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HYDROGEN

[JEE MAIN]

- Q.1 Which of the following process will produce hard water ? [AIEEE 2003]
(1) Saturation of water with CaCO_3 (2) Saturation of water with MgCO_3
(3) Saturation of water with CaSO_4 (4) Addition of Na_2CO_3 water
- Q.2 The reagent commonly used to determine hardness of water titrimetrically is - [AIEEE 2003]
(1) Oxalic acid (2) Disodium salt of EDTA
(3) Sodium citrate (4) Sodium thiosulphate.
- Q.3 In context with the industrial preparation of hydrogen from water gas ($\text{CO} + \text{H}_2$), which of the following is the correct statement ? [AIEEE 2008]
(1) CO is removed by absorption in aqueous Cu_2Cl_2 solution
(2) H_2 is removed through occlusion with Pd
(3) CO is oxidized to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali
(4) CO and H_2 are fractionally separated using differences in their densities
- Q.4 Very pure hydrogen (99.9%) can be made by which of the following processes ? [AIEEE 2012]
(1) Electrolysis of water
(2) Reaction of salt like hydrides with water
(3) Reaction of methane with steam
(4) Mixing natural hydrocarbons of high molecular weight
- Q.5 The numbers of protons, electrons and neutrons in a molecule of heavy water are respectively :
(1) 8, 10, 11 (2) 11, 10, 10 (3) 10, 11, 10 (4) 10, 10, 10 [JEE (Main-Online) 2013]
- Q.6 Which of the following statements about Na_2O_2 is **not** correct ?
(1) Na_2O_2 oxidises Cr^{3+} to CrO_4^{2-} in acid medium.
(2) It is diamagnetic in nature.
(3) It is a derivative of H_2O_2
(4) It is the super oxide of sodium. [JEE (Main-Online) 2014]
- Q.7 Hydrogen peroxide acts both as an oxidising and as a reducing agent depending upon the nature of the reacting species. In which of the following cases H_2O_2 acts as a reducing agent in acid medium ?
(1) SO_3^{2-} (2) MnO_4^- (3) KI (4) $\text{Cr}_2\text{O}_7^{2-}$ [JEE (Main-Online) 2014]

- Q.8 Which physical property of dihydrogen is wrong ?
 (1) Tasteless gas (2) Non-inflammable gas
 (3) Odourless gas (4) Colourless gas
[JEE (Main-Online) 2015]
- Q.9 The concentration of fluoride, lead, nitrate and iron in a water sample from an underground lake was found to be 1000 ppb, 40 ppb, 100 ppm and 0.2 ppm, respectively. This water is unsuitable for drinking due to high concentration of :
[JEE (Main-Offline) 2016]
 (1) Iron (2) Fluoride (3) Lead (4) Nitrate
- Q.10 Which one of the following statements about water is **FALSE** ?
[JEE (Main-Offline) 2016]
 (1) Ice formed by heavy water sinks in normal water.
 (2) Water is oxidized to oxygen during photosynthesis.
 (3) Water can act both as an acid and as a base.
 (4) There is extensive intramolecular hydrogen bonding in the condensed phase.
- Q.11 Identify the **incorrect** statement regarding heavy water:
 (1) It reacts with Al_4C_3 to produce CD_4 and $\text{Al}(\text{OD})_3$.
 (2) It is used as a coolant in nuclear reactors
 (3) It reacts with CaC_2 to produce C_2D_2 and $\text{Ca}(\text{OD})_2$
 (4) It reacts with SO_3 to form deuterated sulphuric acid (D_2SO_4)
[JEE (Main-Online) 2016]
- Q.12 Identify the reaction which does **not** liberate hydrogen :
 (1) Reaction of zinc with aqueous alkali.
 (2) Electrolysis of acidified water using Pt electrodes.
 (3) Allowing a solution of sodium in liquid ammonia to stand.
 (4) Reaction of lithium hydride with B_2H_6 .
[JEE (Main-Online) 2016]
- Q.13 In which of the following reactions, hydrogen peroxide acts as an oxidizing agent ?
 (1) $\text{HOCl} + \text{H}_2\text{O}_2 \longrightarrow \text{H}_3\text{O}^+ + \text{Cl}^- + \text{O}_2$
 (2) $\text{I}_2 + \text{H}_2\text{O}_2 + 2\text{OH}^- \longrightarrow 2\text{I}^- + 2\text{H}_2\text{O} + \text{O}_2$
 (3) $2\text{MnO}_4^- + 3\text{H}_2\text{O}_2 \longrightarrow 2\text{MnO}_2 + 3\text{O}_2 + 2\text{H}_2\text{O} + 2\text{OH}^-$
 (4) $\text{PbS} + 4\text{H}_2\text{O}_2 \longrightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$
[JEE (Main-Online) 2017]
- Q.14 Hydrogen peroxide oxidises $[\text{Fe}(\text{CN})_6]^{4-}$ to $[\text{Fe}(\text{CN})_6]^{3-}$ in acidic medium but reduces $[\text{Fe}(\text{CN})_6]^{3-}$ to $[\text{Fe}(\text{CN})_6]^{4-}$ in alkaline medium. The other products formed are, respectively:
[JEE (Main-Offline) 2018]
 (1) H_2O and $(\text{H}_2\text{O} + \text{O}_2)$ (2) H_2O and $(\text{H}_2\text{O} + \text{OH}^-)$
 (3) $(\text{H}_2\text{O} + \text{O}_2)$ and H_2O (4) $(\text{H}_2\text{O} + \text{O}_2)$ and $(\text{H}_2\text{O} + \text{OH}^-)$
- Q.15 The isotopes of hydrogen are :
 (1) Protium and deuterium only (2) Deuterium and tritium only
 (3) Tritium and protium only (4) Protium, deuterium and tritium
[JEE (Main-Online) 2019]

