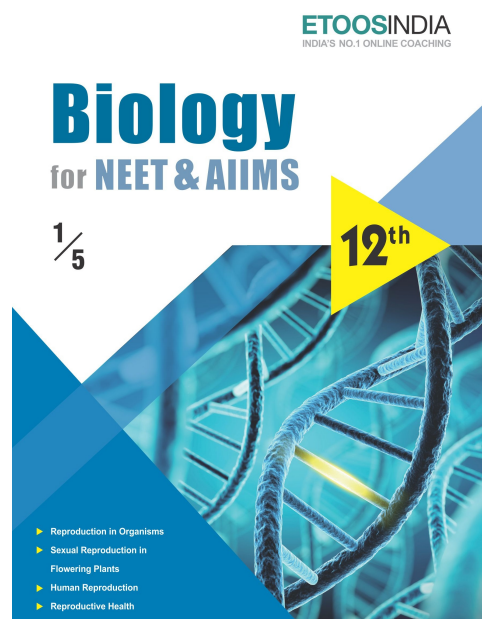
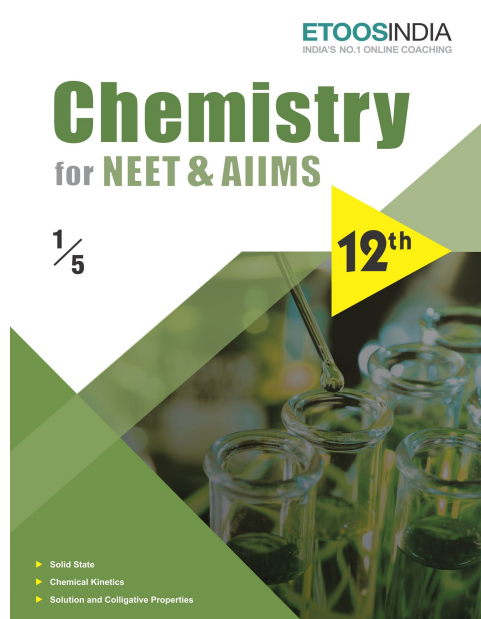
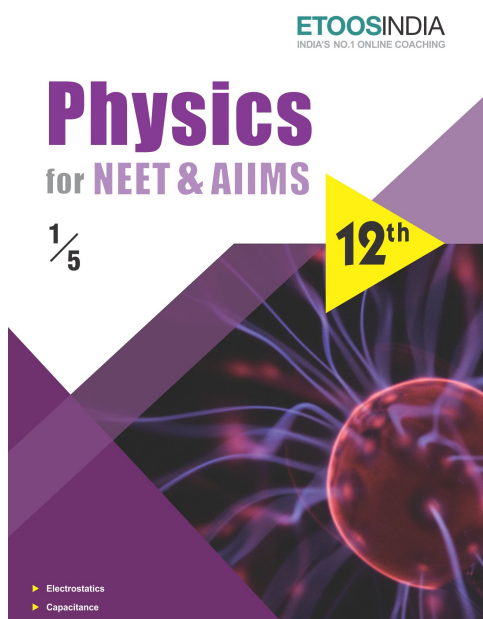
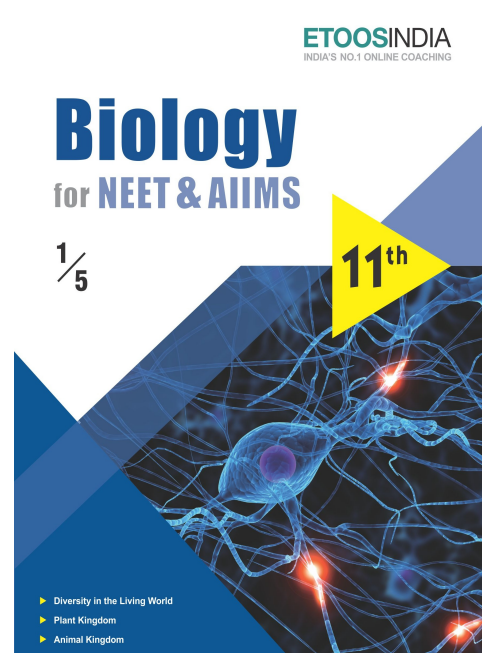
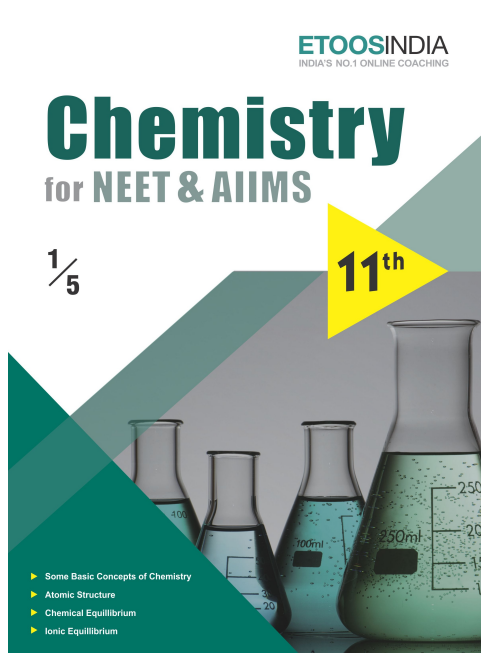
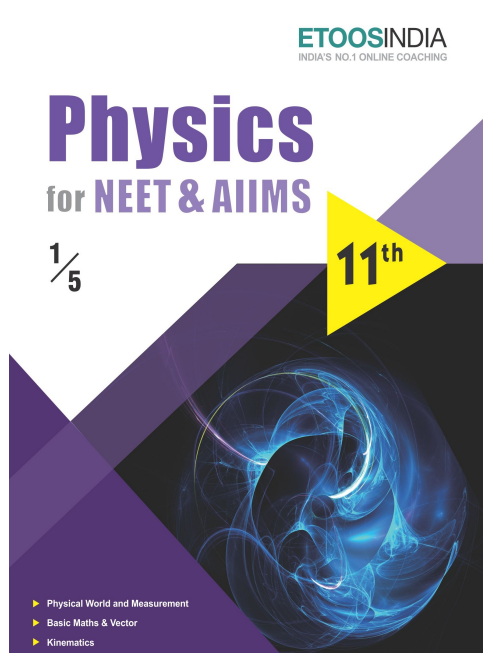


