

CHEM 3331 (Richardson) Midterm Exam 3 – Nov. 19, 2024

Your Name: _____

Student ID: _____

Recitation TA (fill in one circle):

- 134 (Phil Pham) 142 (Phil Pham)
 135 (Phil Pham) 143 (Zhehao Yuan)
 136 (Max Abreu) 144 (Tania Shahvali)
 137 (Max Abreu) 147 (Tania Shahvali)
 141 (Phil Pham)

Question	Score	Out of
1		30
2		20
3		20
4		30
5		10 e.c.
Total		100

This is a closed-book exam, except for one double-sided sheet of 8.5 x 11" paper. The use of calculators or cell phones will not be allowed during the exam. You may use models sets brought in a clear bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified, you will lose points. For mechanisms, show all intermediates including correct formal charges, but do not show transition states.

Periodic Table of the Elements

The periodic table includes the following series at the bottom:

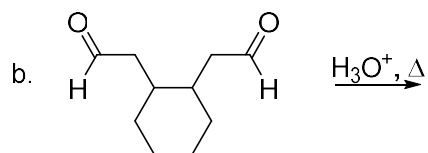
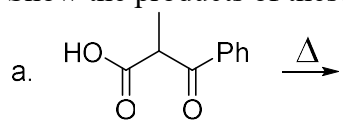
Lanthanide Series: 57 La, 58 Ce, 59 Pr, 60 Nd, 61 Pm, 62 Sm, 63 Eu, 64 Gd, 65 Tb, 66 Dy, 67 Ho, 68 Er, 69 Tm, 70 Yb, 71 Lu

Actinide Series: 89 Ac, 90 Th, 91 Pa, 92 U, 93 Np, 94 Pu, 95 Am, 96 Cm, 97 Bk, 98 Cf, 99 Es, 100 Fm, 101 Md, 102 No, 103 Lr

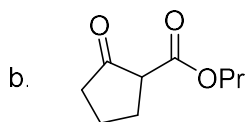
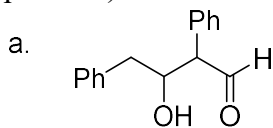
pKa Values

HI	-10	CH ₃ COOH	4.7	ArOH	10	HC≡CH	26
HBr	-8	HN ₃	4.7	RSH	10-12	H ₂	35
HCl	-6	H ₂ S	7.0	H ₂ O	15.7	NH ₃	36
H ₃ O ⁺	-1.7	NH ₄ ⁺	9.3	ROH	16-18	H ₂ C=CH ₂	45
HF	3.2	HCN	9.4	O=C-CH	9-25	CH ₄	60

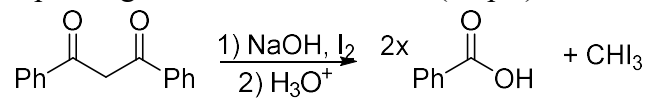
1) Show the products of these reactions and the mechanism for their formation. (30 pts).



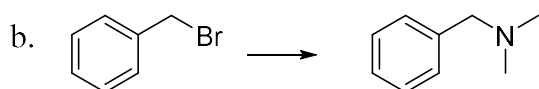
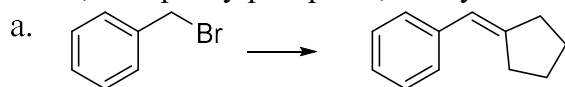
- 2) Show how you would use an aldol or Claisen reaction to make each compound. (20 pts; 10 pts each)



- 3) When the compound shown below is exposed to NaOH and I₂, it forms the products shown below. Show a mechanism for this reaction and explain why it works, even though this is not a typical setup for a haloform reaction. If the same step happens multiple times, you only need to show the arrow pushing for one of these times. (20 pts)



- 4) Find a way to synthesize the desired product from any reagents containing at most six carbon atoms, or triphenylphosphine, or any transition metal catalyst. (30 pts)



- 5) Extra credit! You are trying to hydrolyze both the compounds shown below (an ester and a thioester) using NaOH, H₂O, and heat. Which reaction would proceed faster, and why? (10 pts e.c.)

