

Study Guide - Unit 0+1

① a) P b) C c) P

$$\textcircled{2} \quad (x) \text{ mL} = \frac{.5000 \text{ g}}{13.58 \text{ g}} \times 1 \text{ mL} = \boxed{.03682 \text{ mL}}$$

③ a) $3.5 \cdot 10^{14}$
b) $8.21 \cdot 10^{-9}$

④ a) $4.000 \cdot 10^6$
b) 3.682
c) 7.252

$$\textcircled{5} \quad \text{a) } \frac{.75 \text{ kg}}{1 \text{ kg}} \times \frac{1000 \text{ g}}{1 \text{ g}} = \boxed{7.5 \cdot 10^5 \text{ mg}}$$

$$\text{b) } \frac{.52 \text{ nm}}{1 \cdot 10^9 \text{ nm}} \times \frac{1 \text{ m}}{1000 \text{ m}} = \boxed{5.2 \cdot 10^{-11} \text{ km}}$$

$$\textcircled{6} \quad \left| \frac{48.45 \text{ g/mol} - 52.9 \text{ g/mol}}{52.9 \text{ g/mol}} \right| = \frac{4.45}{52.9} = \boxed{8.4\%}$$

⑦ a) represents isotopes. Both are the same elements but w/ different # neutrons

⑧ a) $^{171}_{79} \text{Au}$: 79 p^+ 92 n^0 79 e^-
b) $^{79}_{35} \text{Br}^-$: 35 p^+ 44 n^0 36 e^-

| | |
|---------------------|-------------------------|
| ⑨ lead (II) nitride | PbCl_2 |
| sulfur hexafluoride | K HCO_3 |
| ammonium carbonate | Fe_2O_3 |

⑩ a) $52.00\text{g compd} - 43.74\text{g C} = \boxed{8.26\text{g H}}$

b) $\% \text{C} = \frac{43.74\text{g C}}{52.00\text{g compd}} = \boxed{84.12\% \text{C}}$

$\% \text{H} = \frac{8.26\text{g H}}{52.00\text{g compd}} = \boxed{15.9\% \text{H}}$

c) $31.00\text{g} \cdot .8412 = 26.08\text{g C}$

$31.00\text{g} \cdot .159 = 4.93\text{g H}$

d) $\frac{26.08\text{g C}}{12.01\text{g}} \cdot \frac{1\text{mol}}{7.004} = 1.4$

$\boxed{\text{C}_4\text{H}_9}$

$\frac{4.93\text{g H}}{1.008\text{g}} \cdot \frac{1\text{mol}}{7.004} = 2.25 \cdot 4$

e) $\frac{\text{MF}}{\text{EF}} = \frac{114\text{g/mol}}{57.11\text{g/mol}} = 2 \quad \boxed{\text{MF} = \text{C}_8\text{H}_{18}}$

⑪ $\frac{32.59\text{g H}_2\text{O}}{18.016\text{g H}_2\text{O}} \cdot \frac{2.016\text{g H}}{1.008\text{g H}} \cdot \frac{1\text{mol H}}{1\text{mol H}} \cdot 6.022 \cdot 10^{23} \text{ atoms} = \boxed{2.179 \cdot 10^{24} \text{ atoms H}}$

↖ $\% \text{H in H}_2\text{O}$

⑫ a) released

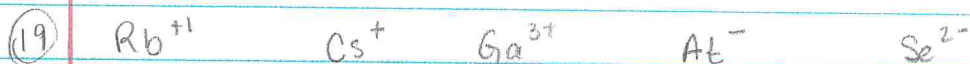
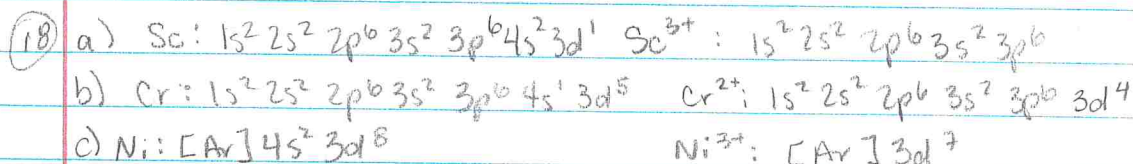
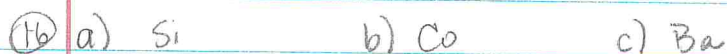
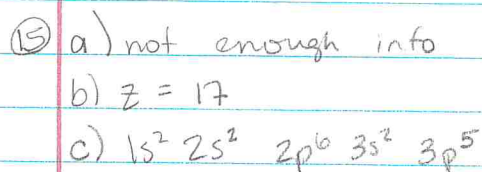
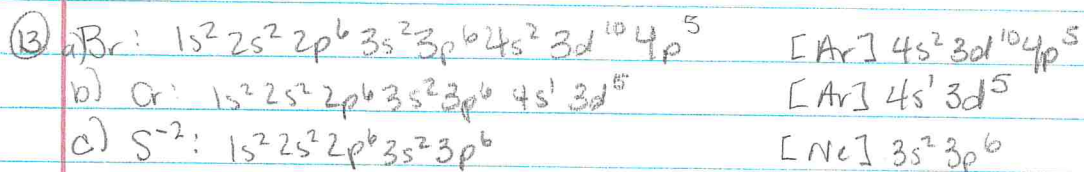
b) $\Delta E = -R_H \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right) = -(2.18 \cdot 10^{-18}\text{J}) \left(\frac{1}{5^2} - \frac{1}{3^2} \right)$
 $= \boxed{-1.55 \cdot 10^{-19}\text{J/photon}}$

