CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (HINGLISH)

HYDROGEN, WATER AND HYDROGEN PEROXIDE

Illustration

1. Commet on the reactions of dihydrogen with (a) chlorine,(b) sodium and (c) copper (II) oxide.

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2. a. Would you except the hydrides of N, O and F to have lower boiling points than the hydrides of their subsequent group members? Give reason.

b. Can phosphorous with outer electronic configuration $3s^2 3p^3$ form PH_5?

c. How many hydrogen-bonded water molecules(s) are associated with $CuSO_4.5H_2O$?

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3. a. Which isotpe of hydrogen is used as a tracer in organic reactions.?

b.Concentrated H_2SO_4 cannot be used for drying H_2. Why?

c. The electrolysis of water of manufactures H_2 gas is always carried out in presence of acid (H_2SO_4) or alkali (KOH), yet no SO_4^{2-} or $K^{\oplus}$ are discharged. Why?

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4. a. A solution of ferric chloride acidified with HCl is unaffacted when hydrogen is bubbled through it, but gets reduced when zinc is added to acidified solution. Explain.

b. When sodium hydride in fused state is electrolysed, hydrogen is discharged at the anode. Explain.

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5. In the laboratory, for the prepration of dihydrogen gas form granular zinc, conc H_2SO_4, conc HCl and HNO_3 cannot be used. Why? Which is the most suitable acid?

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6. A sample of hard water contains 1 mg $CaCl_2$ and 1 mg $MgCl_2$ per litre. Calculate the hardness of water in terms of $CaCO_3$ present in per 10^6 parts of water.

(a). 2.5 ppm

(b). 1.95 ppm

(c). 2.15 ppm

(d). 195 ppm

A. $2.5ppm$

B. $1.95ppm$

C. $2.15ppm$

D. $195ppm$

Answer: B

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7. A water sample is found to contain $96ppm$ of SO_4^{2-} and $122ppm$ of $HCO_3^{\ominus}$ with Ca^{2+} ion as the only cation.

a. Calculate the p p m of Ca^{2+} in water.

b. Calculate the mol of CaO required to remove $HCO_3^{\ominus}$ ion form $1000kg$ of the water

c. Calculate the concetrated of Ca^{2+} in ppm remaining in water after adding CaO.

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8. Hardness of water id $200ppm$. The normality and molarity of $CaCO_3$ in the water is

A. $2 \times 10^{-6}N, 2 \times 10^{-6}M$

B. $4 \times 10^{-2}N, 2 \times 10^{-2}M$

C. $4 \times 10^{-3}N, 2 \times 10^{-3}M$

D. $4 \times 10^{-1}N, 2 \times 10^{-1}M$

Answer: C

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9. A sample of hard water contains 122 p p m of $HCO_3^{\ominus}$ ions,. What is the minimum weight of CaO required to remove ions completely from $1kg$ of such water sample?

A. $56mg$

B. $112mg$

C. $168mg$

D. $244mg$

Answer: A

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10. $100mL$ sample of distilled water, tap water and boiled water required, respectively, $2mL, 17mL$ and $7mL$ of soap solution to form permanent lather. The ratio of permanent to temprorary hardness in the tap water is

A. $3:2$

B. $2:3$

C. $1:2$

D. $2:1$

Answer: C

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11. $0.0093gofNa_2H_2EDTA.2H_2O$ is dissolved in $250mL$ of aqueous solution. A sample of hard water containing Ca^{2+} and Mg^{2+} ions is titrated with the above $EDTA$ solution using a buffer of $NH_4OH + NH_4Cl$ using eriochrome balck-T as indicator. $10mL$ of the above $EDTA$ solution requires $10mL$ of hard water at equivalent point. another sample of hard water is titrated with $10mL$ of above $EDTA$ solution using KOH solution $(pH = 12)$. using murexide indicator, it requires $40mL$ of hard water at equivalence point.

a. Calculate the ammount of Ca^{2+} and Mg^{2+} present in $1L$ of hard water.

b. Calculate the hardness due to Ca^{2+}, mG^{2+} ions and the total hardness of water in p p m of $CaCO_3$. (Given

MW(EDTA sal t)=372 g mol^{-1}, $MW(CaCO_3) = 100 g mol^{-1}$)

View Text Solution

12. A $50mL$ sample of hard water containing Ca^{2+} and Mg^{2+} ions is titrated with $50mL.\ 0.005MEDTA$ solution at $pH = 10$, using eriochrome balck$-T$ indicator to reach equivalence point.

In a equal amount of hard water sample, Mg^{2+} ions are precipated as $Mg(OH)_2$ by adding suitable amount of $NaOH$. the solution, after precipation of $Mg(OH)_2$, is strired and then titrated with $EDTA$ solution using calcon as indicator, and it requires $10mL$ of above $EDTA$ solution to reach equivalence point.

a. Calculate the strength of Ca^{2+} and Mg^{2+} ions present in hard water.

b. Calculate the hardness due to Ca^{2+} ions in p p m of $CaCO_3$.

c. Calculate the hardnesss due to Mg^{2+} ions in p p m of $CaCO_3$.

d. Calculate the total hardness of water in p p m of $CaCO_3$.

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13. $100mL$ sample of hard water is titrated with $500mL$ of $0.001MEDTA$ solution at $pH = 10$, using eriochrome black $-T$ indicator to reach equivalence point. An equal another amount of hard water sample is boiles for $30min$.

After filtration and cooling, the same sample is titrated with $200mL$ of $0.001MEDTA$ solution at $pH = 10$ using $Mg - EDTA$ complex solution and erichrome black $-T$ indicator to reach equivalence point.

a. Calculate the total hardness of water sample (temprary +permanent) in ppm of $CaCO_3$.

b. Calculate the permanent hardness of water sample is ppm of $CaCO_3$.

c. Calculate the temporary hardness of water sample is ppm of $CaCO_3$.

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14. a. What does $[H_9O_4]^{\oplus}$ stand for ? Draw its structures.

b. Can sodium bicarbonate make water hard?

c. Hard water is softened before using in boilers. Why?

d. What is sequestration? How is hard water made soft by sequestration?

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15. a. Water extinguishes most fires, but it does not extinguish petrol fires. Explain.

b. Soft water lathers with soap, but not hard water. Why?

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16. a. A small amount of acid or alkali is added before electrolysis of water. Why?

b. What happens when:

i. Hydrolith is treated with water.

ii. Heavy water reacts with aluminium carbide.

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17. a. Naturally hard water is usually preferred in drinking and soft water in working. Why?

b. How many types of heavy water are possible? Write down formulae of all possible heavy water molecules.

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18. Calculate (a) normality (b) molarity (c) strength in gL^{-1} and (d) percentage strength of 10 volume strength of H_2O

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19. Calculate the number of moles and weight of O_2 produced on heating $1.12L$ of 10 volume strength of H_2O_2 at STP.

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20. 10 ml of H_2O_2 liberates $12.7g$ of iodine from an acidic KI solution. Calculate (a) normality, (b) molarity, (c) volume strength. (d) Strength and (c) percentage strength of H_2O_2.

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21. A solution of $K_2cr_2O_7$ contanining $4.9gL^{-1}$ is used to tirate H_2O_2 solution contaning $3.4gL^{-1}$ in acidic medium. What volume of $K_2Cr_2O_7$ will be required to react with $20mL$ of H_2O_2 solution ? Also calculate the strength of H_2O_2 in terms of available oxygen.

