

Name: Key
 Blk: _____ Date: _____

Chemistry 12
ACID BASE PART II Lesson # 17
INDICATORS CONTINUED

For today's lesson we first need to review our elementary school knowledge of COLOURS

- To make Green you mix:
blue + yellow
- To make Orange you mix:
red + yellow
- To make Purple you mix:
red + blue
- To make Brown you mix:
all colours

PH	Colour
3	ORANGE
4	YELLOW-ORANGE
5	YELLOW
6	YELLOW-GREEN
7	GREEN-YELLOW
8	GREEN
9	YELLOW-BROWN
10	RED-PURPLE

A **UNIVERSAL INDICATOR** is an indicator solution that changes colour several times over a range of pH values.

Example 1. Identify the colour and pH range that a UNIVERSAL INDICATOR made up of Methyl Orange, Bromothymol Blue and Phenolphthalein would produce.

Indicator	pKa	colour of HIn	colour of In ⁻
Methyl Orange	3.8	RED	YELLOW
Bromo-Blue	6.8	YELLOW	BLUE
Phenolphthalein	9.1	colourless	PINK

PH range	0-3.8	3.8-6.8	6.8-9.1	9.1-14.0
Methyl Orange	red	yellow	yellow	yellow
Bromo Blue	yellow	yellow	blue	blue
Phenol	colourless	colourless	colourless	pink
Combined colour	ORANGE	yellow	green	purple

Example 2. When a unknown substance was tested with a mixed indicator of Methyl Red, Phenol Red and Phenolphthalein the solution was ORANGE. Give the pH range for the unknown substance.

	pKa	HIn	In ⁻
Methyl Red	5.4	Red	Yellow
Phenol Red	7.3	YELLOW	RED
Ph	9.1	colourless	PINK

	0-5.4	5.4-7.3	7.3-9.1	9.1-14.0
M.R.	RED	YELLOW	YELLOW	YELLOW
P.P.	YELLOW	YELLOW	RED	RED
Ph	Colourless	Colourless	Colourless	PINK
TOGETHER:	ORANGE	YELLOW	ORANGE	PURPLE

Either 4 or 5.4 or 7.3 or 9.1
PH = 5.4 - 7.3

Example 3. A mixture of Thymol Blue and Alizarin Yellow is put in a solution with $[OH^-] = 1.0 \times 10^{-4} M$. Use your table of Acid-Base indicators to determine the colour of this mixed indicator.

$$pOH = -\log(1.0 \times 10^{-4}) = 4.00 \text{ pOH}$$

$$pH = 14.00 - 4.00$$

$$pH = 10.00$$

Thymol Blue	2.0 →	2.8 - Yellow Red	Yellow
Alizarin Yellow	11.1	Yellow	Red
Thymol Blue	8.8	Yellow	Blue

	0.-2.0	2.0-8.8	8.8-11.1
TB	RED	Yellow	BLUE
A.Y	YELLOW	YELLOW	YELLOW
COMB.	ORANGE	YELLOW	GREEN

∴ GREEN

SEATWORK/HOMEWORK: Exercises 115-120 pg 163 in HEBDEN
PLO's: 01-05