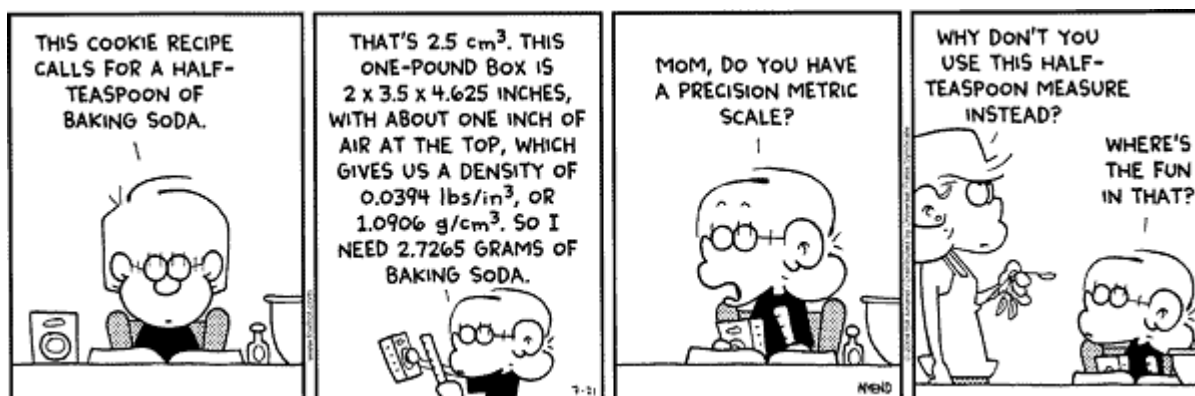


CHEMISTRY 302
EXAM 2
11:15 AM / SECTION 3
27 MARCH 2009

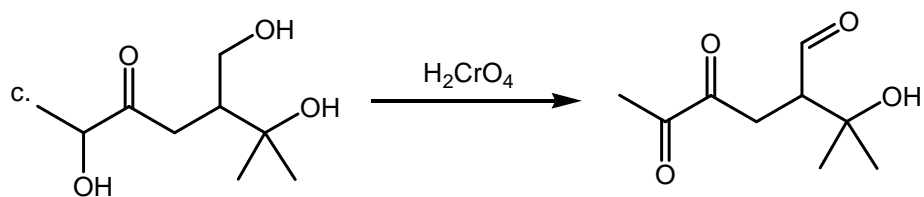
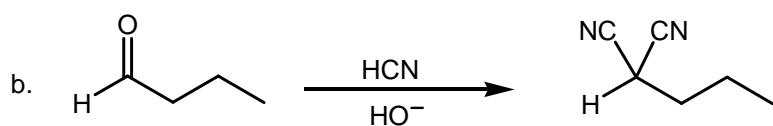
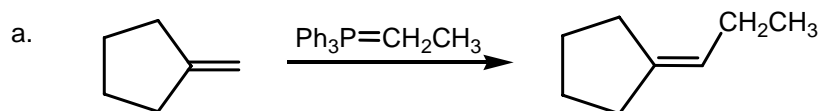
Name: _____

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.

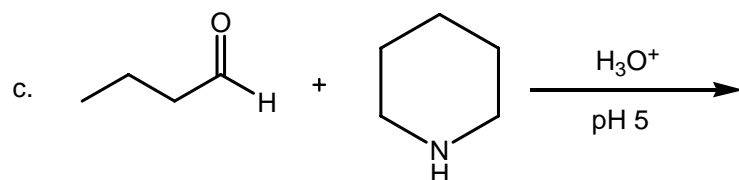
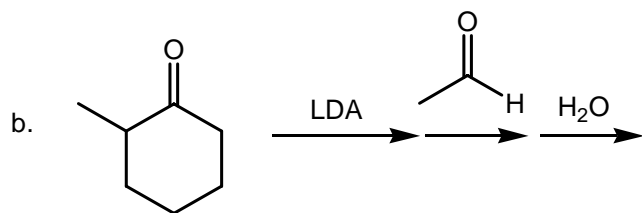
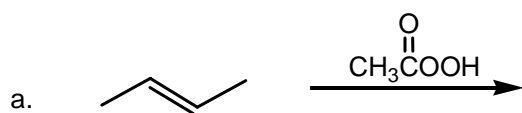


PLEASE DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO.

1. (6 pts each) Each of the following reaction schemes contains some sort of error. In each case, clearly identify all the error(s) and correct it/them. The errors may be in any element of the transformation (starting materials, reagents, products).

