

Unless otherwise specified, each question is worth XX points.

## CHIRALITY

*chirality (6.1-6.3)*

1. Which of the following statements is true? (1 point each)

Enantiomers are always chiral..... T F

A diastereomer of a chiral compound must also be chiral. .... T F

A molecule that possesses an internal plane of symmetry can never be chiral. .... T F

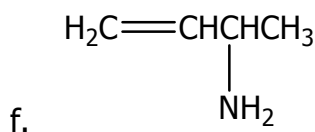
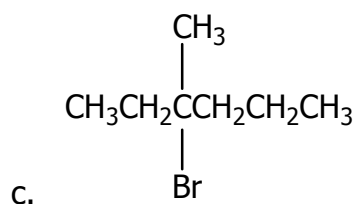
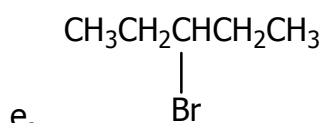
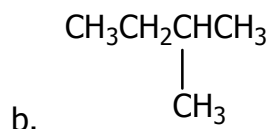
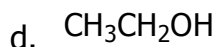
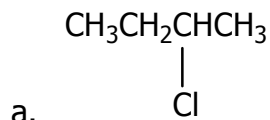
An achiral molecule will always have an enantiomer. .... T F

An achiral molecule will always have a diastereomer..... T F

A chiral molecule will always have an enantiomer..... T F

A chiral molecule will always have a diastereomer. .... T F

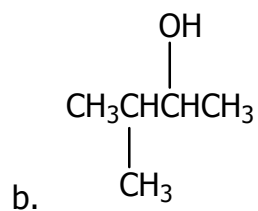
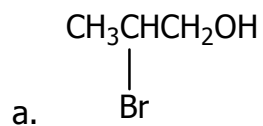
2. Circle any of the following compounds that have a stereocenter:



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*Enantiomers (6.3)*

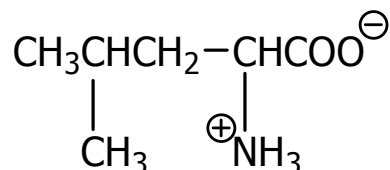
3. Draw enantiomer pairs for each of the following using the wedge/dashed/solid line convention:



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*≥2 stereocenters (6.5-6.7)*

4. Draw the stereoisomers of the following amino acid, leucine. Indicate pairs of enantiomers and pairs of diastereomers.



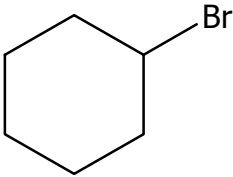
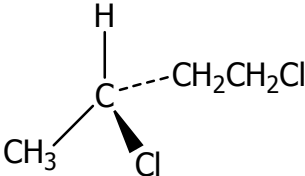
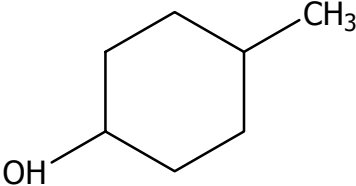
5. Which of the following compounds has a stereoisomer that is a meso compound? Draw the meso compound.
- 2,4-dibromohexane
  - 2,4-dibromopentane
  - 2,4-dimethylpentane

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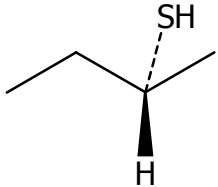
## NOMENCLATURE & STRUCTURE

*R, S convention (6.4), haloalkanes (7.1-7.2), alcohols (8.2), ethers (8.4) & thiols (8.6)*

6. Complete the following table: (2 points each)

	NAME	FORMULA
A	2-fluoropropane	
B		
C	( <i>R</i> )-2-bromobutane	
D		
E	1-pentanol	
F		
G	methoxyethane	

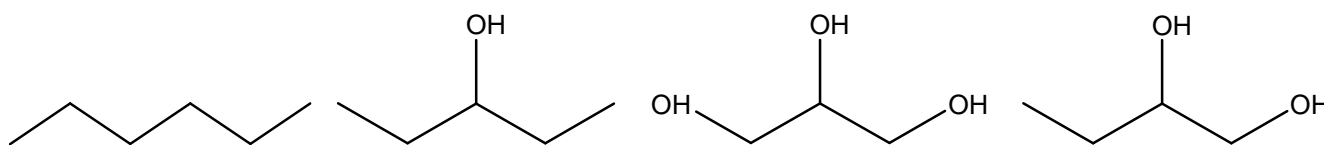
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	NAME	FORMULA
H		$\begin{array}{c} \text{H} \\   \\ \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CCH}_2\text{CH}_2\text{CH}_3 \\   \\ \text{OCH}_2\text{CH}_3 \end{array}$
I	1-propanethiol	
J		

