

<p>© 2010 Pearson Education, Inc.</p>	$\% \text{ by mass} = \frac{\text{g component}}{100 \text{ g mixture}}$	
	$d = m/v$	
	Avogadro's number: $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$	
	$K = ^\circ\text{C} + 273.15$	

Periodic Table of the Elements

1 1A	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIII	9 VIII	10 VIII	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 H	2 He	3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne	11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57-71 Lanthanide Series	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103 Actinide Series	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
109 Tm	110 Yb	111 Lu	112 Hf	113 Ta	114 W	115 Re	116 Os	117 Ir	118 Pt	119 Au	120 Hg	121 Tl	122 Pb	123 Bi	124 Po	125 At	126 Rn
137 Ts	138 Og	139 Nh	140 Fl	141 Mc	142 Lv	143 Ts	144 Og	145 Nh	146 Fl	147 Mc	148 Lv	149 Ts	150 Og	151 Nh	152 Fl	153 Mc	154 Lv
169 Uue	170 Uub	171 Uut	172 Uuq	173 Uup	174 Uuh	175 Uus	176 Uuo	177 Uu7	178 Uu8	179 Uu9	180 Uu10	181 Uu11	182 Uu12	183 Uu13	184 Uu14	185 Uu15	186 Uu16
197 Uuh	198 Uus	199 Uuo	200 Uu7	201 Uu8	202 Uu9	203 Uu10	204 Uu11	205 Uu12	206 Uu13	207 Uu14	208 Uu15	209 Uu16	210 Uu17	211 Uu18	212 Uu19	213 Uu20	214 Uu21
227 Uu22	228 Uu23	229 Uu24	230 Uu25	231 Uu26	232 Uu27	233 Uu28	234 Uu29	235 Uu30	236 Uu31	237 Uu32	238 Uu33	239 Uu34	240 Uu35	241 Uu36	242 Uu37	243 Uu38	244 Uu39
257 Uu40	258 Uu41	259 Uu42	260 Uu43	261 Uu44	262 Uu45	263 Uu46	264 Uu47	265 Uu48	266 Uu49	267 Uu50	268 Uu51	269 Uu52	270 Uu53	271 Uu54	272 Uu55	273 Uu56	274 Uu57
287 Uu58	288 Uu59	289 Uu60	290 Uu61	291 Uu62	292 Uu63	293 Uu64	294 Uu65	295 Uu66	296 Uu67	297 Uu68	298 Uu69	299 Uu70	300 Uu71	301 Uu72	302 Uu73	303 Uu74	304 Uu75
317 Uu76	318 Uu77	319 Uu78	320 Uu79	321 Uu80	322 Uu81	323 Uu82	324 Uu83	325 Uu84	326 Uu85	327 Uu86	328 Uu87	329 Uu88	330 Uu89	331 Uu90	332 Uu91	333 Uu92	334 Uu93
347 Uu94	348 Uu95	349 Uu96	350 Uu97	351 Uu98	352 Uu99	353 Uu100	354 Uu101	355 Uu102	356 Uu103	357 Uu104	358 Uu105	359 Uu106	360 Uu107	361 Uu108	362 Uu109	363 Uu110	364 Uu111
377 Uu112	378 Uu113	379 Uu114	380 Uu115	381 Uu116	382 Uu117	383 Uu118	384 Uu119	385 Uu120	386 Uu121	387 Uu122	388 Uu123	389 Uu124	390 Uu125	391 Uu126	392 Uu127	393 Uu128	394 Uu129
407 Uu130	408 Uu131	409 Uu132	410 Uu133	411 Uu134	412 Uu135	413 Uu136	414 Uu137	415 Uu138	416 Uu139	417 Uu140	418 Uu141	419 Uu142	420 Uu143	421 Uu144	422 Uu145	423 Uu146	424 Uu147
437 Uu148	438 Uu149	439 Uu150	440 Uu151	441 Uu152	442 Uu153	443 Uu154	444 Uu155	445 Uu156	446 Uu157	447 Uu158	448 Uu159	449 Uu160	450 Uu161	451 Uu162	452 Uu163	453 Uu164	454 Uu165
