Name: _____

IA																	0
1 H 1.008	IIA											IIIA	IVA	VA	VIA	VIIA	2 He 4.003
3 Li 6.941	4 Be 9.012											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	IIIB	IVB	VB	VIB	VIIB		VIIIB		IB	IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	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 (226.0)	89 ** Ac (227)	104 Rf	105 Ha	106 Unh	107 Uns	108	109 Une									

* 58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
** 90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (244)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

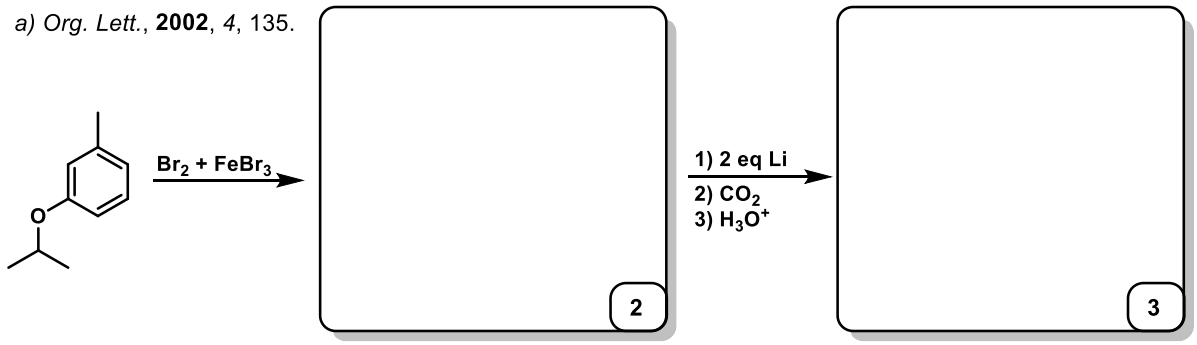
You have 50 minutes to complete this 1st half of the exam.

The section has 3 total questions.

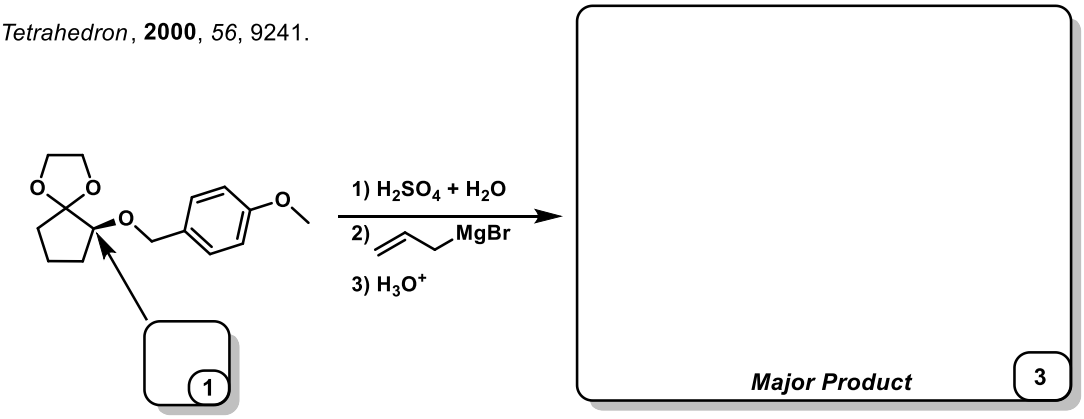
Be sure to be as explicit as possible in your answers.

1. **Quick Synthesis.** Fill in the boxes with either the correct reagents or products. Please be sure to indicate stereochemistry (where appropriate) and steps, if needed. In the small boxes pointing towards specifics atoms, fill in the oxidation number for that atom.