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22. When $100mL$ of an aqueous of H_2O_2 is titrated with an excess of KI solution in dilute H_2O_2, the liberated I_2 required $50mL$ of $0.1MNa_2S_2O_3$ solution for complete reaction. Calculate the percentage strength and volume strength of H_2O_2 solution.

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23. Calculate the volume strength of H_2O_2 solution if $50mL$ of H_2O_2 solution is diluted with $50mL$ of H_2O_2. $20mL$ of this diluted solution required $40mL$ of $M/60K_2Cr_2O_7$ solution in presence of H_2O_2 for complete reaction.

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24. 50 mL of ozone (O_3) at STP were passed through 50 mL of 5 volume H_2O_2 solution. What is the volume strength of H_2O_2 after the reaction?

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25. $5.1g$ sample of H_2O_2 solution containing $x\,\%\,H_2O_2$ by weight requires xmL of $K_2Cr_2O_7$ solution for complete oxidation under acidic condition. What is the molarity of $K_2Cr_2O_7$ solutions?

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26. $200mL$ of acidified $3NH_2O_2$ is reacted with $KMnO_4$ solution till there is a light tinge of purple colour. Calculated the volume of O_2 produced at STP.

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27. a. When H_2O_2 is added to blood, rapid evolution of a gas occures. Why ?

b. Hydrogen peroxide acts both as an oxidising and as a reducing agent in alkaline solution towards certain first row transition metal ions. Illustration both these properties of H_2O_2 using chemical equations.

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28. What happerns when:

a. Chromium hydrogen is treated with hydrogen peroxide in the presence of sodium hydroxide.

b. Hydrogen peroxide is added to ferrous ammonium sulphate solution.

c. hydrogen peroxide is added to acidified potassium permanganate.

d. An alkaline solution of potassium ferricyanide is reacted with H_2O_2.

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29. There are three samples of H_2O_2 labelled as $10vol, 15vol, 20vol$. Half liter of each sample are mixed and then diluted with equal volume of water. Calculate the volume strength of resultant solution.

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Solved Examples

1. A $5.0mL$ of solution of H_2O_2 liberates $0.508g$ of iodine from acidified KI solution. Calculate the strength of H_2O_2 solution in terms of volume strength at STP.

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2. To a 25 mL H_2O_2 solution excess of an acidified solution of potassium iodide was added. The iodine liberated required 20 " mL of " 0.3 N sodium thiosulphate solution Calculate the volume strength of H_2O_2 solution.

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3. Element (A) burns in nitrogen to give an ionic compound, (B) reacts with water to give (C) and (D). A solution of (C) becomes milky on bubbling carbon dioxide. Idendity (A),(B),(C) and (D)

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4. Calculate the volume of 10 volume H_2O_2 solution that will react with $200mLof2NKMnO_4$ in acidic medium.

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5. An aqueous compound of an inorganic compound (X) shows the following reactions:

a. it decolourises and acidified $KMnO_4$ solution accompanied by the evolution of oxygen.

b. it liberates I_2 from an acidified KI solution.

c. It gives a brown precipitate with alkaline $KMnO_4$ solution with evolution of oxygen.

d. It removes black stains from old oil paintings. Identify (X) and give chemical equtions for the reaction at steps (a) to (d).

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6. $3.4g$ sample of H_2O_2 solution containing $x\ \%\ H_2O_2$ by weight requires xmL of a $KMnO_4$ solution for complete oxidation under acidic condition. The normality of $KMnO_4$ solution is

A. $1N$

B. $2N$

C. $3N$

D. $0.5N$

Answer: B

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7. If $100mL$ of acidified $2NH_2O_2$ is allowed to react with $KMnO_4$ solution till there is light tinge of purples colour, the volume of oxygen produced at STP is :

A. $2.24L$

B. $1.12L$

C. $3.36L$

D. $4.48L$

Answer: A

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8. Calcium burns in nitrogen to produce a white powder which dissolves in sufficient water to produce a gas (A) and alkaline solution. The solution on exposure to air produce a thin solid layer of (B) on the surface. Indentity the compound (A) and (B)

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Ex 3 1

1. If water contains $10ppm$ of $MgCl_2$ and $8ppmofCaSO_4$ calculate the $ppmofCaCO_3$

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2. A $100mL$ of tap water was titrated with $M/50HCl$ with methyle orange as indicator. If $30mLofHCl$ were required. Calculate the hardness of $CaCO_3$ per 10^3 parts of water. The hardness is temporary.

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3. In the determination of hardness of a sample of water, the following results were obtained:

Volume of sample $H_2O = 100mL$ volume of $N/50Na_2CO_3$ added to it $= 20mL$

volume of $N/50H_2SO_4$ used to back titrate the unreacted $NA_2CO_3 = 10mL$

Calculate the hardness of water in gL^{-1}

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4. An exhausted zeolite bed was revived by 250 L of NaCl solution containing $50gL^{-1}$ of NaCl solution. How many litres of hard water of hardness 250 ppm can be softened on the zeolite bed?

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Ex 3 2

1. What do you understand by Water gas shift reaction? Discuss its use for the preparation of hydrogen.

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2. Hydrogen forms compounds with elements having atomic chemical formulas? Compare their chemical behaviour.

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3. What are metallic interstitial hydrides? How do they differ from molecular hydrides?

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4. Complete the following reactions.

a. $CaO_{(s)} + H_2O_{(l)} \rightarrow$, b. $Na_2O_{(s)} + H_2O_{(l)} \rightarrow$

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5. Explain why hydrogen peroxide is stored in coloured / plastic botles?

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6. Describe the industrial applications of hydrogen dependent on : a. the heat librated when its atoms are made to combine ont eh surface of a metal.

b. its effect on unsaturated organic system in presence of a catalyst.

c. its ability to combine with nitrogen under specific conditions.

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7. How is dihydrogen prepared

a. from water by using a reducing agent?

b. in the laboratory in pure form?

c. from hydrocarbons?

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8. Complete the following

a. $Fe_{(s)} + H_2O_{(g)} \rightarrow$

b. $PbS_{(s)} + H_2O_{2(aq)} \rightarrow$

c. $MnO^{\ominus}_{4(aq)} + H_2O_{2(aq)} \rightarrow$

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9. Discuss the importance of heavy water in nuclear reactor.

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10. How is heavy water prepared form normal water?

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11. Explain why water has high boling and melting points are compared to H_2S.

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12. Distinguish between :

a. Hard water and soft water

b. Temporary hardness and permanent hardness

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13. Explain the correct context in which the following terms are used:

a. Diprotium ,d. Dihydrogen ,c.Proton,d Hydrogen

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14. Is it correct to say that hydrogen can behaves as a metal? State the conditions under which such behaviour can be possible.

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15. Name the isotopes of hydrogen. What is importance of the heavier isotopes of hydrogen?

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16. How many allotropes of dihydrogen are known? What is their importance?

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17. Name the class of hydrides to which H_2O_2, B_2H_6, NaH and LaH_3 belong. What is understood by 'hydrogen gap'?

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18. Hydrogen forms three types of bond in its compounds. Describe each type of bonding using suitable examples.

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19. Elements with atomic numbers 17 and 20 form compounds with hydrogen. Write the formula of these two compounds and compare their chemical behaviour in water.

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20. Complete the following reactions.

a.$CaO_{(s)} + H_{2(g)} \rightarrow$, $b.\ CO_g + H_{2(g)} \rightarrow$

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21. Describe some unusual properties of water.

