DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 41

SYLLABUS : *p*-Block Elements-IV (Group-16) : Oxygen family

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 deduced 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 SO_2 is obtained when
(a) Oxygen reacts with dilute sulphuric acid
(b) Hydrolysis of dilute H_2SO_4
(c) Concentrated H_2SO_4 reacts with Na_2SO_3
(d) All of these

Q.2 Bond angle is minimum for
(a) H_2O (b) H_2S
(c) H_2Se (d) H_2Te

Q.3 When oxygen is passed through a solution of Na_2SO_3 we get
(a) Na_2SO_4 (b) Na_2S
(c) $NaHSO_4$ (d) NaH

Q.4 Ozone is obtained from oxygen
(a) By oxidation at high temperature
(b) By oxidation using a catalyst
(c) By silent electric discharge
(d) By conversion at high pressure

Q.5 Ozone with Kl solution produces
(a) Cl_2 (b) I_2
(c) HI (d) IO_3

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ

Space for Rough Work

Q.6 When H_2S is passed through acidified $KMnO_4$, we get
(a) K_2SO_3 (b) MnO_2
(c) $KHSO_3$ (d) Sulphur

Q.7 Which compound acts as an oxidising as well as reducing agent?
(a) SO_2 (b) MnO_2
(c) Al_2O_3 (d) CrO_3

Q.8 When SO_2 is passed through acidified $K_2Cr_2O_7$ solution
(a) The solution turns blue
(b) The solution is decolourised
(c) SO_2 is reduced
(d) Green $Cr_2(SO_4)_3$ is formed

Q.9 Bleaching action of SO_2 is due to
(a) Reduction (b) Oxidation
(c) Hydrolysis (d) Its acidic nature

Q.10 A salt of sulphurous acid is called
(a) Sulphate (b) Sulphurate
(c) Sulphite (d) Sulphide

Q.11 The final acid obtained during the manufacture of H_2SO_4 by contact process is
(a) H_2SO_4 (conc.) (b) H_2SO_4 (dil.)
(c) H_2SO_4 (d) $H_2S_2O_7$

Q.12 There is no S - S bond in
(a) $S_2O_4^{2-}$ (b) $S_2O_5^{2-}$
(c) $S_2O_3^{2-}$ (d) $S_2O_7^{2-}$

Q.13 Sulphuric acid reacts with PCl_5 to give
(a) Thionyl chloride
(b) Sulphur monochloride
(c) Sulphuryl chloride
(d) Sulphur tetrachloride

Q.14 Which of the following hydrides has the lowest boiling point?
(a) H_2O (b) H_2S
(c) H_2Se (d) H_2Te

Q.15 The catalyst used in the manufacture of H_2SO_4 by contact process is
(a) Al_2O_3 (b) Cr_2O_3
(c) V_2O_5 (d) MnO_2

Q.16 Shape of O_2F_2 is similar to that of
(a) C_2F_2 (b) H_2O_2
(c) H_2F_2 (d) C_2H_2

Q.17 The number of S – S bonds in sulphur trioxide timer (S_3O_9) is
(a) three (b) two
(c) one (d) zero

Q.18 A gas that cannot be collected over water is
(a) N_2 (b) O_2
(c) SO_2 (d) PH_3

Q.19 The most efficient agent for the absorption of SO_3 is
(a) 80% H_2SO_4
(b) 98% H_2SO_4
(c) 50% H_2SO_4
(d) 20% $H_2S_2O_7$

Q.20 Conc. H_2SO_4 is diluted
(a) by adding water in H_2SO_4
(b) by adding H_2SO_4 in water
(c) by adding glacial acetic acid in H_2SO_4
(d) none of these

RESPONSE GRID					
	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ
	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ
	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ

Space for Rough Work

Q.21 Sulphur in +3 oxidation state is present in

(a) Sulphurous acid (b) Pyrosulphuric acid
(c) Dithionous acid (d) Thiosulphuric acid

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 properties is/are correct for ozone?

(1) It oxidises lead sulphide
(2) It oxidises potassium iodide
(3) It oxidises mercury
(4) It cannot act as bleaching agent

Q.23 Which of the following are basic ?

(1) HgO (2) N_2O (3) BeO (4) SO_3

Q.24 About H_2SO_4 which are correct ?

(1) Highly viscous (2) Dehydrating agent
(3) Sulphonating agent (4) Reducing agent

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

Several features of sulfuric acid are given below :

Preparation of sulfuric acid : Sulfuric acid is commonly prepared by the combustion of elemental sulfur to sulfur dioxide, followed by the catalytic oxidation of sulfur dioxide to sulfur trioxide. Sulfur trioxide is then absorbed into a 98% aqueous solution of H_2SO_4 and water is added to maintain a 98% concentration. SO_3 reacts with the water in the aqueous solution according to Reaction-1.

$$SO_3(g) + H_2O(\ell) \longrightarrow H_2SO_4(\ell) \text{ ; Reaction-1}$$

Properties : Concentrated sulfuric acid is 98% H_2SO_4 and 2% water by mass. It has a density of 1.84 g/mL and a boiling point of 338°C.

