


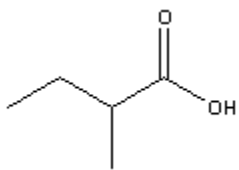
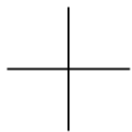
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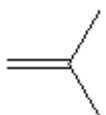
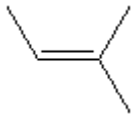
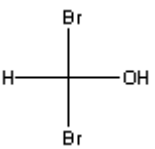

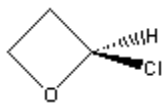
1) Write chemical formulas in the order C H O for the following skeletal structures. The answers are case sensitive.

2) Identify the oxidant and the number of electrons transferred in the following reaction.

reaction	oxidant	n
$5\text{Au} + 24\text{H}^{1+} + 3\text{MnO}_4^{1-} \rightarrow 5\text{Au}^{3+} + 3\text{Mn}^{2+} + 12\text{H}_2\text{O}$	<p><input type="radio"/> Au</p> <p><input type="radio"/> H^{1+}</p> <p><input type="radio"/> MnO_4^{1-}</p>	<input type="text"/>

3) You get only one submission of this question! Does each the following molecules have a stereoisomer?

4) Use a [Standard Reduction table](#) to write a balanced redox equations and to determine both the cell potential and the number of electrons transferred for the spontaneous redox process that occurs when the following couples are connected.

- Use a caret to indicate a superscript: $\text{Ag}^{1+} = \text{Ag}^{1+}$
-
- Use a hyphen + greater than ($->$) for yields.
- Enter substances in the order **OX(1) + RED(2) \rightarrow RED(1) + OX(2)**.
- [Table of Standard Reduction Potentials](#)

$\text{Pb}^{2+}/\text{Pb} + \text{Ag}^{1+}/\text{Ag}$

$E^\circ = \text{[]} \text{ V}$

$n = \text{[]}$

$\text{I}_2/\text{I}^{1-} + \text{Fe}^{3+}/\text{Fe}^{2+}$

$E^\circ = \text{[]} \text{ V}$

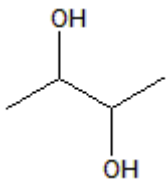
$n = \text{[]}$

5) Write out the Bronsted acid-base reaction and determine the equilibrium constant for the reactions that occur when the following solutions are mixed. Use ^ to indicate superscripts but nothing for subscripts. **Express all equilibrium constants to three significant digits.** [Acid-Base Table](#)

- Use carots to indicate superscripts and -> for yields.
- Express all equilibrium constants to three significant figures.
- Write the substances in the order given at the top of the column.

Mixed Solutions	Acid(1) + Base(2) -> Base(1) + Acid(2)	K
$\text{KH}_2\text{PO}_4 + \text{K}_2\text{S}$	<input type="text"/>	<input type="text"/>
$\text{KCN} + \text{HC}_2\text{H}_3\text{O}_2$	<input type="text"/>	<input type="text"/>
$\text{HCl} + \text{KNO}_2$	<input type="text"/>	<input type="text"/>
$\text{HClO} + \text{H}_2\text{O}$	<input type="text"/>	<input type="text"/>

6) How many constitutional isomers are there of $\text{C}_4\text{H}_8(\text{OH})_2$? How many of the isomers have branched carbon chains? One isomer is drawn below.

	Number of isomers: <input type="text"/>	Number of branched isomers: <input type="text"/>
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7) Use the energy diagram to answer the true or false questions.