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22. What is the difference between hydrolysis and hydrations?

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23. What is understood by hydrogenations?

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24. What are the advantanges in using hydrogen as a fuel?

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25. Ionic hydrides are frequently used to remove traces of water from organic compounds. What is the underlying basis of this process?

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26. Although D_2O resembles H_2O chemically yet it is a toxic substance. Explain

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27. Why do lakes freeze form water top towards bottom?

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28. Why is ice dense than water and what kind of attractive force must be overcome to melt ice?

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29. A white solid is either Na_2O or Na_2O. A piece of red litmus paper turns white when it is dipped into a freshly made aqueous solution of the white solid.

a. Identify the substance and explain the balanced equation.

b. Explain what would happen to the red litmus if the white solid were the other compound.

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30. Explain the following.

a. Hydrated barium peroxide is used in the preparation of H_2O_2 instead of anhydrous barium peroxide.

b. Phosphoric acid is preferred to sulphuric acid in the preparation of H_2O_2 from barium peroxide.

c. Hydrogen is not prepared by action of concentrated sulphuric acid on zinc.

d. A solution of ferric chloride is unaffected when hydrogen is bubbled through it, but gets reduced when zinc is added to the same acidified solution.

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31. An element has the minimum and maximum oxidation states as $-X$ and $+X$ respectively. It does not have the possibility of undergoing disproportionation in any of its compounds. What is the value of X?

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32. Give reason for the following

a. The process $\frac{1}{2}H_{2(g)} + e^{\ominus} \rightarrow H^{\ominus}_{(g)}$ is endothermic, yet ionic hydrides are known.

b. A mixture of hydrazine and H_2O_2 with $Cu(II)$ catalyst is used as a rocket propellant.

c. It is possible to remove completely the temporary hardness caused due to $Mg(HCO_3)_2$ by boiling.

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33. The degree of hardness of a given sample of hard water is $40ppm$. If the entire hardness is due to $MgSO_4$, how much of $MgSO_4$ is present per kg of water?

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34. $34g$ of H_2O_2 is present in H_2OmL of solution. This solution is called.

A. $10vol$

B. $20vol$

C. $34vol$

D. $32vol$

Answer: A

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35. A $5.0cm^3$ solution of H_2O_2 liberates $1.27g$ of iodine from an acidified KI solution. The precentage strength of H_2O_2 is

A. 11.2

B. 5.6

C. 1.7

D. 3.4

Answer: D

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36. $100mL$ of ozone at STP was passed through $100mL$ of 10 volume H_2O_2 solution. What is the volume strength of H_2O_2 after attraction?

A. 9.5

B. 9.0

C. 4.75

D. 4.5

Answer: A

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Exercises Linked Comprehension

1. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O_2. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

The equivalent of H_2O_2 reacted with Sn^{2+} is

A. 0.2

B. 0.3

C. 0.4

D. 0.6

Answer: D

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2. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O_2. $136g$ of $10\ \%$ by mass of H_2O_2 in water is treated with $100mL$

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$$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$$

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

The equivalent of H_2O_2 left after reacting with Sn^{2+} is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: B

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3. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O_2. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

The volume strength of H_2O_2 left after reacting with Sn^{2+}

A. $1.12V$

B. $11.2V$

C. $2.24V$

D. $22.4V$

Answer: B

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4. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O_2. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

Calculate the volume of O_2 produced at $27^{\circ}C$ and 1 atm after H_2O_2 is reacted with `Sn^(2+) and the mixture is allowed to stand.

A. $2.46L$

B. $4.92L$

C. $1.23L$

D. $7.38L$

Answer: C

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5. Hydrogen accounts for approximately $75\ \%$ of the mass of the universe. Hydrogen serves as the nuclear fuel of our Sun and other stars, and these are mainly composed of hydrogen. On the earth, though hydrogen is rarely found in the uncombined state. Since the earth's gravity is too

weak to hold such light molecules, nearly all the H_2 originally present in the earth's atmosphere has been lost to space. In the earth's crust and oceans, hydrogen is found in water, petroleum, proteins, carbohydrates and other compounds and it is the ninth most abundant element on a mass basis. Hydrogen has three isotopes : hydrogen or protium $()$, deuterium or heavy hydrogen (D or), tritium $(T \text{ or })$. The physical properties of the three isotopes are different due to the difference in their masses, i.e. isotope effect. The chemical properties of the three isotopes are similar as they have the same electronic configuration. Reaction between hydrogen and oxygen is highly exothermic, and gas mixtures that contain as little as $4\,\%$ by volume hydrogen in oxygen (or in air) are highly flammable and potentially explosive.

$2H_{2(g)} + O_{2(g)}, \Delta H^{\ominus} = -485 kJmol^{-1}$

As hydrogen is environmentally clean it is an enormously attractive fuel. 'Hydrogen economy' is an emerging field in which it is thought that our energy needs can be met by gaseous, liquid and solid hydrogen. As hydrogen is no a naturally occuring substance such as coal, oil or natural gas, energy must be exploaded to produce hydrogen before it can be used.

If an isotope of hydrogen has one neautron in its atom, its atomic number and atomic mass will respectively be

A. $1, 2$

B. $1, 3$

C. $1, 1$

D. $2, 1$

Answer: A

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before it can be used.

Which of the following fuel produces least environmental pollution?

A. Hydrogen

B. Coal

C. Wood

D. Gasoline

Answer: A

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Which of the following is radioactive in nature?

A. Hydrogen only

B. Deutrium only

C. Tritium only

D. Deutrium and tritium

Answer: C

8. Hydrogen accounts for approximately $75\ \%$ of the mass of the universe. Hydrogen serves as the nuclear fuel of our Sun and other stars, and these are mainly composed of hydrogen. On the earth, though hydrogen is rarely found in the uncombined state. Since the earth's gravity is too weak to hold such light molecules, nearly all the H_2 originally present in the earth's atmosphere has been lost to space. In the earth's crust and oceans, hydrogen is found in water, petroleum, proteins, carbohydrates and

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$2H_{2(g)} + O_{2(g)}, \Delta H^{\ominus} = -485 kJ mol^{-1}$

As hydrogen is environmentally clean it is an enormously attractive fuel. 'Hydrogen economy' is an emerging field in which it is thought that our energy needs can be met by gaseous, liquid and solid hydrogen. As hydrogen is no a

naturally occuring substance such as coal, oil or natural gas, energy must be exploaded to produce hydrogen before it can be used.

Hydrogen, H_2 is very less abundant in the atmosphere due to

A. inflammable nature of H_2

B. weak earth's gravity which is not able to hold light H_2 molecules

C. diatomic nature of hydrogen

D. very rapid reaction between hydrogen and atmosphere oxygen

Answer: B

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9. Hydrogen accounts for approximately $75\ \%$ of the mass of the universe. Hydrogen serves as the nuclear fuel of our Sun and other stars, and these are mainly composed of hydrogen. On the earth, though hydrogen is rarely found in the uncombined state. Since the earth's gravity is too weak to hold such light molecules, nearly all the H_2 originally present in the earth's atmosphere has been lost to space. In the earth's crust and oceans, hydrogen is found in water, petroleum, proteins, carbohydrates and other compounds and it is the ninth most abundant element on a mass basis. Hydrogen has three isotopes : hydrogen or protium $()$, deuterium or heavy hydrogen (D or), tritium $(T\ \text{or}\ )$. The physical properties of the three isotopes are different due to the difference in their

masses, i.e. isotope effect. The chemical properties of the three isotopes are similar as they have the same electronic configuration. Reaction between hydrogen and oxygen is highly exothermic, and gas mixtures that contain as little as 4% by volume hydrogen in oxygen (or in air) are highly flammable and potentially explosive.

