pH and Indicator Data

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

At 25 °C, an aqueous solution is acidic below pH 7 and basic above pH 7. Each drop of one pH unit corresponds to ten times the hydronium concentration in the dilute solutions in this worksheet.

1 Which sample is acidic at 25 °C?

(1) pH 4

(2) pH 7

(3) pH 9

(4) pH 12

2 How many times as concentrated in hydronium is a pH 3 solution as a pH 5 solution? Show your reasoning. [1]

Answer and work

_____

_____

3 Two basic aqueous samples have pH values of 8 and 10 at 25 °C. Which contains the greater hydronium concentration? Explain. [1]

Answer and work

_____

_____

4 What generally happens to the pH of a dilute acidic solution when distilled water is added at 25 °C?

(1) It decreases as hydronium concentration falls.

(2) It increases toward 7 as hydronium concentration falls.

(3) It remains fixed because only volume changes.

(4) It increases above 7 as more acid is formed.

Indicator Screening

Use the information below to answer the questions.

A laboratory adds each indicator to a separate portion of one sample at 25 °C. X turns yellow and Y stays colorless. In this model, the colors within each transition range are distinct from both colors listed.

Indicator	Lower pH color	Higher pH color
X	Red below 3.1	Yellow above 4.4
Y	Colorless below 8.2	Pink above 10.0

5 What does the yellow color of indicator X establish using the table?

(1) pH below 3.1

(2) pH exactly 3.1

(3) pH exactly 4.4

(4) pH above 4.4

6 Give the pH range supported by both indicator observations. State the evidence for each limit. [1]

Answer and work

7 Is a pH of 7 consistent with these two observations?

(1) Yes, 7 is between the limits from the indicators.

(2) No, yellow X requires a pH below 3.1.

(3) No, colorless Y requires a pH above 10.0.

(4) No, both indicators show that the pH must be exactly 4.4.

8 Name a measurement the laboratory could make to decide whether the original sample is acidic, neutral, or basic. [1]

Answer and work