CHEMISTRY

BOOKS - V PUBLICATION

HYDROGEN

Question Bank

1. Justify the position of hydrogen in the periodic table

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2. Write the names of isotopes of hydrogen. What is the mass ratio of these isotopes?

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3. Why does hydrogen occur in a diatomic fom rather than in a monoatomic form under nomal conditions?

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4. How can the production of dihydrogen, obtained from 'coal gasification' be increased?

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5. Describe the bulk preparation of dihydrogen by electrolytic method. ?

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6. Complete the following reactions :

i) $H_2(g) + M_mO_0(s), \xrightarrow{\Delta}$

ii) $CO(g) + H_2(g) \xrightarrow[catalyst]{\Delta}$

iii) $C_3H_8(g) + 3H_2O(g) \xrightarrow[catalyst]{\Delta}$

iv). $Zn(s) + NaOH(aq) \xrightarrow{heat}$

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7. Discuss the consequences of high bond enthalpy of H-H bond in terms of chemical reactivity.

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8. What do you understand by (i) electron-deficient (ii) electron-precise (iii) electron-rich compounds of hydrogen ?

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9. What characteristics do you expect from an electron cleficient hydride with respect to its structure and chemical reactions?

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10. Do you expect carbohydrides of the type $[C_nH_{2n+2}]$ to act as Lewis acid or base? Why?

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11. What do you mean by non-stoichiometric hydrides?

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12. How do you expect the metallic hydrides to be useful for hydrogen storage? Explain

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13. How does the atomic hydrogen torch function for cutting and welding purposes.

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14. Among NH_3, H_2O` and HF which would you expect to have highest magnitude of hydrogen bonding? Why?

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15. Saline hydrides are known to react with water violently producing fire. Can CO_2 a well known fire extinguisher be used in this case? Explain.

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16. Arrange the following CaH_2, BeH_2 and TiH_2 in order of increasing electrical conductance

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17. Compare the structures of water and hydrogen peroxide.

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18. What is meant by 'autoprotolysis' of water? What is its significance?

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19. Consider the reaction of water with 'F_2' and suggest, in terms of oxidation andreduction which species are oxidised/reduced.

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20. Complete the following chemical reactions.

i) $PbS(s) + H_2O_2(aq) \rightarrow$ ii)

$MnO_4^{-(aq)} + H_2O_2(aq) \rightarrow$ iii)

$CaO(s) + H_2O(g) \rightarrow$ iv)

$AlCl_3(g) + H_2O(l) \rightarrow$ v)

$Ca_3N_2(s) + H_2O(l) \rightarrow$ Classify the above into (a) hydrolysis (b) redox and (c) hydration reactions.

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21. Describe the structure of the common form of ice.

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22. What causes the temporary and permanent hardness of water?

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23. Discuss the principle and method of softening of hard water by synthetic ion-exchange resins.

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24. Write chemical reactions to show amphoteric nature of water.

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25. Write chemical reactiöns to justify that hydrogen peroxide can function as an oxidizing as well as reducing agent.

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26. What is meant by 'demineralished water '?

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27. Is demineralised or distilled water useful for drinking purposes? If not, how can it be made useful?

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28. Describe the usefulness of water in bíosphere and biological systems.

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29. What properties of water make it useful as a solvent?

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30. Knowing the properties of H_2O and D_2O . Do you think that D_2O can be used for drinking purpose?

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31. What is the difference between the terms 'hydrolysis' and 'hydration'?

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32. How can saline hydrides remove traces of water from organic compounds?

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33. What do you expect the nature of hydrides formed by elements of atomic number 15, 19 ,23 and 44 with hydrogen?

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34. Do you expect different products in solution when aluminium (III) chloride and potassium chloride treated separately with (i) normal water (ii) acidified water and (iii)

alkaline water? Write equations wherever necessary.

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35. How does H_2O_2, behave as a bleaching agent?

