

DPP - Daily Practice Problems

Name :

Date :

Start Time :

End Time :

CHEMISTRY

16

SYLLABUS : Hydrogen

Max. Marks : 120

Time : 60 min.

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 Deuterium, an isotope of hydrogen is-

- (a) radioactive (b) non-radioactive
(c) heaviest (d) lightest

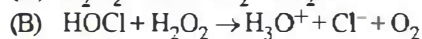
Q.2 The difference between ortho & para hydrogen is-

- (a) ortho is more stable than para
(b) conductivity of ortho is more than para
(c) magnetic moment of ortho is zero
(d) all of these

Q.3 Structure of H_2O_2 is-

- (a) non-planar (b) spherical
(c) planar (d) linear

Q.4 Consider the reactions



Which of the following statements is correct about H_2O_2 with reference to these reactions? Hydrogen peroxide is

- (a) an oxidising agent in both (A) and (B)
(b) an oxidising agent in (A) and reducing agent in (B)
(c) a reducing agent in (A) and oxidising agent in (B)
(d) a reducing agent in both (A) and (B)

Q.5 Calgon, a water softener is-

- (a) sodium aluminosilicate
(b) sodium hexametaphosphate
(c) sodium zeolite
(d) sodium bicarbonate

RESPONSE GRID

1. (a) (b) (c) (d)

2. (a) (b) (c) (d)

3. (a) (b) (c) (d)

4. (a) (b) (c) (d)

5. (a) (b) (c) (d)

Space for Rough Work

- Q.6** Which can adsorb largest volumes of hydrogen gas ?
 (a) Colloidal solution of palladium
 (b) Finely divided nickel
 (c) Colloidal ferric hydroxide
 (d) Finely divided platinum
- Q.7** Ionic hydrides react with water to give -
 (a) acidic solutions (b) basic solutions
 (c) hydride ion (d) protons
- Q.8** H_2O_2 reduces $\text{K}_3[\text{Fe}(\text{CN})_6]$ in -
 (a) neutral solution (b) acidic solution
 (c) alkaline solution (d) non-polar medium
- Q.9** The exhausted permutit is generally regenerated by passing through it a solution of -
 (a) sodium chloride (b) calcium chloride
 (c) magnesium chloride (d) potassium chloride
- Q.10** Permanent hardness of water can be removed by adding calgon $\text{Na}_6\text{P}_6\text{O}_{18}$. This is an example of -
 (a) adsorption (b) exchange of ions
 (c) precipitation (d) None of these
- Q.11** When SO_3 is treated with heavy water, the product is/are
 (a) Deuterium and sulphuric acid
 (b) Deuterium and sulphurous acid
 (c) Only deuterium
 (d) Dideutero-sulphuric acid
- Q.12** Which one of the following substances is used in the laboratory for fast drying of neutral gases?
 (a) Phosphorus pentoxide
 (b) Active charcoal
 (c) Anhydrous calcium chloride
 (d) Na_3PO_4
- Q.13** The property of hydrogen which distinguishes it from alkali metals is
 (a) Its electropositive character
 (b) Its affinity for non-metal
 (c) Its reducing character
 (d) Its non-metallic character
- Q.14** The hydride ion (H^-) is a stronger base than the hydroxide ion (OH^-). Which of the following reactions will occur if sodium hydride (NaH) is dissolved in water?
 (a) $\text{H}^- (\text{aq}) + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ (\text{aq})$
 (b) $\text{H}^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{OH}^- (\text{aq}) + \text{H}_2 (\text{g})$
 (c) $\text{H}^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{No reaction}$
 (d) None of these
- Q.15** Which of the following statements do not define the characteristic property of water ? : "Water is a universal solvent"
 (a) It can dissolve maximum number of compounds
 (b) It has very low dielectric constant
 (c) It has high liquid range
 (d) None of these
- Q.16** Which of the following is not true?
 (a) Hardness of water depends on its behaviour towards soap
 (b) The temporary hardness is due to the presence of Ca and Mg bicarbonates
 (c) Permanent hardness is due to the presence of soluble Ca and Mg sulphates, chlorides and nitrates
 (d) Permanent hardness can be removed by boiling the water
- Q.17** Heavy water freezes at
 (a) 0°C (b) 3.8°C (c) 38°C (d) -0.38°C
- Q.18** Lead pipes are not used for carrying drinking water because
 (a) They are covered with a coating of lead carbonate
 (b) They are corroded by air and moisture
 (c) Water containing dissolved air attacks lead forming soluble hydroxide
 (d) None of these
- Q.19** The boiling point of water is exceptionally high because
 (a) There is covalent bond between H and O
 (b) Water molecule is linear
 (c) Water molecules associate due to hydrogen bonding
 (d) Water molecule is not linear

