No Paired p-electrons

A Level

Select which of the following elements has *no* paired p electrons in a single uncombined atom of the element:

- Neon
- Oxygen
- Magnesium
- Silicon
- Carbon

Adapted with permission from UCLES, A Level Chemistry, June 1990, Paper 1, Question 6

Electron configurations (D1.3)

A Level

Complete the following ground state electron configurations.

Part A K

What is the ground-state electron configuration of K?

Items:

[Ar] [Kr] [Xe] 3s 4s 2p 4p 3d 1 2 6

Part B Sc

What is the ground-state electron configuration of Sc?

$[\mathrm{Ar}]\,3\mathrm{d}$

Items:

3s 4s 3p 4p 1 2 3 4 5 6

Part C Cr

What is the ground-state electron configuration of Cr?

$[\mathrm{Ar}]\,3\mathrm{d}$

Items:

3s | 4s | 3p | 4p | 1 | 2 | 3 | 4 | 5 | 6

Part D Co

What is the ground-state electron configuration of Co?

$[\mathrm{Ar}]\,3\mathrm{d}$

Items:

3s | 4s | 4p | 1 | 2 | 3 | 5 | 6 | 7 | 8

Part E Cu

What is the ground-state electron configuration of Cu?

$1\mathrm{s}^2\,2\mathrm{s}^2\,2\mathrm{p}^6\,3\mathrm{s}^2\,3\mathrm{p}^6\,3\mathrm{d}$

Items:

4s | 4p | 1 | 2 | 3 | 4 | 7 | 8 | 9 | 10

Based on question D1.1 from Physical Chemistry book

Electron configurations (D1.6)

A Level

Complete the following ground state electron configurations.

Part A Ti^{3+}

What is the ground-state electron configuration of Ti^{3+}?

Items:

[Ar] [Kr] 3s 4s 3p 3d 4d 1 2 3 4

Part B Fe^{2+}

What is the ground-state electron configuration of Fe^{2+}?

Items:

[Ar] [Kr] 3s 4s 3p 3d 4d 2 4 6 8

Part C Ni^{2+}

What is the ground-state electron configuration of Ni^{2+}?

Items:

[Ar] [Kr] 3s 4s 3p 3d 4d 2 4 6 8 10

Part D Cu^{+}

What is the ground-state electron configuration of Cu^{+}?

Items:

[Ar] [Kr] 3s 4s 3p 3d 4d 2 4 6 8 10

Part E Zn^{2+}

What is the ground-state electron configuration of Zn^{2+}?

$1\mathrm{s}^2\,2\mathrm{s}^2\,2\mathrm{p}^6\,3\mathrm{s}^2$

Items:

4s 3p 3d 4d 1 2 4 6 8 9 10

Based on question D1.6 from Physical Chemistry book

Orbital Basics

A Level

Part A $5\mathrm{f}$ subshell

Give the number of f-orbitals that comprise the $5\mathrm{f}$ subshell.

Part B Number of electrons

Give the maximum number of electrons that can occupy a single orbital.

Part C Electrons in the second shell

Give the maximum number of electrons that can occupy the second shell.

Part D $3\mathrm{d}$ subshell

Give the maximum number of unpaired electrons that can occupy the $3\mathrm{d}$ subshell.

Part E Unpaired electrons

Give the number of unpaired electrons in the ground state of an oxygen atom.

Part F Paired electrons

Give the number of paired electrons in the ground state of the Na^{+} ion.

Based on questions D2.1 and D2.2 from Physical Chemistry book

Essential Pre-Uni Chemistry D2.3

A Level

Identify the subshell to which each of the orbitals below belongs.

Part A **(a)**

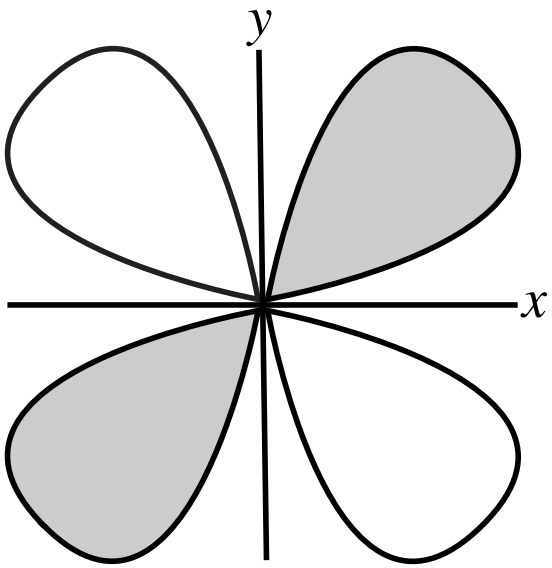

Figure 1: Unknown Orbital

What kind of orbital is depicted above?