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HYDROGEN AND ITS COMPOUNDS

Hydrogen is a light, odorless gas, which, given enough time, turns into people.

“EDWARD ROBERT HARRISON”

INTRODUCTION

Hydrogen, the most abundant element in the universe and the third most abundant on the surface of the globe, is being visualised as the major future source of energy.

Hydrogen has the simplest atomic structure among all the elements around us in Nature. In atomic form it consists of only one proton and one electron. However, in elemental form it exists as a diatomic (H_2) molecule and is called dihydrogen. It forms more compounds than any other element. Do you know that the global concern related to energy can be overcome to a great extent by the use of hydrogen as a source of energy? In fact, hydrogen is of great industrial importance as we will learn in this unit.

PHYSICS FOR NEET & AIIMS

Hydrogen is the lightest element and also the lightest gas in the periodic table.

It is the lightest non-metal. It is the simplest element in periodic table having only $1e^-$, $1p$ & no neutron.

Electronic configuration of H is $1s^1$

Number of $e^- = 1$

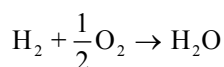
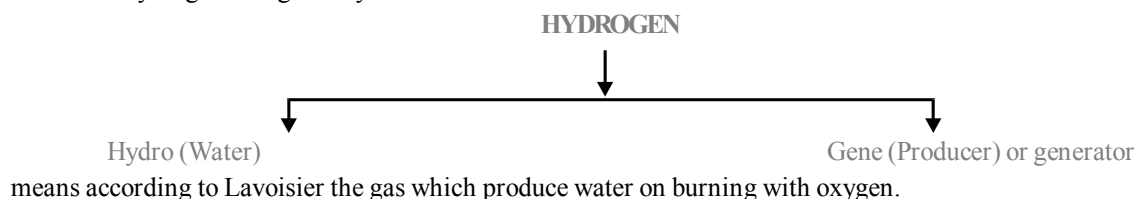
Number of orbital = 1

Number of shells = 1

Number of subshell = 1

It is discovered by Henry Cavendish & it was called inflammable element.

The name hydrogen was given by **Lavoisier**



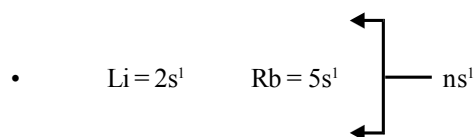
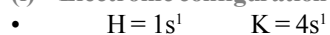
POSITION OF H_2 IN PERIODIC TABLE

Hydrogen is the first element of Periodic table but still it could not be assigned a proper position either in Mendeleef periodic table or in Modern periodic table because of following reasons.

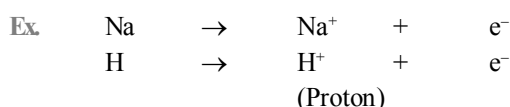
It may kept in $1^{st}/IA$ or $17^{th}/VIIA$ group due to following reason.

