

1. a. (6 pts.) Determine the degree of unsaturation for the hydrocarbon with the formula C_5H_6 .

1. _____

2. _____

3. _____

- b. (8 pts.) When a molecule has a degree of unsaturation of 1, what does that mean?

4. _____

5. _____

6. _____

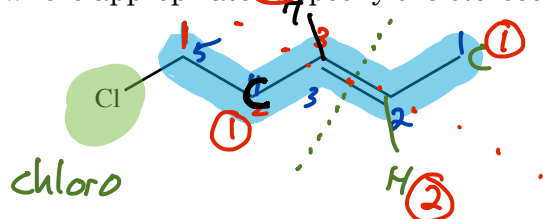
2. (8 pts. each) Provide IUPAC names for the following alkenes. Use *Z/E* nomenclature where appropriate to specify the stereochemistry of the alkene.

7. _____

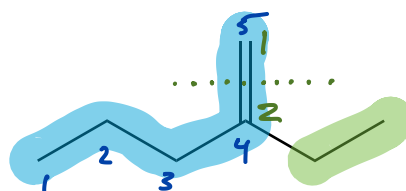
8. _____

9. _____

a.



b.



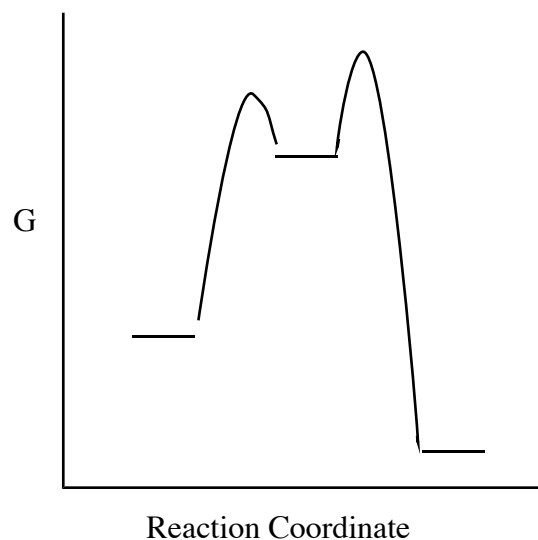
(E)-5-chloro-2-pentene

2-ethyl-1-pentene

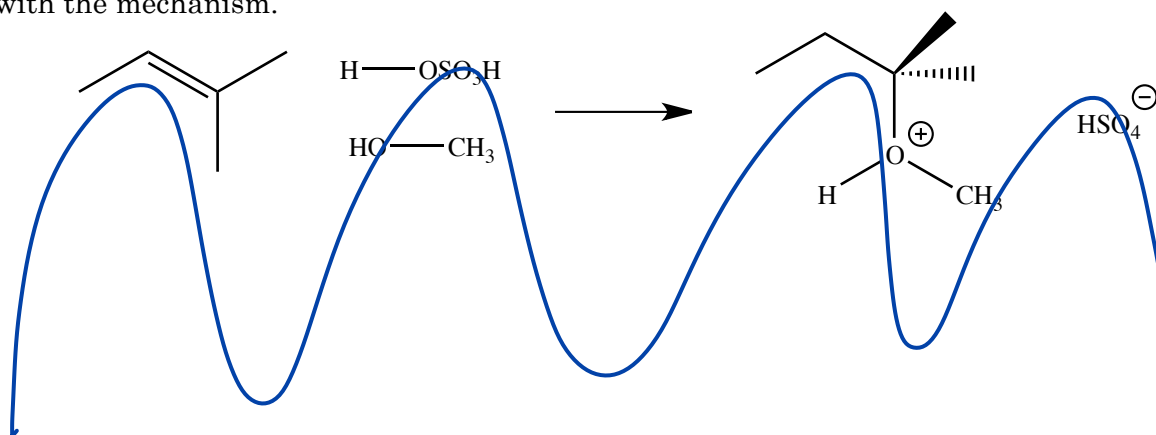
3. (8 pts.) Using valence bond theory (hybridization) explain why alkenes are nucleophilic.

4. (2 pts. ea.) The questions below refer to the reaction coordinate diagram draw to the right.

