Chem15, Fall 2016, SJCC, Test3 Name_____Section_____

Please read all the questions VERY carefully before answering. Ask your instructor if you do not understand. No outside paper is allowed. The last page is a periodeic table with constants. Total points = 50 + (20 * 3 =) 60 = 110

SHORT ANSWER. Please write the set-up equation first, then put the raw data with units before calculating. Write the word or phrase that best completes each statement or answers the question.

1) Phosphorus ($P_4$) reacts with chlorine gas, $Cl_2$ to produce $PCl_5$ according to the following reaction: 1) _____

$$P_4\,(s) + 10\,Cl_2\,(g) \text{ ------> } 4\,PCl_5\,(s)$$

a) How many grams of $PCl_5$ is formed from 95.0 g of $P_4$ (3 pts.).

b) How many grams of $PCl_5$ is formed from 235.2 g of $Cl_2$ gas (3 pts.).

c) Which is the limiting agent if 95.0 g of $P_4$ and 235.2 g of $Cl_2$ gas was used in the rxn. (2 pts.)

2) Draw the complete ground state electron configuration for (4 pts./each; Total = 8pts.) 2) _____

(a) Potassium (K; Z=19):

(b) Cobalt (Co; Z=27)

3) Write the name of the element with the valence electron configuration given below (3 pts) 3) _____

(a) $4s^2 4p^5$

4) Using only periodic table, 4) _____

(a) List atomic numbers 15, 16, 33 in order of increasing atomic size (6 pts.)

(b) List elements Cl, Br, I in order of increasing first ionic ionization energy (6 pts.)

5) Calculate the energy (in joule) of one mole of blue light with wavelength = 434 nanometer. 5) _____
Given, $E = h\gamma$; $c = \lambda\gamma$; N= 6.022 x $10^{23}$/mol; h = 6.626x$10^{-34}$ j.s/photon, Vel of light c = 2.89x$10^{8}$m/s.; (8 pts.)

6) A monoatomic ion with a charge of 1- has an electronic configuration of $1s^2 2s^2 2p^6$. 6) _____

(a) Circle the correct answer: It is a CATION/ It is an ANION (3pts.)

(b) Write the name and the symbol of the noble gas it is isoelectronic with(3 pts.)

(c) What is the symbol of the ion ? (3 pts.)

7) (a) Draw the Lewis structure of $H_2O$ (2pts.) 7) _____

(b) Draw and name the electronic geometry of $H_2O$ (4 pts.)

8) Magnesium reacts with Oxygen gas forming Magnesium oxidein the following balanced equation: 2 Mg (s) + $O_2$ (g) -> 2 MgO (s) 8) _____
What mass of $O_2$ (g) is needed to completely react with 15.00 g of Mg? (6 pts.)

MULTIPLE CHOICE. On the scantron, fill up the circle with the same number as the question number. Choose the one alternative that best completes the statement or answers the question (3 pts each).

9) How many eggs are needed to make 1 dozen waffles, assuming you have enough of all other ingredients? 9) _____
Given: 2 cups flour + 3 eggs + 1 tbs oil →4 waffles
A) 48
B) 12
C) 9
D) 16
E) not enough information

10) What is the theoretical yield of a reaction if 25.0 grams of product were actually produced from a reaction that has a 88% yield? 10) _____
A) 28.4
B) 352
C) 22.0
D) 3.52
E) none of the above

11) Which among the following statements is TRUE? 11) _____
A) Red light has a shorter wavelength than violet light.
B) The wavelength of light is inversely related to its energy.
C) As the energy increases, the frequency of radiation decreases.
D) As the wavelength increases, the frequency also increases.
E) none of the above

12) Which color of the visible spectrum has the shortest wavelength (400 nm)? 12) _____
A) green B) red C) yellow D) orange E) violet

13) Which color of the visible spectrum has photons with the most energy? 13) _____
A) violet B) red C) yellow D) orange E) green

14) Which form of electromagnetic radiation has the highest frequency? 14) _____
A) Gamma Rays
B) Microwaves
C) Infrared Radiation
D) Radio Waves
E) X-rays

15) Which statement below does NOT follow the Bohr Model? 15) _____
A) The energy emitted from a relaxing electron can have any wavelength.
B) When an atom emits light, electrons fall from a higher orbit into a lower orbit.
C) When energy is absorbed by atoms, the electrons are promoted to higher-energy orbits.
D) Electrons exist in specific, quantized orbits.
E) none of the above

16) How many subshells are there in the n = 2 principal shell? 16) _____

A) 2
B) 4
C) 1
D) 3
E) not enough information

17) Which one of the following is the correct orbital diagram for nitrogen? 17) _____

A) ⇅ ⇅ ↓ ↓ ↑
B) ⇅ ⇊ ↓ ↑ ↑
C) ⇅ ⇅ ↑ ↑ ↑
D) ⇅ ⇊ ↑ ↑ ↑
E) none of the above

18) The "d" subshell can hold a maximum of _____ electrons. 18) _____

A) 5
B) 6
C) 10
D) 2
E) none of the above

19) How many electrons are unpaired in the orbitals of carbon? 19) _____

A) 6
B) 12
C) 2
D) 4
E) none of the above

20) How many valence electrons are in a chlorine atom? 20) _____

A) 17
B) 1
C) 10
D) 7
E) none of the above

21) What is the element in which at least one electron is in the d-orbital? 21) _____

A) Sc
B) K
C) Ar
D) Ca
E) none of the above

22) The size of an atom generally increases 22) _____

A) down a group and from right to left across a period.
B) down a group and from left to right across a period.
C) up a group and from left to right across a period.
D) up a group and diagonally across the Periodic Table.
E) up a group and from right to left across a period.

23) Which of the following elements has the highest ionization energy? 23) _____

A) Ba B) Cl C) Ca D) Ne E) Al

TRUE/FALSE. On the scantron, fill up circle "A" for a true answer and "B" for wrong answer (3 pts each).

24) A photon of red light contains the same amount of energy as a photon of blue light. 24) _____

25) Wavelength of visible light determines color. 25) _____

26) The possible values for the principal quantum numbers are: n = 0, 1, 2, 3, 4. 26) _____

27) The double bond is shorter and stronger than a single bond. 27) _____

28) When calculating the number of electrons for the Lewis structure of a polyatomic ion, subtract one electron for each negative charge. 28) _____