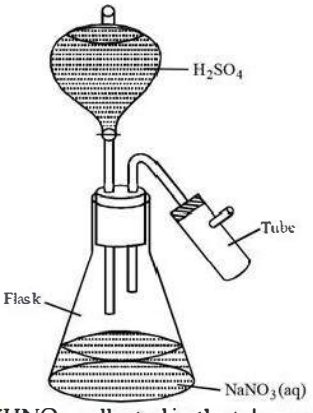
Preparation of other Acids : HCl (g) and $HNO_3(\ell)$ may be prepared by the reaction between sulfuric acid and the sodium salt of the corresponding conjugate base (Cl^- or NO_3^-, respectively).

Formation of SO_2 : Sulfuric acid forms SO_2 gas when it reacts with several compounds. For example, I_2 and SO_2 are formed when I^- reacts with concentrated H_2SO_4; Br_2 and SO_2 are formed when Br^- reacts with concentrated H_2SO_4. Cu^+ and SO_2 are formed in hot solutions of Cu(s) in H_2SO_4. This last reaction is unusual, because most metals react with solution of H_2SO_4 to form hydrogen gas and a metal sulfate.

Q.25 When sulfuric acid reacts with copper, how does the oxidation number of the sulfur change?

(a) From + 4 to + 6 (b) From + 6 to + 4
(c) From + 6 to + 8 (d) From + 8 to + 6

Q.26 The apparatus shown below can be used to prepare HNO_3 (boiling point = 86°C).



The yield of HNO_3 collected in the tube can be maximized by maintaining the temperatures of the flask and tube, respectively, at :

(a) 0°C and 100°C (b) 100°C and 0°C
(c) 350°C and 150°C (d) 350°C and 100°C

RESPONSE GRID	21. ⓐⓑⓒⓓ 22. ⓐⓑⓒⓓ 23. ⓐⓑⓒⓓ 24. ⓐⓑⓒⓓ 25. ⓐⓑⓒⓓ 26. ⓐⓑⓒⓓ

Space for Rough Work

Q.27 Which of the following is the balanced equation describing the combustion of elemental sulfur?

(a) $2H_2S+3O_2 \longrightarrow 2SO_2+2H_2O$

(b) $H_2S+2O_2 \longrightarrow SO_3+H_2O$

(c) $2SO_3 \longrightarrow 2S+3O_2$

(d) $S+\bullet_2 \longrightarrow SO_2$

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.

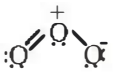
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

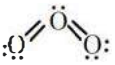
(c) Statement-1 is False, Statement-2 is True.

(d) Statement-1 is True, Statement-2 is False.

Q.28 Statement-1: Superoxides of alkali metals are paramagnetic.

Statement-2: Superoxides contain the ion O_2^- which has one unpaired electron.

Q.29 Statement-1: The electronic structure of O_3 is 

Statement-2: 

Structure is not allowed because octet around O cannot be expanded.

Q.30 Statement-1: Ozone is a powerful oxidizing agent in comparison to O_2.

Statement-2: Ozone is diamagnetic but O_2 is paramagnetic.

RESPONSE GRID	27.ⓐⓑⓒⓓ	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 41 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	36	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

(41)

1. (c) $Na_2SO_3(s) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + H_2O(l) + SO_2(g)$

2. (d)

H_2O	H_2S	H_2Se	H_2Te
104.5°	92.1°	91°	90°

As we go down the group electronegativity decreases due to which repulsion between bonded pairs of electron also decreases. Hence, bond angle decreases.

3. (a) $2Na_2SO_3 + O_2 \rightarrow 2Na_2SO_4$

4. (c) $3O_2 \underset{\text{electric discharge}}{\overset{\text{silent}}{\rightleftharpoons}} 2O_3$

5. (b) $O_3 \rightarrow O_2 + [O]$;

$$\frac{2KI + H_2O + [O] \rightarrow 2KOH + I_2}{2KI + H_2O + O_3 \rightarrow 2KOH + I_2 + O_2}$$

6. (d) $2KMnO_4 + 3H_2SO_4 + 5H_2S \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5S$

7. (a) The minimum and maximum oxidation number of S are -2 and +6 respectively. Since the oxidation number of S in SO_2 is +4, therefore it can be either increased or decreased. Therefore SO_2 behaves both as an oxidising as well as reducing agent.

