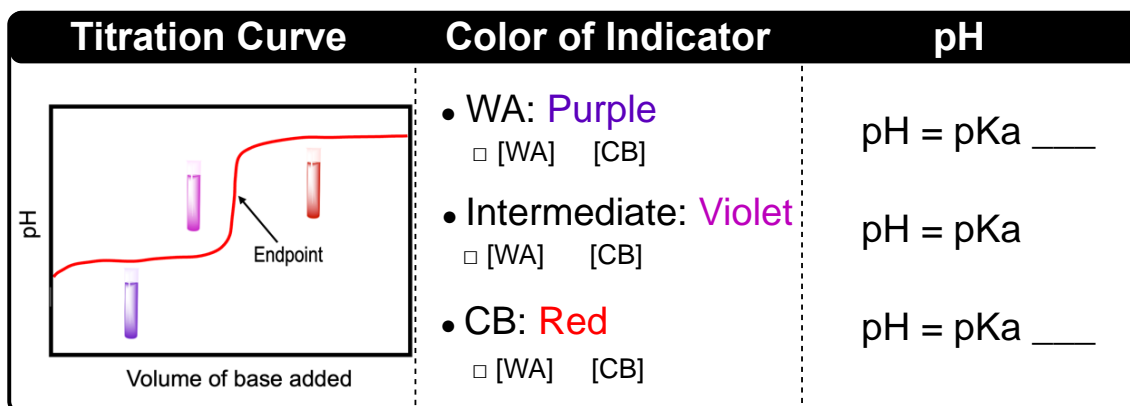


CONCEPT: ACID-BASE INDICATORS

- **Acid-Base Indicator** is a weak _____ or _____ that *indicates* the pH at *endpoint* of titration.
 - **Endpoint:** point in titration right _____ the equivalence point when indicator changes _____.
 - Color change: weak form of indicator possesses a different color from its conjugate form.
 - Best indicator for titration: when _____ value of indicator is close to _____ at equivalence point.
- Each indicator has a pH range: $\text{pH} = \text{pK}_a \pm \text{_____}$

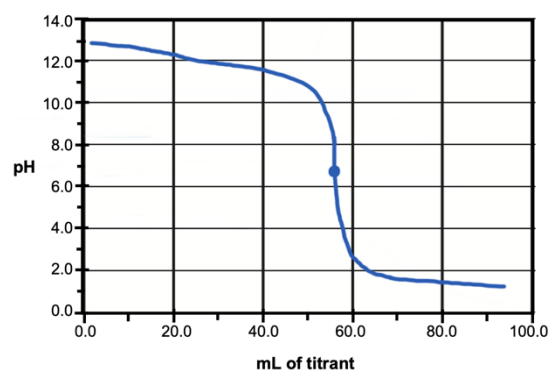


- Some common acid-base indicators:

Indicator	pH Range	Colors
Crystal Violet	0 -1.8	yellow to blue
Thymol Blue	1.2-2.8 / 8.0-9.2	red to yellow/yellow to blue
Bromophenol Blue	3.0-4.6	yellow to blue
Methyl Orange	3.3-4.5	red to yellow
Methyl Red	4.2-6.2	red to yellow
Phenolphthalein	8.3-10.0	colorless to pink

EXAMPLE: Pick the best indicator for the following titration

- bromothymol blue $\text{pK}_a = 7.2$
- thymolphthalein $\text{pK}_a = 9.2$
- phenolphthalein $\text{pK}_a = 9.5$
- methyl red $\text{pK}_a = 5.1$
- bromophenol blue $\text{pK}_a = 4.1$



CONCEPT: ACID-BASE INDICATORS

PRACTICE: Chemistry student is using an indicator with a pKa of 4.7 for the titration of a strong acid with strong base.

Calculate the pH range at which the indicator will change colors.

- a) 2.7-3.5 b) 10-11 c) 4.7-8.7 d) 3.7-5.7 e) 2.7-5.8

PRACTICE: Bromophenol blue ($\text{pK}_a = 4.1$) is a common acid-base indicator. It is yellow in its acidic form and blue in conjugate base form. If the solution being titrated has a $\text{pH} = 4.0$, what color would the bromophenol blue indicator possess?

- a) yellow b) orange c) blue d) green e) purple