DPP - Daily Practice Problems

Name :

Date :

Start Time :

End Time :

CHEMISTRY

13

SYLLABUS : Ionic equilibrium (Ionisation of weak electrolyte, Arrhenius theory, Bronsted-Lowry concept, Ionic Product of Water, pH Scale, Hydrolysis)

Max. Marks : 120 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 A certain weak acid has $K_a = 1.0 \times 10^{-4}$. Calculate the equilibrium constant for its reaction with a strong base -

(a) 10^9 (b) 10^{10}

(c) 10^{11} (d) 10^{12}

Q.2 Calculate pH of a solution whose 100 ml contains 0.2 gm NaOH dissolved in it -

(a) 10.699 (b) 11.699

(c) 12.699 (d) 13.699

Q.3 The degree of ionization of a compound depends on

(a) size of solute

(b) nature of solute

(c) nature of vessel

(d) quantity of electricity passed

Q.4 $BaCl_2$ solution is always neutral in nature. Because -

(a) Number of barium ion = number of chloride ion

(b) Number of barium ion is just double than chloride ions

(c) Number of chloride ions are just half than Ba^{+2} ions

(d) Number of Ba^{2+} ions is just half that of Cl^- ions

Q.5 The acid with maximum strength has pK_a value equal to

(a) 10 (b) 4.5 (c) 1.0 (d) 2.0

RESPONSE GRID 1. ⓐⓑⓒⓓ 2. ⓐⓑⓒⓓ 3. ⓐⓑⓒⓓ 4. ⓐⓑⓒⓓ 5. ⓐⓑⓒⓓ

Space for Rough Work

Q.6 The conjugate base of H_2SO_4 in the following reaction is -

$$H_2SO_4 + H_2O \rightleftharpoons H_3O^+ + HSO_4^-$$

(a) H_2O (b) H_3O^+

(c) HSO_4^- (d) SO_4^{2-}

Q.7 Which one of the following can act as Bronsted acid as well as Bronsted base ?

(a) CH_3COO^- (b) CO_3^{2-}

(c) HPO_4^{2-} (d) H_3PO_4

Q.8 What will be the hydroxyl ion concentration in a 0.175 M solution of HCl?

(a) 5.7×10^{-14} M (b) 6.75×10^{-12} M

(c) 5.75×10^{-10} M (d) 6.75×10^{-14} M

Q.9 What will be the hydrogen ion concentration of a 0.01 M solution of $Ca(OH)_2$?

(a) 5×10^{-13} M (b) 5×10^{-16}

(c) 5×10^{-10} (d) None

Q.10 The ionization constant for water is $1 \times 10^{-13.6}$ at 37°C. What will be H_3O^+ and OH^- concentration at that temperature ?

(a) 3.75×10^{-8} (b) 1.75×10^{-8}

(c) 1.58×10^{-7} (d) 1.85×10^{-8}

Q.11 A 0.01 M solution of HCN is 0.01% ionised. The ionisation constant of the acid is -

(a) 10^{-4} (b) 10^{-6}

(c) 10^{-10} (d) 10^{-8}

Q.12 What will be the pH of an aqueous solution of 1.0 M ammonium formate, assuming complete dissociation? (pK_a of formic acid = 3.8 and pK_b of ammonia = 4.8)

(a) 8.5 (b) 6.5

(c) 9.5 (d) 5.5

Q.13 What is the pH of 0.10 M CH_3COONa solution. Hydrolysis constant of sodium acetate is 5.6×10^{-10} ?

(a) 8.874 (b) 88.74

(c) 887.4 (d) 0.88

Q.14 The pH of 0.1 M NH_4Cl solution is 5.13. What will be the dissociation constant of NH_4OH ?

(a) 1.8×10^{-7} (b) 1.8×10^{-9}

(c) 1.8×10^{-5} (d) None

Q.15 Which one of the following ionic species has the greatest proton affinity to form stable compound?

(a) I^- (b) HS^-

(c) NH_2^- (d) F^-

Q.16 The percentage dissociation of 0.02 M CH_3COOH solution (K_a: 1.8×10^{-5}) is

(a) 3% (b) 0.03%

(c) 2% (d) 0.02%

Q.17 The dissociation constant of CH_3COOH is 1.8×10^{-5}. Determine the H^+ ion concentration of 0.01 M solution of acetic acid at 25°C.

(a) 5.5×10^{-5} (b) 1.8×10^{-5}

(c) 4.24×10^{-4} (d) 1.01×10^{-4}

Q.18 How many hydrogen ions are present in 1 ml of a solution of pH =13 ?