$2H_{2(g)} + O_{2(g)}, \Delta H^{\ominus} = -485kJmol^{-1}$

As hydrogen is environmentally clean it is an enormously attractive fuel. 'Hydrogen economy' is an emerging field in which it is thought that our energy needs can be met by gaseous, liquid and solid hydrogen. As hydrogen is no a naturally occuring substance such as coal, oil or natural gas, energy must be exploaded to produce hydrogen before it can be used.

Liquid H_2 has been used as rocket fuel as

A. its reaction with oxygen is highly exothermic

B. it occupies small space

C. it has high thrust

D. all of the above

Answer: D

Watch Video Solution

10. Hydrogen accounts for approximately 75% of the mass of the universe. Hydrogen serves as the nuclear fuel of our Sun and other stars, and these are mainly composed of hydrogen. On the earth, though hydrogen is rarely found in the uncombined state. Since the earth's

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Which of the following is the lightest gas?

A. hydrogen

B. oxygen

C. nitrogen

D. helium

Answer: A

Watch Video Solution

11. Hydrogen peroxide is a powerful oxidising agent, both in the acidic and alkaline medium.

In acidic medium: $H_2O_2 + 2H^{\oplus} + 2e^{\ominus} \rightarrow 2H_2O$

In alkaline medium: $H_2O_2 + 2e^{\ominus} \rightarrow 2\overset{\Theta}{O}H$

Hydrogen peroxide acts as a reducing agent towards powerful oxidising agents.

In acidic medium: $H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$ In alkaline medium, however, its reducing nature is more effective.

$H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$

On addition of H_2O_2 to accidified $KMnO_4$, $KMnO_4$ gets decolourised due to

A. oxidation of $KMnO_4$

B. reduction of $KMnO_4$

C. both oxidation and reduction

D. none of the above of $KMnO_4$

Answer: B

Watch Video Solution

12. Hydrogen peroxide is a powerful oxidising agent, both in the acidic and alkaline medium.

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$H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$

H_2O_2 behaves as a bleaching agent due to

A. oxidising nature

B. reducing nature

C. acidic nature

D. unstable nature

Answer: A

Watch Video Solution

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In the reaction, $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$, H_2O_2 behaves as

A. an oxdising agent

B. reducing agent

C. acid

D. base

Answer: B

Watch Video Solution

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$H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$

In which of the following reactions, H_2O_2 act as a reducing agent?

A. $2KI + H_2O_2 \rightarrow 2KOH + I_2$

B. $KNO_2 + H_2O_2 \rightarrow KNO_3 + H_2O$

C. $Na_2SO_3 + H_2O_2 \rightarrow Na_2SO_4 + H_2O$

D. $PbO_2 + H_2O_2 \rightarrow PbO + H_2O + O_2$

Answer: D

Watch Video Solution

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$H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$

In which of the following reactions, H_2O_2 acts as an oxidising agent?

A. $2I^{\ominus} + H_2O_2 + 2H^{\oplus} \rightarrow I_2 + 2H_2O$

B. $IO_4^{\ominus} + H_2O_2 \rightarrow IO_3^{\ominus} + H_2O + O_2$

C. $Ag_2O + H_2O_2 \rightarrow 2Ag + H_2O + O_2$

D.

$2MnO_4^{\ominus} + 6H^{\oplus} + 5H_2O_2 \rightarrow 2Mn^{2+} + 8H_2O + 5O_3$

Answer: A

Watch Video Solution

16. Red hot coke+Steam $\xrightarrow{100^\circ C} \underset{\uparrow}{X}_{\text{Stream}} \xrightarrow[Catalyst\,(Y)]{500^\circ C} (Z) + H_2$

the above sequence refers to

A. Lane's process

B. Bosch's process

C. Ostwald's process

D. Haber's process

Answer: B

Watch Video Solution

17. Red hot coke+Steam $\xrightarrow{100^\circ C} \underset{\uparrow \text{Stream}}{X} \xrightarrow[Catalyst\,(Y)]{500^\circ C} (Z) + H_2$

$'X'$ is

A. water gas

B. producer gas

C. coal gas

D. oil gas

Answer: A

Watch Video Solution

18. Red hot coke+Steam $\xrightarrow{100^\circ C} \underset{\uparrow \text{Stream}}{X} \xrightarrow[Catalyst\,(Y)]{500^\circ C} (Z) + H_2$

$'Z'$ is

A. CO

B. CO_2

C. O_2

D. H_2O

Answer: B

Watch Video Solution

19. Red hot coke+Steam $\xrightarrow{100^\circ C} \underset{\uparrow \text{Stream}}{X} \xrightarrow[Catalyst\,(Y)]{500^\circ C} (Z) + H_2$

Catalyst $'Y'$ is

A. V_2O_5

B. Cr_2O_3

C. Fe_2O_3

D. $Fe_2O_3 + Cr_2O_3$

Answer: D

Watch Video Solution

20. Red hot coke+Steam $\xrightarrow{100^\circ C} \underset{\uparrow}{X} \xrightarrow[Catalyst\,(Y)]{500^\circ C} (Z) + H_2$

Stream

$'Z'$ is removed by passing the gaseous mixture through

A. acidic solution

B. alkaline solution

C. water under high pressure of $25atm$

D. an organic solvent

Answer: C

Watch Video Solution

Exercises Multiple Correct

1. Which of the following is//are basic hydride?

A. HCl

B. NH_3

C. H_2S

D. PH_3

Answer: B::D

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2. In which of the following property hydrogen does not resemble with halogen:

A. atomicity

B. ionisation enthalpy

C. reducing nature

D. electropositive nature

Answer: C::D

Watch Video Solution

3. In the reaction of sodium hydride and water:

A. sodium is reduced

B. hydrogen is oxidised

C. hydrogen is reduced

D. No element is oxidised or reduced

Answer: B::C

Watch Video Solution

4. Which of the following elements are oxidised when they react with dihydrogen?

A. Calcium

B. Sulphur

C. Lithium

D. Carbon

Answer: A::C

Watch Video Solution

5. What is true about saline dydrides?

A. They are binary compounds of hydrogen and metallic elements

B. They are crystalline solids.

C. They are generally very soft.

D. Their common examples are SiH_4, CH_4, etc.

Answer: A::D

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6. Among the hydrides given below which are reasonable good acids?

A. NH_3

B. HF

C. HN_3

D. NaH

Answer: B::C

Watch Video Solution

7. Which is false about ice?

A. It has open cage-like structure.

B. it has more density than water.

C. Each O atom is surrounded by four H atoms

D. Each O atom has four H-bonds around it.

Answer: B::D

Watch Video Solution

8. Which of the following statements about the following reaction is / are not correct?

$$Cr_2O_7^{2-} + 3H_2O_2 + 8H^{\oplus} \rightarrow 2Cr^{3+} + 7H_2O + 3O_2$$

A. H_2O_2 is oxidised to O_2

B. H_2O_2 is reduced to H_2O

C. The oxidation number of chromium atom changes by 3.

D. Hydrogen ions are oxidised to H_2O

Answer: B::D

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9. Which of the following statements is / are correct about $6.8\,\%$ stregnth of H_2O_2.

