Sophie

Chem 180 — [redacted] — Quiz 05 — [redacted]

Turn in one copy per group before you leave. You will mix pages from individual copies to create the group submission. Answer all questions in the boxes provided, and label all parts clearly (a), (b), (c), etc. when applicable.

Answer the questions completely and correctly, to the best of your ability. Pay attention to the Objective (FO/CO) listed for all questions: this is the same format you will see on your tests.

In addition to the CHEM 180 reference sheet, you may use your own model kit, and your own mind.

Best practices:
Make mistakes on paper.
Do not erase, cross out answers you wish to change and add new answers.
If you are staring at a question without writing anything down, move on to something else.

The group Manager is in charge of organizing the pages (in order) so that the group's work can be scanned for upload to Gradescope.

This page was completed by: Sophie Olson (list first and last name)

Cs+

FO 18: Relate pH to concentrations of acids and bases in aqueous solutions.

base

You prepare an aqueous solution of: 1.0 M CsOH

(a) List all species that are present in concentrations of approximately 1 M or higher.
(b) List all additional species that are present in concentrations of at least 10^{-5} M.
(c) Estimate the solution pH

(a)	(b)	(c)
$\ominus OH$ $Cs^{\oplus}$ H_2O	none	pH < 7

FO 19: Identify acids and bases to prepare a buffer.

You need to prepare a buffer at pH = 6.75 for your biochemistry lab. If you have glassware, water and other measuring equipment available in your lab, along with the chemicals listed below, carefully select the compound(s) you wish to use.
H_3PO_4, 98.0 g/mol
NaH_2PO_4, 119.98 g/mol
Na_2HPO_4, 141.96 g/mol
Na_3PO_4, 163.94 g/mol
Phosphoric acid (H_3PO_4) is a triprotic acid, with the following pKa's: 2.12, 7.21, 12.38

(a) List what you will use to make this buffer (use chemical formulas).

H_3PO_4

(b) List which buffer component is present at the higher concentration.

Na_3PO_4

This page was completed by: Abdul Khan [redacted] (list first and last name)

FO 20: Describe how a buffer reacts to the addition of strong acids and bases.

You made 1.0 L of a buffer using 0.24 M sodium dihydrogen phosphate, NaH_2PO_4 (pKa 7.21) and 0.18 M sodium hydrogen phosphate, Na_2HPO_4.

(a) Write a net ionic equation for the proton-transfer that happens in the buffer when you add 0.25 moles CsOH.

$H_2PO_4^{-} + OH^{-} \rightleftharpoons HPO_4^{2-} + H_2O$

0.24 0.25 0.18

(b) What happens to the pH of the solution when you add 0.25 moles CsOH?

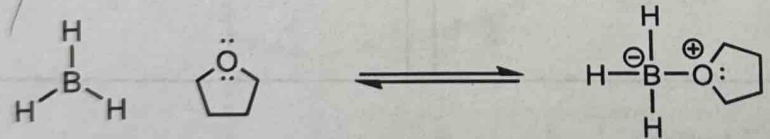
decreases

(c) Is it still a buffer?

No

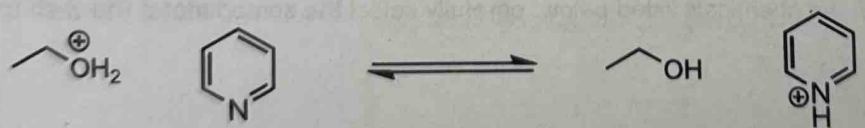
FO 21: Identify and compare/contrast Brønsted-Lowry and Lewis acids/bases by structure and reaction.

(a) In the following reaction, describe the reactivity of the **ether.** List any/all that apply: Brønsted-Lowry acid, Brønsted-Lowry base, Lewis acid, Lewis base.



Lewis base

(b) In the following reaction, describe the reactivity of the **alcohol.** List any/all that apply: Brønsted-Lowry acid, Brønsted-Lowry base, Lewis acid, Lewis base.

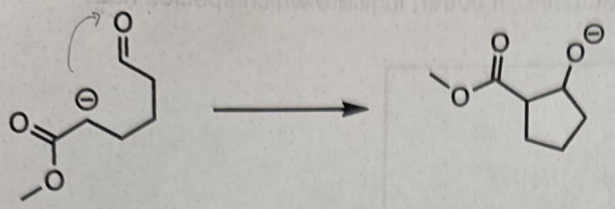


Brønsted-Lowry acid
Lewis acid

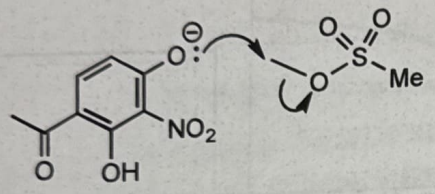
This page was completed by: Anthie Poulos (list first and last name)

FO 22: Draw the products or draw the curved arrows for any step of a mechanism.

Draw the curved arrow(s).

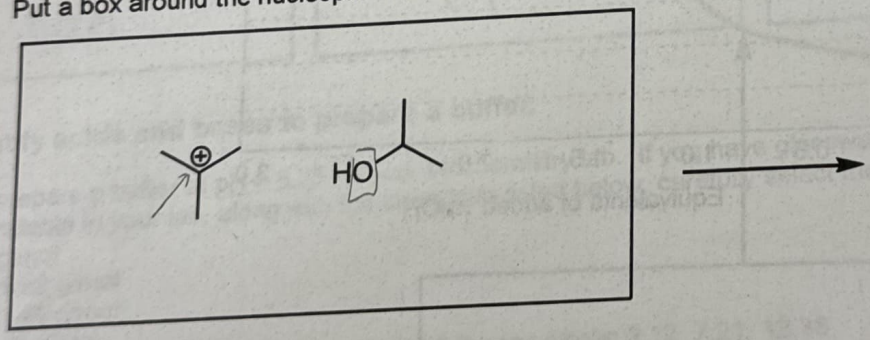


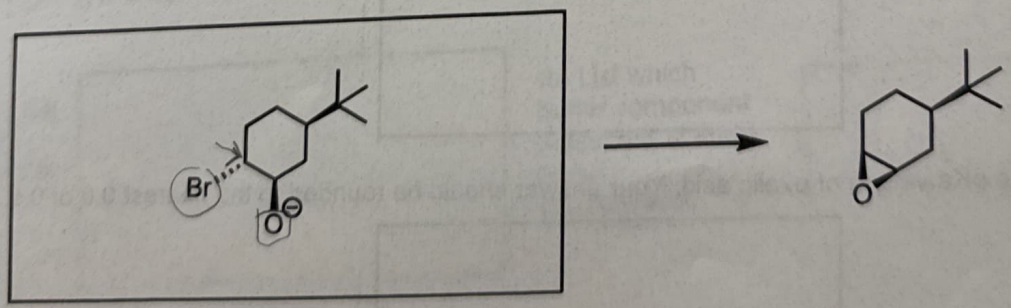
Draw the product(s).



FO 23: Identify whether an atom or group of atoms constitutes a nucleophile, electrophile, or good leaving group.

Put a box around the nucleophile. Circle the leaving group. Draw an arrow pointing at the electrophile.