(a) 6.02×10^{13} (b) 6.02×10^{12}

(c) 6.02×10^{7} (d) 6.02×10^{5}

Q.19 Which of the following is not a lewis base ?

(a) Ag^+ (b) H_2O

(c) CN^- (d) NH_3

Q.20 What is the maximum concentration of Ni^{2+} ions in water (at 25°C) that is saturated with H_2S (0.1M at 25°C) and maintained at pH 3 with HCl . K_{SP} of NiS is 3×10^{-21}. H_2S dissociates in two steps, each with an equilibrium constant given below:

$$H_2S \rightleftharpoons H^+ + HS^- \quad K_{a_1} = 9.1 \times 10^{-8}$$

$$HS^- \rightleftharpoons H^+ + S^{-2} \quad K_{a_2} = 1.1 \times 10^{-12}$$

(a) 3×10^{-7} M (b) 4×10^{-7} M

(c) 5×10^{-7} M (d) 6×10^{-7} M

RESPONSE GRID					
	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ
	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ
	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ

Space for Rough Work

Q.21 Suppose the change $HC_2O_4^- + Cl_2 \rightarrow CO_3^{2-} + Cl^-$ is to be carried out in basic solution. Starting with 0.1 mole of OH^-, 0.1 mole of $HC_2O_4^-$ and 0.05 mole of Cl_2, how many moles of Cl^- would be expected to be in the final solution ?

(a) 3.04 (b) 2.04 (c) 1.04 (d) 0.04

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

(a) 1, 2 and 3 are correct **(b)** 1 and 2 are correct

(c) 2 and 4 are correct **(d)** 1 and 3 are correct

Q.22 The pH values of 0.1 M and 0.01 M NH_4Cl are 5.128 and 5.628 respectively. Choose the correct statements from the following–

(1) If dilution is the only factor, the pH should be 6.128 instead of 5.628

(2) The given value suggests that NH_4^+ ion dissociates more in a more dilute solution

(3) The degree of hydrolysis of NH_4^+ ion is about 1000 times less for the dilute solution

(4) A 0.01 M solution of NH_4Cl is less acidic than 0.1 M solution

Q.23 A 1 litre solution of pH = 1 was diluted upto 10 times. What volume of a solution with pH = 2 should be added in diluted solution so that pH does not change ?

(1) 1 litre (2) 10 litre

(3) 100 litre (4) None of these

Q.24 Which of the following statements are correct?

(1) The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

(2) The pH of 1.0×10^{-8} M solution of HCl is 8

(3) Autoprotolysis constant of water increases with temperature

(4) When a solution of a weak monoprotic acid is titrated against a strong base, at half-neutralisation point pH = (1/2) pK_a.

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

According to Ostwald's dilution law.

"For a weak electrolyte, the degree of ionisation is inversely proportional to the square root of molar concentration or directly proportional to the square root of volume containing one mole of the solute."

Hence we have

$$\alpha = \sqrt{K_a V}$$

Q.25 The dissociation constant of a monobasic acid which is 3.5% dissociated in $\frac{N}{20}$ solution at 20°C is :

(a) 3.5×10^{-2} (b) 5×10^{-3}

(c) 6.34×10^{-5} (d) 6.75×10^{-2}

Q.26 The dissociation constant of weak acid HA is 4.9×10^{-8}. After making the necessary approximations, calculate pH in 0.1 M acid –

(a) 1.155 (b) 2.155 (c) 3.155 (d) 4.155

Q.27 The dissociation constants for aniline, acetic acid and water at 25°C are 4×10^{-10}, 2×10^{-5} and 10^{-14} respectively. Calculate degree of hydrolysis of aniline acetate in a decinormal solution–

(a) 0.025 (b) 0.015 (c) 0.035 (d) 0.045

RESPONSE GRID	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ
	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ			

Space for Rough Work

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

(c) Statement -1 is False, Statement-2 is True.

(d) Statement -1 is True, Statement-2 is False.

Q.28 Statement 1 : HNO_3 is a stronger acid than HNO_2

Statement 2 : In HNO_3 there are two nitrogen-to-oxygen bonds whereas in HNO_2 there is only one.

Q.29 Statement 1 : pH of hydrochloric acid solution is less than that of acetic acid solution of the same concentration.

Statement 2 : In equimolar solutions, the number of titrable protons present in hydrochloric acid is less than that persent in acetic acid.

Q.30 Statement 1 : The degree of ionization of water is small at 25°C, only about one of every 10^7 molecules in pure water is ionized at any instant.

Statement 2 : In pure water at 25°C, the molar concentration of water is essentially constant.

