Academic Chemistry Mid-Term Review Sheet Version 1

① $2.34 \times 10^6 \text{ cm} \left| \frac{1 \text{ m}}{100 \text{ cm}} \right| \frac{1 \text{ km}}{1000 \text{ m}} = 23.4 \text{ km}$

② $6.78 \times 10^{-3} \text{ Mg} \left| \frac{1 \times 10^6 \text{ g}}{1 \text{ Mg}} \right| \frac{1000 \text{ mg}}{1 \text{ g}} = 6.78 \times 10^6 \text{ mg}$

NOTE: Mg → mega gram = 1,000,000 g

③ a. 3 sig fig ⟹ decimal present, count from left starting w/ first non-zero number

b. 3 sig fig ⟹ same as above

c. 4 sig fig ⟹ same as above

④ a. 1.2 g ← column w/ first uncertain digit

$+ 3.45 \text{ g}$

$+ 6.789 \text{ g}$

$11.439 \text{ g} \Rightarrow$ rounds to 11.4

b. 1.23 m

$\times 4.5 \text{ m}$

$5.535 \text{ m}^2 \Rightarrow$ rounds to 5.5 m^2 same number of sig fig as the least number of sig fig in the problem

⑤ assume 1.275 to be more accurate and the accepted or true value

$$\% \text{ error} = \left| \frac{\text{experimetal value} - \text{accepted value}}{\text{accepted value}} \right| \times 100 = \left| \frac{1.23 - 1.275}{1.275} \right| \times 100$$

$= 3.5\%$

⑥ $\text{Density} = \frac{\text{mass}}{\text{volume}}$ $\quad \frac{0.88\ g}{ml} = \frac{m}{2.34\ ml}$

$m = \frac{0.88\ g}{\cancel{ml}} \times 2.34\ \cancel{ml} = \underline{\underline{2.1\ g}}$

⑦ triple beam balance → 2 decimal places
The smallest measurement is 1/10 of a gram which is 0.1 g
You are then required to estimate between the two 1/10 gram marks to get the closest 1/100 of a gram which is, for example 0.15 g.

graduated cylinder → 1 decimal place
The smallest measure is 1 ml, so you estimate to the nearest 1/10, or 0.1, of a ml.

⑧ bubbles (gas released), heat released, heat absorbed, color change

⑨ a. physical
b. physical
c. chemical
d. physical

⑩ matter is neither created nor destroyed in a chemical reaction

(11) a. mixture
b. mixture
c. mixture

(12) place sample in water to make a solution & then filter out the sand. Then boil the remaining liquid until all water is gone leaving only the salt.

(13) 1. Elements are composed of atoms
2. Atoms of a given element are the same (identical)
3. Atoms are neither created nor destroyed
4. A molecule of a compound always has the same ratio of atoms eg water 2 hydrogens
1 oxygen

(14) $^{23}_{11}Na^{+}$ protons (p+) - 11 neutrons (n°) - 12
electrons (e^-) - 10

(15) Comparing two isotopes of one element to protons stay the same (same number) but the number of neutrons is different
eg $^{235}_{92}U$ $p^+ = 92$ $n^\circ = 143$

$^{238}_{92}U$ $p^+ = 92$ $n^\circ = 146$

(16) In an ion, the number of electrons change while the number of protons remains the same

eg $^{23}_{11}Na$ $p^+ = 11$ $n^\circ = 12$ $e^- = 11$

$^{23}_{11}Na^+$ $p^+ = 11$ $n^\circ = 12$ $e^- = 10$

(17) Atomic Mass = weighted average of all of the isotopes of a given element

Mass number = sum of the number of p^+ plus the number of n° in an atom

(18) $^{23}_{11}Na$ how many n° = mass number − atomic number
= 23 − 11
= 12

(19) Atomic number of Neon (Ne) ⇒ 10

(20) Lead (Pb) has 82 protons

(21) +1

(22) U-238 ⇒ $^{238}_{92}U$ has 238 − 92 = 146 neutrons

(23) Alpha particle $^4_2\alpha$ mass number = 4 atomic number = 2
Beta particle $^0_{-1}\beta$ mass number = 0 atomic number = −1

NOTE: numbering on sheet starts over again at #20

(20)

½ life #	Amount (I-126)	time	Half life is 13 days
0	46g	0	} am't @ beginning
1	23g	13 days	
2	11.5g	26 days	
3	5.75g	39 days	