- Q.16 The total number of isotopes of hydrogen and number of radioactive isotopes among them, respectively, are :
 (1) 2 and 0 (2) 3 and 2 (3) 3 and 1 (4) 2 and 1
[JEE (Main-Online) 2019]
- Q.17 The chemical nature of hydrogen peroxide is :
 (1) Reducing agent in basic medium, but not in acidic medium
 (2) Oxidising and reducing agent in both acidic and basic medium
 (3) Oxidising agent in acidic medium, but not in basic medium
 (4) Oxidising and reducing agent in acidic medium, but not in basic medium
[JEE (Main-Online) 2019]
- Q.18 Among the following reactions of hydrogen with halogens, the one that requires a catalyst is :
 (1) $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$ (2) $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$
 (3) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ (4) $\text{H}_2 + \text{F}_2 \rightarrow 2\text{HF}$
[JEE (Main-Online) 2019]
- Q.19 The correct statements among (a) to (d) regarding H_2 as a fuel are
 (a) It produces less pollutants than petrol.
 (b) A cylinder of compressed dihydrogen weighs ~30 times more than a petrol tank producing the same amount of energy.
 (c) Dihydrogen is stored in tanks of metal alloys like NaNi_5
 (d) On combustion, values of energy released per gram of liquid dihydrogen and LPG are 50 and 142 kJ, respectively.
 (1) (b) & (d) only (2) (a) & (c) only
 (3) (b), (c) & (d) only (4) (a), (b) & (c) only
[JEE (Main-Online) 2019]
- Q.20 The hydride that is NOT electron deficient is:
 (1) SiH_4 (2) B_2H_6 (3) GaH_3 (4) AlH_3
[JEE (Main-Online) 2019]
- Q.21 The equation that represents the water-gas shift reaction is :
 (1) $\text{CO(g)} + \text{H}_2\text{O(g)} \xrightarrow[\text{Catalyst}]{673\text{K}} \text{CO}_2\text{(g)} + \text{H}_2\text{(g)}$
 (2) $\text{CH}_4\text{(g)} + \text{H}_2\text{O(g)} \xrightarrow[\text{Ni}]{1270\text{K}} \text{CO(g)} + 3 \text{H}_2\text{(g)}$
 (3) $\text{C(s)} + \text{H}_2\text{O(g)} \xrightarrow{1270\text{K}} \text{CO(g)} + \text{H}_2\text{(g)}$
 (4) $2\text{C(s)} + \text{O}_2\text{(g)} + 4\text{N}_2\text{(g)} \xrightarrow{1273\text{K}} 2\text{CO(g)} + 4\text{N}_2\text{(g)}$
[JEE (Main-Online) 2020]
- Q.22 The one that is NOT suitable for the removal of permanent hardness of water is :
 (1) Treatment with sodium carbonate (2) Calgon's method
 (3) Clark's method (4) Ion-exchange method
[JEE (Main-Online) 2020]