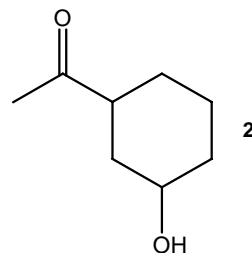
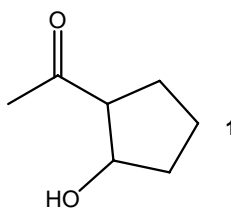


2. (6 pts each) Predict the major product of the following reactions. Mechanisms and explanations are not necessary.

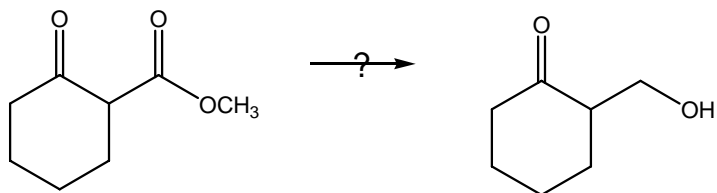


3. (12 pts) Outline two methods for preparing isopropyl methyl ether. Which method is likely to give a better yield of the ether? Explain.

4. (14 pts) Only one of the products to the right can be formed by an aldol reaction. Show the necessary reactant(s) and write a complete mechanism for the reaction you propose.



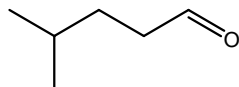
5. (10 pts) What reaction or series of reactions would you use to carry out the following transformation. Mechanisms are not necessary.



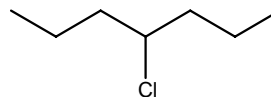
6. (12 pts) Many of the reactions that were covered in chapters 16 and 17 (reactions of aldehydes and ketones) could be catalyzed by both acid and base. Give an example of one reaction that could only be catalyzed by either acid or base (not both). Clearly indicate which catalyst works, and explain why the other catalyst does not work. A full mechanism is not necessary, but your answer must include relevant structures in addition to your explanation.

7. (16 pts) Show how you would synthesize the following compounds starting with saturated alcohols containing four or fewer carbons, oxirane, plus any inorganic reagents needed. You may also use organic compounds (eg TsCl, PPh₃, etc) as long as their carbons are not incorporated into the target. A molecule made in one synthesis can be used in another synthesis without “resynthesizing” it.

a.



b.



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Page	Points	Score
2	36	
3	36	
4	28	
Total	100	

1 1A																	18 8A																												
1 H Hydrogen 1.01																	2 He Helium 4.00																												
2 Li Lithium 6.94	2 Be Beryllium 9.01											13 3A B Boron 10.81	14 4A C Carbon 12.01	15 5A N Nitrogen 14.01	16 6A O Oxygen 16.00	17 7A F Fluorine 19.00	10 Ne Neon 20.18																												
3 Na Sodium 22.99	3 3B Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	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 K Potassium 39.10	4 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 Rb Rubidium 85.47	5 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 Cs Cesium 132.91	6 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 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)																																					
<div>* If this number is in parentheses, then it refers to the atomic mass of the most stable isotope.</div>																																													
<table><tr><td>58 Ce Cerium 140.12</td><td>59 Pr Praseodymium 140.91</td><td>60 Nd Neodymium 144.24</td><td>61 Pm Promethium (145)</td><td>62 Sm Samarium 150.36</td><td>63 Eu Europium 151.96</td><td>64 Gd Gadolinium 157.25</td><td>65 Tb Terbium 158.93</td><td>66 Dy Dysprosium 162.50</td><td>67 Ho Holmium 164.93</td><td>68 Er Erbium 167.26</td><td>69 Tm Thulium 168.93</td><td>70 Yb Ytterbium 173.04</td><td>71 Lu Lutetium 174.97</td></tr><tr><td>90 Th Thorium 232.04</td><td>91 Pa Protactinium 231.04</td><td>92 U Uranium 238.03</td><td>93 Np Neptunium (237)</td><td>94 Pu Plutonium (244)</td><td>95 Am Americium (243)</td><td>96 Cm Curium (247)</td><td>97 Bk Berkelium (247)</td><td>98 Cf Californium (251)</td><td>99 Es Einsteinium (252)</td><td>100 Fm Fermium (257)</td><td>101 Md Mendelevium (258)</td><td>102 No Nobelium (259)</td><td>103 Lr Lawrencium (262)</td></tr></table>																		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)
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