

- Complete the following table.

**3**

Species	Full electron configuration
gallium atom	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
$P^{3-}$	$1s^2 2s^2 2p^6 3s^2 3p^6$
$K^+$	$1s^2 2s^2 2p^6 3s^2 3p^6$

**THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY**

- Gaseous lithium atoms absorb light with a wavelength of 323 nm. The resulting excited lithium atoms lose some energy through collisions with other atoms. One of the emission lines has an energy of  $2.44 \times 10^{-19}$  J.

Calculate the energy of the light used for the excitation.

**The energy of electromagnetic radiation can be calculated from its wavelength using Planck's equation:**

$$E = hc / \lambda$$

As the absorbed light has  $\lambda = 323$  nm:

$$E = (6.626 \times 10^{-34} \text{ J s})(2.998 \times 10^8 \text{ m s}^{-1}) / (323 \times 10^{-9} \text{ m}) = 6.15 \times 10^{-19} \text{ J}$$

Answer:  $6.15 \times 10^{-19}$  J

Calculate the wavelength of the light emitted.

**The emitted light has  $E = 2.44 \times 10^{-19}$  J and the same relationship can be used to calculate the corresponding wavelength:**

$$\begin{aligned} \lambda &= hc / E \\ &= (6.626 \times 10^{-34} \text{ J s})(2.998 \times 10^8 \text{ m s}^{-1}) / (2.44 \times 10^{-19} \text{ J}) \\ &= 8.14 \times 10^{-7} \text{ m} = 814 \text{ nm} \end{aligned}$$

Answer: **814 nm**

- Consider the elements **W**, **X**, **Y** and **Z** from the same period,  $n$ , with the following valence electron configurations:



Which element will conduct electricity in the solid state?

**X (alkaline earth)**

Which element will be the most electronegative?

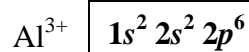
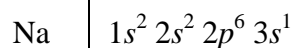
**Y (halogen)**

Which element will possess the largest atomic radius?

**X (left hand side)**

**3**

- Write the electronic configuration of lowest energy for the following species. Na is given as an example.



**2**

What is the ground state electron configuration for the chlorine atom?

**Marks**  
**2**

$1s^2 2s^2 2p^6 3s^2 3p^5$  or  $[\text{Ne}] 3s^2 3p^5$

- What element has the ground state electronic arrangement of  $1s^2 2s^2 2p^6 3s^2 3p^3$ ?

**1****Phosphorus**