RESPONSE GRID	**28.**ⓐⓑⓒⓓ **29.**ⓐⓑⓒⓓ **30.**ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 13 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	32	Qualifying Score	52
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

(13)

(1) **(b)** $HA + BOH \rightleftharpoons BA + H_2O$

weak strong

or $HA + B^+ + OH^- \rightleftharpoons B^+ + A^- + H_2O$

or $HA + OH^- \rightleftharpoons A^- + H_2O$

$\therefore K = \frac{[A^-]}{[HA][OH^-]}$ $[H_2O]$ remains constant

$\therefore$ it can be neglected}

Also for weak acid HA

$HA \rightleftharpoons H^+ + A^-$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$\frac{K_a}{K} = K_W \text{ or } K = \frac{K_a}{K_W} = \frac{10^{-4}}{10^{-14}} = 10^{10}$$

(2) **(c)** 100 ml solution of NaOH contains = 0.2 gm NaOH

$\therefore$ 1000 ml solution of NaOH contains = 2 gm NaOH

Normality of solution $= \frac{2}{40} = 0.05N$

$$\therefore [H^+] = \frac{10^{-14}}{0.05}$$

$$\therefore -\log[H^+] = -\log\left[\frac{10^{-14}}{0.05}\right] \text{ (as pH} = -\log[H^+])$$

$= -[-14+2-0.6990] = 12.699$

(3) **(b)** For strong electrolyte $\alpha \approx 100\%$, for weak electrolyte $\alpha \approx 1 - 10\%$, at the same concentration.

(4) **(d)** Magnitude of opposite charges are equal in solution that's why solution is neutral in nature.

$BaCl_2 \rightleftharpoons Ba^{+2} + 2Cl^-$

(5) **(c)** Acidic strength $\propto K_a \propto \frac{1}{pK_a}$

(6) **(c)** A pair of acid and its conjugate base differs by a proton only, i.e.

Acid $\rightleftharpoons$ Conjugate base + H^+

For H_2SO_4, $\underset{\text{acid}}{H_2SO_4} \rightleftharpoons \underset{\text{conjugate base}}{HSO_4^-} + H^+$

(7) **(c)** According to Bronsted - lowry concept, an acid is a substance which has a tendency to give a proton (H^+) and a base is a substance which has a tendency to accept a proton. Now,

CH_3COO^- can only accept a H^+ and is $\therefore$ a Bronsted base

CO_3^{2-} can only accept H^+ and is $\therefore$ a Bronsted base

H_3PO_4 can only donate H^+ and is $\therefore$ a Bronsted acid only

HPO_4^{2-} can accept as well as donate H^+ to act as a Bronsted acid as well as a Bronsted base, i.e.,

$$PO_4^{3-} \xleftarrow[\text{Bronsted acid}]{-H^+} HPO_4^{2-} \xrightarrow[\text{Bronsted base}]{+H^+} H_2PO_4^-$$

(8) **(a)** $K_W = [H^+][OH^-]$ ...(1)

given [HCl] = 0.175 M.

HCl is a strong acid. Thus,

$[H^+] = 0.175M$

Substituting in (1),

$$[OH^-] = \frac{K_W}{[H^+]} = \frac{10^{-14}}{0.175} = 5.7 \times 10^{-14} M$$

(9) **(a)** $K_W = [H^+][OH^-]$

	$Ca(OH)_2 \rightarrow$	Ca^{2+} +	$2OH^-$
before	0.01	0	0
after	0	0.01	2×0.01

$\therefore [OH^-] = 0.02M$

$$\therefore [H^+] = \frac{1 \times 10^{-14}}{0.02} = 5 \times 10^{-13} M$$

(10) **(c)** $K_W = [H^+][OH^-] = 1 \times 10^{-13.6}$

$[H^+] = [OH^-] = \sqrt{1 \times 10^{-13.6}} = 1.58 \times 10^{-7}$

(11) **(c)** According to Ostwald's dilution Law

$$K_a = \frac{\alpha C}{1-\alpha} = \alpha^2 C \quad \text{(when } \alpha << 1)$$

K_a = Ionisation constant

α = Degree of dissociation

C = Molar concentration

For HCN, C = 0.01 M

	HCN $\rightleftharpoons$	H^+ +	CN^-
before	0.01	0	0
after	$0.01-\alpha$	α	α

0.01% ionization means $\alpha = \frac{0.01}{100} = 10^{-4}$

$\therefore \alpha = 10^{-4}$

$\therefore K_a = (10^{-4})^2 . (0.01) = 10^{-10}$

(12) **(b)** The pH of salt $HCOONH_4$ (a salt of weak acid + weak base) is given by -

