CHM115 Exam #1 B

Name: _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Of the following, only _____ is a chemical reaction. 1) _____
A) tarnishing of silver
B) dissolving sugar in water
C) crushing of stone
D) dropping a penny into a glass of water
E) melting of lead
Answer: A

2) The gold foil experiment performed in Rutherford's lab _____. 2) _____
A) led to the discovery of the atomic nucleus
B) utilized the deflection of beta particles by gold foil
C) was the basis for Thompson's model of the atom
D) confirmed the plum–pudding model of the atom
E) proved the law of multiple proportions
Answer: A

3) A molecular formula always indicates _____. 3) _____
A) how many of each atom are in a molecule
B) which atoms are attached to which in a molecule
C) the simplest whole–number ratio of different atoms in a compound
D) the isotope of each element in a compound
E) the geometry of a molecule
Answer: A

4) Which species below is the sulfite ion? 4) _____
A) SO_2^{-2} B) H_2S C) S^{2-} D) H_2SO_4 E) SO_3^{-2}
Answer: E

5) For which of the following can the composition vary? 5) _____
A) pure substance
B) homogeneous mixture
C) both homogeneous and heterogeneous mixtures
D) element
E) heterogeneous mixture
Answer: C

6) Which one of the following is a nonmetal? 6) _____
A) Zn B) Au C) Pb D) Ca E) I
Answer: E

7) The combustion of propane (C_4H_{10}) produces CO_2 and H_2O: 7) _____

$$2C_4H_{10}\,(g) + 13O_2\,(g) \rightarrow 8CO_2\,(g) + 10H_2O\,(g)$$

The reaction of 0.75 mol of C_4H_{10} will produce _____ mol of H_2O.

A) 0.75 B) 5.0 C) 1.5 D) 2.5 E) 3.75

Answer: E

8) Which of the following are a physical properties? 8) _____

1) The density of a liquid
2) The temperature of the air
3) The color of a solution
4) The weight of a crystal

A) 2, 3 B) 1, 2, 3, 4 C) 1, 4 D) 1, 2

Answer: B

9) Fluorine is a _____ and calcium is a _____. 9) _____

A) metal, nonmetal
B) metal, metal
C) nonmetal, metal
D) metal, metalloid
E) metalloid, nonmetal

Answer: C

10) Of the following, _____ is the largest mass. 10) _____

A) 2.5×10^{15} g
B) 5×10^{-2} mg
C) 2.5×10^{10} μg
D) 2.5×10^{12} ng
E) 7×10^{3} kg

Answer: A

11) The formula of nitrobenzene is $C_6H_5NO_2$. The molecular weight of this compound is _____ amu. 11) _____

A) 3.06 B) 123.11 C) 107.11 D) 43.03 E) 109.10

Answer: B

12) Of the three types of radioactivity characterized by Rutherford, which is/are not electrically charged? 12) _____

A) α–rays, β–rays, and γ–rays
B) γ–rays
C) α–rays and γ–rays
D) α–rays and β–rays
E) α–rays

Answer: B

13) In the periodic table, the elements are arranged in _____. 13) _____

A) reverse alphabetical order
B) order of increasing metallic properties
C) order of increasing atomic number
D) alphabetical order
E) order of increasing neutron content

Answer: C

14) Cathode rays are _____. 14) _____

A) protons B) electrons C) atoms D) neutrons E) x–rays

Answer: B

15) In the following list, only _____ is not an example of matter. 15) _____

A) table salt
B) light
C) elemental phosphorus
D) dust
E) planets

Answer: B

16) The STM was used in class to demostrate that while atoms are very small, they can be visualized with modern instrumentation. What does STM stand for? 16) _____

A) Small Technology Microscope B) Electron Microscope
C) Scanning Electron Microscope D) Scanning Tunneling Microscope

Answer: D

17) The formula for the compound formed between aluminum ions and sulfate ions is _____. 17) _____