A. its normality is $4N$

B. its molarity is $2M$

C. Its volume strength is $22.4V$

D. Volume strength $11.2 \times M$

Answer: A::B::C::D

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10. xg of H_2O_2 requires $100mL$ of $M/5KMnO_4$ in a titration in a solution having $pOH = 1.0$ Which of the following is/are correct?

A. The value of $x$is $1.7g$

B. The value of x is $0.34g$

C. $MnO_4^{\ominus}$ change to $MnO_4^{\ominus}$

D. H_2O_2 change to O_2

Answer: B::C::D

Watch Video Solution

11. $20mL$ of H_2O_2 is reacted completely with acidified $K_2Cr_2O_7$ solution. $40mL$ of $K_2Cr_2O_7$ solution is required to oxidise the H_2O_2 completely. Also, $2.0mL$ of the same $K_2Cr_2O_7$ solution is required to oxidise $5.0mL$ of a $1.0MH_2C_2O_4$ solution to reach equivalence point. Which of the following statements is / are correct?

A. The H_2O_2 solution is $5M$

B. The volume strength of H_2O_2 is $56V$

C. The volume strength of H_2O_2 is $112V$

D. If $40mL$ more $5M/8H_2O$ is further added to the $10mL$ more H_2O_2 solution, the volume strength of the resulting solution is changed to $16.8V$

Answer: A::B::D

Watch Video Solution

12. Permanent hardness is due to $CI^{\ominus}$ and SO_4^{2-} of Mg^{2+} and Ca^{2+} and is removed by adding Na_2CO_3.

$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 + Na_2SO_4$
$CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaCl$

Which of the following statements is / are correct?

A. If hardness is $100 ppm CaCO_3$ the amount of Na_2CO_3 required to soften $10L$ of hard water is $10.6g$

B. If hardness is $100 ppm CaCO_3$, the amount of Na_2CO_3 required to soften $10L$ of hard water is

$1.06g$.

C. If hardness is $420ppm\,MgCO_3$, the amount of Na_2CO_3required to soften $10L$ of hard water is $53g$

D. If hardness is $420ppm\,MgCO_3$ is the amount of Na_2CO_3 required to soften $10L$ of hard water is $5.3g$

Answer: A::D

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13. The hardness of water due to HCO_3 is $122 \pm$. Select the correct statement(s).

A. The hardness of water in terms of $CaCO_3$ is $200ppm$

B. The hardness of water in terms of $CaCO_3$ is $100ppm$

C. The hardness of water in terms of $CaCO_3$ is $22ppm$

D. The hardness of water in terms of $CaCO_3$ is $95ppm$

Answer: B::D

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14. The reagent(s) used for softening the temporary hardness of water is (are):

A. $Ca_3(PO_4)_2$

B. $Ca(OH)_2$

C. Na_2CO_3

D. $NaOCl$

Answer: B::C

Watch Video Solution

15. In which of the following hydrides, hydrogen exists in negative oxidation state?

A. HCl

B. NaH

C. CaH_2

D. HI

Answer: B::C

Watch Video Solution

16. The oxidation states of the most electronegative element in the products of the reaction between BaO_2 with dilute H_2SO_4 are

A. -1

B. $+1$

C. -2

D. 0

Answer: A::C

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17. The oxides which give H_2O_2 on treatment with dilute acid are:

A. PbO_2

B. MnO_2

C. Na_2O_2

D. BaO_2

Answer: C::D

Watch Video Solution

18. When zeolite, which is hydrated sodium aluminate silicate, is treated with hard water, the sodium ions are exchanged with:

A. $Cl^{\ominus}$

B. $SO_4^{\ominus}$

C. Ca^{2+}

D. Mg^{2+}

Answer: C::D

Watch Video Solution

19. Which of the following meals on treatment with $NaOH$ will liberate H_2 gas?

A. Zn

B. Sn

C. Al

D. Mg

Answer: A::B::C

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Exercises Single Correct

1. Which of the following process uses water gas shift reaction?

A. Merck's process

B. Lane's process

C. Permutit process

D. Bosch's process

Answer: D

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2. Ethylene and H_2O_2 react to give

A. CO_2, H_2O

B. CO, H_2O

C. Ethylene oxide

D. Ethylene glycol

Answer: D

Watch Video Solution

3. In which of the following compound does hydrogen exhibit a negative oxidation state:

A. LiH

B. H_2O

C. HCl

D. none of these

Answer: A

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4. The number of neutrons in deuterium is

A. 2

B. 3

C. 1

D. 0

Answer: C

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5. Which of the following represents the heavy water?

A. water at $277k$

B. water contaning large contamination of lead salts

C. deuterium oxide

D. protium oxide

Answer: C

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6. H_2O_2 cannot act as

A. oxidising agent

B. dehydrating agent

C. reducing agent

D. acid

Answer: B

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7. Hardness of water is due to dissolved impurities of

A. calcium and magnesium salt

B. barium and magnesium salts

C. calcium and strontium salts

D. sodium and potasium salts

Answer: A

Watch Video Solution

8. H_2O_2 is reduced by

A. O_3

B. acidic $KMnO_4$ solution

C. lead sulphide suspension in water

D. none of these

Answer: C

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9. When water is dropped over sodium peroxide, the colourless gas produced is

A. dinitrogen

B. dioxygen

C. dihydrogen

D. hydrogen peroxide

Answer: B

Watch Video Solution

10. In which of the following reaction dihydron acts as an oxidising agent?

A. $Ca + H_2 \rightarrow CaH_2$

B. $2H_2 + O_2 \rightarrow 2H_2O$

C. $H_2 + F_2 \rightarrow 2HF$

D. $CuO + H_2 \rightarrow Cu + H_2O$

Answer: A

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11. Which of the following metal does not produce dihydrogen gas with dilute hydrochloric acid?

A. Mg

B. Zn

C. Ag

D. Ba

Answer: C

Watch Video Solution

12. Which oxide cannot be reduced by H_2?

A. Al_2O_3

B. CuO

C. ZnO

D. All of these

Answer: A

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13. Ortho- and para-hydrogen differ in

A. atomic number

B. mass number

C. electron spin in two atoms

D. nuclear spin in two atoms

Answer: D

Watch Video Solution

14. Nascent hydrogen consists of

A. hydrogen ions in the excited state

B. hydrogen molecules with excess energy

C. solvated protons

D. hydrogen atoms with excess energy

Answer: D

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15. $30-$ volume hydrogen peroxide means

A. $30\ \%$ of H_2O_2 by volume

B. $30g$ of H_2O_2 solution contains $1g$ of H_2O

C. $1cm^3$ of solution liberates $30cm^3$ of dioxygen gas at STP

D. $1cm^3$ of solution liberate $30cm^3$ of dioxygen gas at STP

Answer: C

Watch Video Solution

16. The compound which gives H_2O_2 on treatment with dilute acid is

A. PbO_2

B. MnO_2

C. TiO_2

D. KO_2

Answer: D

Watch Video Solution

17. When a sample of hard water is passed through the layer of sodium zeolite resulting which of the following ions will not be present in the resulting sample of water obtained?