$HCOONH_4 + H_2O \rightleftharpoons HCOOH + NH_4OH$

For salt of a weak acid and a weak base.

pH = 1/2 [log K_b – log K_a – logK_W]

$\therefore$ pH = 1/2 [$pK_a + pK_W - pK_b$]

pH = 1/2 [3.8 + 14 – 4.8] = 6.5

(13) **(a)** Hydrolysis of the salt may be represented as

$$CH_3COO^- + Na^+ + H_2O \rightleftharpoons CH_3COOH + Na^+ + OH^-$$

or $$CH_3COO^- + H_2O \rightleftharpoons CH_3COOH + OH^-$$

At t = 0 $\quad C \quad 0 \quad 0$

At equilibrium $\quad C(1-\alpha) \quad C\alpha \quad C\alpha$

$$K_h = \frac{C^2\alpha}{C(1-\alpha)} = C\alpha^2 \text{ when } \alpha << 1$$

$$\alpha = \sqrt{\left(\frac{K_h}{C}\right)} = \sqrt{\left(\frac{5.6\times10^{-10}}{0.10}\right)} = 7.5\times10^{-5}$$

$[OH^-] = C\alpha = 0.10 \times 7.5 \times 10^{-5}$

pOH $= -\log(7.5\times10^{-6}) = 5.126$

pH $= 14 - pOH = 14 - 5.126 = 8.874$

(14) **(c)** NH_4Cl is salt of weak base and strong acid, formula for pH of its hydrolysis may be calculated as,

$$pH = \frac{1}{2}[pK_W - pK_b - \log C] \quad \text{........(1)}$$

where pH = 5.13

$pK_W = -\log K_W = -\log 10^{-14} = 14$

$\log C = \log 0.1 = -1$

Substituting the values in equation (1) we get –

$$5.13 = \frac{1}{2}[14 - pK_b + 1]$$

$10.26 = 15 - pK_b$

$pK_a = 4.74$

$\therefore \quad -\log K_b = pK_b = 4.74$

$K_b =$ antilog (-4.74)

$K_b = 1.8\times10^{-5}$

(15) **(c)** Strongest proton affinity will be for the species which is the strongest base or whose conjugate acid is the weakest. The conjugate acid of NH_2^- is NH_3 which is the weakest acid out of HI, H_2S, NH_3 and HF.

(16) **(a)** $$\alpha = \sqrt{\frac{K_a}{c}} = \sqrt{\frac{1.8\times10^{-5}}{0.02}} = 0.03$$

$\therefore$ Percentage dissociation $= 0.03 \times 100 = 3\%$

(17) **(c)** We know that

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

At equilibrium $\quad C(1-\alpha) \quad C\alpha \quad C\alpha$

$$H^+ = \alpha C \text{ and } \alpha = \sqrt{\frac{K_a}{C}}$$

$$H^+ = \sqrt{\frac{K_a}{C}} \times C = \sqrt{K_a \times C}$$

Given $C = 0.01$ M and $K_a = 1.8\times10^{-5}$

$$H^+ = \sqrt{1.8\times10^{-5}\times10^{-2}} = \sqrt{18\times10^{-8}}$$

$= 4.24\times10^{-4}$

(18) **(c)** pH = 13

$-\log[H^+] = 13$

or $[H^+] = 10^{-13}$ mol/L^{-1}

$[H^+]$ in 1 ml $= 10^{-16}$ moles

1 mole H^+ contains 6.023×10^{23} H^+ ions

10^{-16} moles of H^+ ions contain $= 6.023\times10^{23}\times10^{-16}$

$= 6.023\times10^{7}$

(19) **(a)** Ag^+ ion is a Lewis acid because it can accept a pair of electrons.

(20) **(a)** The overall dissociation of H_2S will be the product of K_{a_1} and K_{a_2}.

$K_a = K_{a_1} \times K_{a_2}$

$= (9.1\times10^{-8})\times(1.1\times10^{-12}) = 1\times10^{-19}$

Saturated H_2S is approximately 0.1 M and dissociation of H_2S is very slight i.e. $H_2S \rightleftharpoons 2H^+ + S^{2-}$

$$\therefore \quad K_a = \frac{[H^+]^2[S^{2-}]}{[H_2S]} \quad \text{.....(1),}$$

or, $[H^+]^2[S^{2-}] = 1\times10^{-19}\times10^{-1} = 10^{-20}$

Since, pH is 3, $[H^+] = 10^{-3}$ M

From (1),

$$[S^{2-}] = \frac{K_a[H_2S]}{[H^+]^2} = \frac{10^{-20}}{10^{-6}} = 10^{-14} M$$

Since NiS will precipitate, if the S.P. is exceeded, the highest value which $[Ni^{+2}]$ can have is:

$$[Ni^{2+}] = \frac{3\times10^{-21}}{10^{-14}} = 3\times10^{-7} M$$

$$\left\{\because K_{SP} = \left[Ni^{2+}\right]\left[S^{2-}\right]\right\}$$

(21) **(d)** The equation for this reaction is

$$HC_2O_4^- + Cl_2 + 5OH^- \rightarrow 2Cl^- + CO_3^{2-} + 3H_2O$$

Here, OH^- is the limiting reagent and will be used up completely.

