

**Q1. 21 January Shift 2**

The first and second ionization constants of  $H_2X$  are  $2.5 \times 10^{-8}$  and  $1.0 \times 10^{-13}$  respectively. The concentration of  $X^{2-}$  in  $0.1M H_2X$  solution is  $\text{---} \times 10^{-15} M$ . (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)  $0.2M NH_4OH(0.5 L) + 0.1M HCl(0.5 L)$

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

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

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

**Q3. 23 January Shift 1**

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

**Q4. 24 January Shift 1**

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

(Given:  $K_{sp}(XS) = 1 \times 10^{-22}$  at  $25^\circ C$ ,  $K_{sp}(YS) = 4 \times 10^{-16}$  at  $25^\circ C$ ,  $[H_2S] = 0.1M$  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  $100 \text{ mL}$  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) 

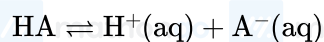
$x$	$y$
11.1	88.9

(4) 

$x$	$y$
42.7	57.3

**Q6. 28 January Shift 1**

Consider the dissociation equilibrium of the following weak acid



If the  $\text{pK}_a$  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