Please read all the questions VERY carefully before answering. If you do not understand any question, please ask. Use the reverse side of the question paper as scratch. Use the periodic table and constant chart in the last page. No outside paper is allowed. Total points = 42+(27x3=)81=123

SHORT ANSWER. Please write the set-up equation and insert the raw data with units in the equation before doing your calculations. Write the word or phrase that best completes each statement or answers the question.

1) Calculate the mass (in grams) of 1.56×10^{21} atoms of magnesium. (6 pts.) 1) _____

2) Calculate how many grams of HNO_3 is produced when 2.0 moles of NO_2 reacts with water in the following reaction: H_2O (l) + 3 NO_2 ---> NO (g) + 2 HNO_3 (aq) (6 pts.) 2) _____

3) Use a noble gas core to draw the ground state electron configuration for (4 pts./each; Total = 8 pts.) 3) _____

(a) Vanadium (V; Z=23):

(b) Bromine (Br, Z=35)

4) Given the following isotope symbol, circle the element it represents in the choices (3 pts.). 4) _____

$$^{32}_{15}X$$

(a) Ge (b) Cl (c) P (d) Ag (e) Xe

5) Circle the best choice among the following elements that has the largest atomic radius (3 pts.). 5) _____

(a) Cl (b) Si (c) Mg (d) Na (e) S

6) A sample of gas in an expandable container is heated from 200 K to 400K while maintaining constant pressure. If the starting volume was 1.0 liter, what is the volume after heating? Circle the best possible choice (4 pts.). 6) _____

(a) 1.0 liters (b) 2.0 liters (c) 0.5 liters

(d) 1.5 liters (e) 2.5 liters

7) Given two 1-L balloons, one containing Argon gas at 1 atm and 25^{o}C and the other Neon gas at 1 atm and 25^{o}C, write T for true statements and F for false statements shown below (4 pts.). 7) _____

(a) _____ The two balloons will have the same number of moles of atoms.

(b) _____ The balloon with Argon gas would have larger number of atoms.

(c) _____ The balloon with Neon gas would have larger mass.

(d) _____ Both balloons would have identical number of atoms and masses.

8) How many moles of NaCl (aq) will be produced when 3.5 moles of $Na_2CO_3(s)$ react according to the given balanced chemical reaction? Circle the best possible choice. (4 pts.). 8) _____

$Na_2CO_3(s) + 2\ HCl\ (aq) \rightarrow CO_2(g) + H_2O(l) + 2\ NaCl(aq)$

(a) 3.5 moles (b) 2.0 moles (c) 7.0 moles

(d) 1.0 mole (e) 1.8 moles

9) Choose the best possible completed chemical equation below by predicting the products. Note: only the products are needed, not the stoichiometric coefficients (4 pts.). 9) _____

$NaBr + F_2 \rightarrow$

(a) FBr + Na (b) Br_2 + NaF

(c) NaF_2 + Br (d) $NaF_2 + Br_2$

(e) F_2Br + Na

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

10) Determine the answer to the following equation with correct number of significant figures: 10) _____
(17.103 + 2.03) × 1.02521 = _____
A) 20
B) 19.6
C) 19.6153
D) 19.62
E) none of the above

11) An atom that has the same number of neutrons as $^{138}_{56}Ba$ is: 11) _____
A) $^{136}_{54}Xe$
B) $^{138}_{55}Cs$
C) $^{136}_{56}Ba$
D) $^{137}_{57}La$
E) none of the above

12) What is the formula mass of copper(II) fluoride? 12) _____
A) 146.10
B) 165.10
C) 101.55
D) 90.00
E) none of the above

13) How many atoms are in 5.80 moles of He? 13) _____
A) 1.03×10^{23}
B) 3.49×10^{24}
C) 6.02×10^{23}
D) 4.00
E) none of the above

14) What is the mass percent of chlorine in hydrochloric acid? 14) _____

A) 70.1
B) 2.8
C) 35.5
D) 97.2
E) none of the above

15) The elements with the highest electronegativity values tend to be found in the: 15) _____

A) upper left-side of the periodic table.
B) center of the periodic table.
C) lower right-side of the periodic table.
D) lower left-side of the periodic table.
E) upper right-side of the periodic table.

