Lab #31: Acid Base Indicators

**Aim:**  To determine the pH of an unknown sample.

**Vocabulary:** (be sure to cite source) (6 POINTS):

Arrhenius Acid:

Arrhenius Base:

Indicator:

**Materials** (2 points):

Well Plate

Indicators (list from Table M):

Acid and Base samples

Unknown sample

pH paper

**Method:** Test the acid, the base and the unknown samples with the indicator given

1. Place a drop of the acid in a well plate. Add a drop of indicator. Complete the data table in the lab.
2. Repeat for base.
3. Repeat steps 1 and 2 for each of the 7 indicators.
4. Analyze results using Table M. Then test the acid and base each with pH paper and record the actual pH value.
5. Test the unknown using a single indicator and record the data. Estimate the pH based on the single indicator.
6. Pass your indicator data to the next lab group; receive data from the prior lab group. Do a new estimate using the two indicators.
7. Continue to share data until you have completed the entire data table for the unknown. Then compare with Table M to estimate the pH (this is your experimental value).
8. Finally test the unknown with pH paper and record the actual pH value.

Data & Analysis:

ACID:

**Complete the data chart and then compare your results for the acid with the color guide on Table M** (14 pts)**:**

|  |  |  |
| --- | --- | --- |
| Indicator | Color in Acid | pH range (from table M) |
| Methyl orange |  |  |
| Bromthymol blue |  |  |
| Phenolphthalein |  |  |
| Red Litmus |  |  |
| Blue Litmus |  |  |
| Bromcresol green |  |  |
| Thymol blue |  |  |

What is the pH range of your acid? (2 pts) :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Test the acid with pH paper. Record actual pH: (2 pts)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

BASE:

**Complete the data chart and then compare your results for the acid with the color guide on Table M** (14 pts):

|  |  |  |
| --- | --- | --- |
| Indicator | Color in Base | pH range (from table M) |
| Methyl orange |  |  |
| Bromthymol blue |  |  |
| Phenolphthalein |  |  |
| Red Litmus |  |  |
| Blue Litmus |  |  |
| Bromcresol green |  |  |
| Thymol blue |  |  |

What is the pH range of your base? (2 pts):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Test the base with pH paper. Record actual pH: (2 pts)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**UNKNOWN:**

Record the indicator used and color from your single indicator test. Complete the final column by comparing your color with Table M (2 pts):

|  |  |  |
| --- | --- | --- |
| Indicator | Color | pH range (from table M) |
|  |  |  |

Based only on this one indicator what is the pH range of your unknown? (1 pt)\_\_\_\_\_\_\_\_\_\_\_\_

Trade your information with the next lab table and record ***both*** the first and second indicators along with results below (2 pts):

|  |  |  |
| --- | --- | --- |
| Indicator | Color | pH range (from table M) |
|  |  |  |
|  |  |  |

Based only on these 2 indicators what is the pH range of your unknown? (1 pt)\_\_\_\_\_\_\_\_\_\_\_\_

Now complete the table below using data shared with all lab groups. Compare with Table M to complete the final column (5 pts):

|  |  |  |
| --- | --- | --- |
| Indicator | Color | pH range (from table M) |
| Methyl orange |  |  |
| Bromthymol blue |  |  |
| Phenolphthalein |  |  |
| Red Litmus |  |  |
| Blue Litmus |  |  |
| Bromcresol green |  |  |
| Thymol blue |  |  |

Based on the results of all indicators what is the pH range of your unknown? (2 pts)\_\_\_\_\_\_\_\_\_\_\_\_\_

Test the unknown with pH paper. Record actual pH: (2 pts) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

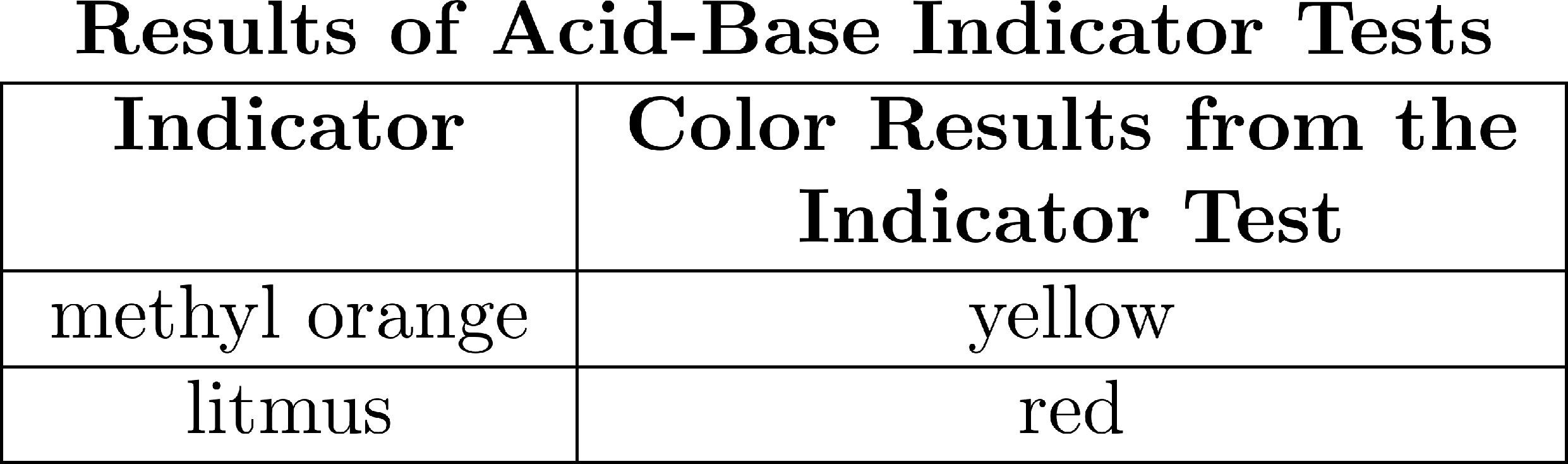
Is the unknown an acid or a base? (2 pts) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Multiple Choice (7 points)**

