CHEMISTRY

BOOKS - NAGEEN CHEMISTRY (ENGLISH)

SAMPLE QUESTION PAPER

Questions

1. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(Linear, four, Heisenberg, three, tetrahedral, bipyramidal 180°, trigonal, 109°, two , Linear, $109^\circ 28.$, Zeeman, de-Broglie, atomic nuclear, one).

The uncertainty principle and the concept of wave nature of matter were proposed by _____ and _____ respectively.

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2. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(Linear, four, Heisenberg, three, tetrahedral, bipyramidal 180°, trigonal, 109°, two , Linear, $109^\circ 28.$, Zeeman, de-Broglie, atomic nuclear, one).

Methane molecule is _____ in shape with al bond angles equal to _____.

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4. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(Linear, four, Heisenberg, three, tetrahedral, bipyramidal 180°, trigonal, 109°, two , Linear, $109^\circ 28.$, Zeeman, de-Broglie, atomic nuclear, one).

The neopentane contains _____ 1° and _____ 4° carbon atoms.

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5. Which one of the following ions has the highest value of ionic radius?

A. Li^+

B. B^{3+}

C. O^{2-}

D. F^-

Answer: C

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6. In which of the following molecule/ion all the bonds are not equal? A XeF_4 B BF_4^- C C_2H_4 D SiF_4

A. SF_4

B. SiF_4

C. XeF_4

D. BF_4^-

Answer: A

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7. Fill in the blanks by using the correct word/term given in the brackets. The hydrogen ion concentration of a solution with pH = 3 is ____ than the solution with pH = 6. (greater/less)

A. 3.98×10^{-6}

B. 3.68×10^{-6}

C. 3.88×10^6

D. 3.98×10^8

Answer: A

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8. Out of the following, the alkene that exhibits optical isomerism is

A. 3-methyl-2-pentene

B. 4-methyl-1-pentene

C. 3-methyl-1-pentene

D. 2-methyl-2-pentene

Answer: C

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9. Complete and balance the following equations:

(i) $Fe + H_2O \rightarrow$ .....+.....

(ii) $Zn + H_2SO_4 \rightarrow$ .....+.....

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10. What is an ideal gas?

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11. State one important significance of Charle.s Law in everyday life.

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12. Predict the sign of ΔG for a reaction that is exothermic and accompanied by an increase in entropy.

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13. What does $\Delta H = q_p$ refers to?

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14. Give IUPAC name of the following compounds:

$(CH_3)_3C - CH = CH_2$

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15. Write the systematic IUPAC names of the following compounds :

$C_6H_5 - CH = CH - COOH$

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16. What is the functional isomer of ethanol ?

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17. What is meant by 5 ppm $CaCO_3$ solution?

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18. In a chemical reaction, what happens to the reactant which is taken in excess?

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19. 0.3780g of an organic chloro compound gave 0.5740g of silver chloride. Calculate the percentage of chlorine in the compound.

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20. In the estimation of sulphur by Carius method, 0.468 g of an organic sulphur compound afforded 0.668 g of barium sulphate. Find out the percentage of sulphur in the given compound.

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21. Complete and balance the following equations:

$K_4\left[Fe(CN)_6\right] + H_2SO_4 + H_2O_2 \rightarrow$ _____+_____+_____

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22. Complete and balance the following equations:

$KMnO_4 + H_2SO_4 + H_2O_2 \rightarrow$ _____+_____+_______+_______

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23. Give reasons why?

Ionic compounds are soluble in water

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24. Write the structural formula of the compounds having the following IUPAC names

2, 5-dimethylheptane

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25. Write the structural formula of the compounds having the following IUPAC names

6-chloro-5-ethyl-2, 4, 4-trimethylhexane-1-nitrile

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26. Beryllium and magnesium to not give colour to flame whereas other alkaline earth metals do so. Why ?

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27. How will you distinguish pentane from 1-pentene ?

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28. What happens when HBr is added to propene

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29. What happens when propene is treated with chlorine at 773 K?

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30. Give reason: Chlorine liberates iodine from KI solution

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31. How many electrons are unpaired in

He

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32. How many electrons are unpaired in

C

Watch Video Solution

33. How many electrons are unpaired in

N

Watch Video Solution

34. How many electrons are unpaired in

K

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35. At room temperature, ammonia gas at 1 atm pressure and hydrogen chloride gas at P atm pressure are allowed to effuse through identical pin holes from opposite ends of a glass tube of one metre length and of uniform cross section. Ammonium chloride is first formed at a distance of 60 cm from the end through which HCl gas is sent in. What is the value of P?

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36. A 4: 1 molar mixture of He and CH4 is contained in a vessel at 20 bar pressure. Due to a hole in the vessel, the gas mixture leaks out. What is the composition of the mixture effusing out initially?

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37. Write the balance equation for the following

Action of heat on $Na_2CO_3.10H_2O$

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38. Write a balanaed chemical equation for each of the following:

Action of heat on aluminium hydroxide

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39. Calculate the standard free energy change for the following reaction at $27^\circ C$.

$H_2(g) + I_2(g) \rightarrow 2HI(g), \Delta H^\circ = +51.9kJ$

[Given : $\Delta S^\circ_{H_2} = 130.6JK^{-1}mol^{-1}$

$\Delta S^\circ_{I_2} = 116.7JK^{-1}mol^{-1}$

$\Delta S^\circ_{HI} = 206.3JK^{-1}mol^{-1}]$.