A. MG^{2+} and Ca^{2+}

B. Ca^{2+} and $Na^{\oplus}$

C. Mg^{2+} and CO_3^{2-}

D. CO_3^{2-} and $Cl^{\ominus}$

Answer: A

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18. Hydrolysis of one mole of peroxodisulphuric acid produces acid produces

A. two moles of sulphuric acid and hydrogen peroxide

B. two moles of peroxomonosulphuric acid

C. one mole of sulphuric acid, one mole of peroxomonosulphuric acid and one mole of hydrogen peroxide

D. one mole of sulphuric acid and one mole of peroxomonosulphate acid

Answer: A

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19. Barium peroxide reacts with phosphoric acid to produce barium phosphate alongwith

A. water

B. hydrogen peroxide

C. dioxygen

D. phosphine

Answer: B

Watch Video Solution

20. One part of heavy water is present in X parts of ordinary water. Here X is

A. 10

B. 60

C. 6000

D. 60000

Answer: C

Watch Video Solution

21. The hydride ion $H^{\ominus}$ is a stronger base than hydroxide ion. Which of the following reaction would occur if NaH is dissolved in water

A. $H^{\ominus}_{(aq)} + H_2O_{(l)} \rightarrow H_3O^{\oplus}$

B. $H^{\ominus}_{(aq)} + H_2O_{(l)} \rightarrow \overset{\ominus}{O}H_{(aq)} + H_2$

C. $H^{\ominus} + H_2O \rightarrow$ No reaction

D. none of the above

Answer: B

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22. The volume strength of $1 \cdot 5$ N H_2O_2 solution is

A. 4.8

B. 5.2

C. 8.8

D. 8.4

Answer: D

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23. Which of the following pair of substances will not evolve H_2 gas

A. Iron and aqeous H_2SO_4

B. Copper and $HCl_{(aq)}$

C. Sodium and ethanol

D. Iron and steam

Answer: C

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24. H_2 molecule has two electrons and two nuclei. In which form of hydrogen the spin of electrons and also the spin of nuclei are in opposite directions.

A. orthohydrogen

B. parahydrogen

C. metahydrogen

D. β-hydrogen

Answer: B

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25. What is false about Lane's process?

A. method is used for manufacture of dihydrogen

B. it involves the oxidation of iron by steam

C. it involves the reducing of $H_2O_{(g)}$ by iron

D. it involves the oxidation of water gas

Answer: D

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26. Which of the following hydrides are generally non-stoichiometric in nature?

A. ionic hydrogen

B. molecular hydrides

C. interstitial hydrides

D. all of these

Answer: C

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27. Dihydrogen gas may be prepared by heating caustic soda on

A. Cu

B. Zn

C. Na

D. Ag

Answer: B

Watch Video Solution

28. The volume of 10 volume of H_2O_2 required to liberate $500mL$ of O_2 at `STP is

A. $25mL$

B. $50mL$

C. $100mL$

D. $125mL$

Answer: B

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29. Pure H_2O_2 is

A. semi-solid

B. liquid

C. solid

D. gas

Answer: B

Watch Video Solution

30. Hydrogen can react with the following even in dark:

A. I_2

B. Cl_2

C. F_2

D. Br_2

Answer: C

Watch Video Solution

31. When zeolite, which is hydrated sodium aluminium silicate is treated with hard water, the sodium ions $\left(Na^{\oplus}\right)$ are exchanged with

A. $H^{\oplus}$ ions

B. Ca^{2+} ions

C. SO_4^{2-} ions

D. $\overset{\Theta}{O}H$ ions

Answer: B

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Watch Video Solution

32. $34g$ of H_2O_2 is present in $1120ml$ of H_2O solution. This solution is called.

A. $10vol$ solution

B. $20vol$ solution

C. $34vol$ solution

D. $32vol$ solution

Answer: A

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33. A $5.0cm^3$ solution of H_2O_2 liberates $1.27g$ of iodine from an acidified KI solution. The precentage strength of H_2O_2 is

A. 11.2

B. 5.6

C. 1.7

D. 3.4

Answer: D

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34. A $5.0mL$ solution of H_2O_2 liberates $1.27g$ of iodine from an acidified KI solution. The strength of H_2O_2 is in terms of volume strength is

A. 11.2

B. 5.6

C. 1.7

D. 3.4

Answer: A

Watch Video Solution

35. $100mL$ of ozone at STP was passed through $100mL$ of 10 volume H_2O_2 solution. What is the volume strength of H_2O_2 after attraction?

A. 9.5

B. 9.0

C. 4.75

D. 4.5

Answer: A

Watch Video Solution

36. $25mL$ samples of distiled water, tap water and boiled water required, respectively, $1mL, 13mL$ and $5mL$ of soap solution to form a permanent lather. The ratio of temporary to permanent hardness in the tap water is

A. $3:2$

B. $2:3$

C. $1:2$

D. $2:1$

Answer: D

Watch Video Solution

37. $3.4g$ sample of H_2O_2 solution containing $x\ \%\ H_2O_2$ by weight requires $xmLofaKMnO_4$ solution for complete oxidation under acidic condition. The normality of $KMnO_4$ solution is

A. $1N$

B. $2N$

C. $3N$

D. $0.5N$

Answer: B

Watch Video Solution

38. If $100mL$ of acidified $2NH_2O_2$ is allowed to react with $KMnO_4$ solution till there is light tinge of purples colour, the volume of oxygen produced at STP is :

A. $2.24L$

B. $1.12L$

C. $3.36L$

D. $4.48L$

Answer: A

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39. $100mL$ of H_2O_2 is oxidised by $100mL$ of $0.01MKMnO_4$ in acidic medium $\left(MnO_4^{\ominus}\right.$ reduced to $\left.Mn^{2+}\right)$. $100mL$ of the same H_2O_2 is oxidised by VmL of $0.01MKMnO_4$ in basic medium. Hence V is

A. $\frac{100}{3}mL$

B. $\frac{500}{3}mL$

C. $\frac{300}{5}mL$

D. None

Answer: B

Watch Video Solution

40. $10mL$ of H_2O_2 solution (volume strength $= x$) requires $10mL$ of $N/0.56MnO_4^{\ominus}$ solution in acidic medium. Hence$x$ is

A. 0.56

B. 5.6

C. 0.1

D. 10

Answer: D

Watch Video Solution

41. The normality and volume strength of a solution made by mixing $1.0L$ each of 5.6 volume and 11.2 volume H_2O_2 solution are:

A. $1N$, $5.6vol$

B. $1.5N$, $5.6vol$

C. $1.5N$, $8.4vol$

D. $1N$, $8.4vol$

Answer: C

Watch Video Solution

42. $100mL$ of H_2O_2 is oxidised by $100mL$ of $0.01MKMnO_4$ in acidic medium $\left(MnO_4^{\ominus}\right.$ reduced to $\left.Mn^{2+}\right)$. $100mL$ of the same H_2O_2 is oxidised by VmL of $0.01MKMnO_4$ in basic medium. Hence V is

A. 500

B. 100

C. $\frac{100}{3}$

D. $\frac{500}{3}$

Answer: D

Watch Video Solution

43. The purity of H_2O_2 in a given sample is 85%. Calculate the weight of impure sample of H_2O_2 which requires $10mL$ of $M/5KMnO_4$ solution in a titration in acidic medium

A. $2g$

B. $0.2g$

C. $0.17g$

D. $0.15g$

Answer: B

Watch Video Solution

44. 10L of hard water required $0.56g$ of time (CaO) for removing hardness. Hence, temporary hardness in p p m (part per million, 10^6) of $CaCO_3$ is

A. 100

B. 200

C. 10

D. 20

Answer: B

Watch Video Solution

45. Hydrogen has the tendency to gain one election to acquire helium configuration, in this respect, it resembles:

A. alkali metals

B. carbon

C. alkaline earth metals

D. halogens

Answer: D

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46. Heavy water is qualified as heavy liquid as it is.

