20. This question has several parts. In each, circle only one entry.

Circle the strongest base:

\[
\begin{align*}
\text{S}^- & \quad \text{O}^- & \quad \text{O}^- & \quad \text{S}^- & \quad \text{Cl} \quad \text{Cl} \quad \text{Cl}
\end{align*}
\]

\[
4 \times 5 = 20 \text{ points}
\]

Circle the only triol:

\[
\begin{align*}
\text{OH} & \quad \text{CH} & \quad \text{OH} & \quad \text{OH} & \quad \text{H}_2\text{N} - \text{CH}_2 - \text{NH}_2 & \quad \text{CH}_3 & \quad \text{C}_6\text{H}_5\text{SH}
\end{align*}
\]

Circle the only compound that does NOT react with \(\text{CH}_3\text{CH}_2\text{MgBr}\):

\[
\begin{align*}
\text{C}_6\text{H}_5\text{SH} & \quad \text{Octane} & \quad \text{Cyclohexane} & \quad \text{Phenylpropanol} & \quad \text{Phenylethylene}
\end{align*}
\]

Circle the most acidic compound:

\[
\begin{align*}
\text{Octyne} & \quad \text{Octyne} & \quad \text{Methylcyclohexene} & \quad \text{Benzene}
\end{align*}
\]

\[
\text{FINAL SCORE} \quad 270
\]
2. Propose a sequence of synthetic steps that would efficiently accomplish the conversion shown below. In addition to the ketone starting material given below, you can use any inorganic reagents and other organic compounds with one carbon only.  

3. For each of the following structures, give a complete systematic IUPAC name. Be sure to indicate stereochemistry where this is pertinent.
4. For each of the reactions or series of reactions below, draw the structure of the missing starting materials, reagents, or final major organic product(s) in the box(es) provided. Make sure to include all the pertinent information about stereochemistry and charges. 120 points
1) $R_2BH / NaOH / H_2O_2$
2) NaBH$_4$
3) $H_3O^+ / heat$

1) mCPBA
2) NaSH, then $H_3O^+$
3) mild oxidation

(specify stereochemistry)

1) TsCl / CH$_2$Cl$_2$
2) CH$_3$C$\equiv$C
3) Na / NH$_3$

1) Mg / Et$_2$O
2) D$_2$O

1) O$_3$, then (CH$_3$)$_2$S
2) LiAlH$_4$
3) $H_3O^+ / heat$
4) $H_2 / Pt$

1) mCPBA
2) NaI, then $H_3O^+$
3) NaBr

(Your reaction sequence should be stereospecific)
5. When compound shown below is exposed to an acid, a molecule of water is eliminated, and a structural rearrangement ensues. The final product is a ketone with a molecular formula C_{18}H_{18}O. However, despite the fact that there are two -OH groups in the starting material, only one ketone is produced, with greater than 99% selectivity. Draw (a) the structure of that ketone and (b) the detailed mechanism that explains its formation. Then (c) provide a brief explanation why no other products are formed. Show all charges and intermediates, and use curved arrows to indicate the flow of electrons. Do not draw transition states.

40 points

6. BONUS QUESTION: Dow Chemicals is the largest US chemical manufacturer. Name another big chemical company, either in the US or worldwide.

10 points

Du Pont, BASF, Celanese, Clorox, etc.