RESEMBLES WITH $1^{st}/IA$ ALKALI METALS

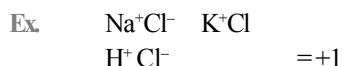
(i) **Electronic configuration** : Like alkali metals hydrogen also has only one electron in outer most shell.



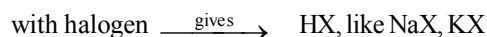
(ii) **Electropositive characters** : Like alkali metals hydrogen also have the tendency to loose one electron to form cation.



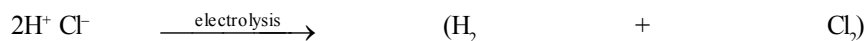
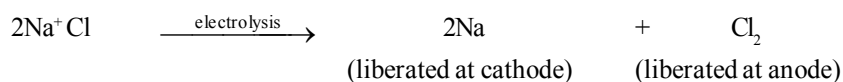
(iii) **Oxidation numbers** : Like alkali metals hydrogen can also exhibit the oxidation number of +1 in most of its compound.



(iv) **Reaction with electronegative elements (non-metals)** : Like alkali metals H also reacts with Oxygen, Sulphur, Halogens to form oxides, sulphides and halides respectively.



(v) **Liberation at Cathode** :

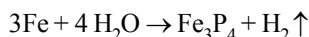


like alkali metals H also get liberated at cathode on electrolysis.

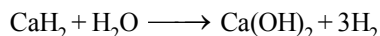
Etoos Tips & Formulas

Preparation of hydrogen

(I) Passing steam over hot iron (Lane process)

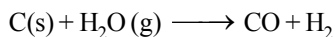


(II) By the action of water on hydrolith

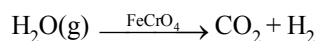


(III) By the electrolysis of water

(IV) Bosch process



+



↓

25 atm

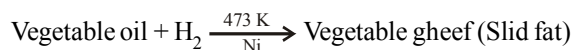


CO₂ absorbed

Properties of molecular hydrogen

Metals like Pd, Pt, Ni, Co etc. adsorb large quantities of the gas due to vacancies between these atoms. This is known as "occlusion".

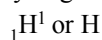
Reaction with vegetable oils



This process is known as "hydrogenation" or "hardening of oils"

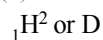
Isotopes of hydrogen

(a) Hydrogen (Protium)



(P = 1, e = 1, n = 0)

(b) Deuterium



(P = 1, e = 1, n = 1)

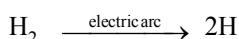
(c) Tritium



(P = 1, e = 1, n = 2)

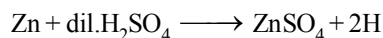
Different forms of hydrogen

Atomic hydrogen



(Molecular hydrogen) (Atomic hydrogen)

Nascent hydrogen



Ortho and Para hydrogen

If two nuclei have same spin then it is called "Ortho H₂".

If two nuclei have different spin then it is called "Para H₂".

HYDRIDES

Ionic or salt like hydrides : s block

LiH, NaH, KH, RbH, SrH₂, BaH₂ etc.

Be & Mg hydrides are covalent in nature

Molecular or covalent hydrides : p block

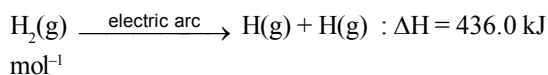
NH₃, PH₃, H₂O, CH₄ etc.

Metallic or Interstitial hydrides : transition elements

SOLVED EXAMPLE

Ex. 1 How does the atomic hydrogen or oxy-hydrogen torch function for cutting and welding purposes ? Explain.

Sol. Atomic hydrogen is produced when molecular hydrogen is passed through an electric arc struck between tungsten electrodes (3773–4273 K).



The life span of atomic hydrogen is about 0.3 sec and therefore, it immediately gets converted into the molecular hydrogen (H_2) liberating a large amount of energy which is used for cutting and welding purposes in the form of atomic hydrogen torch.

Ex. 2 What do you understand by the term " non-stoichiometric hydrides" ? Do you expect this type of hydrides to be formed by alkali metals ? Justify your answer.

Sol. These are hydrides which have low hydrogen content. In these hydrides the ratio of the metal to hydrogen atoms is fractional and they are called non-stoichiometric hydrides. Furthermore, even this fractional ratio of atoms is not fixed but varies with the temperature and the pressure conditions. This type of hydrides are formed by d- and f-block elements. In these hydrides, the hydrogen atoms occupy holes in the metal lattice. Usually some holes always remain unoccupied and hence these metals form non-stoichiometric hydrides.