- s
- f
- p
- d

Part B **(b)**

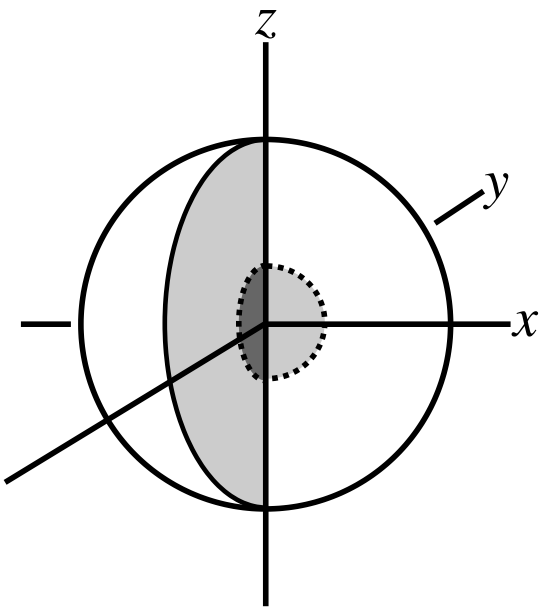

Figure 2: Unknown Orbital

What kind of orbital is depicted above?

- d
- f
- s
- p

Part C (c)

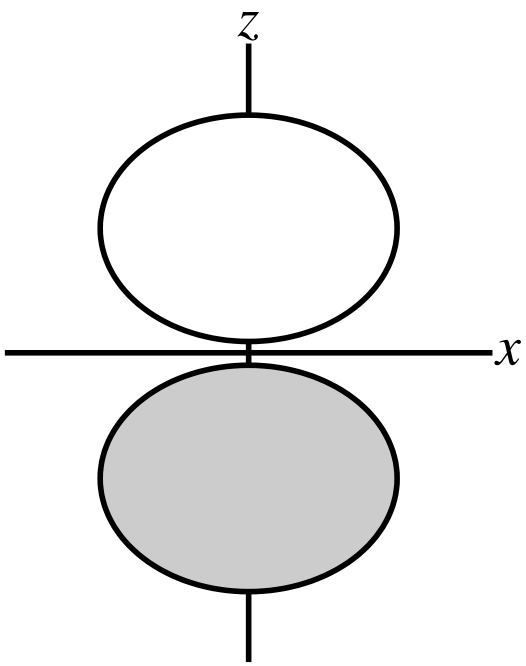

Figure 3: Unknown Orbital

What kind of orbital is depicted above?

- p
- f
- d
- s

Part D (d)

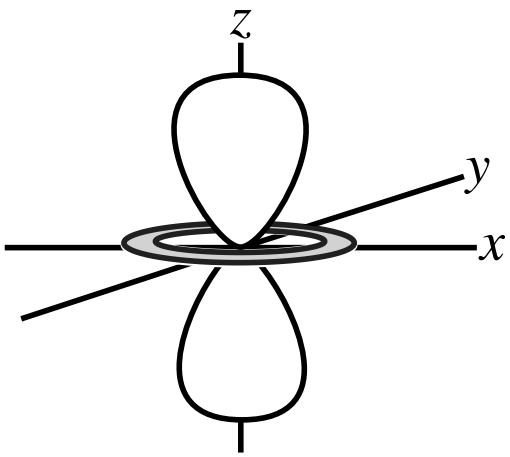

Figure 4: Unknown Orbital

What kind of orbital is depicted above?

- f
- s
- d
- p

First Configurations

A Level

Part A Unpaired electron

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has an unpaired electron in its ground-state configuration

Part B Incomplete shell, no unpaired electrons

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has an incomplete shell, but no unpaired electrons in its ground-state configuration

Part C Cation with unpaired electron

Specify the symbol of the element with the lowest atomic number that satisfies the following property: its singly-charged cation has an unpaired electron in its ground-state configuration

Part D Full shell configuration $^{2-}$ anion

Specify the symbol of the element with the lowest atomic number that satisfies the following property: its doubly-charged anion has only full shells in its ground-state configuration

Part E Cation and anion

Specify the symbol of the element with the lowest atomic number that satisfies the following property: both its singly-charged cation and its singly-charged anion have two unpaired electrons in their ground-state configurations

Part F Partially-filled p-orbital

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has a partially-filled p-orbital in its ground-state configuration.

Part G Fully-filled p-orbital

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has a fully-filled p-orbital in its ground-state configuration.

Part H Six unpaired electrons

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has six unpaired electrons in its ground-state configuration.

Part I Fully-filled d-orbital

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has a fully-filled d-orbital in its ground-state configuration.

Part J Fully-filled d-subshell

Specify the symbol of the element with the lowest atomic number that satisfies the following property: it has a fully-filled d-subshell in its ground-state configuration.

Created for isaacphysics.org by Andrea Chlebikova

Essential Pre-Uni Chemistry D1.10

A Level

A 1^+ ion, in an excited state due to X-ray bombardment, is found to have an electron configuration $1s^2\ 2s^1\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2\ 4p^1$ in the gas phase.

Name the element whose ion this is.

Second Shell Orbital

A Level

What kind of orbital must an electron in the second shell occupy?

- A dumb-bell-shaped orbital
- Either an s or p orbital
- The orbital closest to the nucleus
- A spherically-shaped orbital

Adapted with permission from UCLES, A Level Chemistry, November 1995, Paper 4, Question 3

Four Unpaired Electrons

A Level

Select which of the following is the proton (atomic) number of an element that has four *unpaired* electrons in its ground-state:

- 6
- 14
- 16
- 22
- 26

Adapted with permission from UCLES, A Level Chemistry, June 1991, Paper 1, Question 4