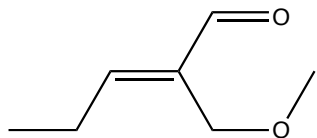
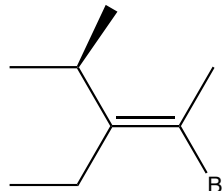


1. (18 pts.) Where appropriate, label the following alkenes as *Z* or *E*. If the molecule can only exist as one stereoisomer write "only one".

a.



b.



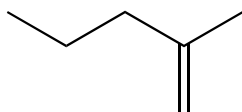
1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

c.



5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

2. A reaction coordinate diagram is drawn on the right.

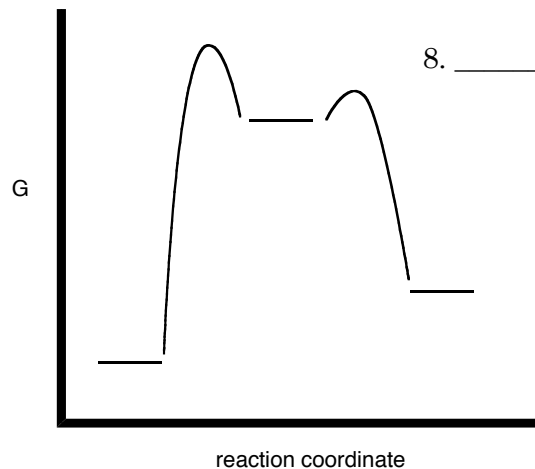
a. (2 pts) Label the reactants and products.

b. (2 pts.) Put a star next to the transition state(s).

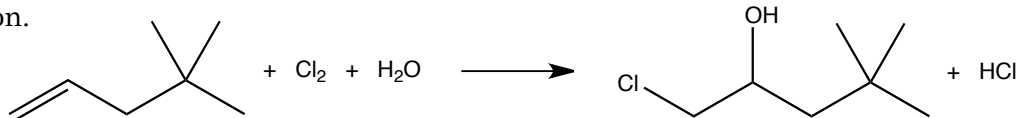
c. (2 pts.) Which is the faster step in this reaction, the first or second step?

d. (2 pts.) Which are higher in energy, the reactants or the products?

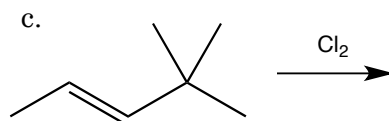
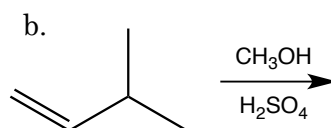
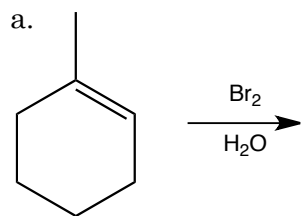
e. (2 pts.) This reaction would have a large or a small *K*?



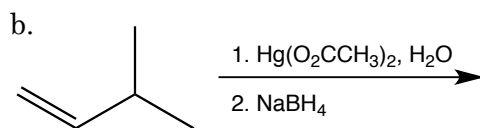
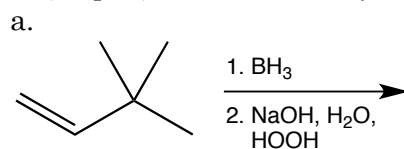
3. (10 pts) Draw a mechanism that accounts for the formation for the product in the following reaction.



3. (18 pts.) Predict the organic products for the following reactions. If a mixture of major and minor products are expected, identify the major product.



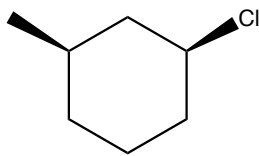
4. (12 pts.) Predict the major organic products for the following two step reactions.



5. (10 pts.) When  $\text{Cl}_2$ ,  $\text{Br}_2$ , and  $\text{Hg}^{2+}$  are used as electrophiles, carbocation rearrangements do not occur. Explain how these electrophiles prevent carbocation rearrangements.

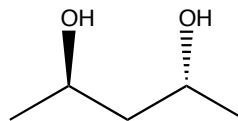
6. (i. 8 pts.) Place a star next to the chiral carbons and (ii. 8 pts.) determine which of the following molecules are chiral or achiral.

a.



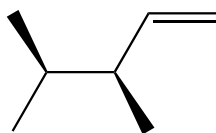

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b.



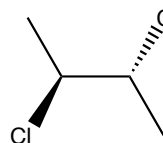

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c.




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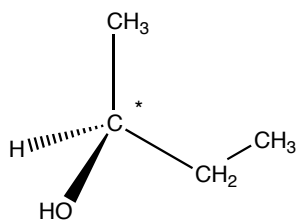
d.



