# 12.1 Electrons in Atoms

## Question Paper

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|---|---|
| Course | DP IB Chemistry |
| Section | 12. Atomic Structure (HL only) |
| Topic | 12.1 Electrons in Atoms |
| Difficulty | Medium |

**Time allowed:** 10

**Score:** /5

**Percentage:** /100

## Question 1

Which of the following calculations gives the correct calculation to find the energy, in kJ, for a photon of blue light given the wavelength $\lambda$ = 550 nm.

$h = 6.626 \times 10^{-34}$ J s; $c = 2.988 \times 10^{8}$ m s$^{-1}$

A. $\frac{6.626 \times 10^{-34} \times 2.988 \times 10^{8}}{550 \times 10^{-9}}$

B. $\frac{6.626 \times 10^{-34} \times 2.988 \times 10^{8}}{550 \times 1000}$

C. $\frac{6.626 \times 10^{-34} \times 2.988 \times 10^{8}}{550 \times 10^{-9} \times 1000}$

D. $\frac{6.626 \times 10^{-34} \times 2.988 \times 10^{8}}{2.988 \times 10^{8} \times 1000}$

**[1 mark]**

## Question 2

Successive ionisation energies for an element, **Y**, are shown in the table below.

| **Electrons removed** | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| **Ionisation energy / kJ mol$^{-1}$** | 736 | 1450 | 7740 | 10500 | 13600 |

What is the most likely formula for the ion of **Y**?

A. $Y^{+}$

B. $Y^{2+}$

C. $Y^{3+}$

D. $Y^{4+}$

**[1 mark]**

## Question 3

Values for the successive ionisation energies for an unknown element are given in the table below.

| First ionisation energy / kJ $mol^{-1}$ | Second ionisation energy / kJ $mol^{-1}$ | Third ionisation energy / kJ $mol^{-1}$ | Fourth ionisation energy / kJ $mol^{-1}$ |
|---|---|---|---|
| 420 | 3600 | 4400 | 5900 |

In which group of the periodic table would the unknown element be found?

A. 1

B. 2

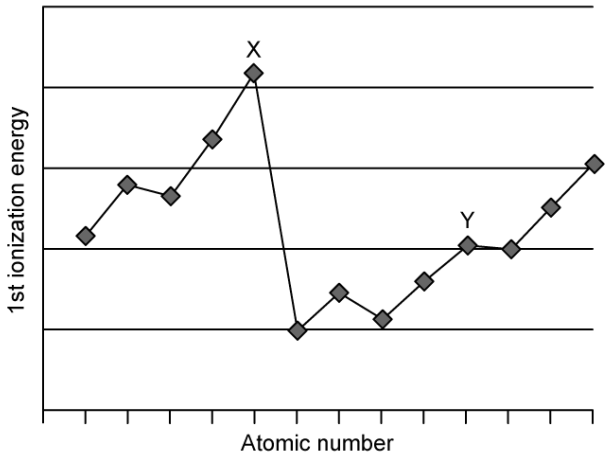
C. 13

D. 14

**[1 mark]**

## Question 4

The graph shows the first ionisation energies of some consecutive elements




Which statement is correct?

A. Y is in group 13

B. Y is in group 10

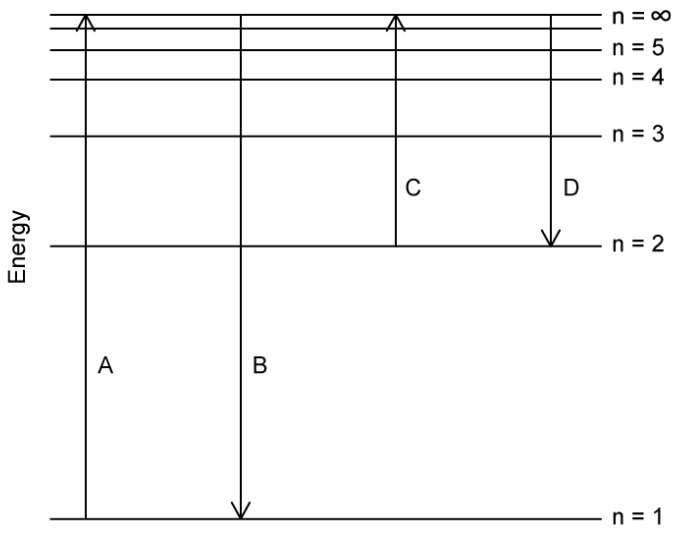
C. X is in group 15

D. X is in group 18

**[1 mark]**

## Question 5

Which transition on the diagram corresponds to the ionisation of hydrogen in the ground state?




**[1 mark]**