Predict whether the reaction is feasible at 27°C or not.

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40. Define the term standard free energy change (ΔG°). How is it related to the equilibrium constant K?

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41. Comment on the spontaneity of a process when

$\Delta H < 0, T\Delta S > 0$

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42. Comment on the spontaneity of a process when

$\Delta H > 0, T\Delta S < 0$

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43. Comment on the spontaneity of a process when

$\Delta H > 0, T\Delta S > 0$ and $T\Delta S < \Delta H$

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44. Comment on the spontaneity of a process when

$\Delta H < 0, T\Delta S > 0$

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45. What is smog and how it is formed?

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46. Define metamerism. What type of compounds do show it? Give an example.

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47. Discuss the shape of the BCl_3 molecules using VSEPR model .

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48. On the basis of VSEPR theory, predict the shapes of the following molecules :

$SiCl_4$

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49. Dicuss the shape of the following molecules using the VSEPR model:

AsF_5

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50. Justify that the following reactions are redox reactions :

$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$

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51. Justify that the following reactions are redox reactions :

$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$

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52. Justify that the following reactions are redox reactions :

$4BCl_3(g) + 3LiAlH_4(s) \rightarrow 2B_2H_6(g) + 3LiCl(s) + 3AlCl_3(s)$

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53. Write formulase for the following compounds :

Mg(II) chloride

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54. Write formulas for the following compounds :

Nickel (II) sulphate

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55. Write formulas for the following compounds :

Tin (IV) oxide

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56. Write formulas for the following compounds :

Thallium (I) sulphate

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57. Identify the substance oxidised and reduced, oxidising agent and reducing agent for each of the following reactions

(a) $2AgBr(s) \rightarrow C_6H_6O_2(aq) \rightarrow 2Ag(s) + 2HBr(aq) + C_6H_4O_2(aq)$

(b)

$HCHO(l) + 2\left[Ag(NH_3)_2\right]^+(aq) + 3OH^-(aq) \rightarrow 2Ag(s) + HCOO^-(aq$

(c)

$HCHO(l) + 2Cu^{2+}(aq) + 5OH^-(aq) \rightarrow Cu_2O(s) + HCOO^-(aq) + 3H$

(d) $N_2H_4(l) + 2H_2O_2(l) \rightarrow N_2(g) + 4H_2O(l)$

$Pb(s) + PbO_2(s) + 2H_2SO_4(aq) \rightarrow 2PbSO_4(s) + 2H_2O(l)$

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58. Calculate the oxidation number of sulphur , chromium and nitrogen in $H_2SO_5, Cr_2O_7^{2-}$ and NO_3^- . Suggest structure of these compounds . Count for the fallacy .

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59. Explain why A branched chain alkane possesses lower boiling point than the corresponding straight chain alkane.

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60. Why do alkenes and alkynes undergo addition reactions ? Describe some important addition reactions of alkenes and alkynes.

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61. How will you convert benzene into

(i) p-nitrobromobenzene

(ii) m-nitrochlorobenzene

(iii) p -nitrotoluene

(iv) acetophenone

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62. How will you convert the following: (Give balanced equation)

Ethyne to methane

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63. How will you bring out the following conversions ?

Ethene to ethyne

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64. An alkene 'A' contains three C – C, eight C – H (σ) bonds and one C – C (π) bond. 'A' on ozonolysis gives two moles of an aldehyde of molar mass 44 u. Write IUPAC name of 'A'.

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65. Draw the cis and trans structures of hex-2-ene. Which isomer will have higher b.p. and why?

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66. PCI_5 is 47.1% dissociated at 18°C and one atmospheric pressure. Calculate the value of K_p .

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67. The solubility product of $BaSO_4$ at 298 K is 1.08×10^{-10} . What is the minimum concentration of SO_4^{2-} ions required to precipitate $BaSO_4$ from a 0.01 M solution of $BaCl_2$

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68. Calculate the pH value of the following

0.001 M HCI

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69. Calculate the pH value of the following

0.01 M NaOH.

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70. Bromine water is brown and weakly acidic due to following equilibrium :

$$\underset{\text{Brown}}{Br_2(aq)} + 2H_2O \Leftrightarrow \underset{\text{Colourless}}{HBrO(aq)} + H_3O^+(l) + \underset{\text{Colourless}}{Br^-(aq)}$$

When sodium hydroxide is added to the solution , the solution becomes colourless but the colour return when hydrochloric acid is added. Explain this observation.

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71. Sort out the Lewis acids and Lewis bases among the following:

$Cl^-, BCl_3, SO_2, OH^-, Fe^{3+}, SnCl_4, Ni, CH_3OH, NH_3$?

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72. Fill in the blanks by chossing the appropriate word/words from those given in the brackets: (increases, ionic radius, CH_2, same, sigma, ionic, 14, 2, decreases, 16, CH_3, pi, covalent, ionic)

An _____bond is formed when the electronegativity difference in teh combining atoms is more than _____

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73. In a homologous series, two successive members differ by a ..... group and a molecular mass of ..... amu.

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74. Fill in the blanks by chossing the appropriate word/words from those given in the brackets: (increases, ionic radius, CH_2, same, sigma, ionic, 14, 2, decreases, 16, CH_3, pi, covalent, ionic)

When N_2 goes to N_2^+, the N-N bond distance ____ and when O_2 goes to O_2^+ the O-O bond distance _____

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75. Fill in the blanks by chossing the appropriate word/words from those given in the brackets: (increases, ionic radius, CH_2, same, sigma, ionic, 14, 2, decreases, 16, CH_3, pi, covalent, ionic)

The carbon-carbon triple bond in acetylene comprises of one ____ and two _____bonds.

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76. What do the constants a and b signify in van der Waals' equation ?

A. intermolecular repulsion

B. intermolecular attraction

C. volume occupied by the molecules

D. intermolecular collisions per unit volume.

Answer: C

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77. At absolute zero, the entropy of a pure crystal is zero. This is

A. 0K

B. 15K

C. 50K

D. 100K

Answer: A

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78. A gaseous mixture contains oxygen and nitrogen in the ratio $1:4$ by weight. Therefore, the ratio of the number of molecules is:

A. $1:4$

B. $7:32$

C. $1:8$

D. $3:16$

Answer: B

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79. But-1-ene may be converted to butane by reaction with

A. Zn-HCl

B. Sn-HCl

C. Zn-Hg

D. Pd/H_2

Answer: D

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80. Match the following

(i)	H_2O is liquid	(a)	Green colouring matter of leaf
(ii)	Non-metal displacement reaction	(b)	Sulphur, Phosphorus
(iii)	Magnesium	(c)	Activity series of halogens
(iv)	Carius method	(d)	Due to hydrogen bonding

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81. What are the laws of chemical combination ? State each law and explain it with suitable examples.

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82. Write the relation between atomic mass and equivalent weight?

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83. Which quantum number does not depend upon the value of n?

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84. For a given value of l, how many values of m are permissible?

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85. Name the alkali metals which form superoxides when heated in excess of air.

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86. Name the metal which floats on water without any apparent reaction with it.

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87. Identify primary, secondary, tertiary and quaternary carbon atoms in the following compound:

$$CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - \overset{\overset{C_2H_5}{|}}{CH} - CH_2 - CH_3$$

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88. What type of isomerism is exhibited by the following equilibrium ?

$$CH_3 - \overset{\overset{O}{||}}{C} - CH_3 \Leftrightarrow CH_3 - \overset{\overset{OH}{|}}{C}H = CH_2$$

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89. 0.1092 g of a dibasic acid is exactly neutralized by $21cm^3$ of 0.1N NaOH. Calculate the molecular mass of the acid.

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90. 0.500 g of the silver salt of an organic dibasic acid on ignition gives 0.325 g of pure silver. Find the molecular mass of the acid.

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91. What is oxidation number? Mention the working rules used to calculate the oxidation number of an atom in a given species. Calculate the oxidation number of S in Na_2S, Na_2SO_3, Na_2SO_4, $Na_2S_2O_3$ and $Na_2S_4O_6$.

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92. Find the oxidation number of:

Cr in $K_2Cr_2O_7$

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93. 7.00 g of a gas occupies a volume of 4.1 L at 300 K and 1 atm pressure. What is the molecular mass of the gas?

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94. Write the structural formula of the compounds having the following IUPAC names:

4-nitropent-1-yne

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95. Write the structural formula of the compounds having the following IUPAC names:

Butane-2, 3-dione

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96. Why are potassium and caesium rather than lithium used in photoelectric cells ?

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97. How will you convert methane to ethane

Watch Video Solution

98. How will you convert ethane to methane?

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99. A hydrocarbon decolourised bromine water. On ozonolysis it gives 3-methyl butanal and acetaldehyde. Write the structure of the hydrocarbon.

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100. Discuss the structure of aluminium chloride.

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101. Why does chromium have configuration of type $3d^5 4s^1$ instead of $3d^4 4s^2$?

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102. How many electrons possess anticlockwise spin in an atom of oxygen?

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103. At $27^\circ C$, a cylinder of 20 L capacity contains three gases He, O_2 and N_2. Their masses are 0.502 g, 0.250 g and 1.00 g respectively. If all these gases behave ideally, calculate the partial pressure of each gas as well as the total pressure.

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104. 750 mL of nitrogen are collected over water at $25^{\circ} C$ and 740 mm pressure. If the aqueous tension at this temperature is 23.8 mm Hg, calculate the mass of the dry gas.

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105. Out of 4s and 3d, which subshell is filled first and why?

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106. In potassium, the 19th electron enter into 4s subshells instead of 3d subshells.

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107. Calculate the entropy change (ΔS) for the following reaction at $25^{\circ} C$.

$SO_2(g) + \frac{1}{2}O_2(g) \rightarrow SO_3(g)$

The absolute entropies at $25^\circ C$ and 1 atm pressure for $SO_2(g), O_2(g)$ and $SO_3(g)$ are 248.5, 205.0 and 256.2 J K^(-1) mol^(-1)` respectively.

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108. Define heat of formation.How is it useful in the calculation of the heat of a reaction ?

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109. Calculate the calorific value of sugar if its heat of combustion is $5645 kJ mol^{-1}$.

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110. Define air pollution. What are the main pollutants ?

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111. Distinguish between primary and secondary air pollutants.

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112. Indicate the σ and π bonds in the following molecules :

$C_6H_6, C_6H_{12}, CH_2C_{l2}, CH_2 = C = CH_2, CH_3NO_2, HCONHCH_3$

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113. Why is +I-effect of t-butyl group greater than that of isopropyl group?

