

Model answer Lesson 5 Chapter 3

Question	Answer	Question	Answer
1	C	38	D
2	D	39	D
3	B	40	A
4	A	41	D
5	D	42	C
6	C	43	A
7	D	44	B
8	D	45	C
9	C	46	A
10	D	47	C
11	B	48	C
12	D	49	D
13	B	50	B
14	C	51	6.63 (steps↓)
15	C	52	c (steps↓)
16	D	53	c (steps↓)
17	A	54	B (steps↓)
18	A	55	B (steps↓)
19	A	56	c (steps↓)
20	B	57	A (steps↓)
21	D	58	B (steps↓)
22	B	59	A (steps↓)
23	B	60	A (steps↓)
24	D	61	D (steps↓)
25	C	62	c (steps↓)
26	D	63	D (steps↓)
27	A	64	c (steps↓)
28	C	65	B (steps↓)
29	A	66	D (steps↓)
30	C	67	B (steps↓)

31	A	68	B (steps↓)
32	C	69	B (steps↓)
33	C	70	D (steps↓)
34	C	71	C (steps↓)
35	B	72	B (steps↓)
36	A	73	A (steps↓)
37	D		

Steps:

51) $K_w = [H^+] \times [OH^-]$

$$5.476 \times 10^{-14} = [H^+] \times [OH^-]$$

Where each is of concentration x ,

$$5.476 \times 10^{-14} = x^2$$

$$x = 0.234 \times 10^{-6}$$

$$pH = -\log [H^+]$$

$$pH = -\log (0.234 \times 10^{-6}) = 6.63$$

52) $pH = -\log [H^+]$

$$pH = -\log (0.01) = 2$$

53) $[H^+] = \sqrt{Ka \times Ca}$

$$[H^+] = \sqrt{1.2 \times 10^{-8} \times 0.2} = 48.98 \times 10^{-6}$$

$$pH = -\log [H^+]$$

$$pH = -\log (48.98 \times 10^{-6}) = 4.3$$

54) $pOH = -\log [OH^-]$

$$pOH = -\log(0.01) = 2$$

$$pH + pOH = 14$$

$$pH = 14 - 2 = 12$$

55) $[OH^-] = \sqrt{Kb \times Cb}$

$$[OH^-] = \sqrt{1.8 \times 10^{-5} \times 0.01} = 4.24 \times 10^{-4}$$

56) $pOH = -\log [OH^-]$

$$pOH = -\log (10^{-4}) = 4$$

$$pH + pOH = 14$$

$$pH = 14 - 4 = 10$$

57) $[H^+] = [H_3O^+]$

$$pH = -\log [H^+]$$

$pH = -\log (10^{-4}) = 4$, therefore, acidic

58) $[H^+] = \text{shift log} - pH$

$$[H^+] = \text{shift log} - 2.63 = 0.00234$$

$$[H^+] = \sqrt{Ka \times Ca}, \text{ when 2 sides are powered by 2}$$

$$[H^+]^2 = Ka \times Ca$$

$$Ka = \frac{[H^+]^2}{Ca} = \frac{0.00234^2}{0.01} = 5.49 \times 10^{-4}$$

59) $pH + pOH = 14$

$$\text{pH} = 14 - 2.5 = 11.5$$

$$[\text{H}^+] = \text{shift log} - \text{pH}$$

$$[\text{H}^+] = \text{shift log} - 11.5 = 3.16 \times 10^{-12}$$

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

$$\text{pH} = -\log (10^{-13}) = 13$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pOH} = 14 - 13 = 1$$

61) $\text{pH} + \text{pOH} = 14$

$$\text{pOH} = 14 - 12 = 2$$

$$[\text{OH}^-] = \text{shift log} - \text{pOH}$$

$$[\text{OH}^-] = \text{shift log} - 2 = 0.01$$

$$\text{Concentration} = \frac{\text{no.of moles}}{\text{volume of solution (L)}}$$

$$0.01 = \frac{x}{1}$$

$$x = 0.01 \text{ moles}$$

$$1 \text{ mole of NaOH} \rightarrow \text{molar mass} = (23+16+1) = 40\text{g}$$

$$0.01 \text{ moles} \rightarrow x$$

$$x = 0.01 \times 40 = 0.4\text{g}$$

62) $[\text{H}^+] = \text{shift log} - \text{pH}$

$$[\text{H}^+] = \text{shift log} - 3 = 0.001$$

$$[\text{H}^+] = \sqrt{K_a \times C_a}, \text{ when 2 sides are powered by 2}$$

$$[H^+]^2 = K_a \times C_a$$

$$K_a = \frac{[H^+]^2}{C_a} = \frac{0.001^2}{0.1} = 10^{-5}$$

63) 1 mole of NaOH \rightarrow molar mass = $(23+16+1) = 40\text{g}$

$$x \text{ moles} \rightarrow 0.4\text{g}$$

$$x = 0.4/40 = 0.01 \text{ moles}$$

$$\text{Concentration} = \frac{\text{no.of moles}}{\text{volume of solution (L)}}$$

$$\text{Concentration} = \frac{0.01}{0.2} = 0.05\text{M}$$

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

$$\text{pH} = -\log (0.05) = 1.3$$

64) $[H^+] = \text{shift log} - \text{pH}$

$$[H^+] = \text{shift log} - 13 = 10^{-13}$$

$$\text{Concentration} = \frac{\text{no.of moles}}{\text{volume of solution (L)}}$$