A. a heavy liquid

B. an oxide of heavier isotope of oxygen

C. an oxide of deuterium

D. denser than water

Answer: C

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47. Which of the following is used as rocket fuel?

A. Liquid O_2

B. liquid NH_3

C. Liquid N_2

D. Liquid H_2

Answer: D

Watch Video Solution

48. On burning hydrogen in air the colour of flame is

A. green

B. light bluish

C. yellow

D. none of these

Answer: B

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49. Number of $H-$ bonds formed by a water molecule is:

A. 2

B. 8

C. 1

D. 4

Answer: D

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50. Surface water contains.

A. suspended impurities

B. organic impurities

C. salt

D. salt and organic compound

Answer: A

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51. Which is false about H_2O_2?

A. acts both as an oxidising and reducing agent.

B. Two $-OH$ bonds lie in the same plane.

C. Pale blue liquid.

D. Can be oxidised by O_3

Answer: B

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52. When electric current is passed through an ionic hydride in molten state:

A. hydrogen is liberated at anode

B. hydrogen is liberated at cathode

C. hydride ion migrates towards cathode

D. hydride ion remains in solution

Answer: A

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53. Among CaH_2, NH_3, NaH and B_2H_6 which are covalent hydrides?

A. NH_3 and B_2H_6

B. NaH and CaH

C. NaH and NH_3

D. CaH_2 and B_2H_6

Answer: A

Watch Video Solution

54. The oxygen atoms in H_2O_2 undergone__hybridisation.

A. sp^3

B. sp^2

C. sp

D. sp^3d^2

Answer: A

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55. Which of the following is correct for hydrogen?

A. it can form bonds in $+1$ as well as -1 oxidation state.

B. it is collected at cathode

C. it has a very high ionisation potential

D. all of the above

Answer: C

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56. Which of the following is not a water softener?

A. calgon

B. permutit

C. Na_2SO_4

D. Na_2CO_3

Answer: C

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57. Calgon is an industrial name given to

A. normal sodium phosphate

B. sodium meta-aluminate

C. sodium hexametaphosphate

D. hydrated sodium aluminium silicate

Answer: B

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58. Both temporary and permanent hardness is removed on boiling with

A. $Ca(OH)_2$

B. N_2CO_3

C. $CaCO_3$

D. CaO

Answer: A

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59. The exhausted permutit is generally regenerated by percolating through it a solution of

A. sodium chloride

B. calcium chloride

C. magnesium chloride

D. barium chloride

Answer: B

Watch Video Solution

60. Heavy water is

A. H_2O

B. D_2O

C. water at $4^\circ C$

D. water obtained by repeated distillation

Answer: A

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61. An orange coloured solution acidified with H_2SO_4 and treated with a substance $'X'$ gives a blue coloured solution of CrO_5. The substance $'X'$ is

A. H_2O_2

B. H_2O

C. $dilHCl$

D. $ConcHCl$

Answer: D

Watch Video Solution

62. The shape of water molecule is same as that of

A. C_2H_2

B. CO_2

C. NH_3

D. Cl_2O

Answer: A

Watch Video Solution

63. Hydrogen can be placed in group 17 pf the periodic table because

A. hydrogen forms hydrides like NaH

B. hydrogen has isotopes D and T

C. it is light

D. hydrogen combines with halogens

Answer: D

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64. Given colourless liquid will be determined whether it is water or not?

A. by smelling

B. by tasting

C. by phenolphthalein

D. by adding a pinch of anhydrous $CuSO_4$

Answer: C

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65. Heavy water is used in atomic reactor as

A. coolant

B. moderator

C. both coolant and moderator

D. neither coolant nor moderator

Answer: C

Watch Video Solution

66. Hydrogen peroxide was first time prepared by

A. gay-lussac

B. priestely

C. thenard

D. bernard

Answer: C

Watch Video Solution

67. Consider LiH, MgH_2 and CuH:

A. all are ionic hydrides

B. LiH, MgH_2 are ionic, whereas CUH is covalent

C. all are covalent

D. LiH is ionic, MgH_2 is covalent CuH is metqallic

Answer: D

 Watch Video Solution

68. Water softening by Clarke's process uses

A. calcium bicarbonate

B. calcium hydroxide

C. potash alum

D. sodium bicarbonate

Answer: B

Watch Video Solution

69. H_2O_2 is a

A. monobasic acid

B. diabasic acid

C. neutral

D. weak alkali

Answer: B

Watch Video Solution

70. Which one of the following compounds is a peroxide?

A. KO_2

B. BaO_2

C. MnO_2

D. NO_2

Answer: B

Watch Video Solution

71. Hard water is not fit for washing clothes because

A. it contains Na_2SO_4 and KCl

B. it gives precipitate

C. it contains impurities

D. it is acidic in nature

Answer: B

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Exercises Assertion Reasoning

1. Assertion (A): Ferrocyanide ion oxidises H_2O_2 to H_2O.

Reason (R) : Oxidation product of H_2O_2 is O_2.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D

Watch Video Solution

2. Assertion (A): In a reaction of H_2O_2 and Na_2CO_3, hydrogen peroxide acts as acid.

Reason (R) : H_2O_2 cannot act as acid.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: C

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3. Assertion (A): The colour of old lead painting can be restored by washing with dilute solution of H_2O_2.

Reason (R) : Black lead sulphide is oxidised by H_2O_2 to white lead suphate.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

4. Assertion (A): A small piece of zinc dissolves in dilute nitric acid but no hydrogen is evolved.

Reason (R) : HNO_3 is an oxidising acid and oxidises hydrogen evolved to water.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

5. Assertion (A): Hydrogen oxidises lithium to Li.

Reason (R) : Hydrogen cannot act as oxidising agent.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

6. Assertion (A): Pink coloured solution of potassium permanganate turns green on passing O_3 through it.

Reason (R) :K_2MnO_4 is oxidised by O_3 to $KMnO_4$.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D

 Watch Video Solution

7. Assertion (A): Electrolysis of hard water produces O_2 and D_2.

Reason (R) :Ordinary hydrogen is called protium.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

View Text Solution

8. Assertion (A): Colour of $KMnO_4$ disappears when dihydrogen gas is bubbled through it.

Reason (R) :Dihydrogen gas is highly inflammable.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: B

View Text Solution

9. Assertion (A): Concentration of H_2O_2 is expressed in volume.

Reason (R) :Volume strength = Normality $\times 5.6$.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: B

Watch Video Solution

10. Assertion (A): Hardness of water is determined by titrating it with disodium salt of $EDTA$.

Reason (R) :The indicator used in the titration is Eriochrome Black$-T$ at $pH = 10$.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

11. Assertion (A): Temporary hardness in water is due to the presence of chlorides of magnesium.

Reason (R) :Temporary hardness is removed by Clark's method.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D

Watch Video Solution

12. Assertion (A): When blood is added to a solution of H_2O_2, the solution bubbles furiously.

Reason (R) : Catalase (an enzyme) present in blood decomposes H_2O_2 and produces bubbles of O_2.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

13. Assertion (A): Alkali metals form ionic hydrides.

Reason (R) : Alkali metals lose their valence electron which is accepted by hydrogen to form hydride ion.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