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114. Give the electron dot structure of the following compounds :

$SO_2, H_2SO_4, HNO_3, HClO_2$ and $HClO_4$

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115. Give the electron dot structure of the following compounds :

$SO_2, H_2SO_4, HNO_3, HClO_2$ and $HClO_4$

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116. Give the electron dot structure of the following compounds :

$SO_2, H_2SO_4, HNO_3, HClO_2$ and $HClO_4$

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117. Whenever a reaction between an oxidising agent and a reducing agent is carried out, a compound of lower oxidation state is formed if the reducing agent is in excess and a compound of higher oxidation state is formed if the oxidising agent is in excess. Justify this statement giving three illustrations.

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118. Justify that the following reactions are redox reactions :

$2K(s) + F_2(g) \rightarrow 2K^+F^-(s)$

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119. Justify that the following reactions are redox reactions :

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

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120. Calculate the oxidation number of the underlined atoms in the following species.

$\underline{N}H_2OH,\ [\underline{Co}(NH_3)_5Cl]Cl_2,\ (\underline{N_2}H_5)_2SO_4,\ \underline{Mg}_3N_2$

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121. Calculate the oxidation number of the underlined atoms in the following species.

$[\underline{Co}(NH_3)Cl]Cl_2$

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122. Calculate the oxidation number of the underlined atoms in the following species.

$\underline{N}H_2OH,\ [\underline{Co}(NH_3)_5Cl]Cl_2,\ (\underline{N_2}H_5)_2SO_4,\ \underline{Mg}_3N_2$

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123. Calculate the oxidation number of the underlined atoms in the following species.

$\underline{N}H_2OH,\ [\underline{Co}(NH_3)_5Cl]Cl_2,\ (\underline{N_2}H_5)_2SO_4,\ \underline{Mg}_3N_2$

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124. How do you account for the following observations ?

Though alkaline potassium permanganate and acidic potassium permanganate both are used as oxidants, yet in the manufacture of benzoic acid from toluene we use alcoholic potassium permanganate as an oxidant. Why? Write a balanced redox equation for the reaction.

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125. How do you account for the following observations ?

When concentrated sulphuric acid is added to an inorganic mixture containing chloride, we get colourless pungent smelling gas HCI, but if the mixture contains bromide then we get red vapour of bromine. Why?

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126. Explain why Alkanes with odd number of carbon atoms possess lower boiling points than those having even number of carbon atoms

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127. Explain why Teflon is used in making non-stick cooking utensils.

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128. How will you convert propene to propane

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129. How will you bring out the following conversions ?

Ethyne to but-2-yne

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130. How would you convert the following compounds into benzene?

(i) Ethyne

(ii) Ethene

(iii) Hexane

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131. Write IUPAC names of the products obtained by the ozonolysis of the following compounds:

(i) Pent-2-ene (ii) 3,4-Dimethyl-hept-3-ene

(iii) 2-Ethylbut-1-ene (iv) 1-Phenylbut-1-ene

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132. Write IUPAC names of the products obtained by the ozonolysis of the following compounds:

(i) Pent-2-ene (ii) 3,4-Dimethyl-hept-3-ene

(iii) 2-Ethylbut-1-ene (iv) 1-Phenylbut-1-ene

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133. How will you convert benzene into (a) p-nitrobromobenzene (b) m-nitrobromobenzene

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134. How will you convert benzene into

(i) p-nitrobromobenzene

(ii) m-nitrochlorobenzene

(iii) p -nitrotoluene

(iv) acetophenone

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135. The solubility of $Mg(OH)_2$ in pure water is $9.57 \times 10^{-3} gL^{-1}$ .Calculate its solubility I $\left(gL^{-1}\right)$ in 0.02 M Mg $(NO_3)_2$ solutions.

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136. Write the equilibrium constant expressions for the following reactions.

$Cu(s) + 2Ag^{+}(aq) \Leftrightarrow Cu^{2+}(aq) + 2Ag(s)$

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137. Write the equilibrium constant expressions for the following reactions.

$AgCl(s) \Leftrightarrow Ag^{+}(aq) + Cl^{-}(aq)$

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138. Calculate the pH of a buffer solution containing 0.15 mole of CH_3COOH and 0.1 mole of CH_3COONa per litre. The dissociation constant for acetic acid 1.8×10^{-5}

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139. What is the condition for a salt to get precipitated from its saturated solutions?

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140. An acidic solution contains both Zn^{2+} and Hg^{2+} ions. Which ion will get precipitated passing H_2S into it ?

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141. The ionic product of water is 0.11×10^{-14} at 273 K. $1.0 \times 10^{-14} at 298K$ and $5.1 \times 10^{-14} at 373K$ Deduce from this data whether the ionisation of water to hydrogen and hydrooxide ions is exothermic or endothermic.

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Question

1. Splitting of spectral lines under the influence of magnetic field is called

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2. Fill in the blanks by choosing the appropriate word/words from those given in the brackets: (completely filled shells, C-H, Zeeman.s effect, propene, very low, half-filled shells, spin, magnetic, propane, explosively, cyclopropane, C-C, very high, propyne)

Nobles gases possess _____ values of ionisation energies due to the presence of _____

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3. Fill in the blanks by choosing the appropriate word/words from those given in the brackets: (completely filled shells, C-H, Zeeman.s effect, propene, very low, half-filled shells, spin, magnetic, propane, explosively, cyclopropane, C-C, very high, propyne)

The ring-chain isomers possible with the molecular formula C_3H_6 are _____and _____

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4. Fluorination of alkenes takes place ..... and may result in the rupture of ..... bond.

