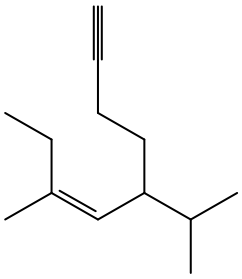
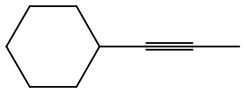
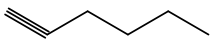
CHM 201-01 - Organic Chemistry I Name_____
Hour Exam IV
December 7, 2012 Signature_____

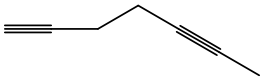
1.(5) Name the following compound:

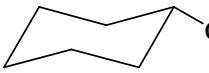


2.(23) Give the major products of the following reactions. a-e, 3 pts ea.; f and g, 4 pts ea.:

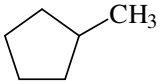
a)  $\xrightarrow[-78^{o}C]{Li,\ NH_3(l)}$

b)  $\xrightarrow[H_2SO_4]{HgSO_4,\ H_2O}$

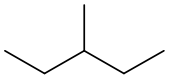
c)  $\xrightarrow[(\text{assume excess } H_2)]{H_2,\ \text{Lindlar's cat.}}$

d)  $\xrightarrow{\text{excess HBr}}$

e) $HC{\equiv}CH \xrightarrow[2)\ CH_3CH_2CH_2CH_2Br]{1)\ NaNH_2,\ NH_3(l)}$

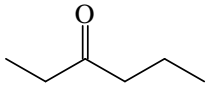
f) 

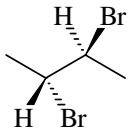
$\xrightarrow[2)\ 2\ Li\ \ 3)\ CuI \\ 4)\ (CH_3)_2CHCH_2CH_2I]{1)\ Br_2,\ h\nu}$

g) 

$\xrightarrow[2)\ Mg\ \text{in ether} \\ 3)\ D_2O]{1)\ Br_2,\ h\nu}$

3.(12) Propose a sequence of steps (use numbers to distinguish between separate steps) to carry out the following syntheses:

a) $HC{\equiv}CCH_2CH_3$ ⟶ 

b) $HC{\equiv}CH$ ⟶ 

4.(10) A hydrocarbon **A** has a formula of C_8H_8. Upon treatment with H_2 on a Lindlar catalyst, compound **B** (C_8H_{12}) forms. Further treatment of **B** with H_2/Pd on carbon (standard hydrogenation) yields **C** (C_8H_{16}).

a) How many sites of unsaturation does **A** have? _____

b) How many triple bonds does **A** have? _____

c) How many double bonds does **A** have? _____

d) How many rings does **A** have? _____

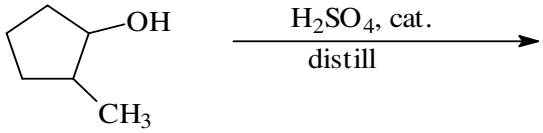
A (C_8H_8) $\xrightarrow{H_2,\ \text{Lindlar's cat.}}$ **B** (C_8H_{12}) $\xrightarrow{H_2,\ \text{Pd on carbon}}$ **C** (C_8H_{16})

Propose structures for **A**, **B** and **C** that fit the above criteria (there are several possibilities).

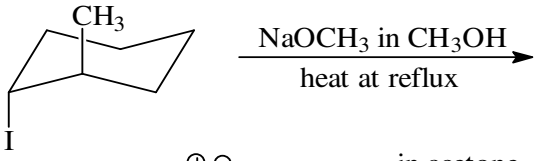
5.(12) **2-Methylbutane** undergoes a free radical chlorination reaction by treatment with Cl_2 and light (hν). Draw zig-zag structures of 2-methylbutane and all the possible monochlorination products (disregarding stereoisomers - all are $C_5H_{11}Cl$). If the relative reactivity of C-H at 1^o : 2^o : 3^o positions is 1 : 3.5 : 5, predict the ratios of the products and show how you arrived at your answer (show work).

6.(28) Draw the major product or products of the following reactions ***and*** *state the mechanism through which each reaction proceeds (e.g. E2).*

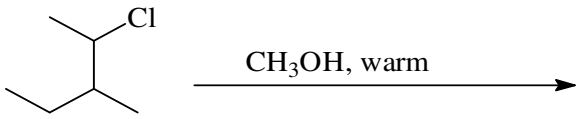
a) 

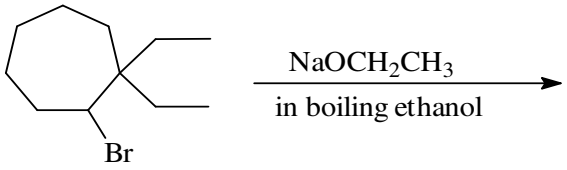
b) 

c) $CH_3CH_2C(CH_3)_2$ (Br) ethanol →

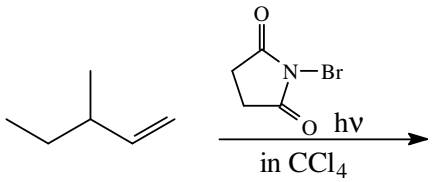
d) 

e) $CH_3OMs + K^{\oplus}\,{}^{\ominus}OCH(CH_3)_2$ in acetone →

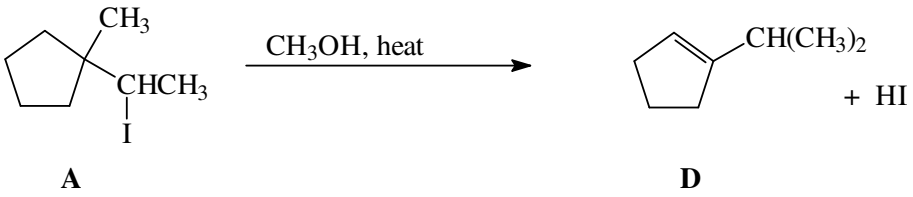
f) 

g) 

7.(8) Consider the reaction of **3-methyl-1-pentene** with N-bromosuccinimide (NBS) and light. Draw the initially formed free radical intermediate, a resonance structure of this intermediate and the two possible bromination products. *Circle the major product*.



8.(8) The reaction of 1-(1-iodoethyl)-1-methylcyclopentane (**A**) in methanol gives several products, one of which (compound **D**) is shown below. The potential energy profile of the reaction is also shown for the formation of this product. Draw the mechanism (use arrows to show electron flow) for the formation of **D**. In your mechanism, identify intermediates **B** and **C** as shown on the reaction profile.



A **D**