## PHYSICAL PROPERTIES

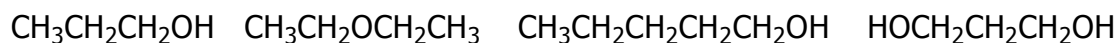
*properties of stereoisomers (6.8-6.9), alcohols (8.2), ethers (8.4), thiols (8.6)*

7. List the following compounds in order of decreasing boiling point:



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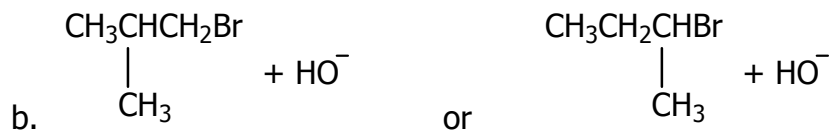
8. Rank the following compounds in order of decreasing solubility in water:



### CHEMICAL PROPERTIES

*general nucleophilic substitution (7.3-7.6), S<sub>N</sub>2 & S<sub>N</sub>1 (7.5-7.7), β-elimination (7.3, 7.8-7.9), alcohols (8.3), epoxides (8.5) & thiols (8.7)*

9. For each of the following pairs of S<sub>N</sub>2 reactions, indicate which reaction occurs faster.



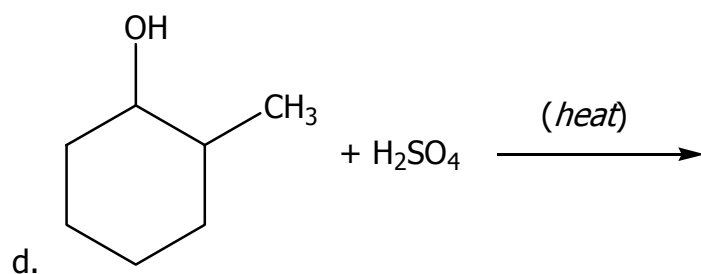
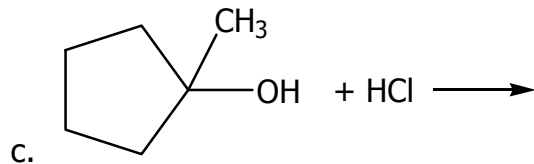
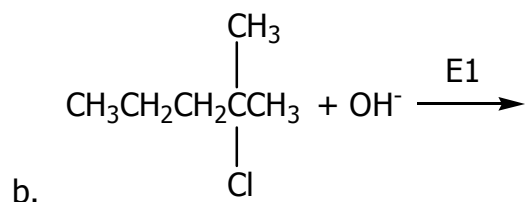
10. Arrange the following alkyl bromides in order of decreasing reactivity in an S<sub>N</sub>1 reaction:

Isopropyl bromide   propyl bromide   t-butyl bromide   methyl bromide

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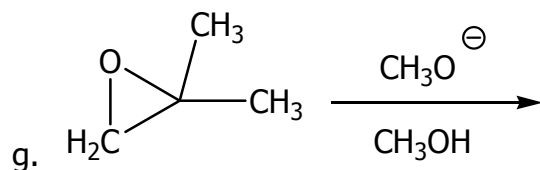
11. Draw the structure of the major organic product of each reaction:

a. (*R*)-2-bromobutane + hydroxide ( $S_N2$ )  $\rightarrow$



e. 3-pentanol + chromic acid  $\rightarrow$

f. 1-pentanol + chromic acid  $\rightarrow$



h.  $4 \text{CH}_3\text{CH}_2\text{SH} + \text{O}_2 \rightarrow$

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**Abbreviated Periodic Table of the Elements**

1 1A																			18 8A
1 H 1.008	2 2A												13 3A	14 4A	15 5A	16 6A	17 7A	2 He 4.00	
3 Li 6.94	4 Be 9.01												5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95		
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80		
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3		
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)		
87 Fr (223)	88 Ra 226	89 Ac** (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub								