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CHEMISTRY · JEE MAIN

Hydrogen

Previous Year Questions with answers

95 questions · **87** papers · **2003–2023** · newest paper first

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What is in this PDF: every Hydrogen question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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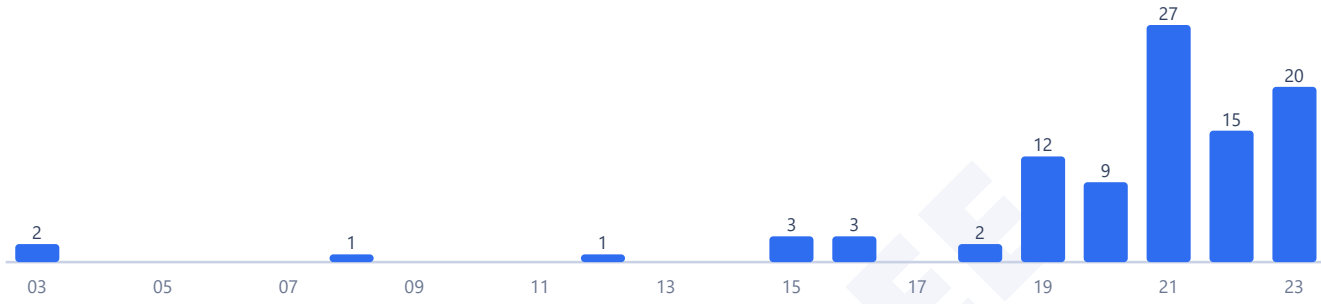
Chapter at a glance

1.8%	95	76 of 162	90 / 5
of Chemistry questions, 2019–2026	questions, 2003–2023	papers asked it, 2019–2026	MCQ / numerical, 2003–2023

Trend. Rising: 0.9 questions per paper in 2021–2023 against 0.7 in 2019–2020.

Questions per year



Counts are the questions we hold: 95 in 87 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2003–2023)

Hydrogen & Its Compounds — 95

How often it comes up

Hydrogen covers the chemistry of dihydrogen and was formerly in the Class 11 curriculum before being removed in 2024, holding rank 28 of 31 chapters with a 1.8% share of the chemistry section. In the 2019 to 2026 examination span, Hydrogen accounted for 83 questions across 162 papers, representing 1.8% of the chemistry section and occupying rank 28 of 31 chapters. Prior to 2019, from 2002 to 2018, it contributed 12 questions across 38 papers with a 0.9% share. Across the recent 2024 to 2026 exam seasons, it recorded 0 questions across 58 papers, registering a 0.0% share. Its testing trajectory has trended down across recent sessions.

The chapter was not asked in 2024, 2025, or 2026 following its curriculum removal. Between 2019 and 2026, it averaged 0.5 questions per paper, including 5 numerical answer questions.

Most-asked topics

Historical test questions fall under a single broad topic:

- Hydrogen & Its Compounds: Encompassed 95 total questions (83 in the 2019 to 2026 window), last examined in 2023. Key themes included the preparation and reducing properties of hydrogen peroxide, volume strength calculations, industrial synthesis of syngas, classification of hydrides into ionic, covalent, and metallic types, and water softening procedures.

What the questions look like

Past questions centered largely on factual reactions and straightforward concentration metrics. Problems on hydrogen peroxide frequently required converting volume strength into molarity, normality, or grams per litre. Other questions tested the dual nature of hydrogen peroxide as both an oxidizing and reducing agent in varied acid-base media.

Descriptive items tested the structural properties of ice, the existence of interstitial hydrides, and industrial catalysts used in the water gas shift reaction.

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How to practise it

Given that Hydrogen is excluded from the current syllabus, structure your preparation accordingly:

1. Prioritize active inorganic units: Direct your core study hours toward Coordination Compounds, p-Block Elements, and d- and f-Block Elements. 2. Maintain basic redox familiarity: Reactions where hydrogen peroxide acts as a titrant or oxidant occasionally surface in practical chemistry questions. 3. Review volume strength formulas: Remember the basic conversion relating volume strength to molarity and normality if required for allied entrance tests.

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Q1 JEE Main 2023 · 15 Apr · Shift 1 MCQ

During water-gas shift reaction

(A) Carbon monoxide is oxidized to carbon dioxide.
(B) Water is evaporated in presence of catalyst.
(C) Carbon is oxidized to carbon monoxide.
(D) Carbon dioxide is reduced to carbon monoxide.

Answer: (A) Carbon monoxide is oxidized to carbon dioxide. · Key from source paper

Q2 JEE Main 2023 · 13 Apr · Shift 1 MCQ

Given below are two statements:
Statement I: Permutit process is more efficient compared to the synthetic resin method for the softening of water.
Statement II: Synthetic resin method results in the formation of soluble sodium salts.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both the statements I and II are incorrect
(B) Statement I is incorrect but statement II is correct
(C) Both the statements I and II are correct
(D) Statement I is correct but statement II is incorrect

Answer: (A) Both the statements I and II are incorrect · Key from source paper

Q3 JEE Main 2023 · 13 Apr · Shift 2 MCQ

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : Isotopes of hydrogen have almost same chemical properties, but difference in their rates of reactions.
Reason R: Isotopes of hydrogen have different enthalpy of bond dissociation.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both A and R are correct but R is NOT the correct explanation of A
(B) Both A and R are correct and R is the correct explanation of A
(C) A is not correct but R is correct
(D) A is correct but R is not correct

Answer: (B) Both A and R are correct and R is the correct explanation of A · Key from source paper

Q4 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Match List I with List II
List I Type of Hydride

A. Electron deficient hydride
B. Electron rich hydride
C. Electron precise hydride
D. Saline hydride
List II Example
I. MgH_2
II. HF
III. B_2H_6
IV. CH_4
Choose the correct answer from the options given below :

(A) A-III, B-II, C-IV, D-I
(B) A-II, B-III, C-I, D-IV
(C) A-II, B-III, C-IV, D-I
(D) A-III, B-II, C-I, D-IV

Answer: (A) A-III, B-II, C-IV, D-I · Key from source paper

Q5 JEE Main 2023 · 11 Apr · Shift 2 MCQ

Which hydride among the following is less stable?

(A) BeH_2
(B) HF
(C) NH_3
(D) LiH

Answer: (A) BeH_2 · Key from source paper

Q6 JEE Main 2023 · 10 Apr · Shift 1 MCQ

Given below are two reactions, involved in the commercial production of dihydrogen H_2. The two reactions are carried out at temperature "T_1" and "T_2", respectively

$$Cs + H_2Og \xrightarrow{T_1} COg + H_2g$$

$$COg + H_2Og \xrightarrow[\text{Catalyst}]{T_2} CO_2g + H_2g$$

The temperatures T_1 and T_2 are correctly related as

(A) $T_1 = T_2$
(B) $T_1 < T_2$
(C) $T_1 = 100\ K$, $T_2 = 1270\ K$
(D) $T_1 > T_2$

Answer: (D) $T_1 > T_2$ · Key from source paper

Q7 JEE Main 2023 · 10 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : Physical properties of isotopes of hydrogen are different.
Reason R : Mass difference between isotopes of hydrogen is very large.
In the light of the above statements, choose the correct answer from the options given below:

(A) Both A and R are true and R is the correct explanation of A
(B) A is false but R is true
(C) A is true but R is false
(D) Both A and R are true but R is NOT the correct explanation of A

Answer: (A) Both A and R are true and R is the correct explanation of A · Key from source paper

Q8 JEE Main 2023 · 8 Apr · Shift 1 MCQ

The water gas on reacting with cobalt as a catalyst forms

(A) Methanal
(B) Methanoic acid
(C) Ethanol
(D) Methanol

Answer: (D) Methanol · Key from source paper

Q9 JEE Main 2023 · 8 Apr · Shift 2 MCQ

Which of the following can reduce decomposition of H_2O_2 on exposure to light

(A) Urea
(B) Alkali
(C) Glass containers
(D) Dust

Answer: (A) Urea · Key from source paper

Q10 JEE Main 2023 · 6 Apr · Shift 1 MCQ

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Loss of electron from hydrogen atom results in nucleus of $\sim 1.5 \times 10^{-3}$ pm size.

Reason R: Proton H^+ always exists in combined form.

In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both A and R are correct and R is the correct explanation of A
(B) A is correct but R is not correct
(C) A is not correct but R is correct
(D) Both A and R are correct but R is NOT the correct explanation of A

Answer: (D) Both A and R are correct but R is NOT the correct explanation of A · Key from source paper

Q11 JEE Main 2023 · 6 Apr · Shift 2 Numerical

In an ice crystal, each water molecule is hydrogen bonded to _____ neighbouring molecules.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q12 JEE Main 2023 · 1 Feb · Shift 1 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
Assertion A: Hydrogen is an environment friendly fuel.
Reason R: Atomic number of hydrogen is 1 and it is a very light element.
In the light of the above statements, choose the correct answer from the options given below

(A) A is true but R is false
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is false but R is true
(D) Both A and R are true and R is the correct explanation of A

Answer: (B) Both A and R are true but R is NOT the correct explanation of A · Key from source paper

Q13 JEE Main 2023 · 1 Feb · Shift 2 MCQ

The starting material for convenient preparation of deuterated hydrogen peroxide (D_2O_2) in laboratory is:

(A) $K_2\ S_2O_8$
(B) 2-ethylanthraquinol
(C) BaO_2
(D) BaO

Answer: (A) $K_2\ S_2O_8$ · Key from source paper

Q14 JEE Main 2023 · 31 Jan · Shift 2 MCQ

Given below are two statements :
Statement I : H_2O_2 is used in the synthesis of Cephalosporin
Statement II : H_2O_2 is used for the restoration of aerobic conditions to sewage wastes.
In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Statement I is correct but Statement II is incorrect
(B) Both Statement I and Statement II are correct
(C) Statement I is incorrect but Statement II is correct
(D) Both Statement I and Statement II are incorrect

Answer: (B) Both Statement I and Statement II are correct · Key from source paper

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Q15 JEE Main 2023 · 30 Jan · Shift 2 Numerical

The strength of 50 volume solution of hydrogen peroxide is _____ g/L (Nearest integer).
Given:
Molar mass of H_2O_2 is 34 g mol^{-1}
Molar volume of gas at STP = 22.7 L.

Numerical value type: the answer is a number.

Answer: 150. · Key from source paper

Q16 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Which of the given compounds can enhance the efficiency of hydrogen storage tank?

(A) Li/P_4
(B) SiH_4
(C) $NaNi_5$
(D) Di-isobutylaluminium hydride

Answer: (C) $NaNi_5$ · Key from source paper

Q17 JEE Main 2023 · 29 Jan · Shift 2 MCQ

Given below are two statements:
Statement I : Nickel is being used as the catalyst for producing syn gas and edible fats.
Statement II : Silicon forms both electron rich and electron deficient hydrides.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both the statements I and II are correct
(B) Statement I is incorrect but statement II is correct
(C) Both the statements I and II are incorrect
(D) Statement I is correct but statement II is incorrect

Answer: (D) Statement I is correct but statement II is incorrect · Key from source paper

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Q18 JEE Main 2023 · 25 Jan · Shift 1 MCQ

'25 volume' hydrogen peroxide means

(A) 1 L marketed solution contains 250 g of H_2O_2

(B) 1 L marketed solution contains 75 g of H_2O_2

(C) 100 mL marketed solution contains 25 g of H_2O_2

(D) 1 L marketed solution contains 25 g of H_2O_2

Answer: (B) 1 L marketed solution contains 75 g of H_2O_2 · Key from source paper

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Q19 JEE Main 2023 · 25 Jan · Shift 2 MCQ

Match List I with List II

List I	List II
A. Cobalt catalyst	I. $(H_2 + Cl_2)$ production
B. Syngas	II. Water gas production
C. Nickel catalyst	III. Coal gasification
D. Brine solution	IV. Methanol production

Choose the correct answer from the options given below:-

(A) A-IV, B-I, C-II, D-III

(B) A-IV, B-III, C-I, D-II

(C) A-II, B-III, C-IV, D-I

(D) A-IV, B-III, C-II, D-I

Answer: (D) A-IV, B-III, C-II, D-I · Key from source paper

Q20 JEE Main 2023 · 24 Jan · Shift 2 MCQ

In which of the following reactions the hydrogen peroxide acts as a reducing agent?

(A) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$

(B) $2\,Fe^{2+} + H_2O_2 \rightarrow 2Fe^{3+} + 2OH^-$

(C) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^{-1} + O_2$

(D) $Mn^{2+} + H_2O_2 \rightarrow Mn^{4+} + 2OH^-$

Answer: (C) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^{-1} + O_2$ · Key from source paper

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Q21 JEE Main 2022 · 29 Jul · Shift 1 MCQ

The reaction of zinc with excess of aqueous alkali, evolves hydrogen gas and gives

(A) $Zn(OH)_2$

(B) ZnO

(C) $[Zn(OH)_4]^{2-}$

(D) $[ZnO_2]^{2-}$

Answer: (D) $[ZnO_2]^{2-}$ · Key from source paper

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Q22 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Given below are two statements.
Statement I : Stannane is an example of a molecular hydride.
Statement II : Stannane is a planar molecule. In the light of the above statement, choose the most appropriate answer from the options given below

(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

Answer: (C) Statement I is true but Statement II is false. · Key from source paper

Q23 JEE Main 2022 · 28 Jul · Shift 1 MCQ

The metal salts formed during softening of hardwater using Clark's method are

(A) $\mathrm{CaOH_2}$ and $\mathrm{MgOH_2}$
(B) $\mathrm{CaCO_3}$ and $\mathrm{MgOH_2}$
(C) $\mathrm{CaOH_2}$ and $\mathrm{MgCO_3}$
(D) $\mathrm{CaCO_3}$ and $\mathrm{MgCO_3}$

Answer: (B) $\mathrm{CaCO_3}$ **and** $\mathrm{MgOH_2}$ · Key from source paper

Q24 JEE Main 2022 · 28 Jul · Shift 2 MCQ

The products obtained during treatment of hard water using Clark's method are

(A) $\mathrm{CaCO_3}$ and $\mathrm{MgCO_3}$
(B) $\mathrm{Ca\,(OH)_2}$ and $\mathrm{Mg\,(OH)_2}$
(C) $\mathrm{CaCO_3}$ and $\mathrm{Mg\,(OH)_2}$
(D) $\mathrm{Ca\,(OH)_2}$ and $\mathrm{MgCO_3}$

Answer: (C) $\mathrm{CaCO_3}$ **and** $\mathrm{Mg\,(OH)_2}$ · Key from source paper

Q25 JEE Main 2022 · 28 Jul · Shift 2 Numerical

On reaction with stronger oxidizing agent like $\mathrm{KIO_4}$, hydrogen peroxide oxidizes with the evolution of $\mathrm{O_2}$. The oxidation number of I in $\mathrm{KIO_4}$ changes to

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q26 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Given below are two statements:
Statement I : Hydrogen peroxide can act as an oxidizing agent in both acidic and basic conditions.

Statement II: Density of hydrogen peroxide at 298 K is lower than that of D_2O.
In the light of the above statements. Choose the correct answer from the options.

(A) Both statement I and Statement II are ture
(B) Both statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

Answer: (C) Statement I is true but Statement II is false · Key from source paper

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Q27 JEE Main 2022 · 26 Jul · Shift 1 MCQ

Which of the following can be used to prevent the decomposition of H_2O_2?

(A) Urea
(B) Formaldehyde
(C) Formic acid
(D) Ethanol

Answer: (A) Urea · Key from source paper

Q28 JEE Main 2022 · 25 Jul · Shift 2 MCQ

High purity ($> 99.95\%$) dihydrogen is obtained by

(A) reaction of zinc with aqueous alkali.
(B) electrolysis of warm aqueous barium hydroxide solution between nickel electrodes.
(C) electrolysis of acidified water using platinum electrodes.
(D) reaction of zinc with dilute acid.

Answer: (B) electrolysis of warm aqueous barium hydroxide solution between nickel electrodes. · Key from source paper

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Q29 JEE Main 2022 · 29 Jun · Shift 1 MCQ

Which one of the following reactions indicates the reducing ability of hydrogen peroxide in basic medium?

(A) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$
(B) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$
(C) $2\,MnO_4^- + 3H_2O_2 \rightarrow 2\,MnO_2 + 3O_2 + 2H_2O + 2OH^-$
(D) $Mn^{2+} + H_2O_2 \rightarrow Mn^{4+} + 2\,OH^-$

Answer: (C) $2\,MnO_4^- + 3H_2O_2 \rightarrow 2\,MnO_2 + 3O_2 + 2H_2O + 2OH^-$ · Key from source paper

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Q30 JEE Main 2022 · 28 Jun · Shift 1 MCQ

Dihydrogen reacts with CuO to give

(A) $Cu(OH)_2$
(B) $Cu(s)$
(C) Cu_2O
(D) CuH_2

Answer: (B) $Cu(s)$ · Key from source paper

Q31 JEE Main 2022 · 28 Jun · Shift 2 MCQ

Hydrogen has three isotopes : protium (^1H), deuterium (^2H or D) and tritium (^3H or T). They have nearly same chemical properties but different physical properties. They differ in

(A) Number of protons
(B) Atomic number
(C) Electronic configuration
(D) Atomic mass

Answer: (D) Atomic mass · Key from source paper

Q32 JEE Main 2022 · 27 Jun · Shift 1 MCQ

Addition of H_2SO_4 to BaO_2 produces

(A) BaO, SO_2 and H_2O
(B) $BaHSO_4$ and O_2
(C) $BaSO_4, H_2$ and O_2
(D) $BaSO_4$ and H_2O_2

Answer: (D) $BaSO_4$ and H_2O_2 · Key from source paper

Q33 JEE Main 2022 · 26 Jun · Shift 1 MCQ

Consider the following reaction :

$$2HSO_4^-(aq) \xrightarrow[(2)\ \text{Hydrolysis}]{(1)\ \text{Electrolysis}} 2HSO_4^- + 2H^+ + A$$

The dihedral angle in product A in its solid phase at 110 K is

(A) 104°
(B) 111.5°
(C) 90.2°
(D) 111.0°

Answer: (C) 90.2° · Key from source paper

Q34 JEE Main 2022 · 26 Jun · Shift 2 MCQ

Boiling of hard water is helpful in removing the temporary hardness by converting calcium hydrogen carbonate and magnesium hydrogen carbonate to

(A) $CaCO_3$ and $Mg(OH)_2$
(B) $CaCO_3$ and $MgCO_3$
(C) $Ca(OH)_2$ and $MgCO_3$
(D) $Ca(OH)_2$ and $Mg(OH)_2$

Answer: (A) $CaCO_3$ **and** $Mg(OH)_2$ · Key from source paper

Q35 JEE Main 2022 · 24 Jun · Shift 1 MCQ

The highest industrial consumption of molecular hydrogen is to produce compound of element :

(A) Carbon
(B) Oxygen
(C) Chlorine
(D) Nitrogen

Answer: (D) Nitrogen · Key from source paper

Q36 JEE Main 2021 · 1 Sep · Shift 2 MCQ

Hydrogen peroxide reacts with iodine in basic medium to give :

(A) IO^-
(B) IO_3^-
(C) I^-
(D) IO_4^-

Answer: (C) I^- · Key from source paper

Q37 JEE Main 2021 · 31 Aug · Shift 1 MCQ

Given below are two statements :
Statement I : The process of producing syn-gas is called gasification of coal.
Statement II : The composition of syn-gas is $CO + CO_2 + H_2$ $(1 : 1 : 1)$.
In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Both Statement I and Statement II are false.
(B) Statement I is true but Statement II is false
(C) Statement I is false but Statement II is true.
(D) Both Statement I and Statement II are true.

Answer: (B) Statement I is true but Statement II is false · Key from source paper

Q38 JEE Main 2021 · 31 Aug · Shift 1 Numerical

The number of hydrogen bonded water molecule(s) associated with stoichiometry $CuSO_4 \cdot 5H_2O$ is _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q39 JEE Main 2021 · 31 Aug · Shift 2 MCQ

Which one of the following statements is incorrect ?

(A) Atomic hydrogen is produced when H_2 molecules at a high temperature are irradiated with UV radiation.

(B) At around 2000 K, the dissociation of dihydrogen into its atoms is nearly 8.1%

(C) Bond dissociation enthalpy of H_2 is highest among diatomic gaseous molecules which contain a single bond.

(D) Dihydrogen is produced on reacting zinc with HCl as well as $NaOH_{(aq)}$.

Answer: (B) At around 2000 K, the dissociation of dihydrogen into its atoms is nearly 8.1% · Key from source paper

Q40 JEE Main 2021 · 27 Aug · Shift 1 MCQ

Deuterium resembles hydrogen in properties but:

(A) reacts vigorously than hydrogen

(B) reacts just as hydrogen

(C) emits β^+ particles

(D) reacts slower than hydrogen

Answer: (D) reacts slower than hydrogen · Key from source paper

Q41 JEE Main 2021 · 27 Aug · Shift 2 MCQ

The oxide that gives H_2O_2 most readily on treatment with H_2O is :

(A) Na_2O_2

(B) $BaO_2.8H_2O$

(C) SnO_2

(D) PbO_2

Answer: (A) Na_2O_2 · Key from source paper

Q42 JEE Main 2021 · 26 Aug · Shift 1 MCQ

Which one of the following methods is most suitable for preparing deionized water?

(A) Synthetic resin method
(B) Calgon's method
(C) Clark's method
(D) Permutit method

Answer: (A) Synthetic resin method · Key from source paper

Q43 JEE Main 2021 · 26 Aug · Shift 2 MCQ

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : Heavy water is used for the study of reaction mechanism.
Reason (R): The rate of reaction for the cleavage of $\mathrm{O-H}$ bond is slower than that of $\mathrm{O-D}$ bond.
Choose the most appropriate answer from the options given below :

(A) Both (A) and (R) are true and (R) is the true explanation of (A).
(B) (A) is true but (R) is false.
(C) (A) is false but (R) is true.
(D) Both (A) and (R) are true but (R) is not the true explanation of (A).

Answer: (B) (A) is true but (R) is false. · Key from source paper

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Q44 JEE Main 2021 · 27 Jul · Shift 2 MCQ

The number of neutrons and electrons, respectively, present in the radioactive isotope of hydrogen is :-

(A) 1 and 1
(B) 3 and 1
(C) 2 and 1
(D) 2 and 2

Answer: (C) 2 and 1 · Key from source paper

Q45 JEE Main 2021 · 25 Jul · Shift 1 MCQ

At $298.2\ \mathrm{K}$ the relationship between enthalpy of bond dissociation (in $\mathrm{kJ\ mol^{-1}}$) for hydrogen $\mathrm{E_H}$ and its isotope, deuterium $\mathrm{E_D}$, is best described by:

(A) $\mathrm{E_H = \frac{1}{2}E_D}$
(B) $\mathrm{E_H = E_D}$
(C) $\mathrm{E_H = E_D - 7.5}$
(D) $\mathrm{E_H = 2E_D}$

Answer: (C) $\mathrm{E_H = E_D - 7.5}$ · Key from source paper

Q46 JEE Main 2021 · 25 Jul · Shift 2 MCQ

Which one of the following metals forms interstitial hydride easily ?

(A) Cr
(B) Fe
(C) Mn
(D) Co

Answer: (A) Cr · Key from source paper

Q47 JEE Main 2021 · 22 Jul · Shift 1 MCQ

Isotope(s) of hydrogen which emits low energy β^- particles with $t_{1/2}$ value > 12 years is/are

(A) Protium
(B) Tritium
(C) Deuterium
(D) Deuterium and Tritium

Answer: (B) Tritium · Key from source paper

Q48 JEE Main 2021 · 20 Jul · Shift 1 MCQ

Given below are two statements : One is labelled as Assertion A and other is labelled as Reason R.
Assertion A : The dihedral angles in H_2O_2 in gaseous phase is 90.2° and in solid phase is 111.5°.
Reason R : The change in dihedral angle in solid and gaseous phase is due to the difference in the intermolecular forces.
Choose the most appropriate answer from the options given below for A and R.

(A) A is correct but R is not correct.
(B) Both A and R are correct but R is not the correct explanation of A.
(C) Both A and R are correct and R is the correct explanation of A.
(D) A is not correct but R is correct.

Answer: (D) A is not correct but R is correct. · Key from source paper

Q49 JEE Main 2021 · 20 Jul · Shift 2 MCQ

The single largest industrial application of dihydrogen is:

(A) Manufacture of metal hydrides
(B) Rocket fuel in space research
(C) In the synthesis of ammonia
(D) In the synthesis of nitric acid

Answer: (C) In the synthesis of ammonia · Key from source paper

Q50 JEE Main 2021 · 18 Mar · Shift 1 MCQ

Given below are two statements: One is labelled as Assertion A and the other labelled as reason R
Assertion A : During the boiling of water having temporary hardness, $\mathrm{Mg(HCO_3)_2}$ is converted to $\mathrm{MgCO_3}$
Reason R : The solubility product of $\mathrm{Mg(OH)_2}$ is greater than that of $\mathrm{MgCO_3}$.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both A and R are true but R is not the correct explanation of A
(B) A is true but R is false
(C) Both A and R are true and R is the correct explanation of A
(D) A and R both are false.

Answer: (D) A and R both are false. · Key from source paper

Q51 JEE Main 2021 · 18 Mar · Shift 2 MCQ

In basic medium, $\mathrm{H_2O_2}$ exhibits which of the following reactions?
(A) $\mathrm{Mn^{2+} \rightarrow Mn^{4+}}$
(B) $\mathrm{I_2 \rightarrow I^-}$
(C) $\mathrm{PbS \rightarrow PbSO_4}$
Choose the most appropriate answer from the options given below :

(A) (A),(C) only
(B) (A) only
(C) (B) only
(D) (A), (B) only

Answer: (D) (A), (B) only · Key from source paper

Q52 JEE Main 2021 · 17 Mar · Shift 1 MCQ

The INCORRECT statement(s) about heavy water is (are)
(A) used as a moderator in nuclear reactor
(B) obtained as a by-product in fertilizer industry.
(C) used for the study of reaction mechanism
(D) has a higher dielectric constant than water
Choose the correct answer from the options given below:

(A) (B) only
(B) (C) only
(C) (D) only
(D) (B) and (D) only

Answer: (C) (D) only · Key from source paper

Q53 JEE Main 2021 · 17 Mar · Shift 2 MCQ

The functional groups that are responsible for the ion-exchange property of cation and anion exchange resins, respectively, are :

(A) $-SO_3H$ and $-NH_2$
(B) $-SO_3H$ and $-COOH$
(C) $-NH_2$ and $-COOH$
(D) $-NH_2$ and $-SO_3H$

Answer: (A) $-SO_3H$ **and** $-NH_2$ · Key from source paper

Q54 JEE Main 2021 · 16 Mar · Shift 1 MCQ

Given below are two statements:
Statement I : H_2O_2 can act as both oxidising and reducing agent in basic medium.
Statement II : In the hydrogen economy, the energy is transmitted in the form of dihydrogen. In the light of the above statements, choose the correct answer from the options given below:

(A) Both statement I and statement II are false
(B) Both statement I and statement II are true
(C) Statement I is true but statement II is false
(D) Statement I is false but statement II is true

Answer: (B) Both statement I and statement II are true · Key from source paper

Q55 JEE Main 2021 · 16 Mar · Shift 2 MCQ

Statement I : Sodium hydride can be used as an oxidising agent.
Statement II : The lone pair of electrons on nitrogen in pyridine makes it basic.
Choose the CORRECT answer from the options given below :

(A) Both statement I and statement II are false
(B) Statement I is true but statement II is false
(C) Statement I is false but statement II is true
(D) Both statement I and statement II are true

Answer: (C) Statement I is false but statement II is true · Key from source paper

Q56 JEE Main 2021 · 16 Mar · Shift 2 MCQ

The correct statements about H_2O_2 are :
(A) used in the treatment of effluents.
(B) used as both oxidising and reducing agents.
(C) the two hydroxyl groups lie in the same plane.
(D) miscible with water.
Choose the correct answer from the options given below :

(A) (A), (B), (C) and (D)
(B) (A), (B) and (D) only
(C) (B), (C) and (D) only
(D) (A), (C) and (D) only

Answer: (B) (A), (B) and (D) only · Key from source paper

Q57 JEE Main 2021 · 26 Feb · Shift 1 MCQ

Statements about heavy water are given below.
A. Heavy water is used in exchange reactions for the study of reaction mechanisms.
B. Heavy water is prepared by exhaustive electrolysis of water.
C. Heavy water has higher boiling point than ordinary water.
D. Viscosity of $\mathrm{H_2O}$ is greater than $\mathrm{D_2O}$.
Choose the most appropriate answer from the options given below:

(A) A and C only
(B) A, B and C only
(C) A and B only
(D) A and D only

Answer: (B) A, B and C only · Key from source paper

Q58 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Calgon is used for water treatment. Which of the following statement is NOT true about Calgon?

(A) It is polymeric compound and is water soluble.
(B) Calgon contains the 2nd most abundant element by weight in the Earth's crust.
(C) It is also known as Graham's salt.
(D) It doesnot remove $\mathrm{Ca^{2+}}$ ion by precipitation.

Answer: (B) Calgon contains the 2nd most abundant element by weight in the Earth's crust. · Key from source paper

Q59 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Which of the following forms of hydrogen emits low energy β^- particles?

(A) Deuterium $^{2}_{1}\mathrm{H}$
(B) Proton $\mathrm{H^+}$
(C) Tritium $^{3}_{1}\mathrm{H}$
(D) Protium $^{1}_{1}\mathrm{H}$

Answer: (C) Tritium $^{3}_{1}\mathrm{H}$ · Key from source paper

Q60 JEE Main 2021 · 25 Feb · Shift 1 MCQ

Which of the following equation depicts the oxidizing nature of H_2O_2?

(A) $2I^- + H_2O_2 + 2H^+ \rightarrow I_2 + 2H_2O$

(B) $I_2 + H_2O_2 + 2\,OH^- \rightarrow 2I^- + 2H_2O + O_2$

(C) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$

(D) $KIO_4 + H_2O_2 \rightarrow KIO_3 + H_2O + O_2$

Answer: (A) $2I^- + H_2O_2 + 2H^+ \rightarrow I_2 + 2H_2O$ · Key from source paper

Q61 JEE Main 2021 · 25 Feb · Shift 2 MCQ

Water does not produce CO on reacting with :

(A) CO_2

(B) CH_4

(C) C_3H_8

(D) C

Answer: (A) CO_2 · Key from source paper

Q62 JEE Main 2021 · 24 Feb · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Hydrogen is the most abundant element in the Universe, but it is not the most abundant gas in the troposphere.
Reason R: Hydrogen is the lightest element.
In the light of the above statements, choose the correct answer from the options given below:

(A) Both A and R are true but R is NOT the correct explanation of A

(B) Both A and R are true and R is the correct explanation of A

(C) A is true but R is false

(D) A is false but R true

Answer: (B) Both A and R are true and R is the correct explanation of A · Key from source paper

Q63 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Dihydrogen of high purity ($> 99.95\ \%$) is obtained through :

(A) The reaction of Zn with dilute HCl.

(B) The electrolysis of acidified water using Pt electrodes.

(C) The electrolysis of brine solution.

(D) The electrolysis of warm $Ba(OH)_2$ solution using Ni electrrodes.

Answer: (D) The electrolysis of warm $Ba(OH)_2$ solution using Ni electrrodes. · Key from source paper

Q64 JEE Main 2020 · 5 Sep · Shift 1 MCQ

The equation that represents the water-gas shift reaction is :

(A) $CH_4(g) + H_2O(g) \xrightarrow[Ni]{1270\ K} CO(g) + 3H_2(g)$

(B) $2C(s) + O_2(g) + 4N_2(g) \xrightarrow{1273K} 2\,CO(g) + 4N_2(g)$

(C) $C(s) + H_2O(g) \xrightarrow{1270\ K} CO(g) + H_2(g)$

(D) $CO(g) + H_2O(g) \xrightarrow[catalyst]{673K} CO_2(g) + H_2(g)$

Answer: (D) $CO(g) + H_2O(g) \xrightarrow[catalyst]{673K} CO_2(g) + H_2(g)$ · Key from source paper

Q65 JEE Main 2020 · 5 Sep · Shift 2 MCQ

Hydrogen peroxide, in the pure state, is :

(A) non–planar and almost colorless

(B) Linear and blue in color

(C) Linear and almost colorless

(D) planar and blue in color

Answer: (A) non–planar and almost colorless · Key from source paper

Q66 JEE Main 2020 · 5 Sep · Shift 2 MCQ

The one that is NOT suitable for the removal of permanent hardness of water is :

(A) Clark's method

(B) Ion–exchange method

(C) Calgon's method

(D) Treatment with sodium carbonate

Answer: (A) Clark's method · Key from source paper

Q67 JEE Main 2020 · 3 Sep · Shift 1 Numerical

The volume strength of $8.9\ M\ H_2O_2$ solution calculated at $273\ K$ and $1\ atm$ is _____ $(R = 0.0821\ L\ atm\ K^{-1}\ mol^{-1})$ (rounded off to the nearest integer)

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q68 JEE Main 2020 · 9 Jan · Shift 2 MCQ

5g of zinc is treated separately with an excess of
(a) dilute hydrochloric acid and
(b) aqueous sodium hydroxide.
The ratio of the volumes of H_2 evolved in these two reactions is:

(A) 1 : 2
(B) 1 : 1
(C) 1 : 4
(D) 2 : 1

Answer: (B) 1 : 1 · Key from source paper

Q69 JEE Main 2020 · 8 Jan · Shift 2 MCQ

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

(A) 3
(B) 2
(C) 4
(D) 1

Answer: (A) 3 · Key from source paper

Q70 JEE Main 2020 · 7 Jan · Shift 1 MCQ

In comparison to the zeolite process for the removal of permanent hardness, the synthetic resin method is

(A) less efficient as it exchanges only anions.
(B) more efficient as it can exchange both cations as well as anions.
(C) less efficient as the resins cannot be regenerated.
(D) more efficient as it can exchange only cations.

Answer: (B) more efficient as it can exchange both cations as well as anions. · Key from source paper

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Q71 JEE Main 2020 · 7 Jan · Shift 2 MCQ

Among statements (a) – (d), the correct ones are:
(a) Decomposition of hydrogen peroxide gives di-oxygen.
(b) Like hydrogen peroxide, compounds, such as $KClO_3$, $Pb(NO_3)$ and $NaNO_3$ When heated liberate di-oxygen.
(c) 2-Ethylanthraquinone is useful for the industrial preparation of hydrogen peroxide.
(d) Hydrogen peroxide is used for the manufacture of sodium perborate.

(A) (a), (b), (c) and (d)
(B) (a), (b), and (c) only
(C) (a), (c), and (d) only
(D) (a) and (c) only

Answer: (A) (a), (b), (c) and (d) · Key from source paper

Q72 JEE Main 2019 · 12 Apr · Shift 2 MCQ

The temporary hardness of a water sample is due to compound X. Boiling this sample converts X to compound Y. X and Y, respectively, are:

(A) $Mg(HCO_3)_2$ and $MgCO_3$
(B) $Ca(HCO_3)_2$ and $Ca(OH)_2$
(C) $Mg(HCO_3)_2$ and $Mg(OH)_2$
(D) $Ca(HCO_3)_2$ and CaO

Answer: (C) $Mg(HCO_3)_2$ and $Mg(OH)_2$ · Key from source paper

Q73 JEE Main 2019 · 10 Apr · Shift 1 MCQ

The synonym for water gas when used in the production of methanol is:

(A) syn gas
(B) laughing gas
(C) natural gas
(D) fuel gas

Answer: (A) syn gas · Key from source paper

Q74 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The correct statements among a to d are:
a Saline hydrides produce H_2 gas when reacted with H_2O.
b Reaction of $LiAlH_4$ with BF_3 leads to B_2H_6.
c PH_3 and CH_4 are electron - rich and electron - precise hydrides, respectively.
d HF and CH_4 are called as molecular hydrides.

(A) a, b and c only.
(B) a, c and d only.
(C) c and d only.
(D) a, b, c and d

Answer: (D) a, b, c and d · Key from source paper

Q75 JEE Main 2019 · 8 Apr · Shift 2 MCQ

The strength of 11.2 volume solution of H_2O_2 is
[Given that, the molar mass of H = 1 g mol^{-1} and O = 16 g mol^{-1}]

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(A) 1.7 %
(B) 13.6 %
(C) 34 %
(D) 3.4 %

Answer: (D) 3.4 % · Key from source paper

Q76 JEE Main 2019 · 12 Jan · Shift 2 MCQ

The volume strength of 1M H_2O_2 is:
(Molar mass of H_2O_2 = 34 g mol^{-1})

(A) 5.6
(B) 22.4
(C) 11.2
(D) 16.8

Answer: (C) 11.2 · Key from source paper

Q77 JEE Main 2019 · 11 Jan · Shift 1 MCQ

The correct statements among (a) to (d) regarding H_2 as a fuel are : (i) It produces less pollutants than petrol. (ii) A cylinder of compressed dihydrogen weighs $\sim$ 30 times more than a petrol tank producing the same amount of energy. (iii) Dihydrogen is stored in tanks of metal alloys like $NaNi_5$ (iv) On combustion, values of energy released per gram of liquid dihydrogen and LPG are 50 and 142 kJ, respectively.

(A) (ii) and (iv) only
(B) (i) and (iii) only
(C) (ii), (iii) and (iv) only
(D) (i), (ii) and (iii) only

Answer: (D) (i), (ii) and (iii) only · Key from source paper

Q78 JEE Main 2019 · 11 Jan · Shift 1 MCQ

NaH is an example of:

(A) Electron $-$ rich hydride
(B) Metallic hydride
(C) Saline hydride
(D) Molecular hydride

Answer: (C) Saline hydride · Key from source paper

Q79 JEE Main 2019 · 10 Jan · Shift 1 MCQ

The chemical nature of hydrogen peroxide is:

(A) Oxidizing and reducing agent in both acidic and basic medium.
(B) Oxidizing agent in acidic medium, but not in basic medium
(C) Oxidizing and reducing agent in acidic medium, but not in basic medium
(D) Reducing agent in basic medium, but not in acidic medium.