Since, 5 moles of OH^- produce 2 moles of Cl^-

$\therefore$ 0.1 mol of OH^- will produce 0.04 mole of Cl^-

$\therefore$ Moles of Cl^- in the final solution = 0.04

(22) **(b)** Between 0.1 M and 0.01 M there is a dilution factor of 10. If this is the only change that happens, then the $[H^+]$ should have gone down by a factor of 10 and pH would go up by one unit i.e., 5.128 to 6.128. Actually it is of 5.628 which is less and would thus correspond to a more acidic solution than expected. This means that the acid NH_4^+ ion dissociates more in a more dilute solution.

The degree of hydrolysis for 0.1 M and 0.01 M solution can be shown to be 7.5×10^{-5} and 2.4×10^{-4} respectively.

(23) **(a)** After dilution $[H^+] = 10^{-2} \Rightarrow pH = 2$

Let V litre solution of pH = 2 is added in original solution so that pH remains fixed.

$$\therefore\ [H^+] = \frac{10^{-2}x + V \times 10^{-2}}{10 + V} = 10^{-2}$$

This result is independent of volume taken.

(24) **(d)** pH of 1×10^{-8} M is below 7 because it is an acid.

$$H_2PO_4^- + H_2O \rightleftharpoons HPO_4^{2-} + H_3O^+$$

$$H_2O + H_2O \rightleftharpoons OH^- + H_3O^+$$

K (Autoprotolysis constant of water i.e. ionic product of water) increases with temperature. For half neutralisation of a weak acid by a weak base,

$$pH = pK_a + \log\frac{[Salt]}{[Acid]}$$

$[Salt] = [Acid]$, $\therefore\ pH = pK_a$

(25) **(c)** Concentration of acid $= \frac{N}{20} = 0.05\ N$

Out of 100 molecules, 3.5 molecules have been dissociated

∴ Out of 1 molecules the no. of dissociated molecules

$$= \frac{3.5}{100} = 0.035 = \alpha$$

$$K_a = \frac{c\alpha}{(1-\alpha} = \frac{0.05 \times (0.035)^2}{1-0.035}$$

$$= 6.34 \times 10^{-5}$$

(26) **(d)** For weak acid $K_a = \alpha^2 .C$

$$\therefore\ \alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{4.9 \times 10^{-8}}{0.1}} = 7 \times 10^{-4}$$

$$pH = -\log H^+ = -\log \alpha C$$

$$= -\log 7 \times 10^{-4} \times 10^{-1}$$

$$= 4.1549 = 4.155$$

(27) **(c)** Anilinium ion + Acetate ion + H_2O $\rightleftharpoons$ I + Acetic acid

Before hydrolysis	1	1	0	0
After hydrolysis	1–h	1–h	h	h

Let concen. of salt be C mol L^{-1}

$$K_h = \frac{Ch\ .\ Ch}{C(1-h)\ .\ C(1-h)} = \frac{h^2}{(1-h)^2}$$

$$\frac{h}{1-h} = \sqrt{\frac{K_w}{K_a . K_b}}$$

$$= \sqrt{\frac{10^{-14}}{2 \times 10^{-5} \times 4 \times 10^{-10}}}$$

h = 0.035

(28) **(d)** Among oxoacids, the acidic character increases with increase in oxidation state of the central atom.

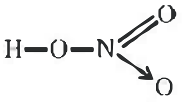
O.S. of N in $HNO_3 = +5$

O.S. of N in $HNO_2 = +3$

thus HNO_3 stronger than HNO_2. Hence assertion is correct.

Structure of HNO_2 : $H-O-N=O$;

Structure of HNO_3 :



The statement 1 is true but the statement 2 is wrong as can be clearly seen from the above structures.

(29) **(d)** HCl is a strong electrolyte since it will produce more H^+ in comparison to that of CH_3COOH. Hence statement 1 is true but statement 2 is false.

(30) **(b)** Degree of ionization of H_2O is small because H_2O is a very weak electrolyte.