Summer Assessment [1-8]

1.
10.05
10.1
9.741
10.6
10.5

$50.991\ cm \Rightarrow 51.1\ cm$ Rounded, smallest decimal

$51.1 \div 5 \Rightarrow \boxed{10.2\ cm}$

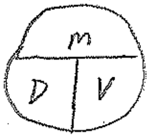
2.
2.7
2.47

$5.17\ g \Rightarrow \boxed{5.2\ g}$ Rounded, smallest decimal

3. $3.43\ cm \times 5.2\ cm \Rightarrow 17.84\ cm^2 \Rightarrow \boxed{18\ cm^2}$ Rounded, smallest sigs

4. $128 - 273 = \boxed{-145°c}$

5.



$$V = \frac{5.4 \times 10^2\ g}{7.73\ \frac{g}{cm^3}} = \boxed{7.0 \times 10^1\ cm^3}$$

6.

$$D = \frac{m}{V} = \frac{980\ g}{59\ cm^3} = \boxed{17\ \frac{g}{cm^3}}$$

Au is $19.3\ \frac{g}{cm^3}$

7. carbon-13 $^{13}_{6}C$ $\boxed{p^+ = 6,\ n^0 = 7,\ e^- = 6}$

8.
Mass Abundance
$19.0 \times .55 = 10.45$
$21.0 \times .45 = 9.45$
$19.90 \Rightarrow \boxed{19.9\ amu}$

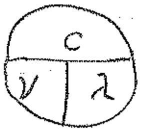
Summer Assessment [9 - 20]

9. $\boxed{{}_{4}Be \quad - \quad 1s^2 2s^2}$

10. ${}_{24}Cr \quad - \quad 1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ $\leftarrow$ exception

also

$- \quad [Ar]\, 3d^5 4s^1$

11. 

$$\nu = \frac{3.00\times10^{8}\ \frac{m}{s}}{2.94\times10^{-8}\ m} = \boxed{1.02\times10^{16}\ Hz}$$

12. 

$$\lambda = \frac{3.00\times10^{8}\ \frac{m}{s}}{2.73\times10^{20}\ Hz} = \boxed{1.10\times10^{-12}\ m}$$

13. 

$$E = (6.63\times10^{-34}\ J\cdot s)(1.12\times10^{12}\ Hz) = \boxed{7.43\times10^{-22}\ J}$$

14. $\boxed{\text{Alkali} \rightarrow \text{Group 1}}$

15. $\boxed{\text{Noble Gas} \rightarrow \text{Group 18}}$

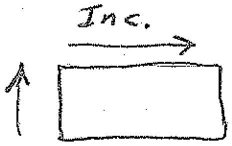
16. $\boxed{{}_{16}S \quad - \quad [Ne]\ 3s^2 3p^4}$

17. ${}_{3}Li \quad - \quad 1s^2 2s^1$

${}_{3}Li^{+} \quad - \quad 1s^2$, therefore the e^- transferred from the $\boxed{2s}$

18. ${}_{53}I \quad - \quad [Kr]\ 4d^{10} 5s^2 5p^5$

${}_{53}I^{-} \quad - \quad [Kr]\ 4d^{10} 5s^2 5p^6$, therefore an e^- is added to the $\boxed{5p}$

19. 

$\boxed{\text{Group 17}}$

20. ${}_{80}Hg \quad - \quad [Xe]\ 4f^{14} 5d^{10} 6s^2$

${}_{80}Hg^{2+} \quad - \quad [Xe]\ 4f^{14} 5d^{10}$

Summer Assessment [21-27]

21. Barium Oxide Ba^{2+} O^{2-}

$\boxed{BaO}$

22. Rubidium phosphide Rb^{+} P^{3-}

$\boxed{Rb_3P}$

23. Boron Chloride B^{3+} Cl^{-}

$\boxed{BCl_3}$

24. $$\begin{array}{c|c} 1.45\,\cancel{g} & 6.02\times10^{23} \\ \hline & 237\,\cancel{g} \end{array} = \boxed{3.68\times10^{21}\ \text{particles}}$$