Alkali metals are highly reducing as they transfer their lone electron to the H atom, thereby, forming H^- ions. In other words, alkali metals hydrides are ionic in nature. Since such hydrides are formed by complete transfer of an electron, therefore, the ratio of metal to hydrogen is always fixed. Therefore, alkali metals form only stoichiometric hydrides. They do not form non-stoichiometric hydrides at all.

Ex. 3 What do you understand by (i) electron-deficient, (ii) electron-precise, and (iii) electron rich compounds of hydrogen ? Provide justification with suitable examples.

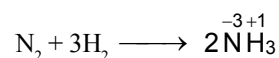
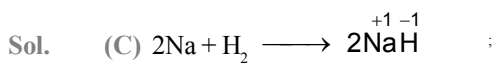
Sol. (i) Hydrides of elements of group-13 such as BH_3 , AlH_3 , etc., do not have sufficient number of electrons to form normal covalent bond and hence are called electron-deficient hydrides. To make up this deficiency, they generally exist in polymeric forms such as B_2H_6 , B_4H_{10} , $(\text{AlH}_3)_n$, etc.

(ii) Hydrides of elements of group-14 like CH_4 ,

SiH_4 , GeH_4 , etc. have exact number of electrons to form covalent bonds and hence are called electron-precise hydrides. All these hydrides have tetrahedral shapes.

(iii) Hydrides of elements of group 15, 16 and 17, like NH_3 , PH_3 , H_2O , H_2S , HF , HCl , etc. have more electrons than required to form normal covalent bonds and hence are called electron-rich hydrides. The excess electron in these hydrides are present as lone pairs of electrons.

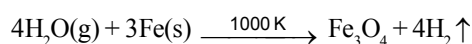
Ex. 4 Which of the following is correct for hydrogen ?
 (A) It is always collected at cathode.
 (B) Its ionization energy is very low in comparison with alkali metals.
 (C) It can form bonds in +1 as well as in -1 oxidation states.
 (D) Its oxide is not stable.



Ex. 5 Metal which does not react with cold water but evolves H_2 with steam is :

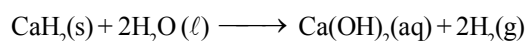
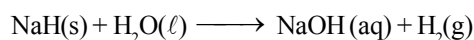
- (A) Na (B) K
 (C) Pt (D) Fe

Sol. (D)

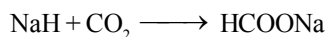


Ex. 6 Saline hydride are known to react with water violently producing fire, Can, CO_2 , a well known fire extinguisher, be used in this case ? Explain.

Sol. Saline hydride (Such as NaH , CaH_2 , etc), react with water violently to form the corresponding metal hydroxides with the evolution of dihydrogen. The dihydrogen gas so liberated undergoes spontaneous combustion causing fire. This is because of exothermic nature of combustion reactions.



The fire so produced cannot be extinguished by CO_2 because it reacts with the hot metal hydride and forms formate ions



However, sand (because of its stable nature) is more effective fire extinguisher in such a case.

