

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 = $56 + (27 \times 3) = 81 = 131$

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 (with units) how many cubic inches (in^3) are in 15615 cubic decimeter (dm^3) (given $1 \text{ dm} = 0.1 \text{ m}$, $1 \text{ cm} = 0.01 \text{ m}$, and $2.54 \text{ cm} = 1 \text{ in}$)? (8 pts.) 1) _____

2) Show your calculation to determine the empirical formula of a compound that is composed of 40.92% C, 4.58% H, and 54.50% O. (8 pts.) 2) _____

3) Calculate the mass (in grams) of 1.56×10^{21} atoms of magnesium. (6 pts.) 3) _____

4) Calculate how many grams of HNO₃ is produced when 2.0 moles of NO₂ reacts with water in the following reaction: H₂O (l) + 3 NO₂ ---> NO (g) + 2 HNO₃ (aq) (6 pts.) 4) _____

5) An inflated balloon has a volume of 6.0 L at 1.0 atm pressure and at 22°C. Calculate its volume when it ascends to an altitude where the pressure is 0.45 atm and the temperature is -21°C. (6 pts.) 5) _____

6) Use a noble gas core to rraw the ground state electron configuration for (4 pts./each; Total = 8pts.) 6) _____
(a) Vanadium (V; Z=23):
(b) Bromine (Br, Z=35)

7) (a) Draw the Lewis structure of H₂O (2pts.) 7) _____

(b) Draw and name the electronic geometry of H₂O (4 pts.)

(c) Circle if H₂O molecule is ploar or non-polar (2pts.)

8) Draw the structure of all possible isomers for a compound with general formula $C_2H_2Cl_2$ (6 pts.) 8) _____

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 points each)

9) Determine the answer to the following equation with correct number of significant figures: 9) _____
 $(17.103 + 2.03) \times 1.02521 =$ _____
A) 20
B) 19.6
C) 19.6153
D) 19.62
E) none of the above

10) What is the value of $27^\circ C$ on the Fahrenheit scale? 10) _____
A) 91 B) 52 C) 73 D) 81

11) Given the table of specific heat values below, what is the identity of a 10.0 g metal sample that increases by $14.0^\circ C$ when 62.9 J of energy is absorbed? (Given: $\Delta H = m \cdot c \cdot \Delta T$). 11) _____

<u>Element</u>	<u>Specific Heat(J/g°C)</u>
Au	0.128
Ag	0.235
Cu	0.385
Fe	0.449
Al	0.903

- A) Au
- B) Fe
- C) Ag
- D) Al
- E) none of the above

12) An atom that has the same number of neutrons as $^{138}_{56}\text{Ba}$ is: 12) _____

- A) $^{136}_{54}\text{Xe}$
- B) $^{138}_{55}\text{Cs}$
- C) $^{136}_{56}\text{Ba}$
- D) $^{137}_{57}\text{La}$
- E) none of the above

- 13) What is the formula mass of copper(II) fluoride? 13) _____
A) 146.10
B) 165.10
C) 101.55
D) 90.00
E) none of the above
- 14) How many atoms are in 5.80 moles of He? 14) _____
A) 1.03×10^{23}
B) 3.49×10^{24}
C) 6.02×10^{23}
D) 4.00
E) none of the above
- 15) What is the mass percent of chlorine in hydrochloric acid? 15) _____
A) 70.1
B) 2.8
C) 35.5
D) 97.2
E) none of the above
- 16) Which of the following compounds would have a linear molecular geometry? 16) _____
1. N_2
2. H_2S
3. CO_2
A) 1 and 2 only
B) 1 and 3 only
C) 1,2 and 3
D) 2 and 3 only
E) neither 1, 2, or 3
- 17) The elements with the highest electronegativity values tend to be found in the: 17) _____
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.
- 18) Which molecule listed below is a nonpolar molecule? 18) _____
A) CO_2
B) CCl_4
C) BH_3
D) all of the compounds
E) none of the compounds

- 19) What is the molecular geometry if you have 4 single bonds around the central atom? 19) _____
 A) linear
 B) trigonal pyramidal
 C) bent
 D) tetrahedral
 E) not enough information
- 20) Considering the following precipitation reaction: 20) _____

$$\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + 2\text{KNO}_3(\text{aq})$$
 What is the correct net ionic equation?
 A) $\text{Pb}^{2+} + \text{I}_2^- \rightarrow \text{PbI}_2(\text{s})$
 B) $\text{Pb}^{2+} + 2\text{NO}_3^- + 2\text{K}^+ + 2\text{I}^- \rightarrow \text{PbI}_2(\text{s}) + 2\text{K}^+ + 2\text{NO}_3^-$
 C) $2\text{NO}_3^- + 2\text{K}^+ \rightarrow 2\text{KNO}_3$
 D) $\text{Pb}^{2+} + 2\text{I}^- \rightarrow \text{PbI}_2(\text{s})$
 E) none of the above
- 21) What is the theoretical yield of waffles if you have 5 cups of flour, 9 eggs and 3 tbs of oil? 21) _____
 Given: $2 \text{ cups flour} + 3 \text{ eggs} + 1 \text{ tbs oil} \rightarrow 4 \text{ waffles}$
 A) 6
 B) 4
 C) 10
 D) 12
 E) not enough information
- 22) Which color of the visible spectrum has photons with the most energy? 22) _____
 A) green B) red C) yellow D) orange E) violet
- 23) The $n =$ _____ principal shell is the lowest that may contain a d-subshell. 23) _____
 A) 4
 B) 1
 C) 2
 D) 3
 E) not enough information
- 24) What is the electron configuration for P? 24) _____
 A) $[\text{Ar}]3s^23p^3$
 B) $[\text{Ne}]1s^21p^62s^22p^3$
 C) $[\text{Ar}]3s^23p^64s^23d^{10}4p^3$
 D) $[\text{Ne}]3s^23p^3$
 E) none of the above
- 25) Which of the following elements has the electron configuration of $3s^23p^4$ in its outermost shell? 25) _____
 A) S
 B) Si
 C) Al
 D) Cl
 E) none of the above

- 26) 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? 26) _____
(R= 0.0821 L atm/ mol K)
A) He
B) Ne
C) Ar
D) Kr
E) not enough information
- 27) 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? 27) _____
A) 0.0230 atm
B) 0.596 atm
C) 0.619 atm
D) 0.573 atm
E) none of the above
- 28) When you make ice cubes: 28) _____
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
- 29) 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. 29) _____
A) 20.0
B) 1.11
C) 0.902
D) 16.2
E) none of the above
- 30) Which statement is TRUE in describing what occurs when a solid melts to a liquid? 30) _____
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

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

- 31) Zeros located after a number and after a decimal point are significant. 31) _____
- 32) Protons and neutrons have similar masses and similar electrical charges. 32) _____
- 33) Molecular elements do not exist in nature. 33) _____
- 34) One mole of chlorine gas has a mass of 35.45 grams. 34) _____
- 35) Li⁺, Na⁺, K⁺ and NH₄⁺ compounds are soluble. 35) _____