

Q1 (a) Write Postulates of Bohr Theory of atomic structure

बोहर के परमाणु संरचना के मुख्य अभिप्रेरित लिखिए।

(b) What do you understand by quantum numbers?

Explain physical significance of any two quantum numbers.

क्या क्वांटम संख्याओं से आप क्या समझते हैं? किसी दो क्वांटम संख्याओं की भौतिक-सांख्यिक-समझाइए।

Q2 (a) Define Ionisation Potential, describe any two factors affecting value of Ionisation potential.

आयनन विभव की परिभाषा लिखिए। आयनन विभव को प्रभावित करने वाले दो कारकों का वर्णन कीजिए। Find out pH value of 0.02 N HCl solution [log 2 = 0.3010]

जल के आयनिक गुणफल का व्यंजक व्युत्पन्न कीजिए। तथा 0.02 N HCl विलयन की pH का मान निकालिए। [log 2 = 0.3010]

Q3. Write short note on any two of the following.

— किसी दो पर टिप्पणी लिखिए।

(i) Long form of Periodic Table.

(आवर्त सारणी का दीर्घ-स्वरूप)

(ii) Pauli's Exclusion's Principle

पॉली का अपवर्जन नियम

(iii) Buffer solution and Buffer action

आम प्रतियोधी विलयन व आम प्रतियोधी क्रिया

(5)

Model answers for Class test - I - 2017-18. (1)

Subject: 103

(Applied Chemistry)

Q.1) Write postulates of Bohr's theory of atomic structure. Ans. The main points of Bohr's theory for atom are as follows

1) An electron revolves around the nucleus in definite orbits which are associated with definite energy. These orbits are also known as shells or energy levels and designated as K, L, M, N ... etc.

2) When electron revolves in a particular orbit, energy is neither absorbed nor emitted but when it jumps from one energy level to another, energy is emitted or absorbed. When  $e^-$  jumps from higher energy level to lower energy level, energy is emitted while it is absorbed when it jumps from lower to higher level.

$$E_2 - E_1 = \Delta E = h\nu$$

3) There are infinite number of orbits around the nucleus but  $e^-$  can move only in those orbits for which angular momentum is quantized

4) When an electron revolves in stationary circular orbits two types of forces i.e. electrostatic force of attraction and centrifugal force act on it, so it remains balanced

$$\text{Centripetal force} = \text{centrifugal force}$$

$$\frac{Ze^2}{r^2} = \frac{mv^2}{r}$$

(b) What do you understand by quantum numbers? Explain physical significance of any two quantum numbers.

Ans To describe the position, energy and every information of electron, some quantum numbers are needed which

## Shielding effect or screening effect (2)

The decreased force of attraction between nucleus and valence  $e^-$  due to presence of inner shell electron is known as shielding effect or screening effect. Thus as inner shell number increases, shielding effect increases which decreases the ionization potential.

(b) Derive ionic product of water and also calculate the pH of 0.02 N HCl.  $[\log 2 = 0.3010]$

Ans water is a weak electrolyte whose ionisation is very less

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

According to law of mass action

$$K = \frac{[H^+][OH^-]}{[H_2O]}$$

Concn of  $[H_2O]$  before ionisation is constant

$$K [H_2O] = [H^+][OH^-]$$

$$K_w = [H^+][OH^-]$$

At  $25^\circ C$ ,  $[H^+] = 1 \times 10^{-7} \text{ g ion/l}$   
 $[OH^-] = 1 \times 10^{-7} \text{ g ion/l}$

$$K_w = 1 \times 10^{-14}$$

The pH of 0.02 N HCl is as follows

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

$$= -\log (2 \times 10^{-2})$$

$$= -\log 2 + 2 \log 10$$

$$= -0.3010 + 2$$

$$pH = 1.699$$

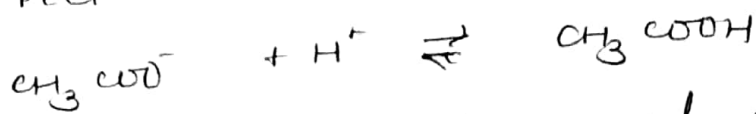
## (b) Mixed buffer solutions

They are of two types

(3)

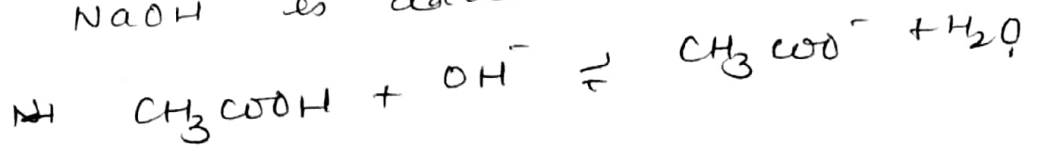
### (i) Acidic - buffer solution

It is formed by weak acid and salt of it with strong base, eg  $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$   
They have pH less than 7.0, if in this solution HCl is added



Thus effect of  $\text{H}^+$  is destroyed and pH does not change

If Base NaOH is added



Thus pH does not change.

### (ii) Basic Buffer solution

They are formed by weak base and salt of it with strong acid