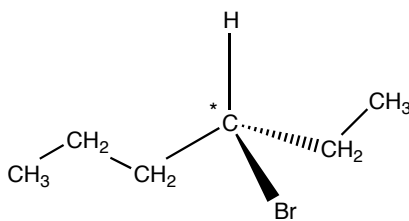

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7. (12 pts.) Determine the configuration (*R* or *S*) for the starred chiral carbon atoms.

a.

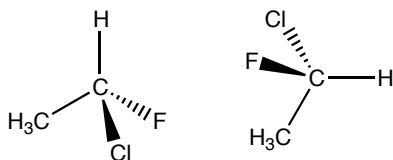


b.



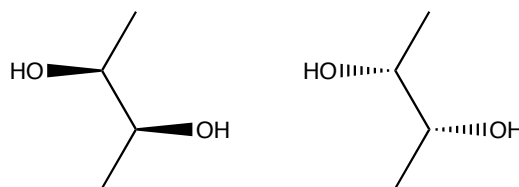
8. (12 pts.) Determine whether the pairs of molecules below are enantiomers, diastereomers, or the same molecule.

a.



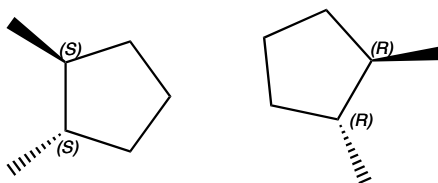

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b.



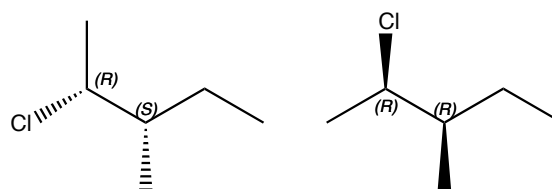

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c.




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d.




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1	<b>H</b> 1.0079																	2	<b>He</b> 4.0026																
3	<b>Li</b> 6.941	4	<b>Be</b> 9.012																	10	<b>Ne</b> 20.1797														
11	<b>Na</b> 22.989	12	<b>Mg</b> 24.305																	18	<b>Ar</b> 39.948														
19	<b>K</b>	20	<b>Ca</b>	21	<b>Sc</b>	22	<b>Ti</b>	23	<b>V</b>	24	<b>Cr</b>	25	<b>Mn</b>	26	<b>Fe</b>	27	<b>Co</b>	28	<b>Ni</b>	29	<b>Cu</b>	30	<b>Zn</b>	31	<b>Ga</b>	32	<b>Ge</b>	33	<b>As</b>	34	<b>Se</b>	35	<b>Br</b>	36	<b>Kr</b>
37	<b>Cs</b>	38	<b>Sr</b>	39	<b>Y</b>	40	<b>Zr</b>	41	<b>Nb</b>	42	<b>Mo</b>	43	<b>Tc</b>	44	<b>Ru</b>	45	<b>Rh</b>	46	<b>Pd</b>	47	<b>Ag</b>	48	<b>Cd</b>	49	<b>In</b>	50	<b>Sn</b>	51	<b>Sb</b>	52	<b>Te</b>	53	<b>I</b>	54	<b>Xe</b>
55	<b>Rb</b>	56	<b>Ba</b>	57	<b>La</b>	72	<b>Hf</b>	73	<b>Ta</b>	74	<b>W</b>	75	<b>Re</b>	76	<b>Os</b>	77	<b>Ir</b>	78	<b>Pt</b>	79	<b>Au</b>	80	<b>Hg</b>	81	<b>Tl</b>	82	<b>Pb</b>	83	<b>Bi</b>	84	<b>Po</b>	85	<b>At</b>	86	<b>Rn</b>
87	<b>Fr</b>	88	<b>Ra</b>	89	<b>Ac</b>	104	<b>Rf</b>	105	<b>Db</b>	106	<b>Sg</b>	107	<b>Bh</b>	108	<b>Hs</b>	109	<b>Mt</b>	110		111		112		114		116								118	

58	<b>Ce</b>	59	<b>Pr</b>	60	<b>Nd</b>	61	<b>Pm</b>	62	<b>Sm</b>	63	<b>Eu</b>	64	<b>Gd</b>	65	<b>Tb</b>	66	<b>Dy</b>	67	<b>Ho</b>	68	<b>Er</b>	69	<b>Tm</b>	70	<b>Yb</b>	71	<b>Lu</b>
90	<b>Th</b>	91	<b>Pa</b>	92	<b>U</b>	93	<b>Np</b>	94	<b>Pu</b>	95	<b>Am</b>	96	<b>Cm</b>	97	<b>Bk</b>	98	<b>Cf</b>	99	<b>Es</b>	100	<b>Fm</b>	101	<b>Md</b>	102	<b>No</b>	103	<b>Lr</b>