14. Assertion (A): The process of adsorption of hydrogen on palladium is known as occlusion.

Reason (R) : The adsorbed hydrogen is more active than ordinary hydrogen.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: B

Watch Video Solution

15. Assertion (A): H_2O is a linear molecule.

Reason (R) : Oxygen is sp^3 hybridised.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D

Watch Video Solution

16. Assertion (A): $NaCl$ is less soluble in heavy water than in ordinary water.

Reason (R) : Dielectric constant of ordinary water is more than that of heavy water.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A

Watch Video Solution

17. Assertion (A): Dihydrogen is prepared in the laboratory by the action of conc H_2SO_4 on granular zinc.

Reason (R) : Pure hydrogen can be obtained by the action of water on sodium hydride.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D

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Exercises Interger

1. What is the molarity of H_2O_2 of the $11.2V$ (volume strength)?

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2. A bottle of H_2O_2 is labelled as $10volH_2O_2$. $112mL$ of this solution of H_2O_2 is titrated against $0.04M$ acidified solution of $KMnO_4$. Calculate the volume of $KMnO_4$ in terms of litre.

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3. What is the oxidation state of oxygen of H_2O_2 in the final products when it reacts with ClO_3?

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4. What is the oxidation state of oxygen of H_2O_2 in the final products when it reacts with As_2O_3?

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5. Washing soda ($Na_2CO_{3.10}H_2O$) is widely used in softening of hard water. If $1L$ of hard water requires 0.0143g of washing soda, what is hardness of water in terms of ppm of $CaCO_3$?

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6. What is the sum of protons, electrons and neutrons in the heaviest isotope of hydrogen?

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7. What is the sum of protons, electrons and neutrons in the lightest isotope of hydrogen?

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8. How many moles of ammonia are produced when one mole of calcium nitride reacts with water?

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9. How many moles of phosphine are produced when one of the calcium phosphides reacts with water?

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10. What is the molarity of a commercial sample of 33.6 volume hydrogen peroxide solution?

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Exercises Fill In The Blanks

1. The principal cause of hardness of water is the presence of____ and___ions.

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2. In reaction of hydrogen peroxide and sodium carbonate, H_2O_2 acts as____.

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3. In the reaction of F_2 and H_2O, water act as_____.

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4. Sodium zeolite is_____.

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5. The trade name of sodium hexametaphosphate is____.

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6. The electrolysis of molten hydrolith produces____gas at anode.

Watch Video Solution

7. Bleaching action of hydrogen peroxide is due to___.

Watch Video Solution

8. $O-O-H$ bond angle in H_2O_2 is approximately_____.

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9. Bleaching powder and hydrogen peroxide ract to give _____.

Watch Video Solution

10. Dropping of water over calcium carbide produces _____gas.

Watch Video Solution

Exercises True False

1. A sample of water which does not produce lather with soap readily is called heavy water.

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2. 1 litre of 30 volume-hydrogen peroxide contains $91.07 g H_2O_2$.

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3. Deuterium is an isomer of hydrogen.

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4. Water is an ionic hydride.

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5. H_2O_2 cannot act as reducing agent.

Watch Video Solution

6. Zinc dissolves in concentrated $NaOH$ solution to produce dihydrogen as well as dioxygen gas.

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7. Protium oxide is the name given to D_2O.

Watch Video Solution

8. Ammonia and phosphine are sailne hydrides.

Watch Video Solution

9. Oxygen atoms and hydrogen atoms in H_2O_2 are collinear.

Watch Video Solution

10. D_O is more polar than H_2O.

Watch Video Solution

Exercises Archive Multiple Correct

1. When zeolite, which is hydrated sodium aluminium silicate is treated with hard water, the sodium ions $\left(Na^{\oplus}\right)$ are exchanged with

A. $H^{\oplus}$ ions

B. Ca^{2+} ions

C. SO_4^{2-} ions

D. Mg^{2+}

Answer: B::D

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2. The reagent(s) used for softening the temporary hardness of water is (are):

A. $Ca_3(PO_4)_2$

B. $Ca(OH)_2$

C. Na_2CO_3

D. $NaOCl$

Answer: B::C::D

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3. Hydrogen peroxide in its reaction with KIO_4 and NH_2OH respectively, is acting as a

A. reducing agent,oxidising agent

B. reducing agent, reducing agent

C. oxidising agent,oxidising agent

D. oxidising agent, reducing agent

Answer: A

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Exercises Archive Single Correct

1. The temporary hardness of water due to calcium bicarbonate can be removed by adding

A. $CaCO_3$

B. $Ca(OH)_2$

C. $CaCl_2$

D. HCl

Answer: B

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2. Heavy water is

A. H_2O^{18}

B. water obtained by repeated distillation

C. D_2O

D. water at $4^\circ C$

Answer: C

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3. The oxide that gives H_2O_2 on treatment with a dilute acid is

A. PbO_2

B. Na_2O_2

C. MnO_2

D. TiO_2

Answer: B

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4. The species that does not contain peroxide bond is //are :

A. PbO_2

B. H_2O_2

C. SrO_2

D. BaO_2

Answer: A

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5. Hydrolysis of one mole of peroxodisulphuric acid produces

A. 2 mol of sulphuric acid

B. 2 mol of peroxomonosulphuric acid

C. 1 mol of H_2SO_4 and 1 mol of peroxomonosulphuric acid

D. 2 mol of H_2O_2 and 1 mol H_2O_2

Answer: D

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6. Polyphosphates are used for softening agents because they

A. form soluble complexes with anionic species

B. percipitate anionic species

C. form soluble complexes with cationic species

D. percipitate cationic species.

Answer: C

Watch Video Solution

7. The reagent(s) used for softening the temporary hardness of water is (are):

A. $Ca_3(PO_4)_2$

B. $Ca(OH)_2$

C. Na_2CO_3

D. $NaOCl$

Answer: B

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8. In which of the following reaction H_2O_2 acts as a reducing agents?

$A.\ H_2O_2 + 2H^{\oplus} + 2e^- \rightarrow 2H_2O$

$B.\ H_2O_2 - 2e^{-2} \rightarrow O_2 + 2H^{\oplus}$

$C.\ H_2O_2 + 2e^- \rightarrow 2OH^{\ominus}$

D. $H_2O_2 + 2OH^{\ominus} + 3e^- \rightarrow O_2 + 2H_2O$

A. B and C

B. A and C

C. B and D

D. A and B

Answer: C

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9. From the following statements regarding H_2O_2, choose the incorrect statements:

A. it can act only as an oxidizing agent

B. it decomposes on exposure to light

C. it has to be stored in plastic or wax lined glass bottles in dark

D. it has to be kept away from dust

Answer: A

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Exercises Archive Fill In The Blanks

1. The adsorption of hydrogen by palladium is commonly known as _____.

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2. Hydrogen gas is liberated the action of aluminium with concentrated solution of_____.

Watch Video Solution

Subjective Archive Subjective

1. H_2O_2 is a better oxidising agents than water.

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2. The mixture of hydrazine and hydrogen peroxides with a copper (II) catalyst is used as a rocket propellant.

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3. a. When H_2O_2 is added to blood, rapid evolution of a gas occurs. Why ?

b. Hydrogen peroxide acts both as an oxidising and as a reducing agent in alkaline solution towards certain first row transition metal ions. Illustration both these properties of H_2O_2 using chemical equations.

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