STRONG ACID TITRATED BY STRONG BASE

Add 10.0 mL of 0.100 M $NaOH$ to 50.0 mL of 0.200 M HNO_3

Using stoichiometry to get rid of all $NaOH$

$$1\ NaOH_{(aq)} + 1\ HNO_{3(aq)} \rightarrow 1 H_2O_{(l)} + 1 Na_1(NO_3)_{1(aq)}$$

$$mol\ OH^{1-}_{added} = (10.0\ mL)\left(\frac{1\ L}{1000\ mL}\right)(0.100\ M\ NaOH)\left(\frac{1\ mol\ OH^{1-}}{1\ mol\ NaOH}\right) =$$

$$mol\ OH^{1-}_{added} = 1.00 \times 10^{-3}\ mol\ OH^{1-}_{added}$$

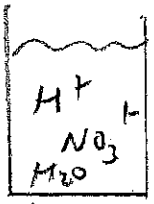
$$mol\ HNO_{3\ con} = (1.00 \times 10^{-3}\ mol\ OH^{1-}_{added})\left(\frac{1\ mol\ HNO_3\ con}{1\ mol\ OH^{1-}_{added}}\right) =$$

Enough HNO_3 to consume $NaOH$ $= 1.00 \times 10^{-3}\ mol\ HNO_{3\ con}$

$$mol\ HNO_{3\ left} = mol\ HNO_{3\ I} - mol\ HNO_{3\ con} =$$

$$= \underbrace{(50.0\ mL)\left(\frac{1\ L}{1000\ mL}\right)(0.200\ M\ HNO_3)}_{0.010\ mol\ HNO_{3\ I}} - 1.00 \times 10^{-3}\ mol\ HNO_{3\ con}$$

$$= 9.00 \times 10^{-3}\ mol\ HNO_{3\ left}$$



strong acid bucket

$HNO_3 \rightarrow H^+ + NO_3^{1-}$

$$mol\ NO_{3\ prod}^{1-} = (1.00 \times 10^{-3}\ mol\ HNO_{3\ con})\left(\frac{1\ mol\ Na_1(NO_3)_{1\ prod}}{1\ mol\ HNO_{3\ con}}\right)$$

$$\left(\frac{1\ mol\ NO_3^{1-}}{1\ mol\ Na_1(NO_3)_{1\ prod}}\right)$$

$$mol\ NO_{3\ left}^{1-} = mol\ NO_{3\ I}^{1-} + mol\ NO_{3\ prod}^{1-}$$

$$mol\ NO_{3\ left}^{1-} = 0 + 1.00 \times 10^{-3}\ mol\ NO_3^{1-}$$

$$mol\ NO_{3\ left}^{1-} = 1.00 \times 10^{-3}\ mol\ NO_3^{1-}$$

} since it is anion of strong acid, does not react w/ H_2O, don't care about [ ].

Stoichiometry (since Strong Acid

$$[H^+] = (9.00 \times 10^{-3}\ mol\ HNO_3)\left(\frac{1\ mol\ H^+}{1\ mol\ HNO_3}\right) = 9.00 \times 10^{-3}\ mol\ HNO_3$$

$$V = (50.0\ mL + 10.0\ mL)\left(\frac{1\ L}{1000\ mL}\right) = 0.060\ L$$

$$[H^+] = \frac{9.00 \times 10^{-3}\ mol\ HNO_3}{0.060\ L} = 0.150\ M$$

$$pH = -\log[H^+] = -\log(0.150\ M) = -(-0.8239) = 0.8239$$

$$\boxed{pH = 0.824}$$