c) $\frac{1.55 \cdot 10^{-19}\text{J}}{\text{photon}} \cdot \frac{6.022 \cdot 10^{23}\text{ photons}}{1\text{mol}} = -9.34 \cdot 10^4\text{J/mol}$

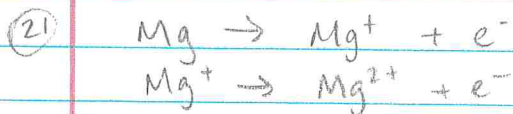
d) $E = h\nu \quad \nu = \frac{E}{h} = \frac{1.55 \cdot 10^{-19}\text{J}}{6.626 \cdot 10^{-34}\text{J}\cdot\text{s}} = \boxed{2.34 \cdot 10^{14}\text{Hz}}$

$c = \nu \cdot \lambda \quad \lambda = \frac{c}{\nu} = \frac{2.998 \cdot 10^8\text{m/s}}{2.34 \cdot 10^{14}\text{1/s}} = \frac{1.28 \cdot 10^{-6}\text{m}}{1\text{m}} = \boxed{1280\text{nm}}$

$\boxed{1280\text{nm}}$



(20) energy required to remove e^- from ground state of gaseous atom



(22) a) Be⁻ - smaller atom, e^- have stronger attraction to nucleus, less shielding
 b) Ar - Ar + Na have same shielding, but Ar has greater effective nuclear charge (Z_{eff})

(23) a) group 13

b) AF_3 (group 13 has +3 charge)

c) At least 5 e^- : the large jump btw 3rd + 4th IE indicates that the 4th IE is removing a core e^- , which would be paired in an orbital

(24) $Y^{3+} < Sr^{2+} < Rb^+ < Kr < Br^- < Se^{2-}$
(all are isoelectronic)

(25) NO^- - after 1st e^- is removed, the resulting cation has a smaller radius + \therefore stronger attraction to nucleus

(26) NO^- - different neutral atoms have diff # p^+ + \therefore diff # e^-

(27) yep: O^{2-} and F^- both have 10 e^-

(28) electron affinity - energy change when e^- added to gaseous atom

(29) $O + e^- \rightarrow O^-$ (1st e^- affinity)
 $O^- + e^- \rightarrow O^{2-}$ (2nd)

(30) a) 2

b) large jump btw 2nd + 3rd IE indicates that 3rd IE removes core e^- after 2 valence e^-

c) XBr_2

(31) Rb has a low 1st IE. After $1e^-$ is removed, 2nd IE is very high + not likely to occur.

(32) Elements in the same group have the same number of valence e^- , which determines how the element will react.

(33) $H^+ < H < H^-$

(34) $H^+ < He < H^-$ (He has 2 p^+ in nucleus to attract e^- where H^- only has 1 p^+)

(35) $Fe^{2+} + Co^{3+}$
 $Al^{3+} + F^-$
 $Sc^{3+} + Ca^{2+}$
 $Cu^+ + Zn^{2+}$

(36) shielding - inner e^- that partially screen outer e^- from attraction of nucleus

(37) mass of hydrated compd: $40.18g - 32.97g = 7.21g$
mass dehydrated compd: $37.75g - 32.97g = 4.78g$
mass H_2O lost = $40.18g - 37.75g = 2.43g$

OR $7.21g - 4.78g =$

% H_2O : $\frac{2.43g H_2O}{7.21g hydrate} = \boxed{33.7\% H_2O}$

EF: $\frac{2.43g H_2O}{18.02g} \Big| \frac{1 mol}{18.02g} = \frac{.135 mol H_2O}{.0449} = 3$

$\frac{4.78g LiClO_4}{106.39g} \Big| \frac{1 mol}{106.39g} = \frac{.0449 mol LiClO_4}{.0449} = 1$

$\boxed{LiClO_4 \cdot 3H_2O}$