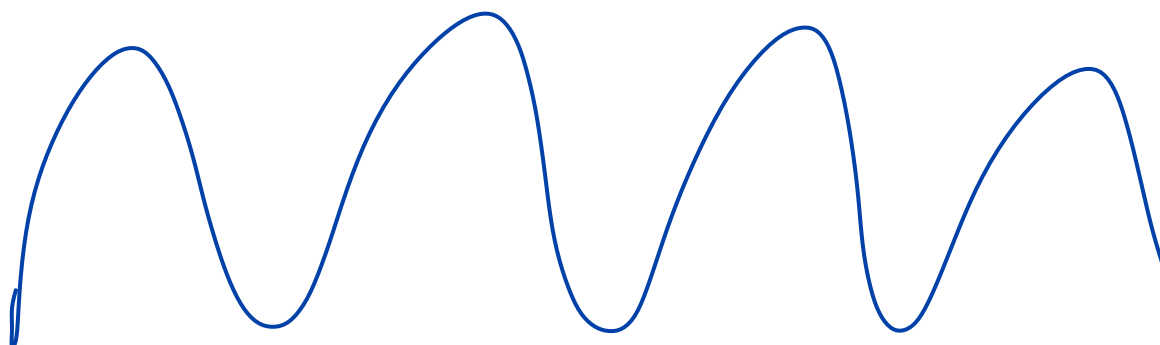
- Label the reactants with an "a".
- Label the products with a "b".
- Label the intermediates with a "c".
- Label the transition state(s) with a "d".
- Does this reaction absorb or release energy?
- Would this reaction have a positive or negative ΔG ?
- Does the equilibrium favor the reactants or products.



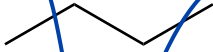
5. (12 pts.) Draw a mechanism for the reaction shown below. Include electron movement arrows with the mechanism.



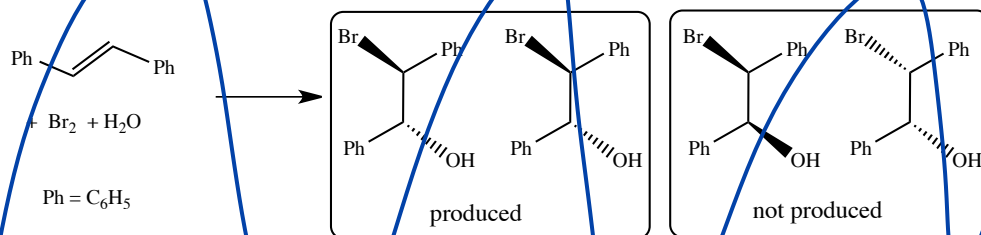
6. a. (8 pts.) Which is more stable, a primary or a tertiary carbocation. b. (12 pts.) Explain why one is more stable than the other.



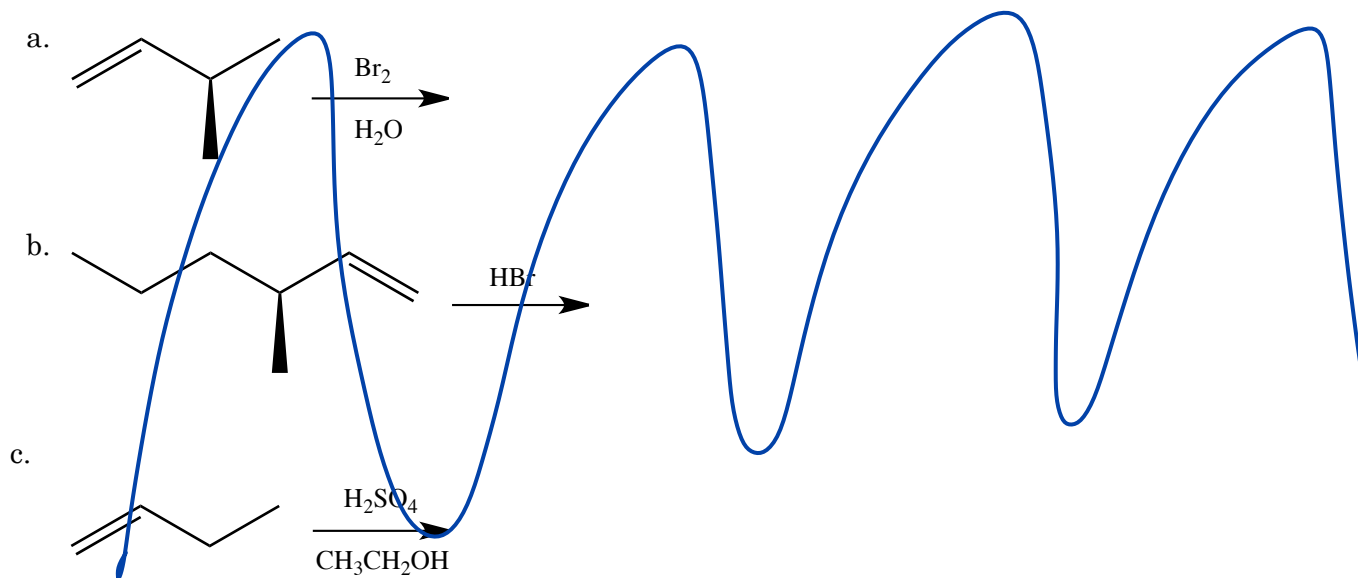
7. (16 pts.) Determine whether the following are nucleophiles, electrophiles, or neither.

