CHM 224 **NAME:**

Test 2

Chapters 13, 14, organometallics, 20

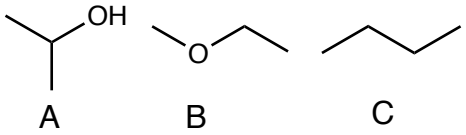
1. Answer the following 3 questions:

   A. Brandy is 80 proof. What is its percent alcohol?

   B. This alcohol has been used as a fuel in race cars:

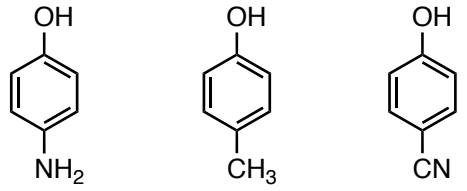
   C. The alcohol found in beer and wines is:

2. The three compounds below have nearly identical molecular weights. Arrange them according to their expected boiling points from highest >>> lowest.

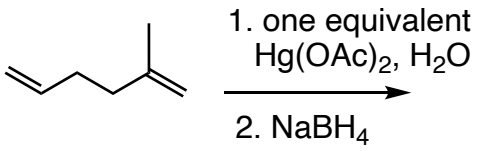


A B C

3. Match the pKa values with the compounds provided: pKa's = 8.0, 10.1, 10.3



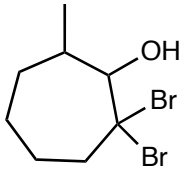
4. What is the expected major product of the following reaction?



5. Which of the following compounds is expected to undergo reaction with $KMnO_4$ (may be more than one)?

   A. 1-methylcyclopentanol
   B. 2-methyl-3-hexanol
   C. 4-ethyl-4-heptanol
   D. 3-bromo-1-butanol

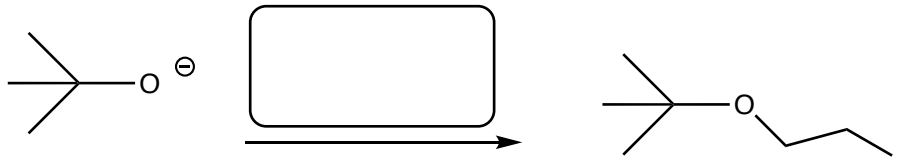
6. Provide the IUPAC name for the following compound:



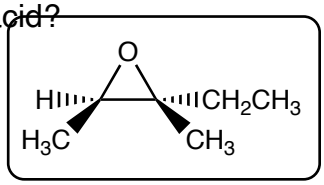
7. Which ONE of the following statements is true?

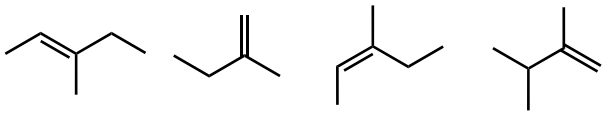
A. ethers are generally water soluble, flammable, and reactive with strong bases
B. ethers are generally water insoluble, not flammable, and reactive with strong acids
C. ethers are generally water soluble, flammable, and reactive with strong bases
D. ethers are generally water insoluble, flammable, and reactive with strong acids

8. In the box, provide the compound required to complete the Williamson ether synthesis below:



9. Which one of the following alkenes will form the epoxide below upon treatment with a peroxyacid?





A B C D

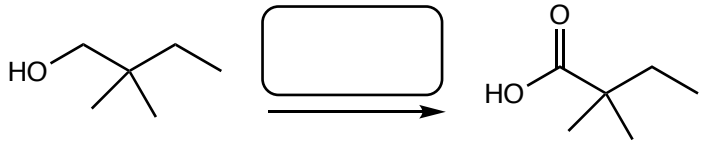
10. Answer the following 3 questions:

A. the solvent commonly referred to as "ether" has what structure?

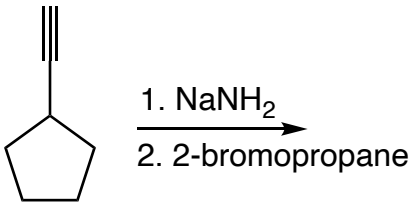
B. ether was first developed as an anesthetic for what type of medical practice?

