CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

GROUP 16 ELEMENTS

Problems

1. What is the percentage make up of most abundant element in the most abundant liquid of the earth's crust?

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2. Oxygen is a gas, but other elements of group 16 are solids at room temperature. Why?

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3. First and second electron gain enthalpies of oxygen are -141 and $+702 kJ mol^{-1}$ How is large number of oxides accounted for ?

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4. Viscosity of sulphur increases when molten sulphur is heated from $120^{\circ}C$ to $160^{\circ}C$. Why

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5. Comment on the catenation capacity of sulphur.

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6. What is the maximum covalency of oxygen ? Give examples.

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7. The dissociation coustant of H_2O, H_2Se and H_2 Te are 1.8×10^{-16}, 1.4×10^{-7}, 1.3×10^{-4} and 2.2×10^{-3}, respectively. What do these values denote ?

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8. Tellurium forms oxides of the formula Teo, TeO_2 and Te_3. What is the nature of these oxides?

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9. Oxygen forms only fluorides, but other chalcogens form different halides. Why?

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10. A and B are elements with atomic numbers 16 and 17. Write different combinations of binary compounds known from them.

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11. Dry sulphurdioxide does not bleach dry flowers. Explain.

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12. Which oxyacid of sulphur has $S-O-S$ link ? How is it prepared?

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13. Oxygen is divalent in its compounds, but sulphur is even hexavalent. Why?

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14. Write the tautomerism in sulphurous acid.

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15. Justify that peroxymono and peroxydisulphuric acids have a peroxy linkage. How are they structurally diffferent?

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16. Protocity of sulphuric acid is two. Explain?

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17. Mention the principle in iodometry.

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18. Write the structure and oxidation numbers of sulphur in tetrathionic acid.

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19. The magnetic properties of oxygen and ozone are different. Explain.

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20. Both ozone and hydrogen peroxide act as oxidants as well as reductants. What main differences are noticed in their reactions?

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21. In the manufacture of sulphuric acid by the contact process, sulphur trioxide is not directly dissolved in water. Why?

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22. Ozone is used in improving the atmosphere of crowded places. Why?

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23. How does H_2SO_4 react with KCl and KBr?

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24. Hydrogen sulphide is important in cation analysis. Explain.

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25. How is dilute sulphuric acid prepared?

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26. How are SO_2Cl_2 and SO_2 obtained from sulphuric acid ?

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27. How is thiosulphate distinguished from sulphate?

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Exercise 2 1 1

1. Discuss the electronic configuration of group 16 elements.

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2. What are chalcogens? Why are they so called?

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3. Write the trends in atomic radius, ionisation potential and metallic nature of group VIA elements.

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4. Write a short note on the allotropy of sulphur.

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5. Discuss the valency and bonding in oxygen and sulphur molecules

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6. Why oxidation states of sulphur are all even numbers ?

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Exercise 2 1 2

1. Write on the stability and acidic nature of hydrides of chalcogens.

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2. Water is a liquid and abnormally has low volatility. Explain.

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3. How are oxides of sulphur prepared ? What are their properties?

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4. Discuss the structures of sulphur dioxide and sulphur trioxide molecules.

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5. Mention the preparation and discuss the structures of SCI_4 and SF_6.

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Exercise 2 1 3

1. Mention the four types of oxyacids of sulphur and give examples.

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2. Write the oxidation states of sulphur in its oxyacids.

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3. Draw the structures of sulphite sulphate and thiosulphate.

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4. Write the peroxy acids and polythionic acids of sulphur.

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5. How is oxygen different from other elements of the same group ? What are the reasons ?

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Exercise 2 1 4

1. Discuss the structure of ozone.

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2. Write four examples of properties of ozone acting as oxidant.

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3. Write the uses of ozone.

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4. How is hydrogen sulphide prepared?

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5. Hydrogen sulphide can be used as reducing agent. Support with three examples.

