JEE-ADVANCED-2014-P2-Model

Time: 2.00 PM to 5.00 PM **IMPORTANT INSTRUCTIONS** **Max Marks: 180**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 11 – 16)	Questions with Comprehension Type (3 Comprehensions – 2 +2+2 = 6Q)	3	-1	6	18
Sec – III(Q.N : 17 – 20)	Matrix Matching Type	3	-1	4	12
Total				**20**	**60**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 31 – 36)	Questions with Comprehension Type (3 Comprehensions – 2 +2+2 = 6Q)	3	-1	6	18
Sec – III(Q.N : 37 – 40)	Matrix Matching Type	3	-1	4	12
Total				**20**	**60**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 51 – 56)	Questions with Comprehension Type (3 Comprehensions – 2 +2+2 = 6Q)	3	-1	6	18
Sec – III(Q.N : 57 – 60)	Matrix Matching Type	3	-1	4	12
Total				**20**	**60**

PART-II_CHEMISTRY **Max Marks : 60**

Section-1
(One or more options correct type)

This section contains 10 Multiple Choice questions. Each Question has Four choices (A), (B), (C) and (D). Out of Which **Only One is correct**

21. Which of the following expressions is not true?

A) $\left[H^+\right]=\left[OH^-\right]=\sqrt{K_w}$ FOR A NEUTRAL SOLUTION

B) $\left[H^+\right]>\sqrt{K_w}$ and $\left[OH^-\right]<\sqrt{K_w}$ for an acidic solution

C) $\left[H^+\right]<\sqrt{K_w}$ and $\left[OH^-\right]>\sqrt{K_w}$ for an alkaline solution

D) $\left[H^+\right]=\left[OH^-\right]=10^{-7}M$ for a neutral solution at all temperature

22. The following equilibrium is established when hydrogen chloride is dissolved in acetic acid. $HCl+CH_3COOH \rightleftharpoons Cl^{-1}+CH_3COOH_2^+$, The set that characterizes the conjugate acid-base pairs is :

A) $\left(HCl,CH_3COOH\right)$ and $\left(CH_2COOH_2^+,Cl^-\right)$

B) $\left(HCl,CH_3COOH_2^+\right)$ *and* $\left(CH_3COOH,Cl^-\right)$

C) $\left(CH_3COOH_2^+,HCl\right)$ *and* $\left(Cl^-,CH_3COOH\right)$

D) $\left(HCl,Cl^-\right)$ *and* $\left(CH_3COOH_2^+,CH_3COOH\right)$

23. A weak acid HA has $K_a = 10^{-6} M^2$. What would be the molar ratio of this acid and its salt with strong base so that pH of the buffer solution is 5?

A) 1 B) 2 C) 10 D) 1/10

24. The correct order of increasing $\left[H_3O^+\right]$ in the following aqueous solution is

A) $0.01M\ H_2S < 0.01M\ H_2SO_4 < 0.01M\ NaCl < 0.01M\ NaNO_3$

B) $0.01M\ NaCl = 0.01M\ NaNO_3 < 0.01M\ H_2S < 0.01M\ H_2SO_4$

C) $0.01M\ H_2S < 0.01M\ NaNO_3 = 0.01M\ NaCl < 0.01M\ H_2SO_4$

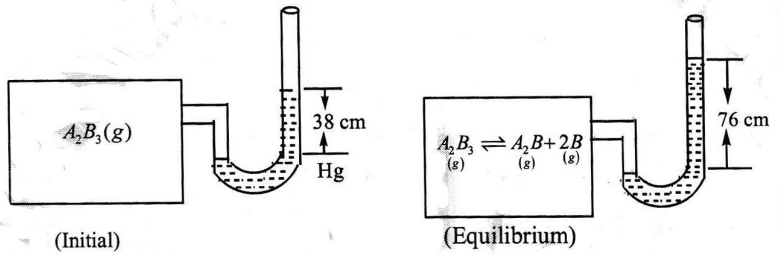
D) $0.01M\ H_2S < 0.01M\ NaNO_3 < 0.01M\ NaCl < 0.01M\ H_2SO_4$

25. When equal volumes of the following solutions are mixed, precipitation of $AgCl\left(K_{sp} = 1.8 \times 10^{-10} M^2\right)$ will occur only with

A) $10^{-4} M\left(Ag^+\right) and\, 10^{-4} M\left(Cl^-\right)$ B) $10^{-5} M\left(Ag^+\right) and\, 10^{-5} M\left(Cl^-\right)$