**RESPONSE
GRID**

- | | | | | |
|------------------|------------------|------------------|------------------|------------------|
| 6. (a)(b)(c)(d) | 7. (a)(b)(c)(d) | 8. (a)(b)(c)(d) | 9. (a)(b)(c)(d) | 10. (a)(b)(c)(d) |
| 11. (a)(b)(c)(d) | 12. (a)(b)(c)(d) | 13. (a)(b)(c)(d) | 14. (a)(b)(c)(d) | 15. (a)(b)(c)(d) |
| 16. (a)(b)(c)(d) | 17. (a)(b)(c)(d) | 18. (a)(b)(c)(d) | 19. (a)(b)(c)(d) | |

Space for Rough Work

Q.20 Match list I with list II and select the correct answer using the codes given below the lists :

	List I		List II
1	Heavy water	(a)	Bicarbonates of Mg and Ca in water
2	Temporary hard water	(b)	No foreign ions in water
3	Soft water	(c)	D ₂ O
4	Permanent hard water	(d)	Sulphates and chlorides of Mg and Ca in water

Codes

- (a) 1-c, 2-d, 3-b, 4-a
 (b) 1-b, 2-a, 3-c, 4-d
 (c) 1-b, 2-d, 3-c, 4-a
 (d) 1-c, 2-a, 3-b, 4-d

Q.21 What is formed when calcium carbide reacts with heavy water?

- (a) C₂D₂ (b) CaD₂
 (c) Ca₂D₂O (d) CD₂

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

- (a) 1, 2 and 3 are correct
 (b) 1 and 2 are correct
 (c) 2 and 4 are correct
 (d) 1 and 3 are correct

Q.22 Which of the following statements about H₂O₂ is/are true?

- (1) H₂O₂ is a reducing agent.
 (2) Concentrated H₂O₂ in water is generally expressed as 20 or 30 volumes of H₂O₂.
 (3) H₂O₂ is an oxidizing agent.
 (4) H₂O₂ is a linear molecule.

Q.23 When zeolite, which is hydrated sodium aluminium silicate, is treated with hard water, the sodium ion are exchanged with

- (1) Ca²⁺ ions (2) Mg²⁺ ions
 (3) H⁺ ions (4) SO₄²⁻ ions

Q.24 The species that do not contain peroxide ion are

- (1) PbO₂ (2) H₂O₂
 (3) SrO₂ (4) BaO₂

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

Hydrogen combines with a number of metals and non-metals to form compounds known as hydrides.

Q.25 Ionic or salt like hydrides are formed by metals with –

- (a) low electronegativity
 (b) high electronegativity
 (c) electronegative with respect to hydrogen
 (d) None of these

Q.26 Molecular or covalent hydrides are –

- (a) soft
 (b) hard
 (c) high electrical conductor
 (d) None of these

Q.27 Metallic hydrides are –

- (a) soft
 (b) hard
 (c) stoichiometric hydrides
 (d) None of these

**RESPONSE
GRID**

20. (a) (b) (c) (d) 21. (a) (b) (c) (d) 22. (a) (b) (c) (d) 23. (a) (b) (c) (d) 24. (a) (b) (c) (d)
 25. (a) (b) (c) (d) 26. (a) (b) (c) (d) 27. (a) (b) (c) (d)

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

- (a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
 (c) Statement -1 is False, Statement-2 is True.
 (d) Statement -1 is True, Statement-2 is False.

28. **Statement 1 :** H_2O_2 reduces Cl_2 to HCl .
Statement 2 : H_2O_2 is called antichlor.
 29. **Statement 1 :** In alkaline solution, H_2O_2 reacts with potassium ferricyanide.
Statement 2 : H_2O_2 is a strong reducing agent.
 30. **Statement 1 :** Hydrogen peroxide forms only one series of salts called peroxides.
Statement 2 : Hydrogen peroxide molecule has two replaceable hydrogen atoms.