Exercise # 1

SINGLE OBJECTIVE

NEET LEVEL

1. Which is used hydrogen generators
(A) NaH (B) HI
(C) S_6H_3 (D) None of these
2. Metal hydride on treatment with water gives
(A) H_2O_2 (B) H_2O
(C) Acid (D) Hydrogen
3. Hydrogen burns in air with a
(A) Light bluish flame (B) Yellow flame
(C) Green flame (D) None of these
4. Which pair does not show hydrogen isotopes
(A) Ortho hydrogen and para hydrogen
(B) Protium and deuterium
(C) Deuterium and tritium
(D) Tritium and protium
5. Which is distilled first
(A) Liquid CO_2 (B) Liquid N_2
(C) Liquid O_2 (D) Liquid H_2
6. On reaction with Mg, very dilute nitric acid produces
(A) NH_3 (B) Nitrous oxide
(C) Nitric oxide (D) Hydrogen
7. Among the following, identify the compound which cannot act as both oxidising and reducing agents
(A) H_2O_2 (B) H_2
(C) SO_2 (D) Cl_2
8. Which of the following reaction produces hydrogen
(A) $Mg + H_2O$ (B) $BaO_2 + HCl$
(C) $H_2S_4O_8 + H_2O$ (D) $Na_2O_2 + 2HCl$
9. Hydrogen resembles in many of its properties
(A) Halogen (B) Alkali metals
(C) Both (A) and (B) (D) None of these
10. Ortho and para hydrogen differ in
(A) Proton spin (B) Electron spin
(C) Nuclear charge (D) Nuclear reaction
11. Action of water or dilute mineral acids on metals can give
(A) Monohydrogen (B) Tritium
(C) Dihydrogen (D) Trihydrogen
12. Hydrogen from HCl can be prepared by
(A) Mg (B) Cu
(C) P (D) Pt.
13. Which of the following can adsorb largest volume of hydrogen gas
(A) Finely divided platinum
(B) Finely divided nickel
(C) Colloidal palladium
(D) Colloidal platinum
14. The nuclei of tritium (H^3) atom would contain neutrons
(A) 1 (B) 2
(C) 3 (D) 4
15. The colour of hydrogen is
(A) Black (B) Yellow
(C) Orange (D) Colourless
16. Ordinary hydrogen at room temperature is a mixture of
(A) 75% of o-Hydrogen + 25% of p-Hydrogen
(B) 25% of o-Hydrogen + 75% of p-Hydrogen
(C) 50% of o-Hydrogen + 50% of p-Hydrogen
(D) 1% of o-Hydrogen + 99% of p-Hydrogen
17. Hydrogen cannot reduce
(A) Hot CuO (B) Fe_2O_3
(C) Hot SnO_2 (D) Hot Al_2O_3
18. Hydrogen does not combine with
(A) Antimony (B) Sodium
(C) Bismuth (D) Helium
19. The adsorption of hydrogen by metals is called
(A) Dehydrogenation (B) Hydrogenation
(C) Occlusion (D) Adsorption
20. Which of the following produces hydrolith with dihydrogen
(A) Mg (B) Al
(C) Cu (D) Ca
21. The metal which displaces hydrogen from a boiling caustic soda solution is
(A) As (B) Zn
(C) Mg (D) Fe
22. Metals like platinum and palladium can absorb large volumes of hydrogen under special conditions. Such adsorbed hydrogen by the metal is known as
(A) Adsorbed hydrogen (B) Occluded hydrogen
(C) Reactive hydrogen (D) Atomic hydrogen
23. Which is poorest reducing agent
(A) Nascent hydrogen
(B) Atomic hydrogen
(C) Dihydrogen
(D) All have same reducing strength

Exercise # 2

SINGLE OBJECTIVE

AIIMS LEVEL

1. Hydrogen will not reduce
(A) Heated cupric oxide
(B) Heated ferric oxide
(C) Heated stannic oxide
(D) Heated aluminium oxide
2. HCl is added to following oxides. Which one would give H_2O_2
(A) MnO_2 (B) PbO_2
(C) BaO (D) None of these
3. Which of the following pair will not produce dihydrogen gas
(A) $Cu + HCl(dil.)$ (B) $Fe + H_2SO_4$
(C) Mg + steam (D) Na + alcohol
4. The amount of H_2O_2 present in 1 L of 1.5 N H_2O_2 solution is
(A) 2.5 g (B) 25.5 g
(C) 3.0 g (D) 8.0 g
5. Hydrogen is evolved by the action of cold dil. HNO_3 on
(A) Fe (B) Mn
(C) Cu (D) Al
6. Hydrogen can behave as a metal
(A) At very high temperature
(B) At very low temperature
(C) At very high pressure
(D) At very low pressure
7. D_2O is preferred to H_2O , as a moderator, in nuclear reactors because
(A) D_2O slows down fast neutrons better
(B) D_2O has high specific heat
(C) D_2O is cheaper
(D) None of these
8. Out of the two allotropic forms of dihydrogen, the form with lesser molecular energy is
(A) Ortho (B) Meta
(C) Para
(D) All have same energy
9. Saline hydrides react explosively with water, such fires can be extinguished by
(A) Water (B) Carbon dioxide
(C) Sand (D) None of these
10. Nascent hydrogen consists of :
(A) Hydrogen atoms with excess of energy
(B) Hydrogen molecules with excess energy
(C) Hydrogen ions in excited state
(D) solvated protons
11. Hydrogen molecule differs from chlorine molecule in the following respect :
(A) hydrogen molecule is non-polar but chlorine molecule is polar.
(B) hydrogen molecule is polar while chlorine molecule is non-polar.
(C) hydrogen molecule can form intermolecular hydrogen bonds but chlorine molecule does not.
(D) hydrogen molecule cannot participate in co-ordinate bond formation but chlorine molecule can.
12. Which one of the following properties shows that hydrogen resembles alkali metals ?
(A) It shows metallic character like alkali metals.
(B) It is diatomic like alkali metals.
(C) Its ionization energy is of the same order as that of alkali metals.
(D) When hydrogen halides and alkali metal halides are electrolysed, hydrogen and alkali metals are liberated at the cathode.
13. Hydrogen has three isotopes, the number of possible diatomic molecules will be :
(A) 3 (B) 6
(C) 9 (D) 12
14. The first ionization energy for in $KJ mol^{-1}$ H, Li, F, Na has one of the following values 1681, 520, 1312, 495. Which of these values corresponds to that of hydrogen ?
(A) 1681 (B) 1312
(C) 520 (D) 495
15. Reaction between following pairs will produce hydrogen except :
(A) $Cu + HCl$ (B) $Fe + H_2O(g)$
(C) $Mg + H_2O(hot)$ (D) Na + Alcohol