467 Uu166	468 Uu167	469 Uu168	470 Uu169	471 Uu170	472 Uu171	473 Uu172	474 Uu173	475 Uu174	476 Uu175	477 Uu176	478 Uu177	479 Uu178	480 Uu179	481 Uu180	482 Uu181	483 Uu182	484 Uu183
497 Uu184	498 Uu185	499 Uu186	500 Uu187	501 Uu188	502 Uu189	503 Uu190	504 Uu191	505 Uu192	506 Uu193	507 Uu194	508 Uu195	509 Uu196	510 Uu197	511 Uu198	512 Uu199	513 Uu200	514 Uu201
527 Uu202	528 Uu203	529 Uu204	530 Uu205	531 Uu206	532 Uu207	533 Uu208	534 Uu209	535 Uu210	536 Uu211	537 Uu212	538 Uu213	539 Uu214	540 Uu215	541 Uu216	542 Uu217	543 Uu218	544 Uu219
557 Uu220	558 Uu221	559 Uu222	560 Uu223	561 Uu224	562 Uu225	563 Uu226	564 Uu227	565 Uu228	566 Uu229	567 Uu230	568 Uu231	569 Uu232	570 Uu233	571 Uu234	572 Uu235	573 Uu236	574 Uu237
587 Uu238	588 Uu239	589 Uu240	590 Uu241	591 Uu242	592 Uu243	593 Uu244	594 Uu245	595 Uu246	596 Uu247	597 Uu248	598 Uu249	599 Uu250	600 Uu251	601 Uu252	602 Uu253	603 Uu254	604 Uu255
617 Uu256	618 Uu257	619 Uu258	620 Uu259	621 Uu260	622 Uu261	623 Uu262	624 Uu263	625 Uu264	626 Uu265	627 Uu266	628 Uu267	629 Uu268	630 Uu269	631 Uu270	632 Uu271	633 Uu272	634 Uu273
647 Uu274	648 Uu275	649 Uu276	650 Uu277	651 Uu278	652 Uu279	653 Uu280	654 Uu281	655 Uu282	656 Uu283	657 Uu284	658 Uu285	659 Uu286	660 Uu287	661 Uu288	662 Uu289	663 Uu290	664 Uu291
677 Uu292	678 Uu293	679 Uu294	680 Uu295	681 Uu296	682 Uu297	683 Uu298	684 Uu299	685 Uu300	686 Uu301	687 Uu302	688 Uu303	689 Uu304	690 Uu305	691 Uu306	692 Uu307	693 Uu308	694 Uu309
707 Uu310	708 Uu311	709 Uu312	710 Uu313	711 Uu314	712 Uu315	713 Uu316	714 Uu317	715 Uu318	716 Uu319	717 Uu320	718 Uu321	719 Uu322	720 Uu323	721 Uu324	722 Uu325	723 Uu326	724 Uu327
737 Uu328	738 Uu329	739 Uu330	740 Uu331	741 Uu332	742 Uu333	743 Uu334	744 Uu335	745 Uu336	746 Uu337	747 Uu338	748 Uu339	749 Uu340	750 Uu341	751 Uu342	752 Uu343	753 Uu344	754 Uu345
767 Uu346	768 Uu347	769 Uu348	770 Uu349	771 Uu350	772 Uu351	773 Uu352	774 Uu353	775 Uu354	776 Uu355	777 Uu356	778 Uu357	779 Uu358	780 Uu359	781 Uu360	782 Uu361	783 Uu362	784 Uu363
797 Uu364	798 Uu365	799 Uu366	800 Uu367	801 Uu368	802 Uu369	803 Uu370	804 Uu371	805 Uu372	806 Uu373	807 Uu374	808 Uu375	809 Uu376	810 Uu377	811 Uu378	812 Uu379	813 Uu380	814 Uu381
827 Uu382	828 Uu383	829 Uu384	830 Uu385	831 Uu386	832 Uu387	833 Uu388	834 Uu389	835 Uu390	836 Uu391	837 Uu392	838 Uu393	839 Uu394	840 Uu395	841 Uu396	842 Uu397	843 Uu398	844 Uu399