RESPONSE GRID

28. (a) (b) (c) (d) 29. (a) (b) (c) (d) 30. (a) (b) (c) (d)

DAILY PRACTICE PROBLEM SHEET 16 - CHEMISTRY

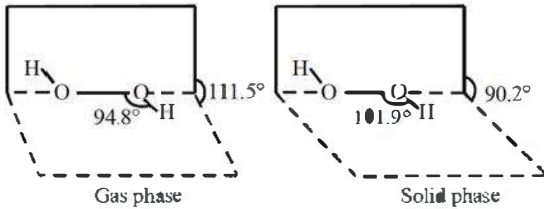
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	40	Qualifying Score	68
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

(16)

- (1) (b) For, ${}^2_1\text{D}$, $\frac{n}{p} = \frac{1}{1} = 1$.
Hence, it is a stable nucleus.
- (2) (a) At room temp., ratio of $s\text{-H}_2$ & $p\text{-H}_2$ is 3 : 1.
- (3) (a) 
- (4) (b)
- (5) (b) Calgon removes Ca and Mg ions from hard water by forming a soluble complex.

$$2\text{Ca}^{2+} + \text{Na}_2[\text{Na}_4(\text{PO}_3)_6] \rightarrow \text{Na}_2[\text{Ca}_2(\text{PO}_3)_6] + 2\text{Na}^+$$
Hard water Calgon Soluble complex
- (6) (a) The amount of hydrogen occluded depends upon the nature and physical state of the metal.
- (7) (b) Ionic hydrides react violently with water to form corresponding metal hydroxides with the liberation of H_2 gas. Thus, they act as strong bases.

$$\text{NaH (s)} + \text{H}_2\text{O (l)} \rightarrow \text{NaOH (aq)} + \text{H}_2\text{(g)}$$

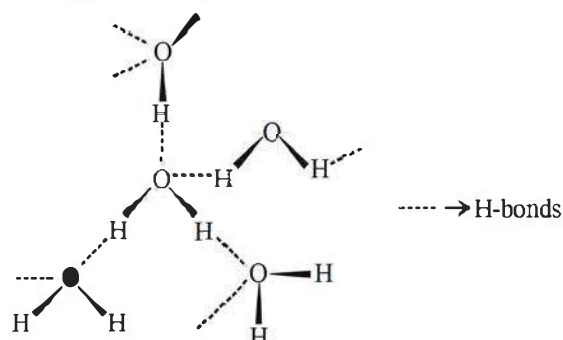
$$\text{CaH}_2\text{(s)} + 2\text{H}_2\text{O (l)} \rightarrow \text{Ca (OH)}_2\text{(aq)} + 2\text{H}_2\text{(g)}$$
- (8) (c) $2\text{K}_3[\text{Fe(CN)}_6] + 2\text{KOH} + \text{H}_2\text{O}_2 \rightarrow 2\text{K}_4[\text{Fe(CN)}_6] + 2\text{H}_2\text{O} + \text{O}_2$
- (9) (a) The whole permutit gets exhausted due to conversion of sodium zeolite into calcium and magnesium zeolite. It can be regenerated by passing 10% solution of NaCl through it.

$$\text{MgZ} + 2\text{NaCl} \rightarrow \text{Na}_2\text{Z} + \text{MgCl}_2$$

$$\text{CaZ} + 2\text{NaCl} \rightarrow \text{Na}_2\text{Z} + \text{CaCl}_2$$
(Exhausted permutit) (Regenerated permutit)
- (10) (b) $\text{Na}_6\text{P}_6\text{O}_{18}$ is used in Calgon process. It forms soluble complex with Ca^{2+} and Mg^{2+} ions.

$$2\text{CaCl}_2 + \text{Na}_2[\text{Na}_4(\text{PO}_3)_6] \rightarrow \text{Na}_2[\text{Ca}_2(\text{PO}_3)_6] + 4\text{NaCl}$$
from hard water calgon soluble complex
- $$2\text{MgSO}_4 + \text{Na}_2[\text{Na}_4(\text{PO}_3)_6] \rightarrow \text{Na}_2[\text{Mg}_2(\text{PO}_3)_6] + 2\text{Na}_2\text{SO}_4$$
- Thus, there occurs an exchange of ions.
- (11) (d) $\text{SO}_3 + \text{D}_2\text{O} \rightarrow \text{D}_2\text{SO}_4$ (Dideutero-sulphuric acid).

