1. Give the information requested for $^{65}_{30}\text{Zn}^{2+}$

- atomic number = 30
- mass number = 65
- # of protons = 30
- # of neutrons = 35
- # of electrons = 28

2. A particular chemical species has 46 neutrons, 36 electrons, and a mass number of 81. Give the information requested below:

- Atomic number = 35
- # of protons = 35
- Nuclear symbol = $^{81}_{35}\text{Br}$

3. Give the names for the following compounds. (Note: These are ones you should be able to name using the ions you have memorized.)

- Na$_2$CO$_3$ sodium carbonate
- AgNO$_3$ silver nitrate
- BaCl$_2$ barium chloride
- Al$_2$(SO$_4$)$_3$ aluminum sulfate
- Mg(OH)$_2$ magnesium hydroxide
- Fe$_2$O$_3$ iron (III) oxide
- Ca$_3$N$_2$ calcium nitride
- FeCl$_2$ iron (II) chloride
- Zn(C$_2$H$_3$O$_2$)$_2$ zinc acetate

4. Give the correct formula for the following compounds (Note: same as 3):

- Silver sulfate Ag$_2$SO$_4$
- Barium acetate Ba(C$_2$H$_3$O$_2$)$_2$
- Aluminum carbonate Al$_2$(CO$_3$)$_3$
- Sodium bicarbonate NaHCO$_3$
- Iron (II) phosphate Fe$_3$(PO$_4$)$_2$
- Cesium fluoride CsF
- Ammonium sulfide (NH$_4$)$_2$S
- Sodium cyanide NaCN

5. Name the following compounds. You may need the ion chart.

- KMnO$_4$ potassium permanganate
- Na$_2$CrO$_4$ sodium chromate
- Pb(SO$_4$)$_2$ lead (IV) sulfate
- PbSO$_4$ lead (II) sulfate
- CoCl$_3$ cobalt (III) chloride
- BiCl$_5$ bismuth (V) chloride
- Na$_2$SO$_3$ sodium sulfite
- CuO copper (II) oxide
- (NH$_4$)$_3$PO$_3$ ammonium phosphite
- Ca(ClO$_4$)$_2$ calcium perchlorate
- KCIO potassium hypochlorite

6. Write the formula for each compound. You may need the ion chart.

- Potassium phosphate $K_3$PO$_4$
- Tin (IV) carbonate $\text{Sn}$(CO$_3$)$_2$
- Cobalt (II) bromate $\text{Co}$(BrO$_3$)$_2$
- Ammonium perchlorate $\text{NH}_4$ClO$_4$
- Cadmium phosphate $Cd_3$(PO$_4$)$_2$
- Copper (I) sulfide Cu$_2$S
7. Draw the orbital diagram for the following:
   a. Si $^{14}e^-$
      \[\begin{array}{ccccccc}
      \text{1s} & \text{2s} & \text{2p} & \text{3s} & \text{3p} \\
      1 & 1 & 1 & 1 & 1 & 1 & 1 \\
      \end{array}\]
   b. Zn $(30e^-)$
      \[\begin{array}{cccccccccc}
      \text{1s} & \text{2s} & \text{2p} & \text{3s} & \text{3p} & \text{4s} & \text{3d} \\
      1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
      \end{array}\]
   c. the ion formed by Rb
      \[\begin{array}{cccccccc}
      \text{1s} & \text{2s} & \text{2p} & \text{3s} & \text{3p} & \text{4s} & \text{3d} \\
      1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
      \end{array}\]
      \[\text{Rb}^{+} \Rightarrow 37 - 1 = 36e^-\]

8. Write the electron configuration for the following:
   a. Ba $(56e^-)$
      \[\text{1s}^2\text{2s}^2\text{2p}^6\text{3s}^2\text{3p}^6\text{4s}^2\text{3d}^{10}\text{4p}^6\text{5s}^2\text{4d}^{10}\text{5p}^6\text{6s}^2\]
   b. Sc $(21e^-)$
      \[\text{1s}^2\text{2s}^2\text{2p}^6\text{3s}^2\text{3p}^6\text{4s}^2\text{3d}^1\]

9. Write the electron configuration using core notation for the following:
   a. Y
      \[\begin{array}{l}
      [\text{Kr}] \text{5s}^2\text{4d}^1 \\
      39e^- \\
      \frac{-36}{3} \text{ val e}^- \\
      \end{array}\]
   b. O
      \[\begin{array}{l}
      [\text{He}] \text{2s}^2\text{2p}^4 \\
      \frac{8}{6} \text{ val e}^- \\
      \end{array}\]
   c. the ion formed by Br
      \[\text{Br}^- \Rightarrow 35 + 1 = 36e^-\]
10. Consider each pair separately. Which substance in each pair has the larger radius?
   a. Ca vs. (Ba)
   b. Br\(^-\) vs. Br
   c. Li\(^+\) vs. Li\(^+\)
   d. S\(^2-\) vs. Ca\(^2+\)
   e. B vs. F

11. Consider each pair separately. Which substance in each pair has greater metallic character?
   a. S vs. (Mg)

12. Consider each pair separately. Which substance in each pair has the largest ionization energy?
   a. S vs. Mg
   b. Mg vs. Ca

13. Consider each pair separately. Which substance in each pair has the most negative electron affinity (i.e. will gain an electron most easily)?
   a. S vs. Mg

14. Is each of the following sets of quantum numbers an allowed set? If not, why not?
   a. n = 4, l = 2, m\(_l\) = -1  \text{ allowed}
   b. n = 3, l = 0, m\(_l\) = 2  \text{ not allowed - if } l = 0, \text{ then } m\(_l\) \text{ can only be 0.}

15. Which of the following statements describes some aspect of the QM model of the atom?
   a. Electrons have a wave-like properties.
   b. If the energy of an electron is known for certain, then its exact location can be found as well. \text{ NO}
   c. Three quantum numbers are used to describe an orbital.
   d. Electrons are found in circular orbitals around the nucleus. \text{ no - orbitals aren't circular}
   e. The azimuthal quantum number describes the energy of an electron. \text{ no - } l \text{ describes shape}

16. What are the quantum numbers associated with the following subshells:
   a. 1s \( n = 1, \ l = 0, \ m\_l = 0 \)
   b. 2p \( n = 2, \ l = 1, \ m\_l = \pm 1 \)
   c. 3d \( n = 3, \ l = 2, \ m\_l = \pm 2 \)
17. Urea, which contains 46.65% nitrogen by weight, is commonly used as a fertilizer in agriculture. To grow wheat, 2.00 lbs of nitrogen are needed to produce 1 bushel of wheat. Use dimensional analysis to calculate the number of tons of urea that Dr. Bailey must spread on her 152 acre wheat farm if she wants to produce 50.0 bushels of wheat per acre. (2000 lb = 1 ton)

Given:
\[
\frac{46.65 \text{ lb nitrogen}}{100 \text{ lb urea}}
\]
\[
2.00 \text{ lb nitrogen} = 1 \text{ bu wheat}
\]
\[
152 \text{ Acres}
\]
\[
50.0 \text{ bu wheat} = 1 \text{ acre}
\]
\[
2000 \text{ lb} = 1 \text{ ton}
\]

Find: \(\text{tons urea}\)

\[
\text{tons urea} = 152 \text{ Acres} \times \frac{50.0 \text{ bu}}{1 \text{ acre}} \times \frac{2.00 \text{ lb nitrogen}}{1 \text{ bu}} \times \frac{100 \text{ lb urea}}{46.65 \text{ lb nitrogen}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}
\]

\[= 16.2915 \text{ tons} = 16.3 \text{ tons urea}\]