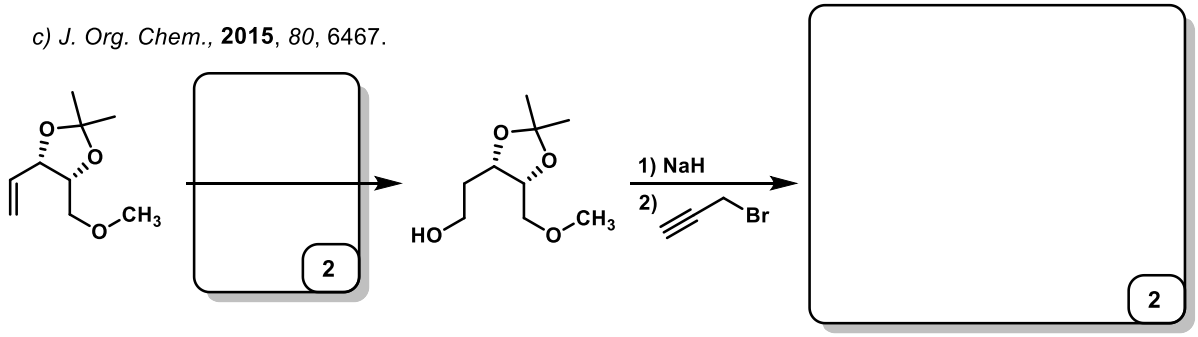
a) Org. Lett., **2002**, *4*, 135.



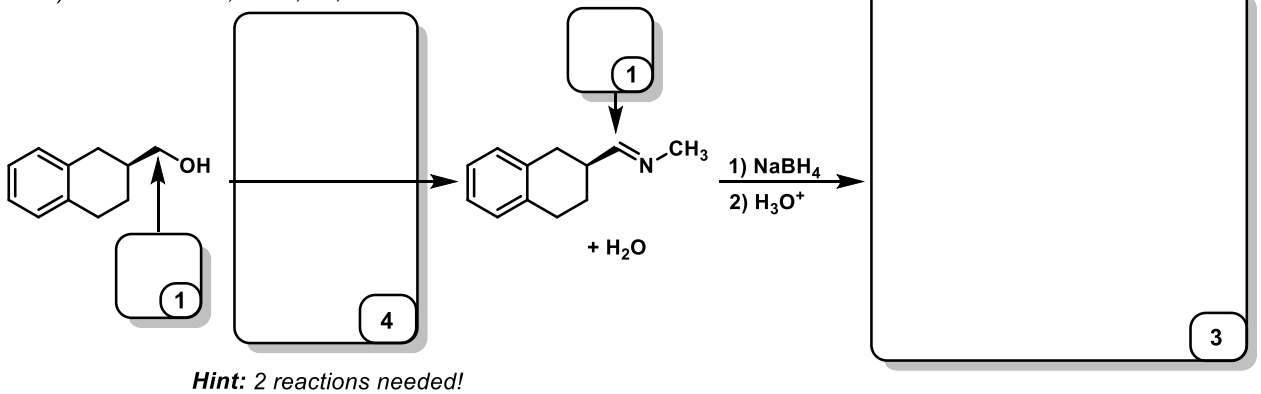
b) Tetrahedron, **2000**, *56*, 9241.



c) J. Org. Chem., **2015**, *80*, 6467.

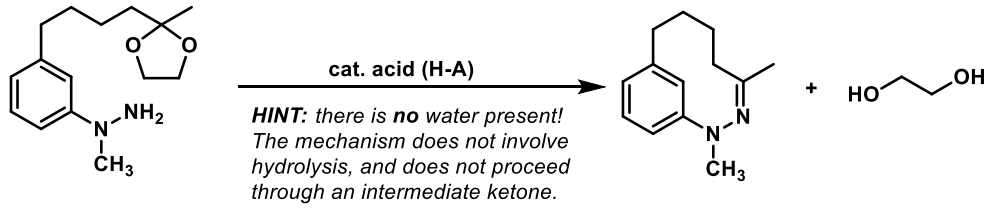


d) J. Med. Chem., **2010**, *53*, 2315.

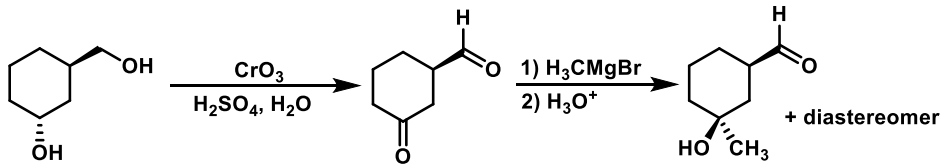


Hint: *2 reactions needed!*

2. **Mechanism.** Provide an arrow pushing mechanism for the reaction shown below. You may use H-A for acid and A^- for base, if necessary. Be sure to read the ***HINT*** before beginning! Adapted from *Org. Lett.* **2016**, *18*, 5634.