- (12) (c) Anhydrous CaCl_2 is used for fast drying of neutral gases.
- (13) (d) Hydrogen is a non-metal while all other members of group 1 (alkali metals) are metals.
- (14) (b)
$$\text{H}^-\text{(aq)} + \text{H}_2\text{O(l)} \rightarrow \text{OH}^-\text{(aq)} + \text{H}_2\text{(g)}$$
Base 1 Acid 2 Base 2 Acid 1
- (15) (b) Water has high dielectric constant i.e. 82, high liquid range and can dissolve maximum number of compounds. That is why, it is used as universal solvent.
- (16) (d) Permanent hardness cannot be removed by boiling of water but temporary hardness can be removed.
- (17) (b) Heavy water freezes at slightly higher temperature than water.
- (18) (c) Due to plumbosolvency, lead dissolves in water to a small extent to form soluble hydroxide which is poisonous so lead pipe is not used for carrying drinking water.
- (19) (c) Water molecules associate due to intermolecular hydrogen bonding.



As a result, H_2O boils at a much higher temperature as compared to other members of the group.

- (20) (d) Heavy water is D_2O (1-c)
Temporary hard water contains bicarbonates of Ca^{2+} and Mg^{2+} (2-a)
Soft water does not have foreign ions (3-b).
Permanent hard water contains sulphates and chlorides of Ca^{2+} and Mg^{2+} (4-d)
- (21) (a) $\text{CaC}_2 + 2\text{D}_2\text{O} \rightarrow \text{C}_2\text{D}_2 + \text{Ca (OD)}_2$
- (22) (a) The strength of a sample of hydrogen peroxide solution is expressed in terms of volume of oxygen at STP that one volume of hydrogen peroxide gives on heating. For example, '20 volumes of H_2O_2 ' means 1 litre of this solution liberates 20L of O_2 at STP.
Hydrogen peroxide acts both as an oxidizing and a reducing agent. As an oxidizing agent, H_2O_2 is converted to H_2O and as a reducing agent it is converted to O_2 .

- (23) (b) $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot x\text{H}_2\text{O} + \text{Ca}^{2+} \rightarrow \text{CaAl}_2\text{Si}_2\text{O}_8 \cdot x\text{H}_2\text{O} + 2\text{Na}^+$
 $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot x\text{H}_2\text{O} + \text{Mg}^{2+} \rightarrow \text{MgAl}_2\text{Si}_2\text{O}_8 \cdot x\text{H}_2\text{O} + 2\text{Na}^+$
- (24) (d) Only H_2O_2 (hydrogen peroxide) and BaO_2 (Barium peroxide) contain peroxide ions. So (1) and (3) are the correct choices.
- (25) (a) Ionic or salt-like or saline hydrides are formed by those metals whose electronegativity values are appreciably lower than that of hydrogen (2.1). Thus, all elements of groups 1 and 2 i.e. s-block elements on heating with hydrogen form ionic hydrides.
- (26) (a) They are soft because they consist of discrete covalent molecules held together by weak van der Waal's forces of attraction.
- (27) (b) They are hard as they consist of strong metallic bonds in their lattice structure.
- (28) (a) $\text{Cl}_2 + \text{H}_2\text{O} \longrightarrow 2\text{HCl} + [\text{O}]$
 $\text{H}_2\text{O}_2 + [\text{O}] \longrightarrow \text{H}_2\text{O} + \text{O}_2$
 $\text{H}_2\text{O}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl} + \text{O}_2$
- Since H_2O_2 can reduce Cl_2 , it acts as an antichlor in bleaching by removing the excess unreacted chlorine.
- (29) (a) Due to its reducing character, it reduces alkaline potassium ferricyanide to potassium ferrocyanide, i.e.
 $2\text{K}_3[\text{Fe}(\text{CN})_6] + 2\text{KOH} + \text{H}_2\text{O}_2 \longrightarrow 2\text{K}_4[\text{Fe}(\text{CN})_6] + 2\text{H}_2\text{O} + \text{O}_2$
- (30) (c) Hydrogen peroxide forms two series of salts called hydroperoxides and peroxides.