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36. What do you understand by the terms (i) hydrogen economy (ii) hydrogenation (iii)

'syngas' (iv) water-gas shift reaction (v) fuel cell?

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37. Water a compound of hydrogen is .unique in many of its.properties.Water can act as both acid and base.Explain?

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38. i) Rain water and séa, water differ in their behaviour towards soap. Give the difference and establish the chemistry behind this.

ii) A water boiler in a factory burst due to high interior pressure. It was reported that the incident was occured due to certain dissolved salt in water used, As a chemistry student how will you explain this?

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39. Cite two examples of metallic oxides which are acidic as well as basic in nature.

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40. Is it correct to say that hydrogen can behave as a metal? State the conditions under which such béhaviour can be possible.

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41. A sample of river water does not give lather with soap easily when it is cold, but on heating gives ready lather with soap. Why?

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42. Statues coated with white lead on long exposure to atmosphere turn black and the original colour can be restored on treatment with 'H_2 O_2'. Why?

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43. What is water gas? How is it prepared?

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44. Boiling point of H_2O (373K) is very much higher than that of H_2S (213 K). Give reason.

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45. A mixture of hydrazine and 'H_2 O_2' with Cu(II) catalyst is used as a rocket propellant. Why?

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46. Explain the following statements giving appropriate reasons.

i) Sea water doesn't form lather with soap.

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47. Hydrogen forms three type of bonds in its compounds. Describe each type of bonding using suitable examples.

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48. Name one example of a reaction in which dihydrogen acts as (i) an oxidizing agent

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49. a) Compare atomic hydrogen with nascent hydrogen.

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50. Anhydrous 'BaO_2' is not used for preparing 'H_2 O_2 .' Why?

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51. Hydrogen forms compounds with elements having atomic number '9,11,12' and '17 .' What are their chemical formulae?

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52. H_2S is a gas at ordinary condition, while H_2O is liquid. Account for the above statement.

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53. Why hard water is not used in industrial boilers for producing steam?

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54. Outline the similarities of hydrogen with the 1st.group elements

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55. In a science fair, a debate based on 'Position of Hydrogen in the periodic table" was condùcted. Imagine that you were a participant in the debate arguing for including hydrogen along with alkali metals.

i. Write any three statements you would have made in the debate in order to establish your árgument.

ii. If Raju was in the opposite side arguing for including hydrogen with halogens, how would he have countered your arguments?

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56. In nuclear reactors, heavy water is used as 'moderator'.

a. What is a moderator and which isotope of hydrogen is present in it?

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57. Raju noticed that while washing clothes by using rain water collected in a tank, the quantity of soap required was found to be less

than that required using tap water.

a. If Raju asked the reason behind it, how will you explain it?

b. Also mention any two methods to overcome.it,

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58. i. Hydrogen bonding is the cause for several peculiar properties of water in the liquid and solid states. What are those properties?

ii. Water forms several types of hydrates with metal salts. Discuss any two of them with examples.

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59. i. Dalda available in the market is prepared from vegetable oil. Write the science bèhind it.

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60. Soap does not give lather with hard water. Why?

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61. a. What is heavy water? Mention one use of heavy water.

b. Explain why hydrogen peroxide is not stored in glass vessels.

c. What is calgon? What is its use?

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62. Dihydrogen undergoes redox reactions with many metals at high temperature.

a) Write the reaction between hydrogen with sodium

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63. Explain why hydrogen peroxide is stored in coloured plastic bottles.

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64. In nuclear reactors, heavy water is used as 'moderator'.

a. What is a moderator and which isotope of hydrogen is present in it?

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65. What are the disadvantages of using dihydrogen as a fuel?

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66. Why does the electrolysis of ordinary water leaves behind water richer in heavy. water?

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67. Hydrogen peroxide restore the colour of lead paintings. Give a reason.

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68. Why is dihydrogen gas not preferred in balloons?

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69. What is syn gas? How is it prepared?

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70. Find the volume strength of '1.6 N H_2O_2' solution?