(21) Fusion – joining together

(22) Fission - breaking apart

(23) Fission – atoms break apart and release heat. The heat boils water which turns to steam. The steam turns a turbine which generates electricity

(24) Na – $1s^2\ 2s^2\ 2p^6\ 3s^1$

(25) Cr – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \boxed{4s^2\ 3d^4}$ → $4s^1\ 3d^5$

NOTE: Cr is an exception + changes to

(26) Li (Lithium)

(27) 6 e^-

(28) electrons have been excited to higher energy levels and when they drop back they emit light (photons) of specific energies

(29) Na is larger than Na^+ because Na^+ has lost one e^- so the effective nuclear charge is greater and holds the remaining e^- more closely.

(30) S because it has fewer p^+ than Cl

(31) Cl because it is smaller, holds its e^- more tightly

(32) Cl (means Cl gives off more heat than S when an e^- is gained

(33) Cl (means Cl is more likely than S to attract an e^- when bonded to another element)

(34) Group - a column on the Periodic Table. Elements in the same group tend to have similar properties

(35) Family - same a group

(36) Period - a row on the Periodic Table.

(37) a. NaCl - Sodium Chloride (Rule #1)

b. $CuSO_4$ - Copper (II) Sulfate (Rule #2)
$SO_4 \rightarrow -2$ since no subscript after Cu then
$Cu \rightarrow +2$

c. Cu_2SO_4 - Copper (I) Sulfate (Rule #2)
since there is a subscript after Cu the valences do not add to "0" + since the is no subscript after SO_4 the valence of Cu must be +1

(37 cont.) d. AlN – Aluminum Nitride (Rule #1)
[1] lower case "L"

e. Al_2S_3 – Aluminum Sulfide (Rule #1)

(38) a. Iron (III) Chloride $Fe^{+3}\ Cl^{-1} \rightarrow FeCl_3$

b. Iron (II) Chloride $Fe^{+2}\ Cl^{-1} \rightarrow FeCl_2$

c. Aluminum Sulfate $Al^{+3}\ SO_4^{-2} \rightarrow Al_2(SO_4)_3$

d. diphosphorous pentoxide P_2O_5 (Rule #3)

e. nitrogen monoxide NO (Rule #3)

(39) elements want to have a full valence shell of 8 e^-

(40) they already have a full valence shell (they're happy or perfect))

Academic Chemistry Mid Term Review Version 2

① $^{222}_{86}Rn$ $p^+ = 86$ $n^0 = 136$ $e^- = 86$

b. $^{36}_{16}S$ $p^+ = 16$ $n^0 = 20$ $e^- = 16$

c. $^{80}_{34}Se^{-2}$ $p^+ = 34$ $n^0 = 46$ $e^- = 36$

d $^{60}_{27}Co^{+3}$ $p^+ = 27$ $n^0 = 33$ $e^- = 24$

② refer to 16 above: $^{36}_{16}S$

a. atomic number = 16

b. mass number = 36

c. average atomic mass = 32.07 (from periodic table)

d. an isotope w/ $p^+ = 16$ $n^0 = 17$ $e^- = 16$

③ Sr $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2$

b. Ne $1s^2\ 2s^2\ 2p^6$

c. Ag (Silver) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^9$

d. F $1s^2\ 2s^2\ 2p^5$

e. K (Potassium) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$

④ a. Neon

b. Silver, Potassium, Strontium

c. Fluorine

d. Fluorine

(5) a. Magnesium nitride (Rule #1)
b. Diphosphorous pentoxide (Rule #3)
c. Copper (II) Nitrate (Rule #2)
d. Amanonium Chloride (Rule #1)
e. Carbon monoxide (Rule #3)
f. Iron (III) Sulfate (Rule #2)
g. Xenon hexafluoride (Rule #3)
h. Carbonic Acid (Rule #5)

(6) H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2

(7) N_2

(8) a. CCl_4
b. TiO_2 (Ti_2O_4 ionic compound & reduce ratio to 1:2)
c. NO_2
d. $CsCl$
e. $Ca(OH)_2$
f. H_2SO_4 (also known as sulfuric acid)
g. Sb_2O_3
h. $NaCl$
i. $(NH_4)_2O$

(9) a. 2.1

b. 3.5

c. 1.4

d. single polar covalent

e.

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b. Ne $1s^2\ 2s^2\ 2p^6$

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