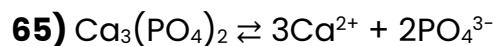
$$10^{-13} = \frac{x}{1 \times 10^{-3}}$$

$$x = 10^{-16} \text{ moles}$$

$$1 \text{ mole} \rightarrow 6.02 \times 10^{23} \text{ ions}$$

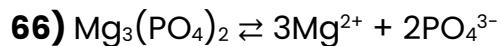
$$10^{-16} \text{ moles} \rightarrow x$$

$$x = 10^{-16} \times 6.02 \times 10^{23} = 6.02 \times 10^7 \text{ ions}$$



$$K_{\text{sp}} = (\text{Ca}^{2+})^3 \times (\text{PO}_4^{3-})^2$$

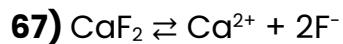
$$K_{\text{sp}} = (2 \times 10^{-8})^3 \times (1 \times 10^{-3})^2 = 8 \times 10^{-30}$$



$$K_{\text{sp}} = (\text{Mg}^{2+})^3 \times (\text{PO}_4^{3-})^2$$

$$K_{\text{sp}} = (3x)^3 \times (2x)^2 = 27x^3 \times 4x^2 = 108x^5$$

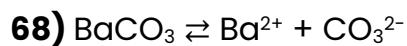
$$K_{\text{sp}} = 108 \times (6.26 \times 10^{-6})^5 = 1.038 \times 10^{-24} = 1.04 \times 10^{-24}$$



$$K_{\text{sp}} = (\text{Ca}^{2+}) \times (\text{F}^-)^2$$

$$K_{\text{sp}} = (x) \times (2x)^2 = x \times 4x^2 = 4x^3 = 3.5 \times 10^{-11}$$

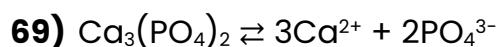
$$x = \sqrt[3]{\frac{3.5 \times 10^{-11}}{4}} = 2.06 \times 10^{-4}$$



$$K_{\text{sp}} = (\text{Ba}^{2+}) \times (\text{CO}_3^{2-})$$

$$K_{\text{sp}} = (x) \times (x) = x^2$$

$$K_{\text{sp}} = (4 \times 10^{-5})^2 = 1.6 \times 10^{-9}$$



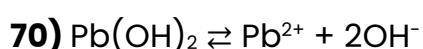
$$K_{\text{sp}} = (\text{Ca}^{2+})^3 \times (\text{PO}_4^{3-})^2$$

$$(\text{PO}_4^{3-}) = 2x = 3.3 \times 10^{-7}$$

$$x = 165 \times 10^{-9}$$

$$(\text{Ca}^{2+}) = 3x = 3 \times 165 \times 10^{-9} = 495 \times 10^{-9}$$

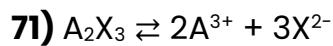
$$K_{\text{sp}} = (495 \times 10^{-9})^3 \times (3.3 \times 10^{-7})^2 = 1.32 \times 10^{-32}$$



$$K_{sp} = (Pb^{2+}) \times (OH^-)^2$$

$$K_{sp} = (x) \times (2x)^2 = x \times 4x^2 = 4x^3 = 2.5 \times 10^{-6}$$

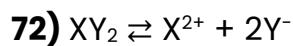
$$x = \sqrt[3]{\frac{2.5 \times 10^{-6}}{4}} = 8.54 \times 10^{-3}$$



$$K_{sp} = (A^{3+})^2 \times (X^{2-})^3$$

$$K_{sp} = (2x)^2 \times (3x)^3 = 4x^2 \times 27x^3 = 108x^5$$

$$x = \sqrt[5]{\frac{1.08 \times 10^{-23}}{108}} = 1 \times 10^{-5}$$



$$K_{sp} = (X^{2+}) \times (Y^-)^2$$

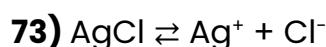
$$K_{sp} = (x) \times (2x)^2 = x \times 4x^2 = 4x^3$$

$$x = \sqrt[3]{\frac{1.6 \times 10^{-10}}{4}} = 3.419 \times 10^{-4}$$

$$\text{Concentration} = \frac{\text{no.of moles}}{\text{volume of solution (L)}}$$

$$3.419 \times 10^{-4} = \frac{x}{2}$$

$$x = 6.838 \times 10^{-4} \text{ moles} = 6.84 \times 10^{-4} \text{ moles}$$



$$K_{sp} = (Ag^+) \times (Cl^-)$$

$$K_{sp} = (x) \times (x) = x^2 = 2.56 \times 10^{-6}$$

$$x = \sqrt{2.56 \times 10^{-6}} = 0.0016M$$

$$\text{Concentration} = \frac{\text{no.of moles}}{\text{volume of solution (L)}}$$

$$0.0016 = \frac{x}{0.1}$$

$$x = 160 \times 10^{-6} \text{ moles}$$

$$1 \text{ mole of AgCl} \rightarrow \text{molar mass} = (108+35.5) = 143.5\text{g}$$

$$160 \times 10^{-6} \text{ moles} \rightarrow x\text{g}$$

$$x = 143.5 \times 160 \times 10^{-6} = 0.0229\text{g} = 0.023\text{g}$$



Nasser
El batal