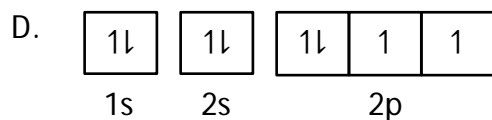
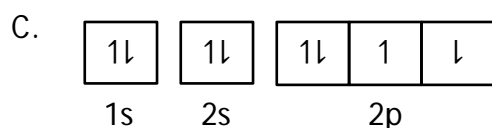
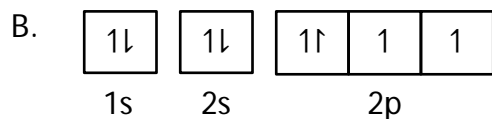
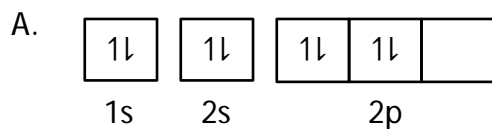


Unit 1: Inorganic and Physical Chemistry Topics 1-4

Please attempt the following questions in preparation for the online tutorial on Tuesday 31st October.

- One of the lines seen on an emission spectrum of calcium has a wavelength of 646 nm.
 - State the colour of this line.
 - Calculate the energy in kJ mol^{-1} associated with this line.
- Which of the following is a correct statement?
 - The 2p orbital is a lower energy than the 2s orbital.
 - A p orbital can hold 2 electrons.
 - A d orbital can hold 10 electrons.
 - The d_{xy} orbital lies along the x and y axes.
- Which of the following shows the correct electronic configuration for a cobalt atom?
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$
 - $1s^2 2s^2 2p^6 3s^2 3p^5 3d^{10}$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^7$
- Which of the following shows the correct electronic configuration for an Fe^{3+} ion?
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
- Name any transition metals (on the top row) which are an exception to the aufbau principle.

6. Which of the following shows the correct box notation for an oxygen atom?



7. Which of these is **not** a possible set of quantum numbers for one of the electrons in a 2p orbital in an oxygen atom?

A. $n = 2, l = 1, m = 0, s = -1/2$

B. $n = 2, l = 1, m = 1, s = +1/2$

C. $n = 2, l = 0, m = 0, s = +1/2$

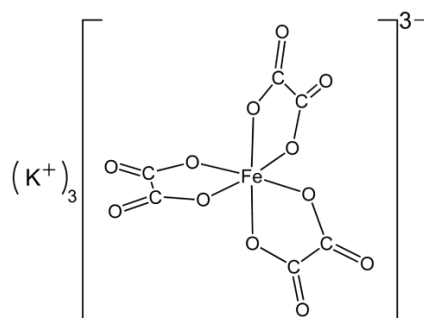
D. $n = 2, l = 1, m = -1, s = +1/2$

8. Which of the following shows the correct shapes for BCl_3 and NCl_3 ?

	<i>Shape of BCl_3</i>	<i>Shape of NCl_3</i>
A.	trigonal pyramidal	trigonal planar
B.	trigonal planar	trigonal pyramidal
C.	trigonal planar	trigonal planar
D.	trigonal pyramidal	trigonal pyramidal

9. (a) Calculate the oxidation number of vanadium in the following:
- (i) VO_3^-
 - (ii) VO^{2+}
- (b) Explain whether the change from $\text{VO}_3^- \rightarrow \text{VO}^{2+}$ is an oxidation or a reduction.
10. Which of the following is the correct formula for the hexacyanoferrate (II) complex ion?
- A. $[\text{Fe}(\text{CN})_6]^{2+}$
 - B. $[\text{Fe}(\text{CN})_6]^{2-}$
 - C. $[\text{Fe}(\text{CN})_6]^{4+}$
 - D. $[\text{Fe}(\text{CN})_6]^{4-}$
11. Write the name of the following complex ions:
- (a) $[\text{Cu}(\text{NH}_3)_6]^{2+}$
 - (b) $[\text{NiCl}_4]^{2-}$
 - (c) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

12. Potassium trioxalatoferrate (III) is a green compound with the following structure:



The ligand is the oxalate ion ($\text{C}_2\text{O}_4^{2-}$).

- (a) State the classification of this ligand.
- (b) State the co-ordination number of the iron in this complex.
- (c) Explain how colour is produced in this complex.