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71. Water softening by clarke's process uses

A. calcium bicarbonate

B. sodium bicarbonate

C. potash alum

D. calcium.hydroxide

Answer: D

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72. 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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73. Hydrogen perioxide can be prepared from

A. NaOH

B. 'BaO_2 .8 H_2 O'

C. Ca(OH)_2'

D. Na_2 O'

Answer: D

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74. Decomposition of hydrogen peroxide is prevented by

A. 'NaOH'

B. 'MnO_2'

C. glycerol

D. oxalic acid

Answer: C

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75. The structure.of 'H_2 O_2' is

A. planar

B. Non planar

C. spherical

D. linear

Answer: B

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76. The strength of 20 volume of H_2O_2 is : 13.6 g /litre, 60.7g /litre, 160 g /litre, 20.2 g /litre

A. 13.6 g' /litre

B. 60.7g' /litre

C. 160 g' /litre

D. 20.2 g' /litre

Answer: B

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77. Heavy water is obtained by

A. boiling water

B. fractional distillation of 'H_2 O'.

C. prolonged electrolysis 'f H_2 O'

D. heating 'H_2 O_2'

Answer: C

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78. Heavy water is

A. 'H_2 O'

B. 'D_2 O'

C. H_2 O_2'

D. None of these

Answer: B

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79. Hydrogen combines with other elements by

A. losing an electron

B. gaining an electron

C. sharing an electron

D. losing, gaining and sharing of an electron

Answer: D

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80. The least abundant isotope of hydrogen is

A. _1^1H'

B. _1^2D'

C. _3^1T'

D. both a and b

Answer: C

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81. When temporary hard water is boiled the precipitate formed may be $Mg(HCO_3)_2$ $Mg(OH)_2$ $MgCO_3$ $MgSO_4$

A. 'Mg(HCO_3)_2'

B. 'Mg(OH)_2'

C. MgCO_3'

D. MgSO_4'

Answer: C

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82. Element containing no neutron

A. protium

B. Deuterim.

C. Helium

D. Tritium

Answer: A

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83. The gas used in the hydrogenation of oils in presence of Ni catalyst is:

A. Methane

B. Ethane

C. Ozone

D. Hydroen

Answer: D

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84. The $O - O - H$ bond angle in H_2O_2 is

A. 106°

B. $109^\circ 28'$

C. 120°

D. 94.8°

Answer: D

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85. In the calgon process of softening of water, which of the following is used

A. sodium polymetaphosphate

B. Hydrated sodium aluminium silicate

C. Caton exchange resins

D. Anion exchange resins

Answer: A

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86. What is 100 volume H_2O_2

A. 17.86N

B. 30.36%'H_2O_2'

C. 8.93M

D. all are correct

Answer: D

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87. The high density of water as compared to ice is due to

A. Hydrogen bonding interactions

B. Dipole-dipole interations

C. Dipole - induced dipole interations

D. Induced dipole induced dipole interactions.

Answer: A

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88. Which of the following on oxidation gives H_2O_2

A. 2-Ethyl anthraquinol

B. 2-Ethyl anthraquinone

C. Anthracene

D. 2-Ethyl anthracene

Answer: A

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89. If an isotope of hydrogen has two neutrons in its atom, its atomic number and atomic mass number will respectively be : 2 and 1, 3 and 1, 1 and 1, 1 and 3

A. 2 and 1

B. 3 and 1

C. 1 and 1

D. 1 and 3

Answer: D

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90. The sum of protons, electrons and neutrons in the heaviest isotope of hydrogen is

A. 6

B. 5

C. 4

D. 3

Answer: C

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91. The 'O-O-H' bond angle in 'H_2 O_2' is

A. 106^circ'

B. 109^circ .28^''

C. 120^circ'

D. None of these

Answer: D

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92. Which of the following pairs of substances on reaction will not evolve 'H_2' gas?