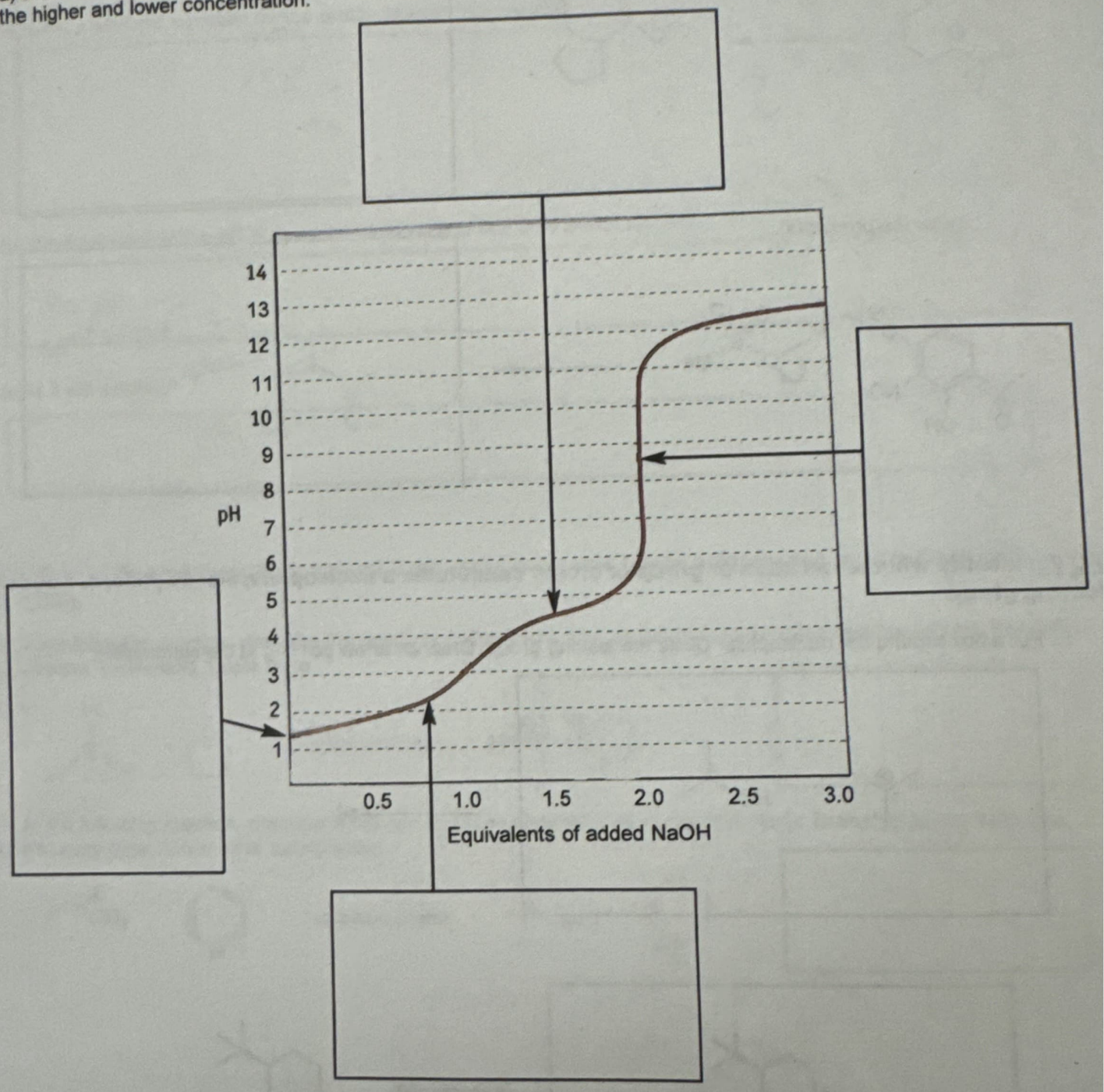


This page was completed by: Matt Colladeo (list first and last name)

CO 2: Identify the composition of all sections of a titration curve.

Oxalic acid (HO_2CCO_2H) is titrated with sodium hydroxide, and the following titration curve is obtained.

a) Draw the predominant species in solution at each indicated point. If buffer, indicate which species has the higher and lower concentration.



b) List the approximate pKa values of oxalic acid. Your answer should be rounded to the nearest 0.0 or 0.5.