Name: _____ **Period:** ____ **Date:** _____

Midterm Review Worksheet #4

Determine the number of significant figures in the following.

1. 0.00247 3
2. 7854 4
3. 960000 2
4. 25.670 5
5. 0.231 3
6. 560001 6
7. 32.12 4
8. 500 1
9. 8100.006 7

Calculate the following, keeping significant figures in mind.

10. 23.9 ml + 120 ml + 5ml = 100ml
11. 623 kg – 98.753 kg = 524kg
12. 43.055 m + 326.0 m + 2300 m = 2700m
13. 3.23 cm X 20.001 cm = $64.6 cm^2$
14. 1500 m^2 ÷ 30.00 m = 50.m
15. 0.00354 L X 0.87 L X 1.004 L = $0.0031 L^3$

Convert the following to scientific notation.

16. 23.4801 = 2.34801×10^1
17. 0.0002183 = 2.183×10^{-4}
18. 25000 = 2.5×10^4
19. 51318310 = 5.131831×10^7
20. 6540.120 = 6.54012×10^3
21. 0.0000080 = 8.0×10^{-6}

Convert the following to standard notation.

22. 2.567×10^5 = 256700
23. 1.452×10^{-6} = 0.000001452
24. 3.20×10^3 = 3200
25. 6.44×10^{-2} = 0.0644
26. 1.1910×10^7 = 11910000
27. 7.334×10^{-4} = 0.0007334

Calculate the following.

28. $(2.504 \times 10^4) + (3.22 \times 10^2) = 2.536 \times 10^4$
29. $(5.11 \times 10^{-2}) + (6.978 \times 10^{-5}) = 5.10 \times 10^{-2}$
30. $(1.0945 \times 10^5) + (8.566 \times 10^3) = 1.1802 \times 10^5$
31. $(4.087 \times 10^9) \times (3.22 \times 10^5) = 1.32 \times 10^{15}$
32. $(6.942 \times 10^{-2}) \times (7.00 \times 10^{-4}) = 4.86 \times 10^{-5}$
33. $(2.022 \times 10^8) \div (5.11 \times 10^5) = 3.96 \times 10^2$

Determine whether the following is accurate, precise or both.

34. The actual mass of a metal rod is 42.6 g. Student 1 obtained the measurements: 42.75g, 43.25g, 43.43g and 43.55
    Student 2 obtained the measurements: 42.01g, 41.98g, 41.99g, and 42.01g
    a) Which is more accurate? 2
    b) Which is more precise? 2

Determine the percent error for following.

35. The known mass of a sample is 72.6 kg, however, the student obtained a mass of 73.1 kg.

$$\frac{|73.1 - 72.6|}{72.6} \times 100 = 0.689 \%\text{error}$$

36. The accepted volume of a solution is 501.20 ml, but in our volumetric cylinder we measured the volume to be 499.07 ml.

$$\frac{|499.07 - 501.20|}{501.20} \times 100 = 0.42498 \%\text{ error}$$

Perform the following conversions.

37. 34.5 m = 34500 mm

38. 234 yds = 8424 in.

39. 1.24 nm = 1.24×10^{-12} km

40. 5.9 hr. = 21240 sec.

41. 8.002 µl = 8.002×10^{-6} L

42. 55 mi/hr = 2458.72 cm/sec.

Complete the following specific heat calculations.

43. How much heat would be absorbed by 55 g of copper when heated from 24°C to 40°C? (Copper: Cp = 0.385 *J*/g °C)

Heat (*J*) = mass (g) x Δ T (°C) x Cp (*J*/g °C)
Heat = (55g)(16°C)(0.385 *J*/g °C)
Heat = 338.8*J* or 300*J*

44. What temperature change will 100 ml of water undergo when it absorbs 325 calories of heat? (remember 1gram of water = 1ml of water!!)

325cal = (100g) (ΔT)(1cal/g°C)
ΔT = 3.25°C or 3°C

45. How much heat is lost when a 4110 g metal bar (Cp 0.2311 *J*/g °C) is cooled from 100.0°C to 20.0°C?

Heat = (4110 g) x (20.0 – 100.0 C) x (0.2311 J/gC)
Heat = - 76000 Joules

46. How much heat (in joules) is required to raise the temperature of 854 g of water from 23.5°C to 85.0°C?

Heat = (854 g) x (85.0 – 23.5 C) x (4.184 J/gC)
Heat = 220000 joules

47. What was the initial temperature of a 100.0 g piece of lead (Cp 0.158 *J*/g °C) when placed in 50.0 g water, the initial temperature of the water was 20.0°C, the systems final temperature was 34°C?