Q.23 Dihydrogen of high purity (> 99.95%) is obtained through:

- (1) the electrolysis of warm $\text{Ba}(\text{OH})_2$ solution using Ni electrodes.
- (2) the reaction of Zn with dilute HCl.
- (3) the electrolysis of brine solution.
- (4) the electrolysis of acidified water using Pt electrodes.

[JEE (Main-Online) 2020]

Q.24 In comparison to the zeolite process for the removal of permanent hardness, the synthetic resins method is

- (1) less efficient as the resins cannot be regenerated
- (2) more efficient as it can exchange both cations as well as anions
- (3) more efficient as it can exchange only cations
- (4) less efficient as it exchanges only anions

[JEE (Main-Online) 2020]

Q.25 Among statements (a)-(d), the correct ones are

- (a) Decomposition of hydrogen peroxide gives dioxygen.
- (b) Like hydrogen peroxide, compounds, such as KClO_3 , $\text{Pb}(\text{NO}_3)_2$ and NaNO_3 .
- (c) 2-Ethylanthraquinone is useful for the industrial preparation of hydrogen peroxide.
- (d) Hydrogen peroxide is used for the manufacture of sodium perborate.

(1) (a), (b), (c) and (d) (2) (a), (b) and (c) only
(3) (a), (c) and (d) only (4) (a) and (c) only

[JEE (Main-Online) 2020]

Q.26 Hydrogen has three isotopes (A), (B) and (C). If the number of neutron(s) in (A), (B) and (C) respectively, are (x), (y) and (z), the sum of (x), (y) and (z) is

(1) 4 (2) 3 (3) 2 (4) 1

[JEE (Main-Online) 2020]

Q.27 The compound that cannot act both as oxidising and reducing agent is
 (1) H_2O_2 (2) HNO_2 (3) H_3PO_4 (4) H_2SO_3
[JEE (Main-Online) 2020]

[JEE (Main-Online) 2020]

Q.28 Hydrogen peroxide, in the pure state, is :

(1) non-planar and almost colorless (2) linear and almost colorless
(3) planar and blue in color (4) linear and blue in color

[JEE (Main-Online) 2020]

[JEE ADVANCED]

- Q.1 When zeolite, which is hydrated sodium aluminium silicate is treated with hard water, the sodium ions are exchanged with - **[JEE 1999]**
(A) H^+ ions (B) Ca^{2+} ions (C) SO_4^{2-} (D) OH^-
- Q.2 Amongst H_2O , H_2S , H_2Se and H_2Te , the one with the highest boiling point is - **[JEE 2000]**
(A) H_2O , because of hydrogen bonding (B) H_2Te , because of higher molecular weight
(C) H_2S , because of hydrogen bonding (D) H_2Se , because of lower molecular weight
- Q.3 Polyphosphates are used as water softening agents because they - **[JEE 2002]**
(A) Form soluble complexes with anionic species
(B) Precipitate anionic species
(C) Form soluble complexes with cationic species
(D) Precipitate cationic species
- Q.4 The reagent(s) used for softening the temporary hardness of water is/are **[JEE 2010]**
(A) $Ca_3(PO_4)_2$ (B) $Ca(OH)_2$ (C) Na_2CO_3 (D) $NaOCl$

HYDROGEN

[JEE MAIN]

Q.1	3	Q.2	2	Q.3	3	Q.4	1	Q.5	4
Q.6	4	Q.7	2	Q.8	2	Q.9	4	Q.10	4
Q.11	2	Q.12	4	Q.13	4	Q.14	1	Q.15	4
Q.16	3	Q.17	2	Q.18	1	Q.19	4	Q.20	4
Q.21	1	Q.22	3	Q.23	1	Q.24	2	Q.25	1
Q.26	2	Q.27	3	Q.28	1				

[JEE ADVANCED]

Q.1	B	Q.2	A	Q.3	C	Q.4	BC
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