A) AlS B) $Al_2(SO_4)_3$ C) $AlSO_4$ D) $Al_3(SO_4)_3$ E) $Al(SO_4)_3$

Answer: B

18) The number 0.000816 has _____ significant figures. 18) _____

A) 6 B) 5 C) 7 D) 3 E) 2

Answer: D

19) Predict the charge of the most stable ion of magnesium. 19) _____

A) +1 B) –1 C) +2 D) +3 E) –2

Answer: C

20) Of the reactions below, which one is a decomposition reaction? 20) _____

A) $NH_4Cl \rightarrow NH_3 + HCl$
B) $Cd(NO_3)_2 + Na_2S \rightarrow CdS + 2NaNO_3$
C) $2Mg + O_2 \rightarrow 2MgO$
D) $2CH_4 + 4O_2 \rightarrow 2CO_2 + 4H_2O$
E) $2N_2 + 3H_2 \rightarrow 2NH_3$

Answer: A

21) Elements in Group 1A are known as the _____. 21) _____

A) noble gases
B) chalcogens
C) alkali metals
D) halogens
E) alkaline earth metals

Answer: C

22) A molecule of ammonia contains hydrogen and nitrogen in a 1:3 ratio by mass. This is a statement of _____. 22) _____

A) the law of constant composition
B) the law of multiple proportions
C) the law of conservation of energy
D) the law of conservation of mass
E) none of the above

Answer: A

23) The correct name for $HClO_2$ is _____. 23) _____

A) hydrochloric acid
B) hydrochlorous acid
C) chlorous acid
D) chloric acid
E) perchloric acid

Answer: C

24) The atom contains _____. 24) _____

A) electrons
B) protons and neutrons
C) protons
D) protons, neutrons, and electrons
E) protons and electrons

Answer: D

25) When the following equation is balanced, the coefficients are _____. 25) _____

$$Al(NO_3)_3 + Na_2S \rightarrow Al_2S_3 + NaNO_3$$

A) 1, 1, 1, 1 B) 4, 6, 3, 2 C) 2, 3, 1, 6 D) 2, 1, 3, 2 E) 2, 3, 2, 3

Answer: C

26) Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties? 26) _____

A) F, He B) Si, P C) K, Ca D) C, N E) O, S

Answer: E

27) Consider the following selected postulates of Dalton's atomic theory: 27) _____

(i) Each element is composed of extremely small particles called atoms.
(ii) Atoms are indivisible.
(iii) Atoms of a given element are identical.
(iv) Atoms of different elements are different and have different properties.

Which of the postulates is(are) no longer valid?

A) (iii) and (iv)
B) (ii) only
C) (iii) only
D) (i) and (ii)
E) (ii) and (iii)

Answer: E

28) Of the following, the smallest and lightest subatomic particle is the _____. 28) _____

A) alpha particle
B) neutron
C) electron
D) nucleus
E) proton

Answer: C

29) There should be _____ significant figures in the answer to the following computation. 29) _____

$$\frac{(10.07 + 7.395)}{2.5}$$

A) 1 B) 2 C) 3 D) 4 E) 5

Answer: B

30) The number with the most significant zeros is _____. 30) _____

A) 2.5100000
B) 2.501×10^{-7}
C) 0.00002510
D) 250000001
E) 0.02500001

Answer: D

31) Which species below is the nitrate ion? 31) _____

A) NO_2^- B) N^{3-} C) NO_3^- D) N_3^- E) NH_4^+

Answer: C

32) The formula weight of ammonium sulfate ($(NH_4)_2SO_4$) is _____ amu. 32) _____

A) 100 B) 116 C) 118 D) 264 E) 132

Answer: E

33) Which of the following about atoms is NOT a true statement 33) _____

A) Atoms are the building blocks of matter
B) Each element is made up of various types of atoms
C) A compound is made of two or more different kinds of elements
D) Molecules are the smallest units of a substance

