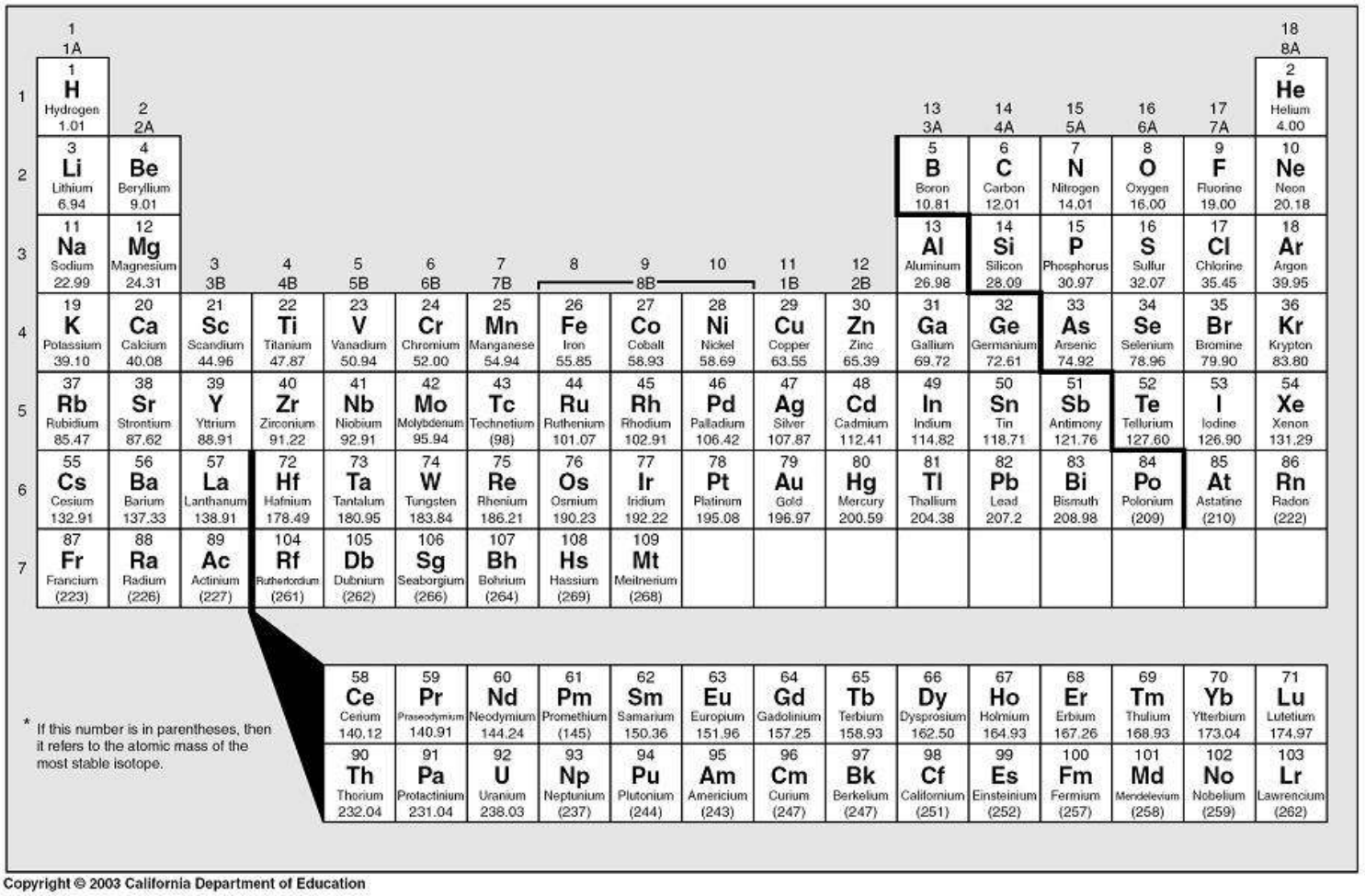
CHEMISTRY 301
11:15 AM Section
EXAM 2
27 Oct 2010

Name: _____

Note: Your exam should consist of 5 pages including the cover page and grade tabulation sheet. Skim the entire exam, and solve the easiest problems first. Exams not returned when time is called will not be graded.



	1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H Hydrogen 1.01	2 2A																2 He Helium 4.00
2	3 Li Lithium 6.94	4 Be Beryllium 9.01											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99	12 Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
4	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Cesium 132.91	56 Ba Barium 137.33	57 La Lanthanum 138.91	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (269)	109 Mt Meitnerium (268)									

58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97
90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)

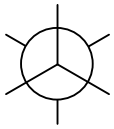
* If this number is in parentheses, then it refers to the atomic mass of the most stable isotope.