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5. Which of the following acids does not exhibit optical isomerism?

A. Maleic acid

B. α-amino-acid

C. Lactic acid

D. Tartaric acid

Answer: A

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6. The correct order of first ionisation potential is

A. $K > Na > Li$

B. $Be > Mg > Ca$

C. $B > C > N$

D. $Ge > Si > C$

Answer: B

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7. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$. This represents its

A. excited state

B. ground state

C. cationic form

D. anionic form

Answer: C

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8. The number of water molecules in one litre of water is:

A. 18

B. 18×1000

C. 6.022×10^{23}

D. 3.3×10^{25}

Answer: D

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9. Match the following

(i)	Beilstein test	(a)	Loss of electrons
(ii)	Purest and densest form of carbon	(b)	Acidic buffer
(iii)	Oxidation	(c)	Halogens
(iv)	Solution of acetic acid and sodium acetate	(d)	Diamond

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10. Using s, p, d, f notations describe the orbitals with the following quantum numbers:

(a) n=1, l=0, m=0

(b) n=3, l=0, m=0

(c) n=2, l=1, m=+1

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11. Using s,p, d, f notations describe the orbitals with the following quantum numbers:

n=3, l= 0, m= 0

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12. Write the electronic configurations for the following ions:

H^-

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13. Write the electronic configurations for the following ions:

Na^+

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14. Predict the blocks, periods and groups to which following elements belong:

Mg

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15. Give the formulae of the species that will be isoelectron c with the following atoms or ions :

Ne

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16. Give the formulae of the species that will be isoelectronic with the following atoms or ions :

Cl^-

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17. Why is the ionisation enthalpy of magnesium higher than that of potassium ?

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18. Why is magnesium oxide used as a refractory material?

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19. What are hybridisation states of each carbon atom in the following compounds ?

$CH_2 = C = O, CH_3CH = CH_2, (CH_3)_2CO, CH_2 = CHCN, C_6H_6$

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20. What are hybridisation states of each carbon atom in the following compounds ?

$CH_2 = C = O, CH_3CH = CH_2, (CH_3)_2CO, CH_2 = CHCN, C_6H_6$

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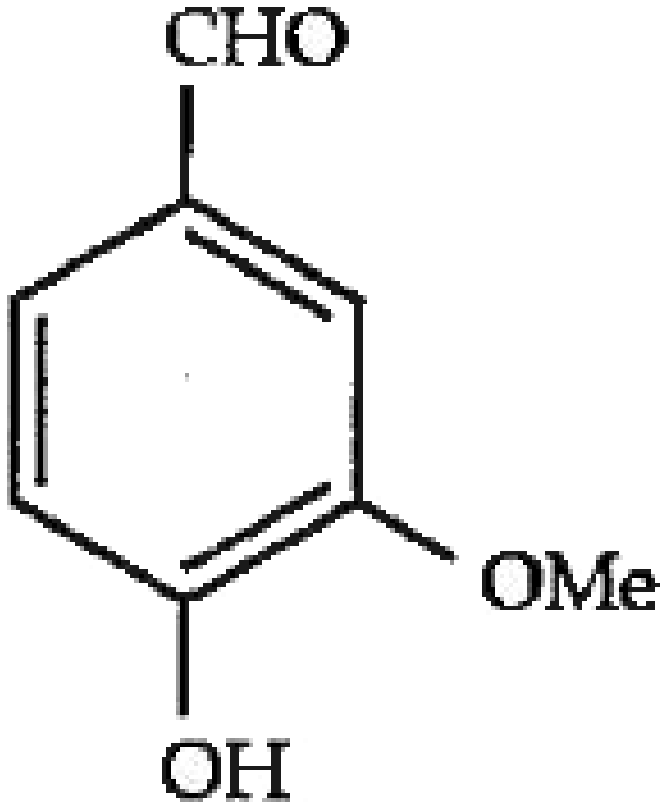
21. Identify the functional groups in the following compounds



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22. Identify the functional groups is the following compounds:

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23. 0.29 g of an organic compound were analysed by Liebig's method. The increase in the mass of U-tube and the potash bulbs at the end of the experiment were found to be 0.27 g and 0.66 g respectively. Calculate the percentage of carbon and hydrogen in it.

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24. 0.22 g of an organic compound on combustion in an atmosphere of CO_2 gave 34 cm^3 of moist N_2 at $17^\circ C$ and 733.4 mm pressure. If the aqueous tension at $17^\circ C$ is 13.4 mm, calculate the percentage of nitrogen in the compound.

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25. Complete and balance the following equation : $Fe + H_2O$

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26. Complete the following chemical reactions.

$PbS(s) + H_2O_2(aq) \rightarrow$

Classify the above into (a) hydrolysis, (b) redox and (c) hydration reactions.

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27. 9.00 litres of a gas at 16 atm and 27°C weigh 93.6 g. What is the molecular mass of the gas ?

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28. Write the structural formula of the following compounds:

1-chloropent-1-ene-4-yne

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29. Write the structural formula of the following compounds:

4-ethyl-2, 2, 6-trimethylheptane

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30. When an alkali metal dissolves in liquid ammonia the solution can acquire different colours. Explain the reasons for this type of colour change

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31. Propanal and pentan-3-one are the ozonolysis products of an alkene?