Answer: B

34) When the following equation is balanced, the coefficient of H_2S is _____. 34) _____

$$FeCl_3\ (aq) + H_2S\ (g) \rightarrow Fe_2S_3\ (s) + HCl\ (aq)$$

A) 1 B) 5 C) 2 D) 4 E) 3

Answer: E

35) Which formula/name pair is incorrect? 35) _____

A) $Fe_2(SO_3)_3$ iron(III) sulfite
B) FeS iron(II) sulfide
C) $FeSO_3$ iron(II) sulfite
D) $Fe_2(SO_4)_3$ iron(III) sulfide
E) $FeSO_4$ iron(II) sulfate

Answer: D

36) A combination of sand, salt, and water is an example of a _____. 36) _____

A) compound
B) pure substance
C) homogeneous mixture
D) beach
E) heterogeneous mixture

Answer: E

37) The formula of a salt is XF. The X–ion in this salt has 36 electrons. The metal X is _____. 37) _____

A) Zn B) Fe C) V D) Pd E) Rb

Answer: E

38) The element _____ is the most similar to magnesium in chemical and physical properties. 38) _____

A) Cs B) Ba C) At D) Rb E) Li

Answer: B

39) 6,020,000 neon atoms is _____ mol of neon atoms. 39) _____

A) 1.0×10^{-17}
B) $1.0 \times 10^{+6}$
C) 6.0×10^{23}
D) 3
E) 1.7×10^{-18}

Answer: A

40) _____ typically form ions with a –1 charge. 40) _____

A) Halogens
B) Transition metals
C) Alkaline earth metals
D) Chalcogens
E) Alkali metals

Answer: A

SHORT ANSWER. Write the word or phrase that best completes each statement or calculate the answer the question showing all work (for max. partial credit).

41) The correct answer (reported to the proper number of significant figures) to the following is _____. 41) _____

(2018+2002) / (7.11 × 9.72) = _____

Answer: 58.2

42) Isotopes can be separated using what type of spectroscopic equipment? 42) _____

Answer: Mass spectrometer

43) The density of aluminum is 2.7 g/cm^3. A piece of aluminum that occupies a volume of 21.4 mm^3 would have a mass of _____g. 43) _____

Answer: 0.0578

44) What is the coefficient of O_2 when the following equation is completed and balanced? If 10 moles of O_2 were consumed how many moles of CO_2 were produced? 44) _____

$C_4H_8O_2 + O_2 \rightarrow$ _____

Answer: 5, 8 moles CO2 produced

45) 5.78 kg/m^3 = _____ μg/cm^3 45) _____

Answer: 5.78×10^3

46) If matter is uniform throughout, cannot be separated into other substances by physical processes, but can be decomposed into other substances by chemical processes, it is called a (an) _____. 46) _____

Answer: compound

47) Predict the formula of the ionic compound that forms from carbonate and calcium. 47) _____

Answer: $CaCO_3$

48) There are _____ carbons atoms in 25 molecules of $C_4H_4S_2$. 48) _____

Answer: 100

49) A sample of CH_2F_2 with a mass of 19 g contains _____ atoms of C. 49) _____

Answer: 2.2×10^{23}

50) Magnesium burns in air with a dazzling brilliance to produce magnesium oxide: 50) _____

$$2Mg\ (s) + O_2\ (g) \rightarrow 2MgO\ (s)$$

When 3.00 g of magnesium burn in excess O_2, the mass of magnesium oxide produced is _____ g.

Answer: 4.98

51) 3.435×10^{-4} L = _____ nL 51) _____

Answer: 3.435×10^{5} nL

52) How many molecules of CO_2 are there in 3.10 moles of CO_2 52) _____

Answer: 1.87×10^{24}

53) Name the following:

A) K_2S _____

B) SO_4^{-2} _____

C) CO_2_____

D) PF_6_____

E) NaF_____

Answer: A) potassium sulfide B) sulfate ion C) carbon dioxide D)phosphorous hexafluoride E) sodium fluoride