25. $$\begin{array}{c|c|c} 3.10\times10^{23}\ \cancel{\text{molecules}}\ F_2 & 1\,\text{mol} & 38.0\ g\ F_2 \\ \hline & 6.02\times10^{23}\ \cancel{\text{molecules}} & 1\,\text{mol}\ F_2 \end{array} = \boxed{19.6\ g}$$

molar mass

26. $\frac{33.1}{41.9}\times100 = \boxed{79.0\ \%\ Ni}$ $\frac{8.8}{41.9}\times100 = \boxed{21.0\ \%\ O}$

27. C_2H_5

$24 + 5 = 29\ g$

Molar Mass

$\frac{58\,g}{29\,g} = 2$

empirical mass

therefore $2\ C_2H_5 \Rightarrow \boxed{C_4H_{10}}$

$C\ H$

$12 + 1 = 13\ g$

$\frac{78\,g}{13\,g} = 6$

$6\ CH \Rightarrow \boxed{C_6H_6}$

$Hg\ Cl$

$200.6 + 35.5 = 236.1$

$\frac{236.1}{236.1}$

$1\ HgCl \Rightarrow \boxed{HgCl}$

Summer Assessment [28 - 33]

28. $Cd(NO_3)_2 + 2NH_4Cl \longrightarrow CdCl_2 + 2NH_4NO_3$

29. $2NaClO_3 \longrightarrow 2NaCl + 3O_2$

30. $2H_3PO_4 + 3Ca(OH)_2 \longrightarrow Ca_3(PO_4)_2 + 6H_2O$

$$6H^+_{(aq)} + 2(PO_4^{3-})_{(aq)} + 3Ca^{2+}_{(aq)} + 6(OH^-)_{(aq)} \longrightarrow 3Ca^{2+}_{(aq)} + 2(PO_4^{3-})_{(aq)} + 6H_2O_{(l)}$$

$$\boxed{6H^+_{(aq)} + 6(OH^-)_{(aq)} \longrightarrow 6H_2O(l)}$$

$4NH_3 + 7O_2 \longrightarrow 4NO_2 + 6H_2O$

31. $$\frac{8 \text{ mol } \cancel{NH_4} \ \big|\ 6 \text{ mol } H_2O}{\big|\ 4 \text{ mol } \cancel{NH_4}} = \boxed{12.0 \text{ mol } H_2O}$$

Mole Ratio

\- OR -

$$\frac{14 \text{ mol } \cancel{O_2} \ \big|\ 6 \text{ mol } H_2O}{\big|\ 7 \text{ mol } \cancel{O_2}} = \boxed{12.0 \text{ mol } H_2O}$$

Mole Ratio

32. $2H_2 + O_2 \longrightarrow 2H_2O$

$$\frac{8.6 \text{ L } H_2 \ \big|\ 2 \text{ L } H_2O}{\big|\ 2 \text{ L } H_2} \quad \boxed{8.6 \text{ L } H_2O}$$

Mol Ratio

No need to covert to moles, Avagadro's Law of equal volumes

33. $4NH_{3(g)} + 6NO_{(g)} \longrightarrow 5N_{2(g)} + 6H_2O_{(g)}$

Σ 10 L $\qquad\qquad$ Σ 11 L

$$\frac{15}{10} = \frac{x}{11} \qquad \boxed{x = 16.5 \text{ L}}$$

Summer Assessment (34-39)

34. $CO_{(g)} + 2H_{2\,(g)} \longrightarrow CH_3OH_{(l)}$

$$\begin{array}{c|c|c|c} 5.0\text{ g } H_2 & 1\text{ mol} & 1\text{ mol } CH_3OH & 32\text{ g } CH_3OH \\ \hline & 2.02\text{ g } H_2 & 2\text{ mol } H_2 & 1\text{ mol} \\ & \text{Molar Mass} \uparrow & \text{Mole Ratio} \uparrow & \text{Molar Mass} \uparrow \end{array} = 39.6\text{ g}$$