3. **Flawed Synthesis.** Below you will find a synthesis that will not ultimately lead to the ***Desired Products***. In the first box, describe the flaw(s) inherent in the synthetic route presented. In the second box, provide a new synthetic route that will lead to the ***Desired Product***.



Desired Products

Flaw(s)

New Synthetic Plan

Name: _____

IA																	0
1 H 1.008	IIA											IIIA	IVA	VA	VIA	VIIA	2 He 4.003
3 Li 6.941	4 Be 9.012											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	IIIB	IVB	VB	VIB	VIIB		VIIIB		IB	IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
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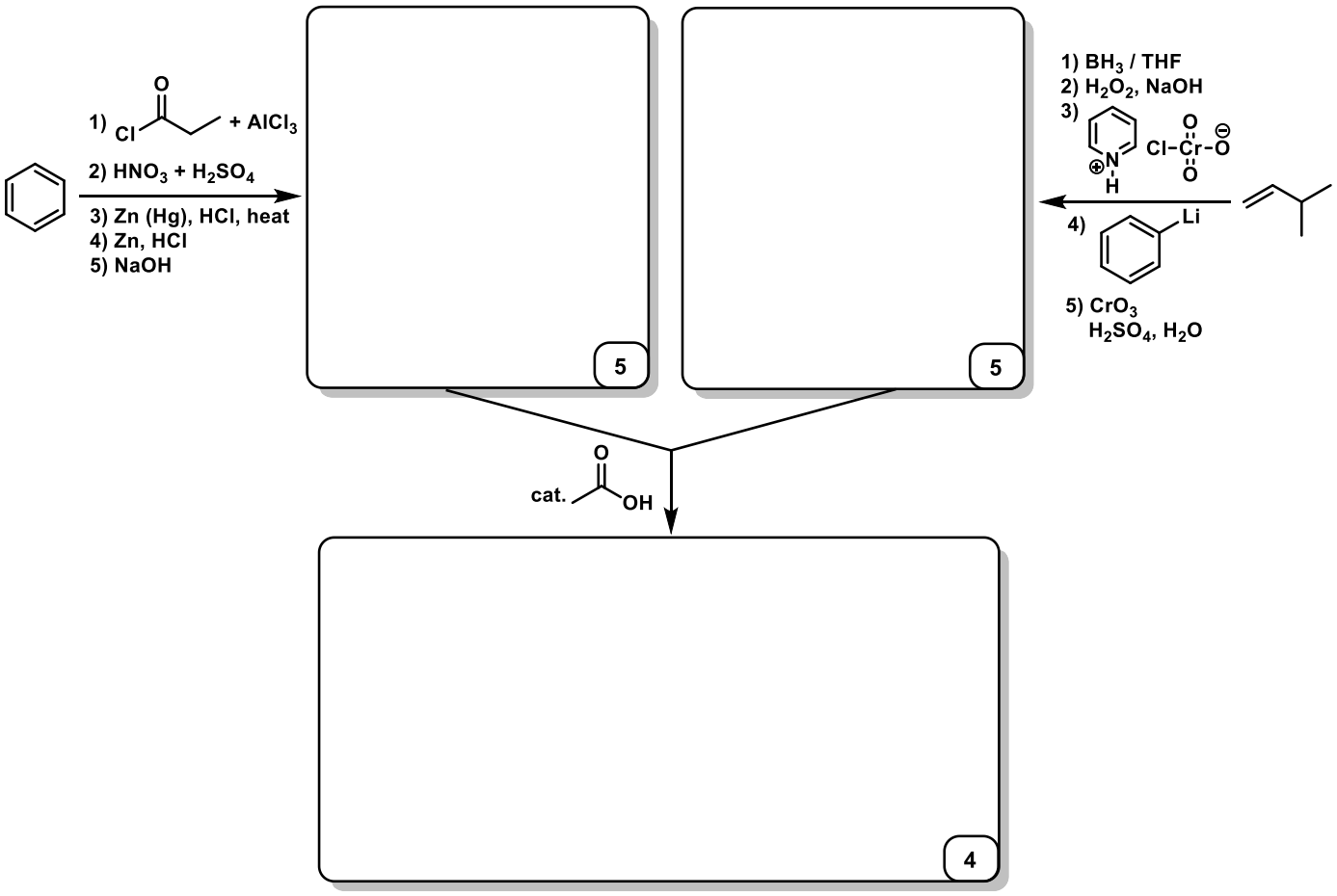
You have 50 minutes to complete the 2nd half of the exam.