Exercise # 3

PART - 1

MATRIX MATCH COLUMN

1. Match the compounds given in column-I with their characteristics/uses given in column – II

Column – I

- (A) Heavy water
(B) Hydrolith
(C) Calgon
(D) Zeolites

Column – II

- (p) Causes sequestration of C^{2+} and Mg^{2+} ions.
(q) Hydrated sodium aluminium silicate
(r) In molten state on electrolysis produces H_2 gas at anode
(s) Used as tracer compound for studying reaction mechanism
(t) Used as moderator in nuclear reactors

2. Match the processes/reactions listed in column-I with the resultant product(s) listed in column – II

Column – I

- (A) Prolonged electrolysis of water (H_2O)
(B) Electrolysis of 50% H_2SO_4
(C) Water gas shift reaction
(D) Auto-oxidation of 2-Ethylanthraquinol

Column – II

- (p) H_2O_2
(q) H_2
(r) CO_2
(s) D_2O
(t) CO

3. Match the entries listed in Column I with appropriate entries listed in Column II.

Column – I

(Hydride)

- (A) BeH_2
(B) AsH_3
(C) B_2H_6
(D) LaH_3
(E) $LiAlH_4$

Column – II

(Types of Hydride)

- (p) Complex
(q) Lewis acid
(r) Interstitial
(s) Covalent
(t) Intermediate

Exercise # 4

PART - 1

PREVIOUS YEAR (NEET/AIPMT)

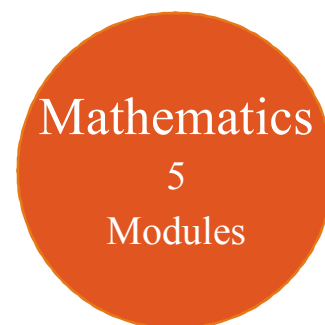
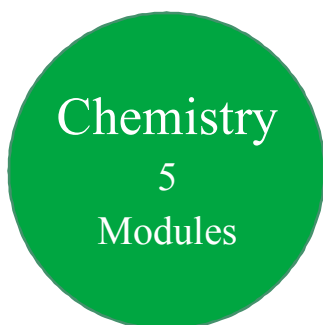
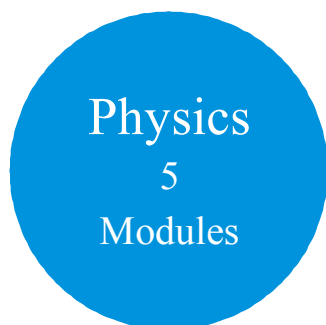
1. The structure of H_2O_2 is [CBSE AIPMT 2006]
 - (A) planar
 - (B) non-planar
 - (C) spherical
 - (D) linear
2. The correct order of the mobility of the alkali metal ions in aqueous solution is [CBSE AIPMT 2006]
 - (A) $Li^+ > Na^+ > K^+ > Rb^+$
 - (B) $Na^+ > K^+ > Rb^+ > Li^+$
 - (C) $K^+ > Rb^+ > Na^+ > Li^+$
 - (D) $Rb^+ > K^+ > Na^+ > Li^+$
3. The correct order of increasing thermal stability of K_2CO_3 , $MgCO_3$, $CaCO_3$ and $BeCO_3$ is [CBSE AIPMT 2007]
 - (A) $BeCO_3 < MgCO_3 < K_2CO_3 < CaCO_3$
 - (B) $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$
 - (C) $MgCO_3 < BeCO_3 < CaCO_3 < K_2CO_3$
 - (D) $K_2CO_3 < MgCO_3 < CaCO_3 < BeCO_3$
4. In which of the following the hydration energy is higher than the lattice energy? [CBSE AIPMT 2007]
 - (A) $BaSO_4$
 - (B) $MgSO_4$
 - (C) $RaSO_4$
 - (D) $SrSO_4$
5. The sequence of ionic mobility in aqueous solution is [CBSE AIPMT 2008]
 - (A) $K^+ > Na^+ > Rb^+ > Cs^+$
 - (B) $Cs^+ > Rb^+ > K^+ > Na^+$
 - (C) $Rb^+ > K^+ > Cs^+ > Na^+$
 - (D) $Na^+ > K^+ > Rb^+ > Cs^+$
6. The alkali metals form salt like hydrides by the direct synthesis at elevated temperature. The thermal stability of these hydrides decreases in which of the following orders? [CBSE AIPMT 2008]
 - (A) $CsH > RbH > KH > NaH > LiH$
 - (B) $KH > NaH > LiH > CsH > RbH$
 - (C) $NaH > LiH > KH > RbH > CsH$
 - (D) $LiH > NaH > KH > RbH > CsH$
7. Equimolar solutions of the following were prepared in water separately. Which one of the solutions will record the highest pH? [CBSE AIPMT 2008]
 - (A) $SrCl_2$
 - (B) $BaCl_2$
 - (C) $MgCl_2$
 - (D) $CaCl_2$
8. Which one of the following is present as an active ingredient in bleaching powder for bleaching action? [CBSE AIPMT 2011]
 - (A) $Ca(OCl)_2$
 - (B) CaO_2Cl_2
 - (C) $CaCl_2$
 - (D) $CaOCl_2$
9. On heating which of the following releases CO_2 most easily? [CBSE AIPMT 2015]
 - (A) K_2CO_3
 - (B) Na_2CO_3
 - (C) $MgCO_3$
 - (D) $CaCO_3$
10. Solubility of the alkaline earth's metal sulphates in water decreases in the sequence [CBSE AIPMT 2015]
 - (A) $Mg > Ca > Sr > Ba$
 - (B) $Ca > Sr > Ba > Mg$
 - (C) $Sr > Ca > Mg > Ba$
 - (D) $Ba > Mg > Sr > Ca$
11. "Metals are usually not found as nitrates in their ores". [CBSE AIPMT 2015]

