

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 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 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 KI solution produces

- (a) Cl_2
- (b) I_2
- (c) I_2O_5
- (d) IO_3^-

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)

- 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 $\text{K}_2\text{Cr}_2\text{O}_7$ solution
 (a) The solution turns blue
 (b) The solution is decolourised
 (c) SO_2 is reduced
 (d) Green $\text{Cr}_2(\text{SO}_4)_3$ 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) $\text{H}_2\text{S}_2\text{O}_7$
- Q.12** There is no S - S bond in
 (a) $\text{S}_2\text{O}_4^{2-}$ (b) $\text{S}_2\text{O}_5^{2-}$
 (c) $\text{S}_2\text{O}_3^{2-}$ (d) $\text{S}_2\text{O}_7^{2-}$
- 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 tetrimer (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% $\text{H}_2\text{S}_2\text{O}_7$
- 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. (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) | 20. (a)(b)(c)(d) |

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) N₂O (3) BeO (4) SO₃

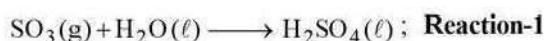
Q.24 About H₂SO₄ which are correct ?

- (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 H₂SO₄ and water is added to maintain a 98% concentration. SO₃ reacts with the water in the aqueous solution according to Reaction-1.



Properties : Concentrated sulfuric acid is 98% H₂SO₄ and 2% water by mass. It has a density of 1.84 g/mL and a boiling point of 338°C.

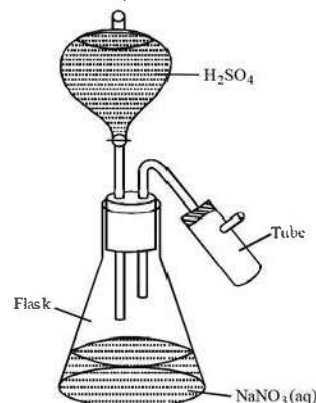
Preparation of other Acids : HCl (g) and HNO₃(ℓ) may be prepared by the reaction between sulfuric acid and the sodium salt of the corresponding conjugate base (Cl⁻ or NO₃⁻, respectively).

Formation of SO₂ : Sulfuric acid forms SO₂ gas when it reacts with several compounds. For example, I₂ and SO₂ are formed when I⁻ reacts with concentrated H₂SO₄; Br₂ and SO₂ are formed when Br⁻ reacts with concentrated H₂SO₄. Cu⁺ and SO₂ are formed in hot solutions of Cu(s) in H₂SO₄. This last reaction is unusual, because most metals react with solution of H₂SO₄ 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 HNO₃ (boiling point = 86°C).



The yield of HNO₃ 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. (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)

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

- (a) $2\text{H}_2\text{S} + 3\text{O}_2 \longrightarrow 2\text{SO}_2 + 2\text{H}_2\text{O}$
 (b) $\text{H}_2\text{S} + 2\text{O}_2 \longrightarrow \text{SO}_3 + \text{H}_2\text{O}$
 (c) $2\text{SO}_3 \longrightarrow 2\text{S} + 3\text{O}_2$
 (d) $\text{S} + \bullet_2 \longrightarrow \text{SO}_2$

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 $\text{:}\ddot{\text{O}}\text{=}\overset{+}{\text{O}}\text{--}\ddot{\text{O}}\text{:}$

Statement-2: $\text{:}\ddot{\text{O}}\text{=}\ddot{\text{O}}\text{=}\ddot{\text{O}}\text{:}$

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 .

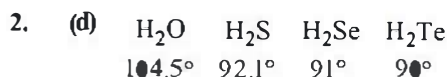
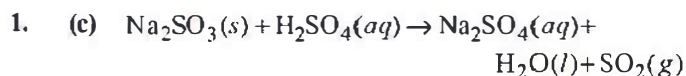
Statement-2: Ozone is diamagnetic but O_2 is paramagnetic.