What is the structural formula of the alkene?

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32. How would you convert the following compounds into benzene?

(i) Ethyne

(ii) Ethene

(iii) Hexane

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33. How would you convert the following compounds into benzene?

(i) Ethyne

(ii) Ethene

(iii) Hexane

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34. Write the resonance structures of CO_3^{2-} and HCO_3^-.

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35. Write the resonance structures of CO_3^{2-} and HCO_3^-.

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36. The energy of $\sigma 2p_z$, molecular orbital is greater than $\pi 2p_x$ and $\pi 2p_y$ molecular orbitals in nitrogen molecule. Write the complete sequence of energy levels in the increasing order of energy in the molecule. Compare the relative stability and the magnetic behaviour of the following species. $N_2, N_2^+, N_2^-, N_2^{2+}$

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37. The energy of $\sigma 2p_z$, molecular orbital is greater than $\pi 2p_x$ and $\pi 2p_y$ molecular orbitals in nitrogen molecule. Write the complete sequence of energy levels in the increasing order of energy in the molecule. Compare the relative stability and the magnetic behaviour of the following species.

$N_2, N_2^+, N_2^-, N_2^{2+}$

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38. Write the molecular orbital configuration of the following species :

$(a) N_2 \quad (b) N_2^+ \quad (c) N_2^- \quad (d) N_2^{2-}$

(i) Calculate their bond orders.

(ii) Predict their magnetic behaviour.

(iii) Which of these does show highest paramagnetism?

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39. Predict their magntic behaviour of N2

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40. van der Waal's equation of state of a gas takes into account

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41. Ethane burns in oxygen by the following equation:

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

2.5L of ethane are burnt in excess of oxygen at $27^\circ C$ and 1 atm pressure.

Calculate how many litres of CO_2 are formed.

at $27^\circ C$ and 1.0 atm?

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42. Ethane burns in oxygen by the following equation:

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

2.5L of ethane are burnt in excess of oxygen at $27^\circ C$ and 1 atm pressure.

Calculate how many litres of CO_2 are formed.

at $50^\circ C$ and 1.5 atm?

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43. Why are the second and third ionisation energies of group 13 elements much higher as compared to their first ionisation energies?

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44. The molar heats of combustion of $C_2H_2(g)$, C (graphite), and H_2 are -310.62kcal, -94.05 kcal and -68.32 kcal respectively. Calculate the standard heat of formation of $C_2H_2(g)$.

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45. For an isolated system, $\Delta U = 0$, what will be ΔS?

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46. Define 'entropy of fusion' and 'entropy of vapourisation and write expressions to represent them.

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47. Sort out non-biodegradable and biodegradable pollutants among the following : Mercury salts, sewage, plant leaves, BHC, cadmium salts.

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48. What do you understand by London smog and how is it formed?

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49. What is tautomerism ? Give two examples.

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50. Write the keto and enolic forms of acetone.

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51. Draw the Lewis structures of the following species :

H_2S

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52. Draw the Lewis structures for the following molecules and ion:

CO_3^{2-} ion

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53. Draw the Lewis structures for the following molecules and ion:

HCOOH

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54. Calculate the oxidation number of the underlined element in the following ions.

$\underline{N}H_4^+$

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55. Calculate the oxidation number of the underlined element in the following ions.

$\underline{P}O_4^{3-}$

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56. Calculate the oxidation number of the underlined element in the following ions.

$\underline{S}_2O_3^{2-}$

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57. Calculate the oxidation number of the underlined element in the following ions.

$\underline{Cr_2}O_7^{2-}$

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58. Justify giving reactions that among halogens, fluorine is the best oxidant and among hydrohalic compounds, hydroiodic acid is the best reductant.

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59. Refer to the periodic table given in your book and now answer the following questions:

(a) Select the possible non metals that can show disproportionation reaction.

(b) Select three metals that can show disproportionation reaction.

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Watch Video Solution

60. Refer to the periodic table given in your book and now answer the following questions:

(a) Select the possible non metals that can show disproportionation reaction.

(b) Select three metals that can show disproportionation reaction.

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61. In Ostwald's process for the manufacture of nitric acid, the first step involves the oxidation of ammonia gas by oxygen gas to give nitric oxide gas and steam. What is the maximum weight of nitric oxide that can be obtained starting only with 10.00 g. of ammonia and 20.00 g of oxygen ?

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62. What is Wurtz reaction ? Explain with examples. What are its limitations?

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63. What happens when acetylene is treated with ozone

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64. What happens when iodoform is heated with silver powder

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65. The alkyl halide C_4H_9Br(A) reacts with alcoholic KOH and gives an alkene (B) which reacts with bromine to give a dibromide (C). (C) is transformed with sodamide into a gas (D) which forms a precipitate when passed through ammoniacal silver nitrate solution. Give the structural

formulae of the compounds (A), (B), (C) and (D) and explain the reactions involved.

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66. One mole of nitrogen is mixed with three moles of hydrogen in a 4 litre container. If 0.25 per cent of nitrogen is converted into ammonia by the following reaction

$N_2(g) + 3H_2 \Leftrightarrow 2NH_3(g)$

calculate the equilibrium constant of the reaction in concentration units. What will be the value of K for the following reaction?

