

# CONCEPT MAP...

## Special type of Integrals

$$(i) \int \sqrt{x^2 - a^2} dx = \frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \log|x + \sqrt{x^2 - a^2}| + c$$

$$(ii) \int \sqrt{a^2 - x^2} dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \log|x + \sqrt{x^2 + a^2}| + c$$

## DIFFERENTIATION:

$$(i) \frac{d}{dx}(\log x) = \frac{1}{x} \quad (ii) \frac{d}{dx}(a^x) = a^x$$

## Integral of special function:

$$(i) \int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \log \left| \frac{x-a}{x+a} \right| + c$$

$$(ii) \int \frac{dx}{a^2 - x^2} = \frac{1}{2a} \log \left| \frac{a+x}{a-x} \right| + c$$

$$(iii) \int \frac{dx}{\sqrt{x^2 - a^2}} = \log|x + \sqrt{x^2 - a^2}| + c$$

$$(iv) \int \frac{dx}{\sqrt{x^2 + a^2}} = \log|x + \sqrt{x^2 + a^2}| + c$$

## Integration by substitution

$$(i) \int \tan x \cdot dx = \log|\sec x| + c$$

$$(ii) \int \cot x \cdot dx = \log|\sin x| + c$$

$$(iii) \int \sec x \cdot dx = \log|\sec x + \tan x| + c$$

$$(iv) \int \operatorname{cosec} x \cdot dx = \log|\operatorname{cosec} x - \cot x| + c$$

## LOG IN CHEMISTRY

$$(i) \text{pH} = -\log[H^+]$$

$$(ii) \text{pOH} = -\log[OH^-]$$

$$(iii) \text{pKa} = -\log K_a$$

$$(iv) \text{pH} = \text{pKa} = \log \left( \frac{[A^-]}{[HA]} \right)$$

## LOGARITHMS

8. Binary log  
 $\log_2(x)$

7. Log in Scientific notation:

$$\log N = \log a + n$$

## 2. INTEGRALS

BASIC FORMULA:

$$(i) \int \frac{1}{x} dx = \log|x| + c$$

$$(ii) \int a^x \cdot dx = \frac{a^x}{\log a} + c$$

## BASIC FORMULAS:

1. Product rule:

$$\log ab = \log a + \log b$$

2. Quotient rule:

$$\log \frac{a}{b} = \log a - \log b$$

3. Power rule:

$$\log_a(m)^n = n \log m$$

4. Change of base formula:

$$\log_a b = \frac{\log_c b}{\log_c a}$$

5. Reciprocal Rule:

$$\log_a b = \frac{1}{\log_b a}$$

6. Power rule of  $\sqrt[n]{x}$ :

$$\log(\sqrt[n]{x}) = \frac{1}{n} \log(x)$$

9. Natural log  
 $\ln(x)$

Used in Python algorithm