Complete the following conversions:

48. 24.9 cal. = ?joules	104 joules	50. 4972.1 cal. = ? Cal.	4.9721 Cal.
49. 983.4 *J* = ? cal.	235.0 cal.	51. 6103.0 *J* = ? Cal.	1.4587 Cal.
52. 32°C to K	305 K	54. 218 K to °C	-55 °C
53. -35°C to K	238 K	55. 201 K to °C	-72 °C

Determine whether the following are solutions, heterogeneous mixtures, elements or compounds.

56. concrete	Hetero.	58. ice cream parfait	Hetero.
57. iced tea	solution	59. oxygen gas (O_2)	compound

Determine whether the following are extensive physical properties (EP), intensive physical properties (IP) or chemical properties (CP).

60. Texture	IP	62. Length	EP
61. Boiling point	IP	63. Malleability	IP

Complete the following density calculations.

64. What is the density of a substance with a mass of 43.9 g and a volume of 10.0 cm^3?

D=M/V D=43.9g / 10.0cm^3 D= 4.39 g/cm^3

65. What is the density of an unknown liquid if the mass is 5.38 g and a volume of 30.0 ml?

D=5.38g / 30.0ml D=0.179 g/ml

66. Mercury has a density of 21.6 g/cm^3. What is the volume of a sample of mercury that has a mass of 2242 g?

21.6 g/cm^3 = 2242g / V V = 104 cm^3

67. A gas is confined in a rectangular tank 29.0 cm long, 12.0 cm high and 10.9 cm wide. If the density of the gas is 19.3 g/ml, what is the mass of the gas?

19.3 g/ml = M/(29.0 cm x 12.0 cm x 10.9 cm) M = 73200 g

Match the scientist to what he did or discovered.

D 68. Discovered that electrons are extremely light particles.
C 69. Proposed that each element is composed of extremely small particles called atoms.
F 70. Wrote the equation *E=hv.*
G 71. Proposed the photoelectric effect.
A 72. Proposed that electrons exist in discrete energy levels.
B 73. Discovered that the atom is made up of mostly spcae with a tight nucleus.
E 74. Discovered and named the particles called electrons.
J 75. Proposed that it is virtually impossible to simultaneously measure the momentum and the position of an electron.
I 76. Stated all objects have wavelike behavior, but for most objects their mass is too great for the wave to be observable.
H 77. Demonstrated that an photon could collide with an electron.

a. Bohr
b. Rutherford
c. Dalton
d. Milikan
e. Thompson
f. Planck
g. Einstein
h. Compton
i. DeBroglie
j. Heinsenberg

$$\frac{(\text{mass} \times \%) + (\text{mass} \times \%) + (\text{mass} \times \%)}{100}$$

Complete the following average atomic weight problems.

78. Iron-55 15%, Iron-56 85%
55 x 15% = 8.25
56 x 85% = 47.6
55.85 a.m.u.

79. Nitrogen-14 95%, Nitrogen-15 3%, Nitrogen-16 2%
14 x 95% = 13.3 15 x 3% = 0.45 16 x 2% = 0.32
ave. atomic mass = 14.07

Complete the following table.

	Element	Symbol	Atomic number	Mass Number	Number of protons	Number of electrons	Number of neutrons
80.	**Nitrogen**	**N**	**7**	**14**	**7**	**7**	**7**
81.	**Calcium**	**Ca**	**20**	**40**	**20**	**20**	**20**
82.	**phosphorus**	**P**	**15**	**31**	**15**	**15**	**16**
83.	**boron**	**B**	**5**	**11**	**5**	**5**	**6**
84.	**Carbon-13**	$^{13}_{6}C$	**6**	**13**	**6**	**6**	**7**
85.	**Beryllium-9**	$^{9}_{4}Be$	**4**	**9**	**4**	**4**	**5**
86.	**Silver ion**	Ag^{1+}	**47**	**108**	**47**	**46**	**61**
87.	**Bromine ion**	Br^{1-}	**35**	**80**	**35**	**36**	**45**

Write the nuclear equation for the following problems.