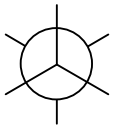
PLEASE DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO.

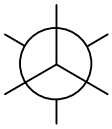
1. (9 pts) Draw cyclopropane and cyclopropene. Predict whether cyclopropane or cyclopropene has the greater (more exothermic) heat of combustion. Clearly explain what is giving rise to the difference in their heats of combustion.

2. (18 pts) There are four possible cis,trans isomers of 2-isopropyl-5-methylcyclohexanol in which the C_1 of the cyclohexane ring has R stereochemistry. (a) Using a **planar hexagon** representation of the cyclohexane ring, draw the structures of the four isomers. (b) Draw the more stable chair conformation for each of your answers in part a. (c) Of the four cis,trans isomers, which is the most stable.

4. (10 pts) (a) Draw a Newman projection for each staggered conformation of the C_1-C_2 bond of 1,2-dichloropropane, in order of least stable to most stable from left to right. (b) Briefly explain how you arrived at the order of stability.



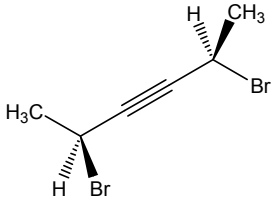




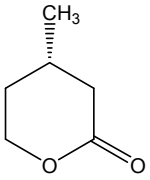
least stable

most stable

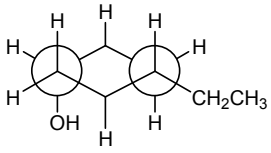
5. (15 pts) Which of the following molecules are chiral? Assign each chirality center in the structures below as R or S.



a. chiral / achiral

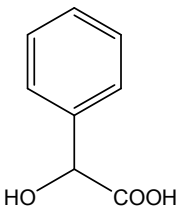


b. chiral / achiral

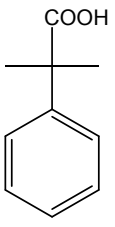


c. chiral / achiral

6. (4 pts) Mandelic acid can be purchased as the (S)-(+) enantiomer. Complete the Fischer projection for this enantiomer of mandelic acid.



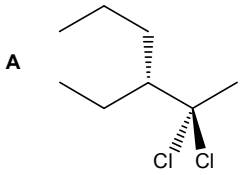
mandelic acid



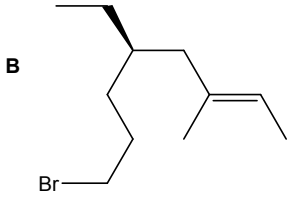
7. (6 pts) Draw a 3D representation of the half-chair conformation, and clearly annotate the origin of its instability.

8. (10 pts) Write the full IUPAC name for each of the following molecules.

A

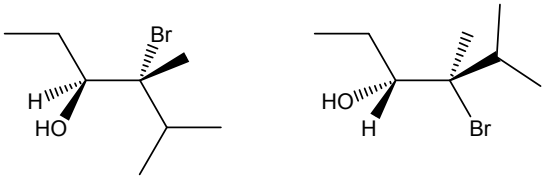


B



9. (7 pts each) Indicate whether each of the following pairs of compounds are non-isomeric, constitutional isomers, identical (but not conformers), conformers, enantiomers, or diastereomers. Then decide whether a 50:50 mixture of each pair would rotate plane polarized light and briefly explain why or why not.

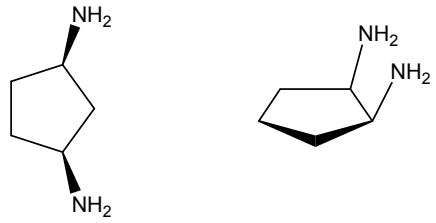
a.



Likely to rotate plane-polarized light?

Reason for your yes/no choice.

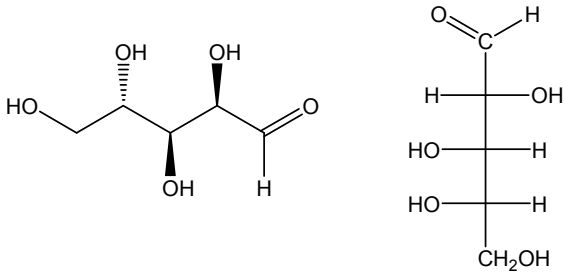
b.



Likely to rotate plane-polarized light?

Reason for your yes/no choice.

c.



Likely to rotate plane-polarized light?

Reason for your yes/no choice.

d.

Likely to rotate plane-polarized light?

Reason for your yes/no choice.

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Page	Points	Score
2	27	
3	35	
4	38	
Total	100	