100% yield

at 86% yield

$$39.6\text{ g} \times .86 = \boxed{34.1\text{ g}}$$

35. $P_1V_1 = P_2V_2$

$$V_2 = \frac{P_1V_1}{P_2} = \frac{(340)(250)}{(50.0)} = \boxed{1700\text{ mL}}$$

36. $V_1T_2 = V_2T_1$

$$V_2 = \frac{V_1T_2}{T_1} = \frac{(30.0\text{ L})(353\text{ K})}{288\text{ K}} = \boxed{36.8\text{ L}}$$

37. $$V_2 = \frac{V_1T_2}{T_1} = \frac{(590\text{ mL})(218\text{ K})}{303\text{ K}} = 424.5\text{ mL} \Rightarrow \boxed{420\text{ mL}}$$

38. $$P_2 = \frac{P_1T_2}{T_1} = \frac{(710\text{ kPa})(300\text{ K})}{500\text{ K})} = 426\text{ kPa} \Rightarrow \boxed{430\text{ kPa}}$$

39. $P_1V_1T_2 = P_2V_2T_1$

$$V_2 = \frac{P_1V_1T_2}{P_2T_1} = \frac{(101\text{ kPa})(3.5\times10^{-5}\text{ m}^3)(263\text{ K})}{(95\text{ kPa})(300\text{ K})} = \boxed{3.3\times10^{5}\text{ m}^3}$$

Summer Assessment (40 - 44)

40. $PV = nRT$ $\quad n = \frac{PV}{RT} = \frac{(300.0\ kPa)(.250\ L)}{(8.314 \frac{L\cdot kPa}{mol\cdot K})(300.0\ K)} = \boxed{0.0301\ mol}$

41. $P = \frac{nRT}{V}$

① $\frac{32.0\,\cancel{g}}{} \Big| \frac{1\ mol\ O_2}{32.0\,\cancel{g}\ O_2} = 1.00\ mol$

② $\frac{(1.00\ mol)(8.314 \frac{L\cdot kPa}{mol\cdot K})(303\ K)}{22.0\ L} = 114.5\ KPa$ $\quad \boxed{115\ KPa}$

-or-

$\frac{(1)(0.0821 \frac{L\cdot atm}{mol\cdot K})(303\ K)}{22.0\ L} = \boxed{1.13\ atm}$

-or-

$\frac{(1)(62.4 \frac{L\cdot torr}{mol\cdot K})(303\ K)}{22.0\ L} = \boxed{859\ torr}$

42. $P_T = P_{N_2} + P_{CO_2} + P_{O_2}$

$P_{O_2} = P_T - P_{N_2} - P_{CO_2} = 95 - 24 - 48 = \boxed{23\ KPa}$

43. $\frac{V_{F_2}}{V_{Cl_2}} = \frac{\sqrt{M_{Cl_2}}}{\sqrt{M_{F_2}}} = \frac{\sqrt{70.9}}{\sqrt{38.0}} = \frac{8.42}{6.16} = \boxed{1.37\ times}$

44. $\underset{\boxed{(+1)\ (+7)\ (-2)}}{H\ Mn\ O_4}$ $\quad (+1)(1) + (+7)(1) + (-2)(4) = 0$

Summer Assessment

(45)

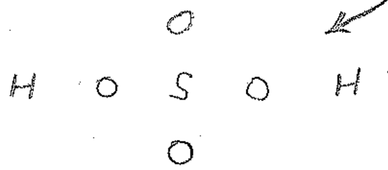
SO_4^{2-}

45. [H_2SO_4] ① Skeletal structure

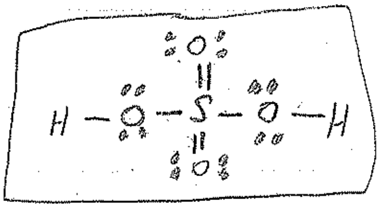
②
- * O & S Group 16 elements
- *6 valence e^-
- * H 1 valence e^- x2=2e^-
- * $(-6) + (-6)4 + (2e^-) = 32^-$

  S O H

a.