C) $10^{-6} M\left(Ag^+\right) and\, 10^{-6} M\left(Cl^-\right)$ D) $10^{-10} M\left(Ag^+\right) and\, 10^{-10} M\left(Cl^-\right)$

26. $A_2B_3(g)$ is injected suddenly into an evacuated rigid container shown below, which attained equilibrium after some time. What is the percentage dissociation of A_2B_3 at equilibrium? $(P_{bar} = 1atm)$(T=constant)



A) 16.67% B) 33.34% C) 25% D) 50%

27. In which of the following acid-base titration, pH is greater than 8 at the equivalence point?

A) Acetic acid versus ammonia

B) Acetic acid versus sodium hydroxide

C) Hydrochloric acid versus ammonia

D) Hydrochloric acid versus sodium hydroxide

28. A solution is saturated with respect to $SrCO_3$ and SrF_2. The $\left[CO_3^2\right]$ was found to be 1.2×10^{-3} M. The concentration of F^{-1} in the solution would be:

A) $1.3\times10^{-3}M$ B) $2.6\times10^{-2}M$ C) $3.7\times10^{-2}M$ D) $5.8\times10^{-7}M$

(Given: $K_{sp}\left(SrCO_3\right)=7.0\times10^{-10}M^2, K_{sp}\left(SrF_2\right)=7.9\times10^{-10}M^3$).

29. In a 1.0 L aqueous solution when the reaction

$2Ag^{+}_{(aq)}+Cu_{(s)}\rightleftharpoons Cu^{2+}_{(aq)}+2Ag_{(s)}$,reaches equilibrium, $\left[Cu^{2+}\right]=xM, \left[Ag^{1+}\right]=yM$

If volume of solution is doubled by adding water, then at equilibrium

A) $\left[Cu^{2+}\right]=\frac{x}{2}M, \left[Ag^{+}\right]=\frac{y}{2}M$ B) $\left[Cu^{2+}\right]>\frac{x}{2}M, \left[Ag^{+}\right]>\frac{y}{2}M$

C) $\left[Cu^{2+}\right]<\frac{x}{2}M, \left[Ag^{+}\right]>\frac{y}{2}M$ C) $\left[Cu^{2+}\right]<\frac{x}{2}M, \left[Ag^{+}\right]<\frac{y}{2}M$

30. $I_2+I^{-}\rightleftharpoons I_3^{-}$

This reaction is set-up in aqueous medium. We start with 1 mol of I_2 and 0.5 mol of I^{-} in 1 L flask. After equilibrium is reached, excess of $AgNO_3$ gave 0.25 mol of yellow ppt. Equilibrium constant $\left(K_c\right)$ is

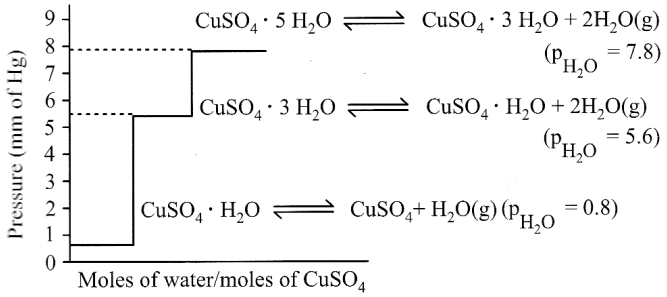
A) 1.33 B) 2.66 C) 2.00 D) 3.00

Section-2
(Paragraph Type)

This section contains 3 paragraphs each describing theory, experiment, data etc. Six questions relate to three paragraphs with two questions on each paragraph. Each question pertaining to a particular **paragraph** should have only one correct answer among the four choices A, B, C and D.

Paragraph For Questions 31 & 32

Dehydration of salts is an important class of heterogeneous reactions. The salt hydrates during dehydration often dissociates in steps to form a number of intermediate hydrates according to the prevailing pressure of moisture in contact with the solid hydrates. Thus copper sulphate pentahydrate (solid)on dissociation yields trihydrates(solid), monohydrates(solid) and then the anhydrous salt(solid) in the above order as follows:



31. The equilibrium constant K_p in the unit of $(mm)^2$ for the equilibrium between pentahydrate and trihydrate is

A) 7.8 B) 60.84 C) 31.36 D) 5.6

32. The ratio of equilibrium constant of equilibrium between pentahydrate and trihydrate and equilibrium between trihydrate and monohydrate is

A) 1.9 B) 2.9 C) 8.6 D) 5.6

Paragraph For Questions 33 & 34

1.0 litre of solution which was in equilibrium with solid mixture of $AgCl$ and Ag_2CrO_4 was found to contain 1×10^{-4} moles of Ag^+ ions, 1.0×10^{-6} moles of Cl^- ions and 8.0×10^{-4} moles of CrO_4^{2-} ions. Ag^+ ions are added slowly to the above mixture (keeping volume constant)till 8.0×10^{-7} moles of $AgCl$ got precipitated.