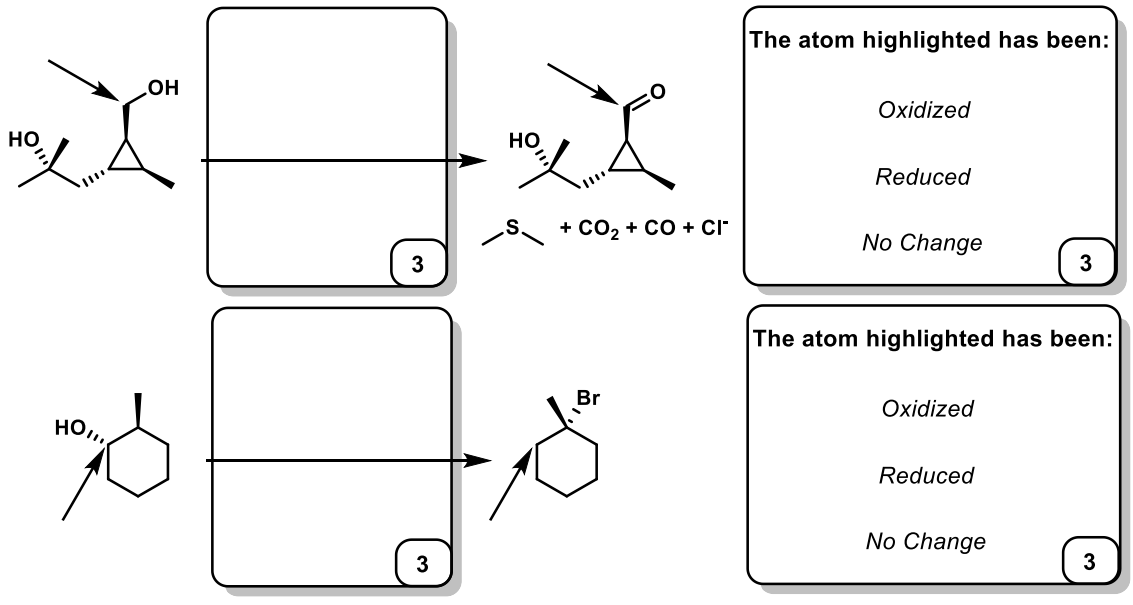
The section has 3 total questions.

Be sure to be as explicit as possible in your answers.

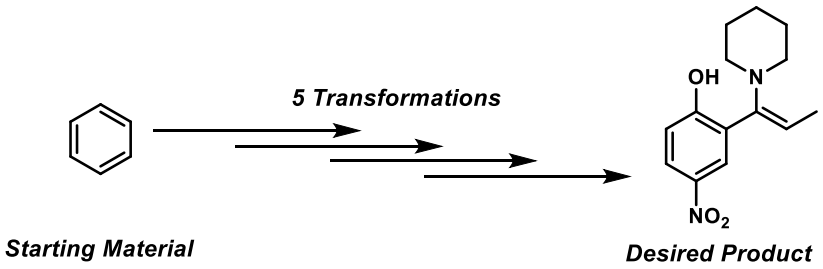
4. **Less-Guided Synthesis.** In the top two boxes, fill in the product you would get from the multiple synthetic steps provided. In the box on the bottom, fill in the product you would expect from combining the two boxed components.



5. **Oxidation States.** Fill in the reagents necessary to complete the transformation. Also, circle which process (oxidation / reduction / no change) has occurred.



6. **Full Synthesis.** The ***Desired Product*** below can be made from the given ***Starting Material*** using reactions we have learned in class. Provide a synthesis in the box below.



Starting Material ***Desired Product***