Chemistry Pretest 3.3

(Due to the large amount of advanced material that we have been covering, the test will be structured exactly like this pretest. Only the examples will change. So, in other words, question 1 on the test is also about calculating Bohr transitions; question 5 is about quantum numbers; question 10 is about getting the voltage etc. And it'll feature the same type of flashbacks)

1. Use Bohr's equation to find the color corresponding to an n = 3 to n = 2 transition in a hydrogen atom.

$$\Delta E = -2.178 \times 10^{-18} J \left(\frac{Z^2}{{n_f}^2} - \frac{Z^2}{{n_i}^2} \right)$$

red 620–750 nm
orange 590–620 nm
yellow 570–590 nm
green 495–570 nm
blue 464–495 nm
indigo 450 - 464 nm
violet 400–450 nm

2. a) Is there a wave-particle duality for both light and matter?

   b) In explaining the photoelectric effect, is light regarded as being a particle? Or a wave?

3. The following table reveals the longest wavelength that can induce the photoelectric effect for various metals.

Surface	Wavelength (nm)
Sodium	491
Zinc	270
Copper	248

Surface	Wavelength (nm)
Platinum	185
Calcium	397

   a) The wavelength needed for the photoelectric effect is not *exactly* related to the atom's ability to act as a reducing agent (because the ion formed after an electron pops out is not aqueous). But if you had to base your decision just on this data, which metal the worst reducing agent?

   b) Will a photoelectric effect occur for sodium if we use a bright yellow light?

4. Write the complete (using boxes) electron configuration for silicon.

5. Give the 14 sets of quantum number-quartets for each of Si's electrons

6. What is the maximum number of electrons held with a principal quantum number of n = 3?

7. Balance the following redox reaction occurring in a ***basic*** solution by means of the half-reaction method.

$S^{-2} + NO_3^{-1} \rightarrow NO_2 + SO_2$

8. In the third world, people were inadvertently poisoned by wells created near natural deposits of arsenic. After continuously drinking water with up to 4 ppm (4 mg per litre; maximum recommended amount is 0.01 ppm) people's skin erupted in disfiguring, leprosy-like lesions. Years later, cancerous growths began to appear. The Indian government then issued chlorination tablets that oxidized the arsenic from AsO_3^{-3} to AsO_4^{-3}, which formed an insoluble salt with Fe^{+3} found in water.
Source: Emsley, John. Nature's Building Blocks. Oxford Press. 2001

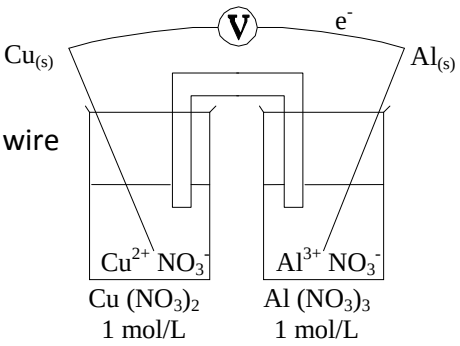
   If the tablets contain ClO_3^{-1}, which of the following is the reducing agent: ClO_3^{-1} ? Or AsO_3^{-3} ?

   Justify your choice.

9. What is the periodic table's strongest oxidizing agent?

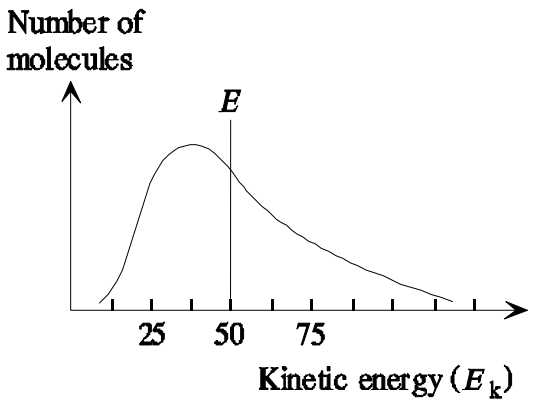
10. a)Indicate the direction of motion of the electrons in the wire and of the ions in the salt bridge;

    b) Calculate the potential difference of the cell.



11. Given the system $A + B \rightarrow C + D$

The energy distribution graph for a given reaction is shown on the right.



Draw the distribution graph below showing the effect of an increase in temperature on the rate of this reaction.

12. A bathtub contained 200.0 kg of water. The water's temperature increased from 20.4 to 38.4 ^{o}C when it absorbed the heat from the combustion of of 420.0 g of C_3H_6 . Find the molar ΔH for the combustion of C_3H_6.

Respect units, your 86 billion neurons (this estimate is based on an average*) and significant figures.

c for water = 4.19 J/(g^{o}C)

*The method involves dissolving the cell membranes of cells within a brain from a donor and creating a homogeneous mixture of the whole lot. You then take a sample of the soup, count the number of cell nuclei belonging to neurons (as opposed to other cells in the brain such as glia) and then scale up to get the overall number. The great advantage of this method is that unlike counting the number of neurons in one part of the brain and then extrapolating from that, it gets over the problem that different brain regions may have more or less densely packed neurons.