Q1. 21 January Shift 2

The first and second ionization constants of H_2X are 2.5×10^{-8} and 1.0×10^{-13} respectively. The concentration of X^{2-} in $0.1 M H_2X$ solution is ____ $\times 10^{-15}$M. (Nearest Integer)

Q2. 22 January Shift 2

Which of the following mixture gives a buffer solution with $pH = 9.25$?

Given : $pK_b(NH_4OH) = 4.75$

(1) $0.2 M NH_4OH(0.5\ L) + 0.1 M HCl(0.5\ L)$

(2) $0.2 M NH_4OH(0.4\ L) + 0.1 M HCl(1\ L)$

(3) $0.4\ M NH_4OH(1\ L) + 0.1 M HCl(1\ L)$

(4) $0.5 M NH_4OH(0.2\ L) + 0.2 M HCl(0.5\ L)$

Q3. 23 January Shift 1

$x$mg of pure HCl was used to make an aqueous solution. 25.0 mL of $0.1 M Ba(OH)_2$ solution is used when the HCl solution was titrated against it. The numerical value of x is ____ $\times 10^{-1}$. (Nearest integer) Given : Molar mass of HCl and $Ba(OH)_2$ are 36.5 and 171.0 g mol^{-1} respectively.

Q4. 24 January Shift 1

Consider two Group IV metal ions X^{2+} and Y^{2+}. A solution containing $0.01 M X^{2+}$ and $0.01 M Y^{2+}$ is saturated with H_2S. The pH at which the metal sulphide YS will form as a precipitate is ____. (Nearest integer)

(Given: $K_{sp}(XS) = 1 \times 10^{-22}$ at $25^\circ C$, $K_{sp}(YS) = 4 \times 10^{-16}$ at $25^\circ C$, $[H_2S] = 0.1 M$ in solution, $K_{a1} \times K_{a2}(H_2S) = 1.0 \times 10^{-21}$, $\log 2 = 0.30$, $\log 3 = 0.48$, $\log 5 = 0.70$)

Q5. 28 January Shift 1

Consider a weak base ' B ' of $pK_b = 5.699$. ' x ' mL of 0.02 M HCl and ' y ' mL of 0.02 M weak base ' B ' are mixed to make 100 mL of a buffer of pH 9 at $25^\circ C$. The values of ' x ' and ' y ' respectively are:

[Given: $\log 2 = 0.3010, \log 3 = 0.4771, \log 5 = 0.699$]

(1)

x	y
85.7	14.3

(2)

x	y
14.3	85.7

(3)

x	y
11.1	88.9

(4)

x	y
42.7	57.3

Q6. 28 January Shift 1

Consider the dissociation equilibrium of the following weak acid

$HA \rightleftharpoons H^+(aq) + A^-(aq)$

If the pKa of the acid is 4, then the pH of 10 mMHA solution is ____.(Nearest integer)

[Given: The degree of dissociation can be neglected with respect to unity]

ANSWER KEYS

1. 100	**2.** (1)	**3.** 1825	**4.** 4	**5.** (2)	**6.** 3