RESPONSE GRID

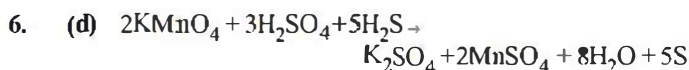
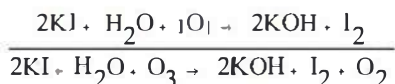
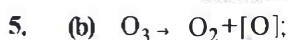
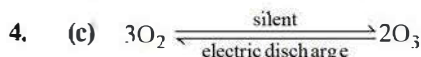
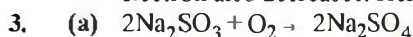
27. (a) (b) (c) (d) 28. (a) (b) (c) (d) 29. (a) (b) (c) (d) 30. (a) (b) (c) (d)

DAILY PRACTICE PROBLEM SHEET 41 - CHEMISTRY

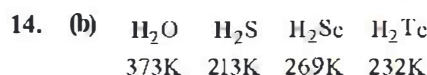
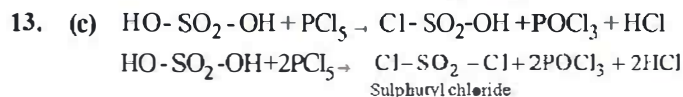
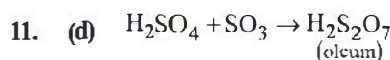
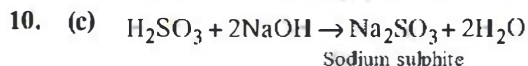
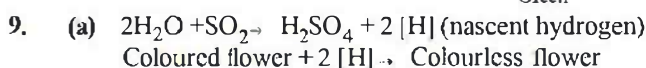
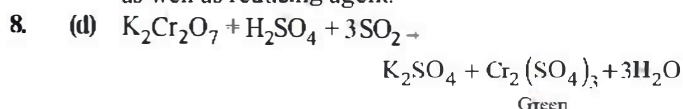
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	36	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			



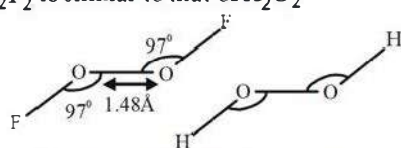
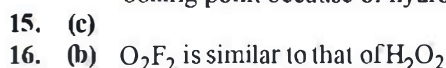
As we go down the group electronegativity decreases due to which repulsion between bonded pairs of electron also decreases. Hence, bond angle decreases.



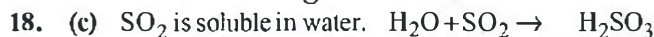
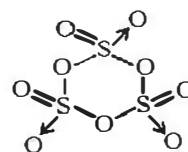
7. (a) The minimum and maximum oxidation number of S are -2 and +6 respectively. Since the oxidation number of S in SO_2 is +4, therefore it can be either increased or decreased. Therefore SO_2 behaves both as an oxidising as well as reducing agent.



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



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

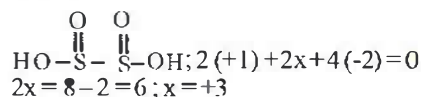


Sulphurous acid

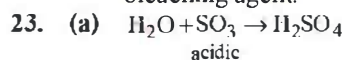
19. (b) 98% H_2SO_4 is used for absorbing dense fog of acid which is formed by dissolving SO_3 in water.

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 ($\text{H}_2\text{S}_2\text{O}_4$) has sulphur in +3 oxidation state.



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



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

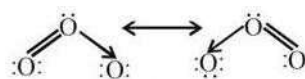
25. (b) The passage states that sulfuric acid reacts with Cu(s) to produce Cu^{2+} and SO_2 . Thus, sulfuric acid is converted into sulfur dioxide, or $\text{H}_2\text{SO}_4 \rightarrow \text{SO}_2$.
O.S. of S in $\text{H}_2\text{SO}_4 = +6$: $[2 \times (+1) + \text{S} + 4 \times (-2) = 0]$
O.S. of S in $\text{SO}_2 = +4$: $[\text{S} + 2 \times (-2) = 0]$

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.]

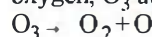
28. (a) Both Statement-1 and Statement-2 are true and statement-2 is the correct explanation of Statement-1 Super oxides of alkali metals are paramagnetic due to the presence of unpaired electron.

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 ease with which it can liberate nascent oxygen, O_3 acts as a powerful oxidising agent.



$\text{O}=\text{O}=\text{O}$
Paramagnetic
(due to presence of two unpaired electrons)