Answer: (A) Oxidizing and reducing agent in both acidic and basic medium. · Key from source paper

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Q80 JEE Main 2019 · 10 Jan · Shift 1 MCQ

The total number of isotopes of hydrogen and number of radioactive isotopes among them, respectively, are

(A) 2 and 1
(B) 2 and 0
(C) 3 and 1
(D) 3 and 2

Answer: (C) 3 and 1 · Key from source paper

Q81 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Among the following reactions of hydrogen with halogens, the one that requires a catalyst is:

(A) $H_2 + Cl_2 \rightarrow 2\,HCl$
(B) $H_2 + I_2 \rightarrow 2\,HI$
(C) $H_2 + F_2 \rightarrow 2\,HF$
(D) $H_2 + Br_2 \rightarrow 2\,HBr$

Answer: (B) $H_2 + I_2 \rightarrow 2\,HI$ · Key from source paper

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Q82 JEE Main 2019 · 9 Jan · Shift 1 MCQ

The isotopes of hydrogen are:

(A) Protium, deuterium and tritium
(B) Tritium and protium only
(C) Protium and deuterium only
(D) Deuterium and tritium only

Answer: (A) Protium, deuterium and tritium · Key from source paper

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Q83 JEE Main 2019 · 9 Jan · Shift 2 MCQ

The temporary hardness of water is due to:

(A) $Na_2\ SO_4$
(B) $NaCl$
(C) $CaCl_2$
(D) $Ca\ (HCO_3)_2$

Answer: (D) $Ca\ (HCO_3)_2$ · Key from source paper

Q84 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Lithium aluminium hydride reacts with silicon tetrachloride to form:

(A) $LiCl$, AlH_3 and SiH_4
(B) $LiCl$, $AlCl_3$ and SiH_4
(C) LiH, $AlCl_3$ and $SiCl_2$
(D) LiH, AlH_3 and SiH_4

Answer: (B) $LiCl$, $AlCl_3$ and SiH_4 · Key from source paper

Q85 JEE Main 2018 · 8 Apr · Offline MCQ

Hydrogen peroxide oxidises $[Fe\ (CN)_6]^{4-}$ to $[Fe\ (CN)_6]^{3-}$ in acidic medium, but reduces $[Fe\ (CN)_6]^{3-}$ to $[Fe\ (CN)_6]^{4-}$ in alkaline medium. The other products formed are, respectively

(A) H_2O and $(H_2O + OH^-)$
(B) $(H_2O + O_2)$ and H_2O
(C) $(H_2O + O_2)$ and $(H_2O + OH^-)$
(D) H_2O and $(H_2O + O_2)$

Answer: (D) H_2O and $(H_2O + O_2)$ · Key from source paper

Q86 JEE Main 2016 · 10 Apr · Online MCQ

Identify the reaction which does not liberate hydrogen

(A) Reaction of lithium hydride with B_2H_6.
(B) Electrolysis of acidified water using Pt electrodes.
(C) Reaction of zinc with aqueous alkali.
(D) Allowing a solution of sodium in liquid ammonia to stand.

Answer: (A) Reaction of lithium hydride with B_2H_6. · Key from source paper

Q87 JEE Main 2016 · 9 Apr · Online MCQ

Identify the incorrect statement regarding heavy water:

(A) It reacts with SO_3 to form deuterated sulphuric acid (D_2SO_4) .
(B) It is used as a coolant in nuclear reactors.
(C) It reacts with CaC_2 to produce C_2D_2 and $Ca(OD)_2$.
(D) It reacts with Al_4C_3 to produce CD_4 and $Al(OD)_3$.

Answer: (B) It is used as a coolant in nuclear reactors. · Key from source paper

Q88 JEE Main 2016 · 3 Apr · Offline MCQ

Which of the following statements about water is FALSE?

(A) There is extensive intramolecular hydrogen bonding in the condensed phase.
(B) Ice formed by heavy water sinks in normal water.
(C) Water is oxidized to oxygen during photosynthesis
(D) Water can act both as an acid and as a base

Answer: (A) There is extensive intramolecular hydrogen bonding in the condensed phase. · Key from source paper

Q89 JEE Main 2015 · 11 Apr · Online MCQ

Which physical property of di-hydrogen is wrong?

(A) Tasteless gas
(B) Odourless gas
(C) Colourless gas
(D) Non-inflammable gas

Answer: (D) Non-inflammable gas · Key from source paper

Q90 JEE Main 2015 · 10 Apr · Online MCQ

Permanent hardness in water cannot be cured by:

(A) Treatment with washing soda
(B) Ion exchange method
(C) Calgon's method
(D) Boiling

Answer: (D) Boiling · Key from source paper

Q91 JEE Main 2015 · 4 Apr · Offline MCQ

From the following statements, choose the incorrect statement regarding H_2O_2.

(A) It has to be kept away from dust.
(B) It can act only as an oxidising agent.
(C) It decomposes on exposure to light.
(D) It has to be stored in plastic or wax-lined glass bottles in the dark.

Answer: (B) It can act only as an oxidising agent. · Key from source paper

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Q92 AIEEE 2012 · Offline MCQ

Very pure hydrogen (99.9%) can be made by which of the following processes?

(A) Reaction of methane with steam
(B) Mixing natural hydrocarbons of high molecular weight
(C) Electrolysis of water
(D) Reaction of salt like hydrides with water

Answer: (C) Electrolysis of water · Key from source paper

Q93 AIEEE 2008 MCQ

In context with the industrial preparation of hydrogen from water gas ($CO + H_2$), which of the following is the correct statement?

(A) CO and H_2 are fractionally separated using differences in their densities
(B) CO is removed by absorption in aqueous Cu_2Cl_2 solution
(C) H_2 is removed through occlusion with Pd
(D) CO is oxidised to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali

Answer: (D) CO is oxidised to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali · Key from source paper

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Q94 AIEEE 2003 MCQ

Which one of the following processes will produce hard water?

(A) Saturation of water with $MgCO_3$
(B) Saturation of water with $CaSO_4$
(C) Addition of Na_2SO_4 to water
(D) Saturation of water with $CaCO_3$

Answer: (B) Saturation of water with $CaSO_4$ · Key from source paper

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Q95 AIEEE 2003 MCQ

Which of the following could act as apropellant for rockets?

(A) Liquid oxygen + liquid argon
(B) Liquid hydrogen + liquid oxygen
(C) Liquid nitrogen + liquid oxygen
(D) Liquid hydrogen + liquid nitrogen

Answer: (B) Liquid hydrogen + liquid oxygen · Key from source paper

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