Out of the following two (I and II) reasons which is/are true for the above observation?

 - I. Metal nitrates are highly unstable
 - II. Metal nitrates are highly soluble in water.
 - (A) I and II are true
 - (B) I and II are false
 - (C) I is false but II is true
 - (D) I is true but II is false
12. In context with beryllium, which one of the following statements is incorrect? [NEET 2016, Phase II]
 - (A) It is rendered passive by nitric acid
 - (B) It forms Be_2C
 - (C) Its salts rarely hydrolyse
 - (D) Its hydride is electron-deficient and polymeric
13. Which of the following statements about hydrogen is incorrect? [NEET 2016, Phase I]
 - (A) Hydrogen never acts as cation in ionic salts
 - (B) Hydronium ion, H_3O^+ exists freely in solution
 - (C) Dihydrogen does not act as a reducing agent
 - (D) Hydrogen has three isotopes of which tritium is the most common
14. Which of the following statements is false? [NEET 2016, Phase I]
 - (A) Ca^{2+} ions are important in blood clotting
 - (B) Ca^{2+} ions are not important in maintaining the regular beating of the heart
 - (C) Mg^{2+} ions are important in the green parts of plants
 - (D) Mg^{2+} ions form a complex with ATP
15. The product obtained as a result of a reaction of nitrogen with CaC_2 is [NEET 2016, Phase I]
 - (A) $CaCN$
 - (B) $CaCN_3$
 - (C) Ca_2CN
 - (D) $Ca(CN)_2$
16. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field? [NEET 2017]
 - (A) Na
 - (B) K
 - (C) Rb
 - (D) Li