C. peroxides are formed when ethers react with what compound?

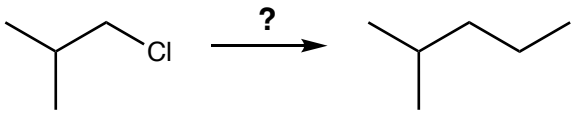
11. In the box, provide the reagent that is best suited for the following reaction:



12. What is the product of the following reaction sequence?

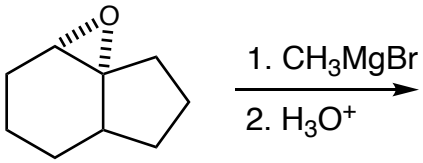


13. What organometallic reagent would be best suited to complete the following reaction (may be more than one)?

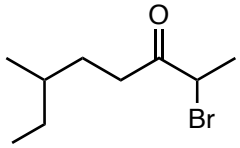


A. CH_3CH_2MgBr
B. CH_3MgBr
C. $(CH_3)_2CuLi$
D. $(CH_3CH_2)_2CuLi$

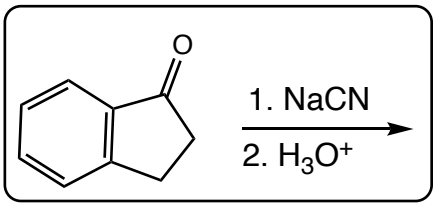
14. What is the expected product of the following reaction sequence (show stereochemistry):

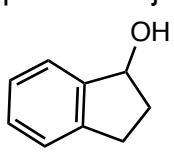


15. What is the IUPAC name of the following compound?

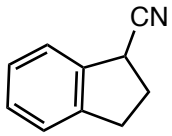


16. What one of the following is the expected major product of the following reaction:

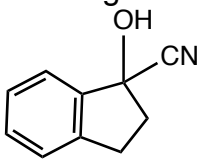




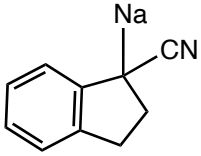
A



B

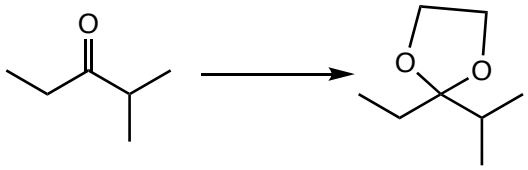


C



D

17. What set of reagents must be added to complete the following reaction:

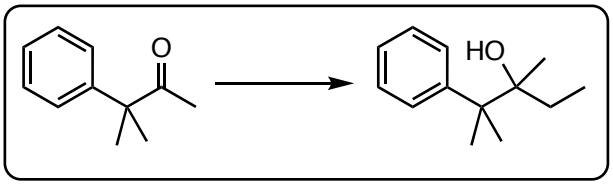


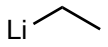
A. $HOCH_2OH$, TsOH
B. $HOCH_2OH$, KOH
C. $HOCH_2CH_2OH$, KOH
D. $HOCH_2CH_2OH$, TsOH
E. $HOCH_2CH_2CH_2OH$, KOH
F. $HOCH_2CH_2CH_2OH$, TsOH

18. Which one of the following statements properly describes why ketones are generally less reactive than aldehydes towards nucleophiles?

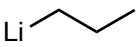
A. because ketones are more electrophilic and less sterically hindered
B. because ketones are less electrophilic and less sterically hindered
C. because ketones are more electrophilic and more sterically hindered
D. because ketones are less electrophilic and more sterically hindered

19. Addition of which alkyllithium compound, followed by H_3O+, is required to complete the following reaction?

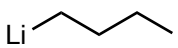




A



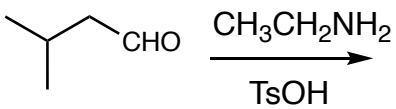
B



C

D

20. Draw the product expected from the following reaction:



The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
37 **Rb** Rubidium 85.4678	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.90585	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.90638	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.90550	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.8682	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90447	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.90545	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.9055	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.9479	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.078	79 **Au** Gold 196.96655	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.3833	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.98038	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (263)	107 **Bh** Bohrium (262)	108 **Hs** Hassium (265)	109 **Mt** Meitnerium (266)	110 (269)	111 (272)	112 (277)	113	114				

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.90765	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.92534	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93032	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93421	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.0381	91 **Pa** Protactinium 231.03588	92 **U** Uranium 238.0289	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)

1995 IUPAC masses and Approved Names from http://www.chem.qmw.ac.uk/iupac/AtWt/
masses for 107-111 from C&EN, March 13, 1995, p. 35
112 from http://www.gsi.de/z112e.html