CHEMISTRY 301 11:15 AM Section EXAM 3 22 Nov 2010

Name: \_\_\_\_\_

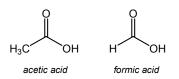
**Note:** Your exam should consist of 5 pages including the cover page and grade tabulation sheet. Skim the entire exam, and solve the easiest problems first. Exams not returned when time is called will not be graded.

	1 1A 1 Hydrogen 1.01 3	2 2A 4	F										13 3A 5	14 4A	15 5A 7	16 6A 8	17 7A 9	18 8A 2 Helium 4.00 10
. M788	Li Lithium 6.94	Be Beryllium 9.01	e.										B Boron 10.81	C Carbon 12.01	Nitrogen 14.01	Oxygen 16.00	F Fluorine 19.00	Neon 20.18
1000	11 Na Sodium 22.99	12 Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 	10	11 1B	12 2B	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 <b>S</b> Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 <b>Ti</b> 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
	37 <b>Rb</b> Rubidium 85.47	38 Sr Strontium 87.62	39 <b>Y</b> 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 <b>Rh</b> Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112,41	49 In Indium 114.82	50 <b>Sn</b> Tin 118.71	51 <b>Sb</b> Antimony 121.76	52 <b>Te</b> Tellurium 127.60	53   lodine 126.90	54 Xe Xenon 131.29
	55 <b>Cs</b> Cesium 132.91	56 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 <b>Re</b> Rhenium 186.21	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 TI 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)
Ī	87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 <b>Rf</b> Rutherfordium (261)	105 <b>Db</b> Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (269)	109 Mt Meitnerium (268)									
		er is in pare		hen	58 <b>Ce</b> Cerium 140,12	59 <b>Pr</b> Praseodymium 140.91	60 Nd Necdymium 144.24	61 Pm Promethium (145)	62 <b>Sm</b> Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 <b>Tb</b> Terbium 158.93	66 Dy Dysprosium 162.50	67 <b>Ho</b> Holmium 164.93	68 <b>Er</b> Erbium 167.26	69 <b>Tm</b> Thulium 168.93	70 <b>Yb</b> Ytterbium 173,04	71 Lu Lutetium 174,97
	reters to t nost stable	he atomic n isotope.	nass of the		90 <b>Th</b> 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 Mendelevtum (258)	102 No Nobelium (259)	103 Lr Lawrenciur (262)

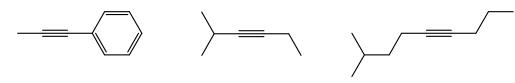
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## PLEASE DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO.

 (12 pts) 2-bromo-2-methylpropane undergoes solvolysis in either acetic acid or formic acid. (a) In one solvent the SN1 reaction is 5000 times faster than it is in the other. In which solvent is the reaction more rapid? Briefly explain. (b) Write a mechanism for the faster reaction. Draw a box around the product of the solvolysis mechanism.

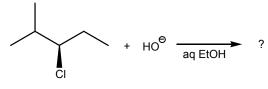


**2.** (10 pts) Of the alkynes shown below, which can be synthesized in the highest yield starting from ethyne. Clearly explain.



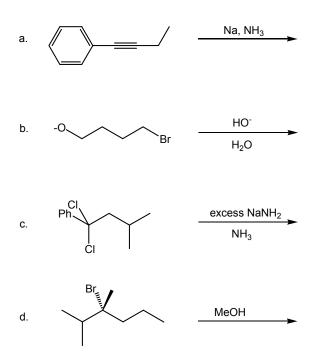
- **3.** (4 pts each) For each pair of reactions, circle which reaction (if either) should have faster rate of reaction. In all cases you can assume that the reactions occur. Explain your choice in 7 words or less.
  - a. reaction of cyanide anion with bromoethane in methanol or acetone
  - b. reaction of 3-methyl-2-butanol or 2,3-dimethyl-2-butanol in aqueous acid
  - c. reaction of ethanol or sodium ethoxide with 1-chloropropane in methanol
  - d. reaction of 2-chloro-2-methylbutane with iodide anion or bromide anion in ethanol

- **4.** (16 pts) Consider the reaction of (*R*)-3-chloro-2-methylpentane, as shown to the right.
  - a. Show the structures of <u>all possible</u> products, both major and minor, assuming second order kinetics. Under each product, label it as major or minor and give the name of the mechanism that produces the product.



b. Draw a three-dimensional picture of the <u>transition state</u> that leads to the formation of the major product identified in Part 4a.

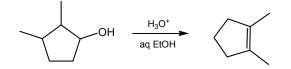
5. (3 pts each) Draw products of the following reactions.



- 6. (16 pts) For parts a through c, outline a synthesis starting from the given reactant. You may use any other needed reagents. More than one reaction may be necessary. Mechanisms are not required.
  - a. 2-butanol ? > butane

 b. alkyl halide — ? → tBuOCH<sub>3</sub> of your choosing

7. (18 pts) (a) Draw a reasonable mechanism for the reaction shown below. (b) Draw a reaction coordinate for the mechanism that you propose. Briefly annotate your diagram to indicate how you arrived at your answer.



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## Name: \_\_\_\_\_

Page	Points	Score
2	38	
3	28	
4	34	
Total	100	