H ⁺	CH ₃ OH		
Br ⁻	H ₂ SO ₄		CH ₃ CHCHCH ₃

8. (12 pts.) In lab, you reacted *trans*-stilbene with bromine and water. The product, 1,2-diphenyl-2-bromo-ethanol, exists as four stereoisomers, but you reaction only made two stereoisomers. Draw the intermediate that forms when the Br₂ reacts with the *trans*-stilbene and explain why only two of the four possible stereoisomers are formed.



9. (8 pts. ea.) Predict the major organic products for the following reactions. Remember to indicate the stereochemistry of the products using wedge (▴), dashed (▾), or squiggly (~~~~) bonds where appropriate.



1	H	1.0079	2	He	4.0026
3	Li	6.941	4	Be	9.012
11	Na	22.989	12	Mg	24.305
19	K	39	20	Ca	40
37	Cs	55	38	Sr	56
55	Rb	72	56	Ba	73
87	Fr	88	89	Ra	89
21	Sc	22	23	Ti	24
39	Y	40	41	Zr	42
57	La	58	59	Ce	60
72	Hf	73	74	Ta	75
89	Ac	90	91	Th	92
104	Rf	105	106	Sg	107
108	Bh	109	110	Mt	111
112	Hs	113	114	Db	115
116	Uu	117	118	Uub	119
120	Uut	121	122	Uuq	123
124	Uup	125	126	Uuh	127
132	Uus	133	134	Uubk	135
136	Uuhk	137	138	Uuqk	139
140	Uuk	141	142	Uukl	143
144	Uul	145	146	Uulm	147
152	Uul	153	154	Uul	155
156	Uul	157	158	Uul	159
160	Uul	161	162	Uul	163
164	Uul	165	166	Uul	167
168	Uul	169	170	Uul	171
172	Uul	173	174	Uul	175
176	Uul	177	178	Uul	179
180	Uul	181	182	Uul	183
184	Uul	185	186	Uul	187
188	Uul	189	190	Uul	191
192	Uul	193	194	Uul	195
196	Uul	197	198	Uul	199
200	Uul	201	202	Uul	203
204	Uul	205	206	Uul	207
208	Uul	209	210	Uul	211
212	Uul	213	214	Uul	215
216	Uul	217	218	Uul	219
220	Uul	221	222	Uul	223
224	Uul	225	226	Uul	227
228	Uul	229	230	Uul	231
232	Uul	233	234	Uul	235
236	Uul	237	238	Uul	239
240	Uul	241	242	Uul	243
244	Uul	245	246	Uul	247
248	Uul	249	250	Uul	251
252	Uul	253	254	Uul	255
256	Uul	257	258	Uul	259
260	Uul	261	262	Uul	263
264	Uul	265	266	Uul	267
268	Uul	269	270	Uul	271
272	Uul	273	274	Uul	275
276	Uul	277	278	Uul	279
280	Uul	281	282	Uul	283
284	Uul	285	286	Uul	287
288	Uul	289	290	Uul	291
292	Uul	293	294	Uul	295
296	Uul	297	298	Uul	299
300	Uul	301	302	Uul	303
304	Uul	305	306	Uul	307
308	Uul	309	310	Uul	311
312	Uul	313	314	Uul	315
316	Uul	317	318	Uul	319
320	Uul	321	322	Uul	323
324	Uul	325	326	Uul	327
328	Uul	329	330	Uul	331
332	Uul	333	334	Uul	335
336	Uul	337	338	Uul	339
340	Uul	341	342	Uul	343
344	Uul	345	346	Uul	347
348	Uul	349	350	Uul	351
352	Uul	353	354	Uul	355
356	Uul	357	358	Uul	359
360	Uul	361	362	Uul	363
364	Uul	365	366	Uul	367
368	Uul	369	370	Uul	371
372	Uul	373	374	Uul	375
376	Uul	377	378	Uul	379
380	Uul	381	382	Uul	383
384	Uul	385	386	Uul	387
388	Uul	389	390	Uul	391
392	Uul	393	394	Uul	395
396	Uul	397	398	Uul	399
400	Uul	401	402	Uul	403
404	Uul	405	406	Uul	407
408	Uul	409	410	Uul	411
412	Uul	413	414	Uul	415
416	Uul	417	418	Uul	419
420	Uul	421	422	Uul	423
424	Uul	425	426	Uul	427
428	Uul	429	430	Uul	431
432	Uul	433	434	Uul	435
436	Uul	437	438	Uul	439
440	Uul	441	442	Uul	443
444	Uul	445	446	Uul	447
448	Uul	449	450	Uul	449

58	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr