold frequency.
- It is the work function of the material.

Part G Common gradient or intercept

g) If you answered `same' to parts (d) or (e), write down the value of the common gradient or intercept.

- Gradient not common

  Common intercept = $\frac{\mathrm{e}}{\mathrm{h}}$

- Common gradient = $\frac{h}{e}$

  Intercept not common

- Common gradient = h

  Intercept not common

- Common gradient = $\frac{h}{e}$

  Common intercept = h

- Common gradient = $-he$

  Intercept not common

- Gradient not common

  Common intercept = $\frac{\text{work function}}{\text{electric charge}}$

Gameboard:

STEM SMART Physics 49 - Revision - Quantum Physics

Essential Pre-Uni Physics D6.6

A Level

Useful physical constants can be found in the hint tabs.

A material has a work function of $3.4\,\mathrm{eV}$, and is illuminated by $5.0\,\mathrm{eV}$ photons. Calculate the stopping potential of its photoelectrons.

Gameboard:

STEM SMART Physics 49 - Revision - Quantum Physics

Essential Pre-Uni Physics D9.2

A Level

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

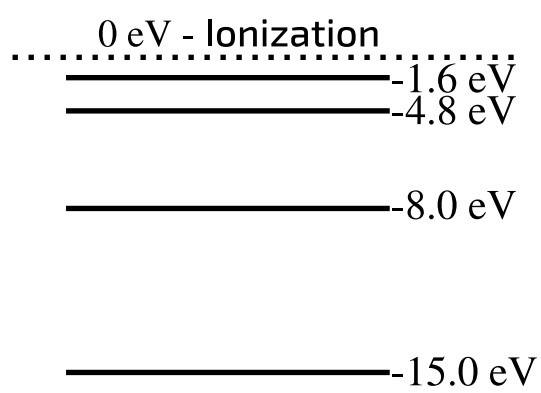

Figure 1: Energy level diagram of the atom this question is concerned with.

What wavelength of light would be emitted if an electron descended from the $-4.8\,\mathrm{eV}$ state to the ground state?

Gameboard:

STEM SMART Physics 49 - Revision - Quantum Physics

Essential Pre-Uni Physics D9.4

A Level

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

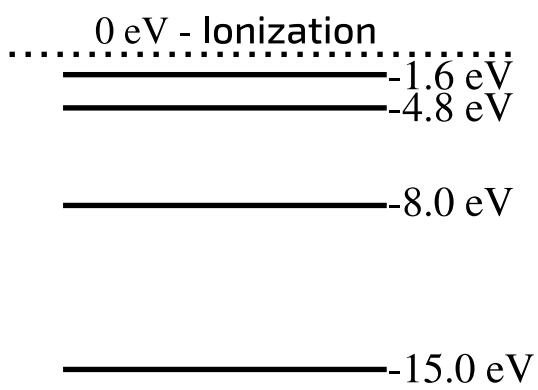

Figure 1: Energy level diagram of the atom this question is concerned with.

When white light is shone onto a gaseous sample of these atoms, which wavelength will be absorbed as atoms excite from the ground state to the first excited state?

Gameboard:

STEM SMART Physics 49 - Revision - Quantum Physics

Photon Flux for an LED 7.2

A Level

A $1.50\,\mathrm{W}$ Infra-Red LED produces electromagnetic radiation of wavelength $850\,\mathrm{nm}$. Calculate

Part A The potential difference across the LED

A $1.50\,\mathrm{W}$ Infra-Red LED produces electromagnetic radiation of wavelength $850\,\mathrm{nm}$. Calculate the potential difference across the LED.

Part B The current that passes through the LED

A $1.50\,\mathrm{W}$ Infra-Red LED produces electromagnetic radiation of wavelength $850\,\mathrm{nm}$. Calculate the current that passes through the LED.

Part C The photon flux emitted by the LED

A $1.50\,\mathrm{W}$ Infra-Red LED produces electromagnetic radiation of wavelength $850\,\mathrm{nm}$. Calculate the photon flux emitted by the LED.