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Exercise 2 1 5

1. Sulphurous acid is a bleaching agent base on sodium. Explain.

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2. The catalyst used in the manufacture of sulphuric acid by contact process is

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3. Sulphuric acid acts as dehydrating agent. Substantiate.

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4. Hypo is used as 'anti chlor' and for 'fixing films'. Discuss with suitable equations.

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Exercise 2 2

1. Oxygen is a blue gas, but sulphur is yellow solid. Explain.

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2. Discuss the structure and bonding in S_8 molecules.

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3. Radius of sulphur atom is 102 pm. SSS angle is 105°. What is the diameter of the sphere from the centre of S_8 molecule?

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4. Why is sulphur paramagnetic in vapour state?

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5. Write on the valency, bonding and catenation of sulphur.

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6. Oxygen is divalent in its compounds, but sulphur is even hexavalent. Why?

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7. Among rhombic, monoclinic and plastic forms of sulphur, which form has highest heat of combustion. Why?

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8. Liquid oxygen stick to magnetic poles but not liquid nitrogen. Why?

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9. Comment on the sability of hydrogen sulphide and polysulphides.

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10. Write on the trends of bond energy, bond angle, volatility and boiling points of MH_2 hydrides.

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11. Write the preparation of hydrogen sulphide. How is it used in qualitative analysis?

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12. Tetrafluorides of sulphur are not prepared directly from elements. Why?

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13. How are fluorides of oxygen prepared ? Write their structures.

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14. Discuss the bonding and structures of SF_6, SCl_4, SCl_2 and S_2Cl_2 molecules.

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15. Nitric acid can not be used to prepare hydrogen sulphide. Why?

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16. The bond angle in water molecule is nearer to tetrahedral angle, but in hydrogen sulphide it is

nearer to right angle. Why?

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17. Discuss the structures of sulphite and sulphate ions.

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18. What is ozonolysis? Write equation for the ozonolysis of ethylene. Draw the structure of the ozonide.

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19. Ozone acts as oxidising agent as well as reducing agent. Substantiate.

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20. Hydrogen sulphide can not be dried over conc. H_2SO_4 Why?

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21. How many sulphur atoms in $H_2S_nO_6$ has sulphur linked to only its atoms?

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22. Turbidity is obtained when hydrogen sulphide is passed through aqueous solution of sulphur dioxide. Explain.

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23. Compared to water, hydrogen sulphide is thermally less stable, stronger acid and better reductant. Substantiate.

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24. Supar turns black on adding with sulphuric acid. Why?

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25. Ozone destroys mercury meriscus. Why?

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26. Water should not be added to cone acid while preparing dilute sulphuric acid. Why?

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27. Chlorination of a gas X with chlorine gives a substance Y. Y is used to prepare anhydrous ferric chloride from its hexahydrated salt and also used to convert ethanol to ethylchloride. Identify Y and write necessary equations.

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28. Sulphuric acid is manufactured in contact process, but some amount of sulphuric acid is used in contact process. Justify.

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29. In the reaction of ozone with potash an orange red solid is formed. What is characteristic about the solid?

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30. Sulphurous acid turns pink permanganate colourless and turns acidified dichromate green. Explain.

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31. An aqueous solution of a gas (G) decolourises acidified permanganate and pararosanilide. On boiling G with hydrogen peroxide, an acid X is formed, which gives a white precipitate Y with barium chloride solution. Y is insoluble in dilute hydrochloric acid. Identify the compounds G and Y.

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32. An aqueous solution of silver nitrate gives a white precipitate with

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33. An inorganic solid (A) dissolve in watger to give acid B and acid C. A also reacts with aqueous alkali to form two salts in solution. The salt solution gives white precipitates with both $AgNO_3$ and $BaCl_2$ solutions. What is A?

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34.

$Na_2CO_3 + SO_2 \xrightarrow{\Delta} A + B, B + S \rightarrow C$ and C +2AgNO_(3)rarr 2NaNO_(3)+D.

When compound D on exposure to moisture gives

black precipitate silver sulphide. What are the substances A and C?

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