33. Find the $\left[Ag^{1+}\right]$ left in the solution after precipitation of $AgCl$?

A) $15\times10^{4-}M$ B) $5\times10^{4-}M$ C) $10^{4-}M$ D) $10^{3-}M$

34. How many moles of Ag_2CrO_4 were precipitated.

A) $7.68\times10^{-4}moles$ B) $7.68\times10^{-3}moles$

C) $3.20\times10^{-5}moles$ D) $3.20\times10^{-6}moles$

Paragraph For Questions 35 & 36

A solution contains a mixture of $Ag^+(0.1M)$ and $Hg_2^{2+}(0.10M)$ which are separated by selective precipitation.

$\left(K_{SP\,AgI}=8.5\times10^{-17}M^2;K_{sp}\,Hg_2I_2=2.5\times10^{-26}M^3\right)$

35. Calculate maximum concentration of iodide ion to be added from outside at which one of them gets precipitated almost completely.

A) $8.5\times10^{-16}M$ B) $5\times10^{-13}M$ C) $1.7\times10^{-4}M$ D) $8.5\times10^{-17}M$

36. What % age of that metal ion is precipitated?

A) 0.17% B) 1.7% C) 99.83% D) 99.17%

Section-3
(Matching List Type)

This section contains four questions, each having two matching lists (List-1 & List-II). The options for the **correct match** are provided as (A), (B),(C) and (D) out of which **ONLY ONE** is correct.

37. Match the following

(Condition for the reaction to be favoured in forward direction)

COLUMN – I	COLUMN – II
(A) $CO_2(g)+H_2O(l)\rightarrow H_2CO_3(aq):\Delta H=-10kj/mol$	(p) Low temperature
(B) $CO(g)+2H_2(g)\rightarrow CH_3OH(g):\Delta H=-91kj/mol$	(q) High temperature
(C) $N_2O_4(g)\rightleftharpoons 2NO_2(g);\Delta H=57.2kJ/mol$	(r) Low pressure
(D) $N_2(g)+O_2(g)\rightarrow 2NO(g);\Delta H=90\ kJ/mol$	(s) High pressure

A) A-p,s;B-s;C-q,r;D-q B) A-p,s;B-s;C-q,r;D-q,r

C) A-p;B-p,s;C-q;D-q D) A-p,s;B-p,s;C-q,r;D-q

38. Match the following

COLUMN – I	COLUMN – II
(A) NH_4NO_3	(p) $pH = \frac{1}{2}\left(pK_w - pK_b - \log c\right)$
(B) NaCN	(q) $pH = \frac{1}{2}\left(pK_w + pK_a + \log c\right)$
(C) Acidic buffer	(r) $pOH = pK_b + \log\frac{[Salt]}{[Base]}$
(D) Basic buffer	(s) $pH = pK_a + \log\frac{[salt]}{[Acid]}$

A) A-p;B-q;C-s;D-r

B)A-q;B-s;C-r;D-p

C) A-p;B-q;C-r;D-s

D) A-q;B-p;C-s;D-r

39. Match the following

COLUMN – I	COLUMN – II
(A) NH_4Cl in water	(p) Neutral solution which does not undergo hydrolysis
(B) CH_3COONa in water	(q) Cationic hydrolysis
(C) NH_4CN in water	(r) Anionic hydrolysis
(D) $NaCl$ in water	(s) Both cationic and anionic hydrolysis

A) A-r;B-q;C-s;D-p

B) A-q;B-r;C-p;D-s

C) A-r;B-q;C-p;D-s

D) A-q;B-r;C-s;D-p

40. Match the Following:

P = equilibrium total pressure, Initial mole = 1, x = Degree of dissociation

Column I	**Column II**
(A) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$	(P) $K_p = \frac{4x^2P}{1-x^2}$
(B) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$	(Q) $K_p = \frac{4P^3}{27}$
(C) $NH_2COONH_{4(s)} \rightleftharpoons 2NH_{3(g)} + CO_{2(g)}$	(R) $K_p = K_c$
(D) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$	(S) $K_p = K_c.RT$

A) A-P,S;B-S;C-Q;D-R

B) A-P;B-S;C-Q;D-R

C) A-S;B-S;C-Q;D-R

D) A-P,S;B-S;C-R;D-R