<p>The diagram shows an energy axis on the left. Species A is represented by a horizontal line with an upward arrow above it. Species B is represented by a horizontal line with both upward and downward arrows above it. Above these, there are two more energy levels: A¹⁺ and B²⁺. A¹⁺ is slightly higher in energy than B²⁺. Both A¹⁺ and B²⁺ are significantly higher in energy than both A and B.</p>	A can oxidize B to B ²⁺	<input type="checkbox"/>
	A ¹⁺ can oxidize B to B ⁴⁺	<input type="checkbox"/>
	A can reduce B to B ¹⁻	<input type="checkbox"/>
	B can reduce A to A ¹⁻	<input type="checkbox"/>
	A ¹⁺ is a better oxidant than B ²⁺	<input type="checkbox"/>
	A ¹⁻ is a better reductant than B	<input type="checkbox"/>

8) What is the pH of a 0.0083-M solution of HCl? Report your answer to the nearest 0.01 pH unit.

pH =

What is the pH of 0.0498-M solution of NaOH? Report your answer to the nearest 0.01 pH unit.

pH =

9) Name the following organic compounds. If a compound can exist in more than one isomer, identify the isomer that is drawn:

	<input type="text"/>
	<input type="text"/>
	<input type="text"/>

10) Write balanced redox equations for the following processes or write **none** if no extensive process takes place.

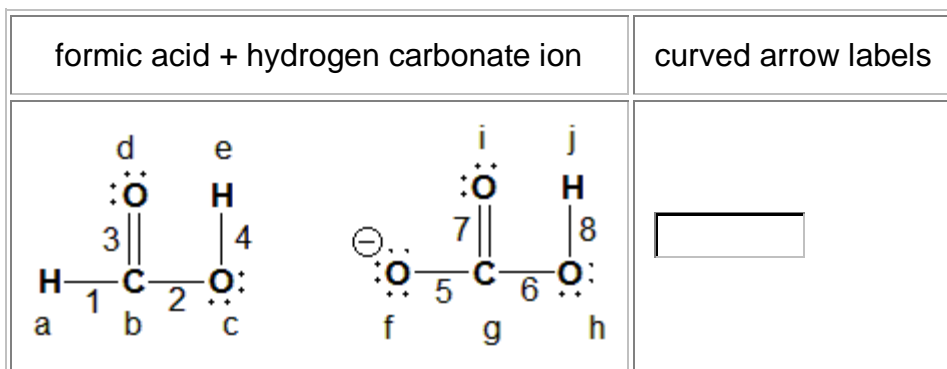
- Use a caret to indicate a superscript: $\text{Ag}^{1+} = \text{Ag}^{1+}$
-
- Use a hyphen + greater than ($->$) for yields.
- Enter substances in the order given at the top of the table.
- [Table of Standard Reduction Potentials](#)

reactants	OX(1) + RED(2) + other -> RED(1) + OX(2) + other
Metallic nickel is added to water	<input type="text"/>
Tin metal is added to hydrochloric acid.	<input type="text"/>
A solution of Fe^{2+} is mixed into nitric acid.	<input type="text"/>
Metallic copper is placed into a solution of Sn^{2+}	<input type="text"/>
Lead metal is added to a solution containing both Zn^{2+} and Cu^{2+} ions.	<input type="text"/>

11) Indicate the direction of curved arrows for the mechanism of the reaction between formic acid and hydrogencarbonate ion.

Instructions:

- Atoms are lettered a - j, and bonds are numbered 1-8.
- The first label of each curved arrow must be its origin and the second label is its destination. cg would indicate a curved arrow from atom c to atom g, while 5g would indicate a curved arrow from bond 5 to atom g.
- Different curved arrows in the same mechanism should be separated by commas. For example, cg,5g would indicate a mechanism with two curved arrows.



12) **You get only one submission of this question!** Indicate which solution (A or B) would have the lower pH. [Acid-Base Table](#)

Solution A	Solution B	lower pH
0.10 M KCN	0.10 M HCN	
0.10 M KF	0.20 M KF	
0.10 M HF	0.10 M HCl	
0.10 M HCl	0.20 M HCl	

13) **Only one submission of this question!** Indicate whether each of the following is a galvanic or an electrolytic cell.

Anode	Cathode	cell type
Cu^{2+}/Cu .34	Zn^{2+}/Zn -.76	
Sn^{2+}/Sn -.14	Fe^{2+}/Fe -.44	

14) **No Marks!** Select the stronger acid in each pair (A or B).

A	B	Stronger acid
CH_3OH	CF_3OH	
H_3PO_4	H_3PO_3	
ClOH	BrOH	