$\frac{1}{2}N_2(g) + \frac{3}{2}H_2 \Leftrightarrow NH_3(g)$

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67. The solubility product of $PbCl_2$ at 298K is 1.7×10^{-5}. Calculate the solubility of $PbCl_2$ in gL^{-1} at 298K

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68. The species: H_2O, HCO_3^-, HSO_4^- and NH_3 can act both as Br$\ddot{o}$nsted acids and bases. For each case give the corresponding conjugate acid and base.

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69. At 298 K, the pH of a solution of lemon juice is 2.32 . What are the conc. Of $\left[H_3O^+\right]$ and $\left[OH^-\right]$ in this solutions?

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Fill In The Blanks

1. .....and..... are temperature independent mode of concentration representation.

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2. Trichloroacetic acid is..... acidic than acetic acid due to .....effect.

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3. Why is an aqueous solution of NH_4Cl acidic ?

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4. .....on hydrolysis gives ethyne while .....on hydrolysis gives methane.

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Multiple Choice Question

1. The electronic configuration of the outer most shell of the most electronegative elements is

A. ns^2np^3

B. ns^2np^4

C. ns^2np^5

D. ns^2np^6

Answer:

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2. Which of the following species is diamagnetic in nature?

A. He_2^-

B. H_2

C. He_2^+

D. H_2^-

Answer:

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3. The volume of .10 vol' H_2O, required to liberate 500 ml of O_2 at NTP is:

A. 50 ml

B. 25 ml

C. 100 ml

D. 125 ml

Answer:

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4. The compound which is not isomeric with diethyl ether is:

A. methyl n-propyl ether

B. 1-butanol

C. 2-methyl propan-2-ol

D. butanone

Answer:

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Match The Following

1. Match the following:

(i) Magnetic quantum number -(a) Optical isomerism

(ii) Boron halides -(b) Sodium carbonate

(iii) Lactic acid -(c) Orientation of the orbital

(iv) Solvay.s process -(d) Lewis acid.

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Answer The Following Questions

1. For a molecule, $N_b = N_a$, will the molecule be stable?

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2. (1) Which alkyne on reductive ozonolysis will produce glyoxal only?

(2) Which gas is produced on dehydrohalogenation of ethyl iodide?

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3. At absolute zero, the entropy of a pure crystal is zero. This is

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4. Give reason:

Alkali metals are good reducing agents

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5. In the Carius method of estimation of halogens, 0.250 g of an organic compound gives 0.141 g of AgBr

Calculate the percentage of bromine in the compound. (At. wt. of Ag= 108, Br= 80).

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6. In a Carius determination, 0.234 g of an organic substance gave 0.334 g of barium sulphate. Calculate the percentage of sulphur in the given compound

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7. Complete and balance the following equations:

(i) $FeSO_4 + H_2O_2 + H_2SO_4 \rightarrow \ldots\ldots\ldots + \ldots\ldots\ldots\ldots\ldots$

(ii) $H_2O_2 + Ag_2O \rightarrow \ldots\ldots\ldots + \ldots\ldots\ldots\ldots\ldots$

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8. A dry gas measuring 280 ml at 305 K and 750 mm of Hg, weighs 0.344 g. Calculate the molecular weight of the gas.

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9. Write the structural formula of the compounds having the following IUPAC names.

(i) 5-methyl hept-3-enal

(ii) 3-hydroxy-6, 6-dimethyl hept-4-ene-1-oic acid.

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10. The first ionisation enthalpy of nitrogen (Z=7) is greater than that of oxygen (Z =8) but the reverse is true for the second ionisation enthalpy. Explain why.

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11. An unsaturated hydrocarbon 'A' adds two molecules of H_2 and on reductive ozonolysis gives butane-1, 4-dial, ethanal and propanone. Give the structure of 'A' , write its IUPAC name and explain the reactions involved.

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12. How will you convert the following:

(i) Ethyl alcohol to ethene

(ii) Propene to 2-bromopropane.

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13. (a) An atomic orbital has n = 3. What are the possible values of l?

(b) What is the maximum number of electrons that can be accommodated in a shell with principal quantum number n ?

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14. (i) Which one of the following is more paramagnetic Fe^{2+} or Fe^{3+}? Explain.

(ii) What is the number of unpaired electrons in Mn^{2+} ion? (At.no. Mn= 25).

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15. Hydrogen combines with oxygen and forms two compounds. In the first compound, hydrogen content is 5.93% while in the other compound it is 11.2%. Verify whether the data agrees with law of multiple proportions.

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16. 750 ml of N_2 gas when taken in a vessel has pressure equal to 900 mm of Hg 1200 ml of O_2 gas when taken in another vessel has pressure equal to 1450 mm of Hg. If both the gases are taken in 1000 ml vessel, what will

be the total pressure exerted by the mixture of above gases? Assume that the gases are non-reacting.

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17. How dould you account for the following :

The stability of +5 oxidation state decreases down the group 15 of the periodic table.

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18. Calculate the standard heat of formation $\left(\triangle H_f^{\circ} \right)$ of $C_6H_{12}O_6(s)$ from the following data:

(i) $\triangle H_c$ of $C_6H_{12}O_6(s) = -2816 \text{kJ mole}^{-1}$

(ii) $\triangle H_f^{\circ}$ of $CO_2(g) = -395.5 \text{kJ mole}^{-1}$

(iii) $\triangle H_f^{\circ}$ of $H_2O(l) = -285.9 \text{kJ mole}^{-1}$

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19. Which of the following possesses higher entropy:

(1) Gaseous substance

(2) Liquid substance

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20. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was

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21. Discuss the optical isomerism of lactic acid.