88. The alpha decay of plutonium-250 $^{250}_{94}Pu \rightarrow {}^{4}_{2}\alpha + {}^{246}_{92}U$

Pu-250 → alpha particle + U-246

89. The beta decay of uranium-240 $^{240}_{92}U \rightarrow {}^{0}_{-1}\beta + {}^{240}_{93}Np$

U-240 → beta particle + Np-240

Describe the following elements using the choices below. Choose one description from both columns.

a. metal
b. non-metal
c. semi-metal
d. solid
e. liquid
f. gas

b,f 90. Nitrogen

b,f 92. Argon

a,d 94. Potassium

a,d 91. Calcium

b,d 93. Carbon

b,f 95. Oxygen

Match the following elements with the group they belong to.

D	96.	Magnesium	a. Halogen
B	97.	Neodymium	b. Lanthanoid
E	98.	Krypton	c. Alkali Metal
C	99.	Rubidium	d. Alkaline Earth Metal
A	100.	Fluorine	e. Noble Gases

For the following elements determine which sublevel is being filled.

101. Strontium **s**
102. Copper **d**
103. Bromine **p**
104. Uranium **f**

Determine which of the following pairs of atoms has the larger radius.

105. Ca or Co Ca
106. Al or B Al
107. F or C C
108. Cl or P P

Determine for the following pairs which has a smaller ionic radius.

109. Cs^{1+} or Bi^{3+} Bi^{3+}
110. I^{1-} or Sn^{2+} Sn^{2+}
111. N^{3-} or Al^{3+} Al^{3+}
112. Ga^{3+} or Ca^{2+} Ga^{3+}

Determine for the following pairs of atoms which has the higher ionization energy.

113. Sr or Sn Sn
114. K or Li Li
115. Al or P P
116. I or F F

Determine which of the following has the higher electronegativity.

117. Li or C C
118. Ba or Be Be
119. Si or Cl Cl
120. Se or O O

Fill in the following chart.

	Sublevel	Maximum No. of Orbitals	**Maximum No. of Electrons**
121.	*s*	1	2
122.	*p*	3	6
123.	*d*	5	10
124.	*f*	7	14

Write the electron configurations, shorthand orbital notations and Lewis dot diagram for the following elements.

125. Ne

Ne $1s^2 2s^2 2p^6$

[He] $\underline{\uparrow\downarrow}$ $2s^2$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}$ $2p^6$

:Ne:

126. Co

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

[Ar] $\underline{\uparrow\downarrow}$ $4s^2$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow}\ \underline{\uparrow}\ \underline{\uparrow}$ $3d^7$

·Co·

127. N

$1s^2 2s^2 2p^3$

[He] $\underline{\uparrow\downarrow}$ $2s^2$ $\underline{\uparrow}\ \underline{\uparrow}\ \underline{\uparrow}$ $2p^3$

·N·

128. Pb $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^2$

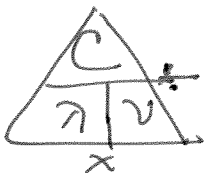
[Xe] $\underline{\uparrow\downarrow}$ $6s^2$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}$ $4f^{14}$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}$ $5d^{10}$ $\underline{\uparrow}\ \underline{\uparrow}\ \underline{\ }$ $6p^2$

·Pb·

129. List and describe each of the four quantum numbers.

1 – *n* – principle energy level
2 – *l* – azimuthal (sublevel)
3 – *m* – magnetic (orbital)
4 – *s* - spin

$\lambda = \frac{c}{\nu}$ $\nu = \frac{c}{\lambda}$



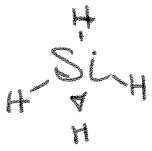
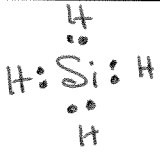
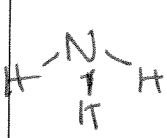
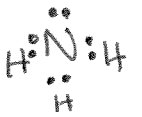
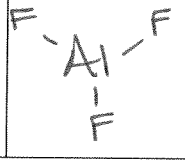
Determine the missing piece of information about the following waves.

130. What is the frequency of a wave if the wavelength is 21m?
$\lambda = c/\nu$ $\nu = 3.00 \times 10^8 m/s / 21m$ $\nu = 1.43 \times 10^7 s^{-1}$

131. What is the wavelength of a wave if the frequency is $3.9s^{-1}$?
$\lambda = 3.00 \times 10^8$ m/s / $3.9\ s^{-1}$ $\lambda = 7.7 \times 10^7 m$

132. What is the frequency of a wave that has a wavelength of 4.95m?
$\nu =$ 3.00×10^8 m/s / 4.95m $\nu = 6.06 \times 10^7\ s^{-1}$

Complete the following table.

