Lesson 3 _Electron Cofiguration_IB Questions

1. (a) Explain why the relative atomic mass of cobalt is greater than the relative atomic mass of nickel, even though the atomic number of nickel is greater than the atomic number of cobalt.

(1)

(b) Deduce the numbers of protons and electrons in the ion Co^{2+}.

25 electrons and 27 protons

(1)

(c) Deduce the electron configuration for the ion Co^{2+}.

[Ar] 3d^7

(1)

(d) Identify a radioactive isotope of cobalt **and** state **one** of its uses.

(1)
(Total 4 marks)

2. The electron configuration of chromium can be expressed as $[Ar]4s^x3d^y$.

(i) Explain what the square brackets around argon, [Ar], represent.

It represents the electron config. of Argon

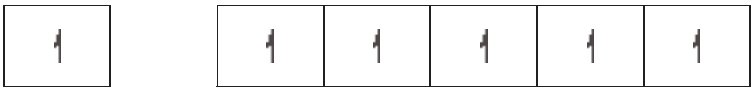
(1)

(ii) State the values of *x* and *y*.

x=1 y=5

(1)

(iii) Annotate the diagram below showing the 4s and 3d orbitals for a chromium atom using an arrow, ↑ and ↓, to represent a spinning electron.



4s 3d

(1)
(Total 3 marks)

3. An ion has the electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$. Which ion could it be?

A. Ni^{2+}

B. Cu^{+} ←----this one

C. Cu^{2+}

D. Co^{3+}

(Total 1 mark)

4. What is the electron configuration of vanadium?

A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^3$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$ ←- this one

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^1$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$

(Total 1 mark)

5. What is the order of increasing energy of the orbitals within a single energy level?

A. d < s < f < p

B. s < p < d < f ←-this one

C. p < s < f < d

D. f < d < p < s

(Total 1 mark)

6. Which species possesses only two unpaired electrons?

A. Zn

B. Mg

C. Ti^{2+} <- this one (do it in your head)

D. Fe^{2+}

(Total 1 mark)

7. What is the electron configuration of the Cr^{2+} ion?

A. [Ar] $3d^5$ $4s^1$

B. [Ar] $3d^3$ $4s^1$

C. [Ar] $3d^6\ 4s^1$

D. [Ar] $3d^4\ 4s^0$ ← this one

(Total 1 mark)

8. What is the electron configuration for the copper(I) ion, (Z = 29)?

A. $[Ar]4s^2 3d^9$

B. $[Ar]4s^1 3d^{10}$

C. $[Ar]4s^1 3d^9$

D. $[Ar]3d^{10}$ ← this one

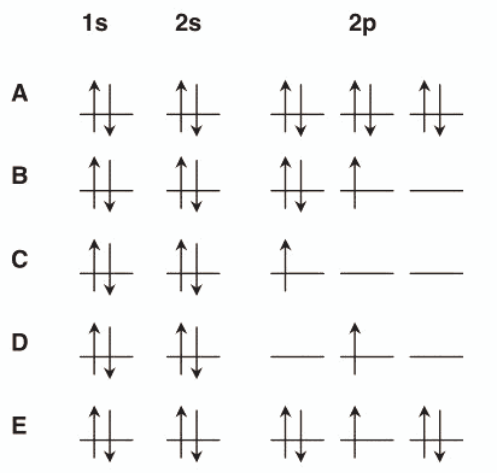
(Total 1 mark)

9. What is the **ground-state electron configuration** of an isolated Fe atom?

A $[Ar]\ 3d^8$ **B** $[Ar]\ 4s^2 3d^6$ **C** $[Ar]\ 4s^2 3d^8$ **D** $[Ar]\ 5s^2 4d^6$ **E** $[Ar]\ 4d^8$

That one↕

10. Which one of the following electron configurations is **inconsistent** with Hund's rule (AKA "The Empty Bus Rule")?



← that one

Answers