A. Fe and 'H_2 SO_4' (aqueous)

B. Copper and HCl (aqueous)

C. Sodium and ethyl alcohol

D. Iron and steam

Answer: B

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93. The oxidation state of most electronegative element in the products of the reaction, 'BaO_2' with dil. 'H_2 SO_4' are

A. 0 and -1

B. -1 and -1

C. -2 and 0

D. -2 and +1

Answer: B

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94. Heavy water is

A. H_2 ^(16) O'

B. H_2 O_3'

C. 'H_2 ^(18) O'

D. D_2 O'

Answer: D

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95. Heavy water is obtained by

A. boiling water

B. fractional distillation of 'H_2 O'

C. prolonged electrolysis of 'H_2 O'

D. heating 'H_2 O_2'

Answer: C

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96. Amongst H_2O, H_2S, H_2Se and H_2Te, the one with the highest boiling point is: H_2O because of hydrogen bonding, H_2Te because

of higher molecular weight, H_2S because of hydrogen bonding, H_2Se because of lower molecular weight.

A. H_2 O' because of hydrogen bonding

B. H_2' Te because of higher molecular weight

C. H_2' S because of hydrogen bonding

D. H_2' Se because of lower molecular weight.

Answer: A

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97. Ortho and para hydrogen differ in

A. atomic number

B. atomic mass

C. spins of protons

D. number of neutrons

Answer: C

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98. Polyphosphates are used as water softening agents because they

A. form soluble complexes with anionic species

B. precipitate anionic specięs

C. form soluble complexes with cationic species

D. precipitate cationic species

Answer: C

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99. Which one of the following processes will produce hard water?

A. Addition of 'Na_2 SO_4' to water

B. Saturation of watèr with 'CaCO_3'

C. Saturation of water with 'MgCO_3'

D. Saturation of water with 'CaSO_4'

Answer: D

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100. The reagent commonly used to determine hardness of water titrimetrically is?

A. Oxalicacid

B. Disodium salt of EDTA

C. Sodium citrate

D. Sodium thiosulphate.

Answer: D

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101. Commercial '11.2' volume 'H_2O_2' solution has a molarity of

A. 1

B. 0.5

C. 11.2

D. 1.12

Answer: A

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102. H_2O_2 acts as an oxidizing agent in

A. neutral medium

B. acidic medium

C. alkaline medium

D. alkaline and neutral medium

Answer:

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103. Which of the following is a true peroxide

A. NO_2

B. MnO_2

C. BaO_2

D. SO_2

Answer: C

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104. What is false about 'H_2 O_2' ?

A. It acts as both oxidising and reducing agent

B. Two OH bonds lie in the same plane

C. It is pale blue liquid

D. It can be oxidised by 'O_3'

Answer: B

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105. One mole of magnesium nitride on reaction with excess of water gives

A. one mole of ammonia

B. one mole of nitric acid

C. two moles of ammonia

D. two moles of nitric acid

Answer: C

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106. A commercial sample of hydrogen peroxide is labelled as 10 volume. Its percentage strength is nearly

A. 0.03

B. 0.01

C. 0.09

D. 0.1

Answer: A

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107. Syn gas' is a mixture of .....

A. CO_2'.and 'H_2 O'

B. CO' and 'H_2 O'.

C. CO' and 'H_2'

D. CO' and 'N_2'

Answer: C

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108. Pure-water does not conduct electricity because it is : basic, almost not ionized, decomposed easily, acidic

A. basic

B. almost not ionized

C. decomposed easily

D. acidic

Answer: B

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109. A l_4 C_3' on hydrolysis gives ..... Gas

A. CH_4'

B. C_2 H_6'

C. C_2 H_4'

D. C_2 H_2'

Answer: A

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110. Hydrogen can' be prepared by the action of dil. 'H_2 SO_4' on

A. copper

B. iron

C. lead

D. mercury

Answer: B

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111. Which of the following is formed by the action of water on 'Na_2 O_2' ?

A. H_2'

B. O_2'

C. 'N_2' '

D. CO_2'

Answer: B

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