857 Uu400	858 Uu401	859 Uu402	860 Uu403	861 Uu404	862 Uu405	863 Uu406	864 Uu407	865 Uu408	866 Uu409	867 Uu410	868 Uu411	869 Uu412	870 Uu413	871 Uu414	872 Uu415	873 Uu416	874 Uu417
887 Uu418	888 Uu419	889 Uu420	890 Uu421	891 Uu422	892 Uu423	893 Uu424	894 Uu425	895 Uu426	896 Uu427	897 Uu428	898 Uu429	899 Uu430	900 Uu431	901 Uu432	902 Uu433	903 Uu434	904 Uu435
917 Uu436	918 Uu437	919 Uu438	920 Uu439	921 Uu440	922 Uu441	923 Uu442	924 Uu443	925 Uu444	926 Uu445	927 Uu446	928 Uu447	929 Uu448	930 Uu449	931 Uu450	932 Uu451	933 Uu452	934 Uu453
947 Uu454	948 Uu455	949 Uu456	950 Uu457	951 Uu458	952 Uu459	953 Uu460	954 Uu461	955 Uu462	956 Uu463	957 Uu464	958 Uu465	959 Uu466	960 Uu467	961 Uu468	962 Uu469	963 Uu470	964 Uu471
977 Uu472	978 Uu473	979 Uu474	980 Uu475	981 Uu476	982 Uu477	983 Uu478	984 Uu479	985 Uu480	986 Uu481	987 Uu482	988 Uu483	989 Uu484	990 Uu485	991 Uu486	992 Uu487	993 Uu488	994 Uu489
1007 Uu490	1008 Uu491	1009 Uu492	1010 Uu493	1011 Uu494	1012 Uu495	1013 Uu496	1014 Uu497	1015 Uu498	1016 Uu499	1017 Uu500	1018 Uu501	1019 Uu502	1020 Uu503	1021 Uu504	1022 Uu505	1023 Uu506	1024 Uu507
1037 Uu508	1038 Uu509	1039 Uu510	1040 Uu511	1041 Uu512	1042 Uu513	1043 Uu514	1044 Uu515	1045 Uu516	1046 Uu517	1047 Uu518	1048 Uu519	1049 Uu520	1050 Uu521	1051 Uu522	1052 Uu523	1053 Uu524	1054 Uu525
1067 Uu526	1068 Uu527	1069 Uu528	1070 Uu529	1071 Uu530	1072 Uu531	1073 Uu532	1074 Uu533	1075 Uu534	1076 Uu535	1077 Uu536	1078 Uu537	1079 Uu538	1080 Uu539	1081 Uu540	1082 Uu541	1083 Uu542	1084 Uu543
1097 Uu544	1098 Uu545	1099 Uu546	1100 Uu547	1101 Uu548	1102 Uu549	1103 Uu550	1104 Uu551	1105 Uu552	1106 Uu553	1107 Uu554	1108 Uu555	1109 Uu556	1110 Uu557	1111 Uu558	1112 Uu559	1113 Uu560	1114 Uu561
1127 Uu562	1128 Uu563	1129 Uu564	1130 Uu565	1131 Uu566	1132 Uu567	1133 Uu568	1134 Uu569	1135 Uu570	1136 Uu571	1137 Uu572	1138 Uu573	1139 Uu574	1140 Uu575	1141 Uu576	1142 Uu577	1143 Uu578	1144 Uu579
1157 Uu580	1158 Uu581	1159 Uu582	1160 Uu583	1161 Uu584	1162 Uu585	1163 Uu586	1164 Uu587	1165 Uu588	1166 Uu589	1167 Uu590	1168 Uu591	1169 Uu592	1170 Uu593	1171 Uu594	1172 Uu595	1173 Uu596	1174 Uu597
1187 Uu598	1188 Uu599	1189 Uu600	1190 Uu601	1191 Uu602	1192 Uu603	1193 Uu604	1194 Uu605	1195 Uu606	1196 Uu607	1197 Uu608	1198 Uu609	1199 Uu610	1200 Uu611	1201 Uu612	1202 Uu613	1203 Uu614	1204 Uu615
1217 Uu616	1218 Uu617	1219 Uu618	1220 Uu619	1221 Uu620	1222 Uu621	1223 Uu622	1224 Uu623	1225 Uu624	1226 Uu625	1227 Uu626	1228 Uu627	1229 Uu628	1230 Uu629	1231 Uu630	1232 Uu631	1233 Uu632	1234 Uu633
1247 Uu634	1248 Uu635	1249 Uu636	1250 Uu637	1251 Uu638	1252 Uu639	1253 Uu640	1254 Uu641	1255 									