\_\_\_\_\_\_\_1. Three samples of the same solution are tested, each with a different indicator. All three indicators, bromthymol blue, bromcresol green and thymol blue, appear blue if the pH of the solution is  
  
A) 4.7 B) 6.0 C) 7.8 D) 9.9

\_\_\_\_\_\_\_2.Which indicator would best distinguish between a solution with a pH of 3.5 and a solution with a pH of 5.5   
A) bromthymol blue B) bromcresol green C) litmus D) thymol blue

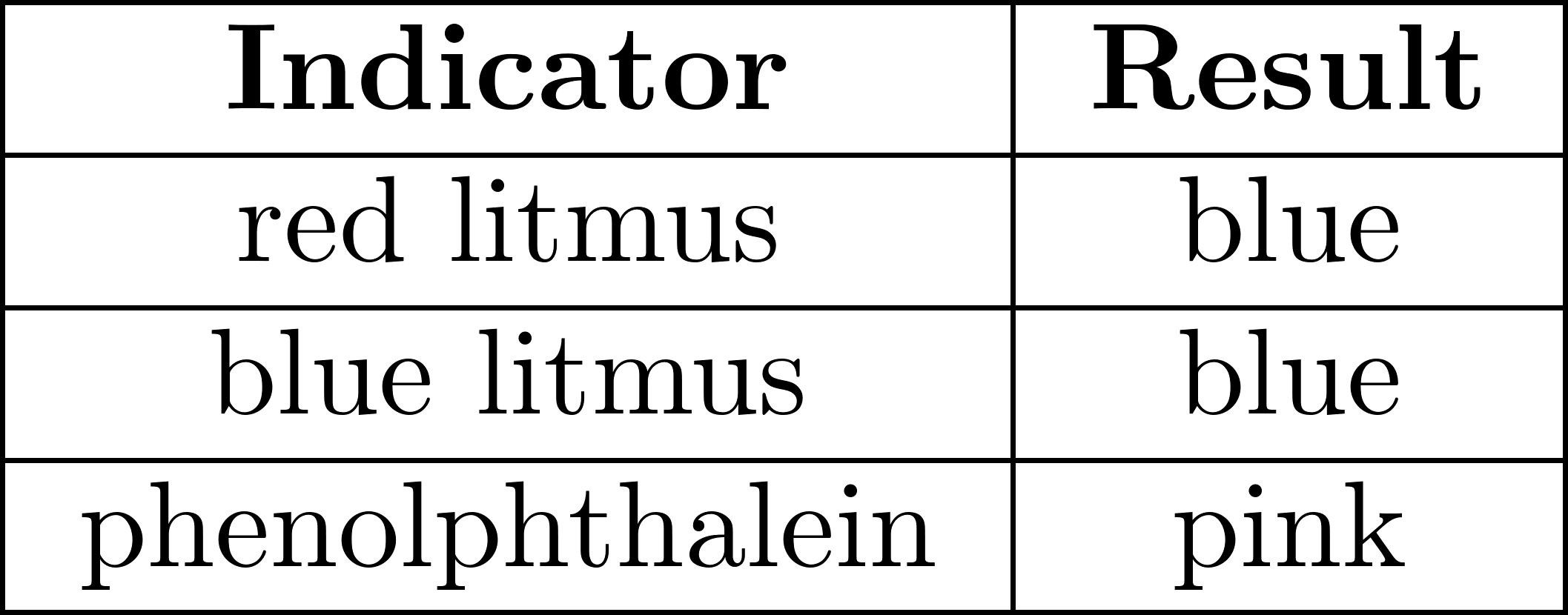
**\_\_\_\_\_\_\_**3.Which indicator, when added to a solution, changes color from yellow to blue as the pH of the solution is changed from 5.5 to 8.0?A) bromcresol green B) bromthymol blue C) litmus D) methyl orange

  
  
**\_\_\_\_\_\_\_**4. The table below shows the color of the indicators methyl orange and litmus in two samples of the same solution.

Which pH value is consistent with the indicator results? A) 1 B) 5 C) 3 D) 10

\_\_\_\_\_\_5. According to Reference Table M, what is the color of the indicator methyl orange in a solution that has a pH of 2?A) blue B) yellow C) orange D) red

\_\_\_\_\_\_6. A solution with a pH of 11 is first tested with phenolphthalein and then with litmus. What is the color of each indicator in this solution?A) Phenolphthalein is colorless and litmus is blue. B) Phenolphthalein is colorless and litmus is red.   
C) Phenolphthalein is pink and litmus is blue. D) Phenolphthalein is pink and litmus is red.

\_\_\_\_\_\_7. The results of testing a colorless solution with three indicators are shown in the table below.

Which formula could represent the solution tested?

A) NaOH(aq) B) HCl(aq) C) C6 H12O6 (aq) D) C12H22O11(aq)

**Name**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd.\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Questions (answer in full sentences**). (12 POINTS)

1. How did you use Table M to determine the pH of your unknown.
2. Compare the accuracy of the unknown pH determined using one indicator, two indicators, and all indicators.
3. What ions present in acids and bases that cause indicators to change color?

Conclusion: RERUN (20 POINTS)

Restate: aim; Explain: see question 1 Results: see analysis for unknown

Uncertainty: See question 2 New Learning: See question 3

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