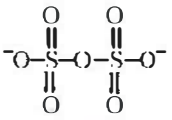
8. (d) $K_2Cr_2O_7 + H_2SO_4 + 3SO_2 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3H_2O$ (Green)

9. (a) $2H_2O + SO_2 \rightarrow H_2SO_4 + 2[H]$ (nascent hydrogen)
Coloured flower + 2 [H] → Colourless flower

10. (c) $H_2SO_3 + 2NaOH \rightarrow Na_2SO_3 + 2H_2O$ (Sodium sulphite)

11. (d) $H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$ (oleum)

12. (d) $S_2O_7^{2-}$



13. (c) $HO\text{-}SO_2\text{-}OH + PCl_5 \rightarrow Cl\text{-}SO_2\text{-}OH + POCl_3 + HCl$
$HO\text{-}SO_2\text{-}OH + 2PCl_5 \rightarrow Cl\text{-}SO_2\text{-}Cl + 2POCl_3 + 2HCl$ (Sulphuryl chloride)

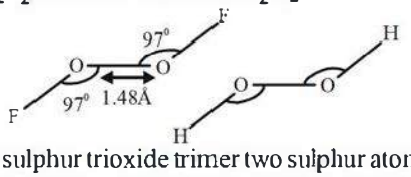
14. (b)

H_2O	H_2S	H_2Se	H_2Te
373K	213K	269K	232K

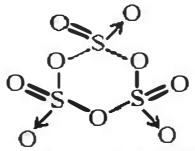
H_2S has lowest boiling point and H_2O has highest boiling point because of hydrogen bond.

15. (c)

16. (b) O_2F_2 is similar to that of H_2O_2



17. (d) In sulphur trioxide trimer two sulphur atoms are linked by O atom. Hence there is no S – S bond present.

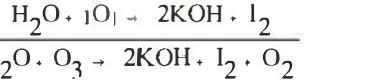


18. (c) SO_2 is soluble in water. $H_2O + SO_2 \rightarrow H_2SO_3$ (Sulphurous acid)

19. (b) 98% H_2SO_4 is used for absorbing dense fog of acid which is formed by dissolving SO_3 in water.

20. (b) Concentrated H_2SO_4 is diluted by adding the conc. H_2SO_4 in the water drop by drop with constant stirring because it is an exothermic reaction and by doing so heat is generated slowly and dissipated in the atmosphere.

21. (c) Dithionous acid ($H_2S_2O_4$) has sulphur in +3 oxidation state.



$HO-\overset{O}{\overset{\|}{S}}-\overset{O}{\overset{\|}{S}}-OH$; $2(+1) + 2x + 4(-2) = 0$
$2x = 8 - 2 = 6$; $x = +3$

22. (a) Ozone can oxidise lead sulphide. Potassium iodide and mercury are also oxidised by O_3, it also act as a bleaching agent.

23. (a) $H_2O + SO_3 \rightarrow H_2SO_4$ (acidic)

24. (a) H_2SO_4 is a dehydrating agent, sulphonating agent and highly viscous.

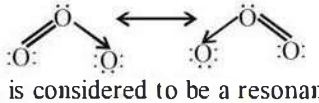
25. (b) The passage states that sulfuric acid reacts with Cu(*s*) to produce Cu^+ and SO_2. Thus, sulfuric acid is converted into sulfur dioxide, or $H_2SO_4 \rightarrow SO_2$.
O.S. of S in $H_2SO_4 = +6$: $[2 \times (+1) + S + 4 \times (-2) = 0]$
O.S. of S in $SO_2 = +4$: $[S + 2 \times (-2) = 0]$

26. (b) The boiling point of HNO_3 is given in the question as 86°C. Because HNO_3 must boil out of the flask and be trapped in the tube, the temperature of the flask must be above the boiling point of HNO_3 (i.e., > 86°C) and the temperature of the tube must be less than the boiling point of HNO_3 (i.e, < 86°C). Answer (b) meets these criteria.

27. (d) The combustion of elemental sulfur involves a reaction between oxygen (O_2) and sulfur (S). [Note: Though sulfur exists as S_8 molecules, its reactions are normally written in terms of its empirical formula S.]

28. (a) Both Statement-1 and Statement-2 are true and statement-2 is the correct explanation of Statement-1
Super oxides of alkali metals are paramagnetic due to the presence of unpaired electron.

29. (a) Both Statement-1 and Statement-2 are true and reason is the correct explanation of assertion.



Ozone is considered to be a resonance hybrid of the following two forms.

30. (b) Due to the case with which it can liberate nascent oxygen, O_3 acts as a powerful oxidising agent.
$O_3 \rightarrow O_2 + O$