Part I. Multiple choice. Write the letter of the correct answer for each problem. 3 points each

- Which of the following is a member of the group of elements called the *halogens*?
A) potassium
B) calcium
C) bromine
D) argon
Answer _____
- When beryllium forms an ion, what charge will the ion have?
A) +1
B) -1
C) +2
D) -2
Answer _____
- The electron configuration for manganese is:
A) $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$
B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$
C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7$
D) $1s^2 2s^2 2p^6 3s^2$
Answer _____
- Below are four statements about protons, only one is true. Identify the true statement.
A) Protons have about the same mass as electrons.
B) Protons have about the same mass as neutrons.
C) Some atoms don't have any protons.
D) Protons have the same magnitude of charge as neutrons, but opposite sign
Answer _____
- Which of these bonds do you expect to be the most polar?
A) F-F
B) O-F
C) N-F
D) C-F
Answer _____
- Which of the following is a **physical** change?
A) Water is decomposed by electricity into hydrogen and oxygen.
B) A red substance is decomposed by heat to mercury and oxygen.
C) Ice melts at 0°C .
D) Carbon combines with oxygen to form carbon dioxide.
Answer _____
- The observation that 20 g of hydrogen gas always combines with 160 g of oxygen gas to form 180 g of water, even when there is more than 160 g of oxygen present in the reaction container, illustrates the law of
A) excess reactants.
B) definite proportions.
C) ideal gases.
D) multiple proportions.
Answer _____
- The **maximum** number of electrons that may reside in the $n=3$ energy level is
A) 8.
B) 18.
C) 2.
D) 3.
Answer _____
- If a central atom has a total of three groups and no lone pairs attached to it, the electron pair geometry about the central atom is
A) linear.
B) tetrahedral.
C) triangular (aka trigonal planar).
D) pyramidal (aka trigonal pyramidal).
Answer _____

10. Mg^{2+} has the same electronic structure as

- A) Mg. B) C. C) Ne. D) Ar.

Answer _____

11. The element tin (Sn) occurs naturally as ten isotopes. Each of these isotopes has

- A) 50 electrons. C) a different number of neutrons.
B) 50 protons. D) all of the above

Answer _____

12. A ring that is 18-karat gold, contains 75.0 % gold by mass. What mass of gold is present in an 18-karat gold ring weighing 6.0 grams?

- A) 1.5 g B) 3.0 g C) 4.5 g D) 6.0 g

Answer _____

13. Covalent bonds generally form between

- A) non-metals. C) ions.
B) metals and non-metals. D) metals.

Answer _____

14. 3.2×10^5 nm is equivalent to _____ mm.

- A) 3.2×10^2 C) 3.2×10^{-4}
B) 3.2×10^{-1} D) 3.2

Answer _____

15. In the hydrogen chloride molecule, HCl, the chlorine end of the molecule is more negative than the hydrogen end because

- A) hydrogen is more electronegative than chlorine.
B) hydrogen and chlorine have the same electronegativity.
C) chlorine is more electronegative than hydrogen.
D) hydrogen transfers an electron to chlorine.

Answer _____

Part II. Complete each of the following. Point values are noted by each question.

16. Complete the following table. (5 points)

symbol	# protons	# neutrons	# electrons	charge	mass #	atomic #
$^{12}_6\text{C}$						
				+2	55	26

17. Complete the table below: (8 points)

Formula	Name
	iron (III) carbonate
N_2O_5	
	phosphorous hexafluoride
Na_2O	

18. Complete the following table for the element barium. (6 points)

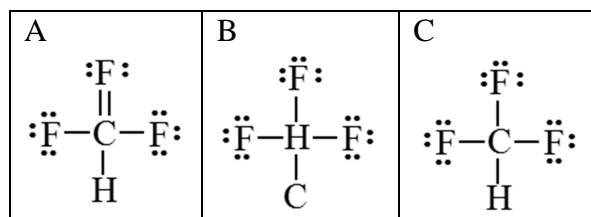
_____ g Ba	=	8.14 mol Ba	=	_____ atoms Ba
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19. Describe what an individual helium-4 atom (${}^4_2\text{He}$) looks like. Be as detailed as you can. You may wish to include a sketch. (6 points)

20. Outline three of the main points of Dalton's atomic theory. Identify one area of his theory that we now understand to be incorrect and required modification. (8 points)

Part III. Complete 3 of the following 4 problems. Clearly mark the problem you do not want graded. Each problem is worth eight (8) points. You must show your work on calculations to receive partial credit. Report numerical results to the correct number of significant figures and with the appropriate units.

21. Below are three potential Lewis structures for the compound CHF_3 . Identify the correct structure and explain why the other structures are incorrect.



22. In a butane lighter, 9.7 g of butane react completely with 34.7 grams of oxygen to form carbon dioxide and water. (4 points each part)
- If 29.3 grams of carbon dioxide are produced, how many grams of water are formed?
 - How many grams of carbon dioxide would be produced if 15.6 grams of butane were allowed to react with 34.7 grams of oxygen?

23. Valence shell electron pair repulsion theory (VSEPR) predicts that the molecule NF_3 would have a trigonal pyramidal shape. Why is this so?
24. Describe the similarities and differences in the electronic structures of fluorine and bromine. Include an electron configuration for each of the atoms. Why do both atoms tend to form anions with a charge of negative one (1^-)?