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22. Write the molecular orbital configuration of N_2. Calculate the bond order and predict its magnetic behaviour.

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23. (ii) Find the oxidation number of:

(1) S in $Na_2S_4O_6$

(2) Cr in K_2CrO_7

(3) Mn in K_2MnO_4

(4) Fe in Fe_3O_4

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24. Give reasons for the following: (1) HNO_3 acts only as an oxidising agent while HNO_2 can act both as a reducing agent and an oxidising agent

(2) Chlorine liberates iodine from Kl solution.

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25. How will you convert the following?

(1) Sodium acetate to methane

(2) Benzene to toluene

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26. (i) Identify the compounds A and B.

(1) $C_6H_5COONa + NaOH \xrightarrow{CaO} A \xrightarrow[\text{Conc.}H_2SO_4]{\text{Conc.}HNO_3} B$

(2) $C_2H_6 \xrightarrow[h\nu]{Br_2} A \xrightarrow[\text{heat}]{\text{Alc koH}} B$

(ii) State an appropriate chemical test used to distinguish between the following pairs of compounds:

(1) Ethene and Ethyne

(2) But-1-ene and but-2-ene.

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27. 15 moles of N_2 is mixed with 20 moles of H_2 in an 8 litre vessel. 5.6 moles of ammonia is formed Calculate Kc for the equation,

$N_2(g) + 3H_2(g) = 2NH_3(g) + \text{heat}$

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28. On the basis of Le- Chatellier's principle ,discuss the condition for obtaining the maximum yield of SO_3 in the following reactions :

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g), \Delta H = -42$ k cal

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Answear The Following

1. (1) Predict the sign of ΔG for a reaction that is exothermic and accompanied by an increase in entropy.

(2) What does $\Delta H = q_p$ refers to ?

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2. (1) What type of hybridization is involved in the formation of each of the C - C single bond, double bond and triple bond?

(2) Name the alkanes with octane numbers 0 and 100.

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3. (1) Why is sodium kept under kerosene oil?

(2) Among groups 1 and 2, the elements of which group have higher ionization enthalpies?

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Questions Answers

1. 750 ml of nitrogen are collected over water at $25^{\circ}C$ and 740 mm pressure. If the aqueous tension at this temperature is 23.8 mm Hg calculate the mass of the dry gas.

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2. Why is Lif almost insoluble in water whereas LiCl soluble not only in water but also in acetone.

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3. Among the following sets of quantum numbers, state which are possible. Explain why the others are not permitted?

(i) n = 1, l = 0, m = -1, s = + 1/2

(ii) n = 1, l = 0, m = 0, s = - 1/2

(iii) n = 2, l = 3, m = 0, s = + 1/2

(iv) n = 3, l = 1, m = 1, s = - 1/2

(v) n = 0, l = 0, m = 0, s = + 1/2

(vi) n = 2, l = 0, m = 0, s = - 1/2

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4. A gas cylinder containing cooking gas can withstand a pressure of 14.9 atm. The pressure gauge of the cylinder indicates 12 atm at $27^{\circ} C$. Due to sudden fire in the building its temperature starts rising. At what temperature cylinder will explode?

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5. A syringe has a volume of 10.0 cm^3 at pressure 1 atm. If you plug the end so that no gas can escape and push the plunger down, what must be the final volume to change the pressure to 3.5 atm?

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6. In a chemical reaction 150 g of baking soda mixture containing sodium bicarbonate and vinegar on heating gives 87g of carbon dioxide gas. What mass of solid residue will be left in food?

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7. Calculate the standard heat of formation of $C_2H_2OH(1)$ from the following data:

$C_2H_5OH(1) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(1)$

(i) $\Delta H^\circ = -1366.5 \quad kj \quad mol^{-1}$

(ii)$\Delta_f H^\circ[CO_2(g)] = -393.5 \quad kj \quad mol^{-1}$

(iii) $\Delta H^\circ[H_2O(l)] = -285.5 \quad kj \quad mol^{-1}$

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8. (1) What are diastereomers ? Mention their important properties.

(ii) Why is dichloroacetic acid stronger than monochloroacetic acid?

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9. (i)1 mole of H_2O and 1 mole of CO are taken in a 10 litre vessel and heated to 725K. At equilibrium, 40 percent of water (by mass) reacts with carbon monoxide, according to the equation.

$H_2O(g) + CO(g) \Leftrightarrow H_2(g) + CO_2(g)$

Calculate the equilibrium constant for the reaction

(ii) The solubility of CaF_2, in water at 298K is 1.7×10^{-3} grams per 100 cm^3. Calculate the solubility product of CaF_2, at 295K.

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10. (i) Dihydrogen gas is obtained from natural gas by partial oxidation with steam as per following endothermic reaction

$CH_4(g) + H_2O(g) \Leftrightarrow CO(g) + 3H_2(g)$

(1) Write an expression for K_p for the above reaction.

(2) How will the values of K_p, and composition of equilibrium mixture be affected by:

(I) Increasing the pressure

(II) Increasing the temperature

(III) Using a catalyst?

(ii) A solution of NaOH is prepared by dissolving 15 g of the base in 500 ml of water Calculate the pH of the solution.

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