16) Considering the following precipitation reaction: 16) _____

$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$

What is the correct net ionic equation?

A) $Pb^{2+} + I_2^- \rightarrow PbI_2(s)$
B) $Pb^{2+} + 2NO_3^- + 2K^+ + 2I^- \rightarrow PbI_2(s) + 2K^+ + 2NO_3^-$
C) $2NO_3^- + 2K^+ \rightarrow 2KNO_3$
D) $Pb^{2+} + 2I^- \rightarrow PbI_2(s)$
E) none of the above

17) What is the theoretical yield of waffles if you have 5 cups of flour, 9 eggs and 3 tbs of oil? 17) _____
Given: 2 cups flour + 3 eggs + 1 tbs oil $\rightarrow$4 waffles

A) 6
B) 4
C) 10
D) 12
E) not enough information

18) Which color of the visible spectrum has photons with the most energy? 18) _____

A) green B) red C) yellow D) orange E) violet

19) The n = _____ principal shell is the lowest that may contain a d-subshell. 19) _____

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

20) What is the electron configuration for P? 20) _____

A) $[Ar]3s^23p^3$
B) $[Ne]1s^21p^62s^22p^3$
C) $[Ar]3s^23p^64s^23d^{10}4p^3$
D) $[Ne]3s^23p^3$
E) none of the above

21) Which of the following elements has the electron configuration of $3s^2 3p^4$ in its outermost shell? 21) _____
A) S
B) Si
C) Al
D) Cl
E) none of the above

22) A 3.76 g sample of a noble gas is stored in a 2.00 L vessel at 874 torr and 25°C. What is the noble gas? 22) _____
(R= 0.0821 L atm/ mol K)
A) He
B) Ne
C) Ar
D) Kr
E) not enough information

23) The vapor pressure of water at 20.0°C is 17.5 mm Hg. If the pressure of a gas collected over water was measured to be 453.0 mm Hg. What is the pressure of the pure gas? 23) _____
A) 0.0230 atm
B) 0.596 atm
C) 0.619 atm
D) 0.573 atm
E) none of the above

24) When you make ice cubes: 24) _____
A) the heat of vaporization must be removed.
B) the process is referred to scientifically as sublimation.
C) it is an endothermic process.
D) it is an exothermic process.
E) none of the above

25) A 250 gram sample of water at the boiling point had 45.0 kJ of heat added. How many grams of water were vaporized? Heat of vaporization for water is 40.6 kJ/mole. 25) _____
A) 20.0
B) 1.11
C) 0.902
D) 16.2
E) none of the above

26) Which statement is TRUE in describing what occurs when a solid melts to a liquid? 26) _____
A) The process is exothermic and the heat of fusion is positive.
B) The process is endothermic and the heat of fusion is negative.
C) The process is endothermic and the heat of fusion is positive.
D) The process is exothermic and the heat of fusion is negative.
E) not enough information

27) What is the correct Lewis structure for water? 27) _____

A) H= O =H

B) H-: O :-H

C) : H - O - H :

D) H- O -H

E) none of the above

28) What is the mass percent of an ammonium carbonate solution prepared by dissolving 33.2 grams of solid into 39.5 grams of water? 28) _____

A) 45.7%
B) 72.7%
C) 84.1%
D) 54.3%
E) none of the above

29) What is the molarity of a solution prepared by dissolving 10.7 g NaI in 0.250 L? 29) _____

A) 2.86×10^{-4}
B) 0.0714
C) 42.8
D) 0.286
E) none of the above

TRUE/FALSE. On scantron, choose "A" for a true answer and "B" for wrong answer. (3 points each)

30) Zeros located after a number and after a decimal point are significant. 30) _____

31) Protons and neutrons have similar masses and similar electrical charges. 31) _____

32) One mole of chlorine gas has a mass of 35.45 grams. 32) _____

33) The conversion factor for pressure is 1 mm Hg = 1 atm. 33) _____

34) A saturated solution holds the maximum amount of solute under the solution conditions. 34) _____

35) The Lewis structure for O_2 contains a triple bond. 35) _____

36) The minor component in a solution is called the solvent. 36) _____