- Hydrogen is :
 (A) electropositive. (B) electronegative.
 (C) both electropositive as well as electronegative. (D) neither electropositive nor electronegative.
- Reaction between following pairs will produce hydrogen except :
 (A) Cu + HCl (B) Fe + H₂O (g) (C) Mg + H₂O (hot) (D) Na + Alcohol
- The colour of hydrogen is :
 (A) black (B) yellow (C) orange (D) colourless
- Which of the following explanations justifies for not placing hydrogen in either the group of alkali metals or halogens ?
 (A) The ionization energy of hydrogen is too high for group of alkali metals and too low for halogen group.
 (B) Hydrogen atom does not contain any neutron.
 (C) Hydrogen is much lighter than alkali metals or halogens.
 (D) Hydrogen can form compounds with almost all other elements.
- Hydrogen accepts an electron to form inert gas configuration. In this it resembles :
 (A) halogen (B) alkali metals (C) chalcogens (D) alkaline earth metals
- Which of the following is an interstitial hydride ?
 (A) TiH_{1.5-1.8} (B) B₂H₆ (C) LiH (D) H₂S
- Hydrogen does not combine with :
 (A) Sb (B) Na (C) He (D) Bi
- The hydride ion H⁻ is a stronger base than its hydroxide ion OH⁻. Which of the following reactions will occur if sodium hydride (NaH) is dissolved in water?
 (A) H⁻(aq) + H₂O → H₃O⁻(aq) (B) H⁻(aq) + H₂O(l) → OH⁻(aq) + H₂(g)
 (C) H⁻(aq) + H₂O(l) → No reaction (D) None of these.
- Which of the following will cause softening of hard water ?
 (A) Passing it through anion exchange resin. (B) Passing it through sand.
 (C) Passing it through cation exchange resin. (D) Passing it through alumina.
- Permutit is a technical name given to :
 (A) aluminates of Ca and Na. (B) hydrated silicates of Al and Na.
 (C) silicates of Ca and Na. (D) silicates of Ca and Mg.
- When H₂O₂ is oxidised by a suitable oxidant, one of the products is :
 (A) O²⁻ (B) HO²⁻ (C) OH⁻ (D) O₂
- The dihedral angle in gaseous H₂O₂ is :
 (A) 180° (B) 90° (C) 111.5° (D) 109°-28'
- What would happen when a small quantity of H₂O₂ is added to a solution of FeSO₄ ?
 (A) Colour of FeSO₄ disappears. (B) H₂ is evolved.
 (C) An electron is added to Fe²⁺. (D) An electron is lost by Fe²⁺.

11th Class Modules Chapter Details



PHYSICS	CHEMISTRY	BIOLOGY
<p>Module-1</p> <ol style="list-style-type: none"> 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics <p>Module-2</p> <ol style="list-style-type: none"> 1. Law of Motion & Friction 2. Work, Energy & Power <p>Module-3</p> <ol style="list-style-type: none"> 1. Motion of system of particles & Rigid Body 2. Gravitation <p>Module-4</p> <ol style="list-style-type: none"> 1. Mechanical Properties of Matter 2. Thermal Properties of Matter <p>Module-5</p> <ol style="list-style-type: none"> 1. Oscillations 2. Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Some Basic Concepts of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom <p>Module-2</p> <ol style="list-style-type: none"> 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals <p>Module-3</p> <ol style="list-style-type: none"> 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition <p>Module-4</p> <ol style="list-style-type: none"> 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases <p>Module-5</p> <ol style="list-style-type: none"> 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

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<p>Module-1</p> <ol style="list-style-type: none"> 1. Electrostatics 2. Capacitance <p>Module-2</p> <ol style="list-style-type: none"> 1. Current Electricity 2. Magnetic Effect of Current and Magnetism <p>Module-3</p> <ol style="list-style-type: none"> 1. Electromagnetic Induction 2. Alternating Current <p>Module-4</p> <ol style="list-style-type: none"> 1. Geometrical Optics 2. Wave Optics <p>Module-5</p> <ol style="list-style-type: none"> 1. Modern Physics 2. Nuclear Physics 3. Solids & Semiconductor Devices 4. Electromagnetic Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Solid State 2. Chemical Kinetics 3. Solutions and Colligative Properties <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Electrochemistry 2. Surface Chemistry <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. P-Block Elements 2. Transition Elements (d & f block) 3. Co-ordination Compound 4. Metallurgy <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. HaloAlkanes & HaloArenes 2. Alcohol, Phenol & Ether 3. Aldehyde, Ketone & Carboxylic Acid <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Nitrogen & Its Derivatives 2. Biomolecules & Polymers 3. Chemistry in Everyday Life 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Reproduction in Organisms 2. Sexual Reproduction in Flowering Plants 3. Human Reproduction 4. Reproductive Health <p>Module-2</p> <ol style="list-style-type: none"> 1. Principles of Inheritance and Variation 2. Molecular Basis of Inheritance 3. Evolution <p>Module-3</p> <ol style="list-style-type: none"> 1. Human Health and Disease 2. Strategies for Enhancement in Food Production 3. Microbes in Human Welfare <p>Module-4</p> <ol style="list-style-type: none"> 1. Biotechnology: Principles and Processes 2. Biotechnology and Its Applications 3. Organisms and Populations <p>Module-5</p> <ol style="list-style-type: none"> 1. Ecosystem 2. Biodiversity and Conservation 3. Environmental Issues

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