	Molecular Structure	Lewis Structure	Type of Bond	Molecular Shape	Polar or Non-polar Molecule
133. SiH_4			2.1 2.8 0.3 nonpolar covalent	tetrahedral	nonpolar
134. NH_3			2.8 2.1 0.7 polar cov.	pyramidal	polar
135. AlF_3			4.0 1.5 2.5 ionic	trigonal planar	nonpolar

Determine the oxidation number for each of the elements in the following molecules and ions.

136. N_2 N=0

137. FeS Fe= +2 S=-2

138. $KMnO_4$ K= +1Mn=+7 O=-2

139. I I=0

140. H_2O H= +1 O=-2

141. Ag_2S Ag= +1 S=-2

142. HCl H= +1 Cl=-1

143. CH_4 C= -4 H=+1

144. $H_2(SO_4)$ H= +1 S= +6O=-2

145. NaOH Na=+1O=-2H=+1

Name the following compounds.

146. KBr Potassium bromide

147. $Na_2(CrO_4)$ Sodium chromate

148. $(NH_4)NO_3$ Ammonium nitrate

149. $Ba_3(PO_4)_2$ Barium phosphate

150. CaF_2 Calcium fluoride

151. FrCl Francium chloride

Write the formula for the following compounds.

152. Sodium bicarbonate $NaHCO_3$

153. Silver acetate $AgC_2H_3O_2$

154. Potassium dichromate $K_2Cr_2O_7$

155. Ammonium sulfate $(NH_4)_2SO_4$

156. Calcium phosphate $Ca_3(PO_4)_2$

157. Magnesium bromide $MgBr_2$

Name the following compounds.

158. CBr_4 Carbon tetra bromide

159. SO_2 Sulfur dioxide

160. F_2O_7 difluorine heptaoxide

161. SiI_4 silicon tetraiodide

162. N_2S_5 dinitrogen pentasulfide

163. PF_5 phosphorous pentafluoride

Write the formula for the following compounds.

164. Dihydrogen monoxide H_2O

165. Diiodine pentoxide I_2O_5

166. Nitrogen triiodide NI_3

167. Disulfur Tetrachloride S_2Cl_4

168. Oxygen hexafluoride OF_6

169. Sulfur dibromide SBr_2

Name the following compounds. (a. stock ~~b. common~~)

170. $Mn(OH)_2$ a. Manganese (II) b. hydroxide

171. $Pb(NO_3)_2$ a. lead (II) b. nitrate

172. $Pb(C_2H_3O_2)_2$ a. lead (II) acetate b.

173. $Cr(PO_4)$ a. chromium (III) b. phosphate

Iron (III)

Write the formula for the following compounds.

174. ~~Ferric~~ oxide Fe_2O_3

175. Tin (II) iodide SnI_2

176. Cobalt (III) hydroxide $Co(OH)_3$

177. ~~Plumbic~~ dichromate $Pb(Cr_2O_7)_2$

lead (IV)

Name the following compounds.

178. HI(aq) hydroiodic acid
179. HBr(aq) hydrobromic acid
180. $H(ClO_3)(aq)$ chloric acid
181. $H(C_2H_3O_2)(aq)$ acetic acid
182. HF(aq) hydrofluoric acid
183. $H(NO_2)(aq)$ nitrous acid

Write the formula for the following compounds.

184. Sulfurous acid $H_2(SO_3)(aq)$
185. Hydrochloric acid $HCl(aq)$
186. Hydrosulfuric acid $H_2S(aq)$
187. Nitric acid $HNO_3(aq)$
188. Phosphoric acid $H_3PO_4(aq)$
189. Chlorous acid $HClO_2(aq)$

Name the following compounds.

190. $Na_2CO_3 \cdot 10\ H_2O$ Sodium carbonate decahydrate
191. $BaCl_2 \cdot 2\ H_2O$ barium chloride di hydrate
192. $CuSO_4 \cdot 5\ H_2O$ Copper (II) sulfate pentahydrate

Write the formula for the following compounds.

193. Magnesium sulfate heptahydrate $MgSO_4 \cdot 7H_2O$
194. ~~Ferric~~ nitrate trihydrate $Fe(NO_3)_3 \cdot 3H_2O$
iron (III)

For the following write both the element symbol/formula and the charge.

195. Potassium +1
196. Chromium +2,+3,+6
197. Francium +1
198. Bromate -1
199. Silver +1
200. Lithium +1
201. Cobalt +2,+3
202. Iron +2,+3
203. Sulfur -2
204. Sodium +1
205. Barium +2
206. Carbonate -2