③



b.

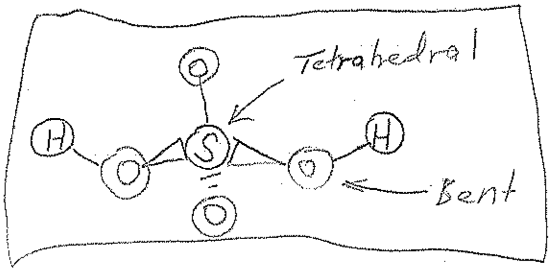
Total Units	Shared	unshared
4	4	0

$\boxed{SP^3}$

c.

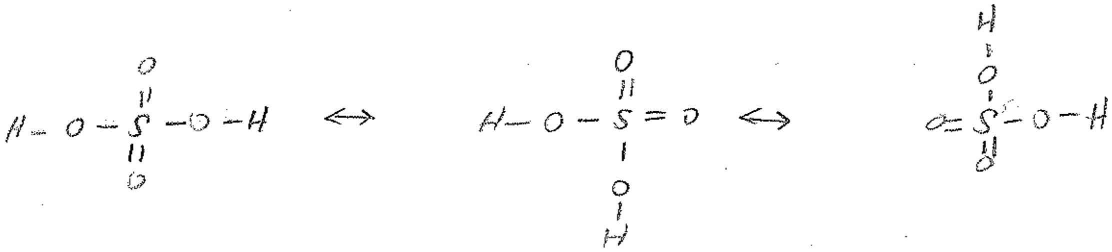
S - 109.5° - tetrahedral
O - 104.5° - bent

d.



e. Polar, dissolves in water

f.



Summer Assessment (46 –

46. $Q = n \Delta H$ $\qquad \Delta H = \frac{Q}{n} = \frac{4.307 \text{ KJ}}{.433 \text{ mol}} = \boxed{9.95 \frac{\text{KJ}}{\text{mol}}}$

47. ① $\frac{26.6 \text{ g}}{} \Big| \frac{1 \text{ mol}}{82.9 \text{ g}} = .321 \text{ mol}$ $\qquad$ ② $(321 \text{ mol})(4.60 \frac{\text{KJ}}{\text{mol}}) = \boxed{1.48 \text{ KJ}}$

48. $Q = m \Delta T C_p$ $\qquad Q_{gained} = Q_{lost}$

$$(20 g)(27^\circ c)(4.18 \frac{J}{g-c}) = 2,257.2 J \quad (water)$$

Therefore: Metal

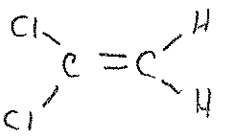
$$Q = m \quad \Delta T^\circ \quad C_p$$

$$2,257.2 J = (50 g)(43^\circ c)\, C_{p\,metal}$$

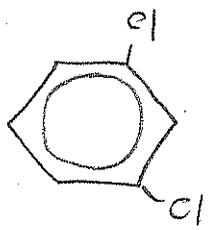
$$\boxed{C_p = 1.05 \frac{J}{g - c^\circ}}$$

49.

CH_4 Methane	CH_3-CH_3 Ethane	CH_3OH Methanol	CH_3CH_2OH Ethanol



1,1-dichloroethanol



1,3-dichlorobenzene

50. Both alcohols are more polar and have greater IMF's, therefore, higher M.P. [MAIN REASON]

Also, both alcohols have a larger surface area, therefore more opportunity for other IMF's such as London Dispersion to act.