FUNDAMENTAL CONCEPTS

2011
Q.1 In mass spectrometer, detector or collector measures the:
A) Masses of isotopes  C) Relative abundances of isotopes
B) Percentages of isotopes D) Mass numbers of isotopes

Q.2 How many 'Cl' (chlorine) atoms are in two moles of chlorine?
A) 2 × 6.02 × 10^-23 atoms  C) 2 × 10^23 atoms
B) 35.5 × 6.02 × 10^23 atoms D) 2 × 6.02 × 10^23 atoms

2012
Q.3 An organic compound has empirical formula C_3H_3O, if molar mass of compound is 110.15 g mol^-1. The molecular formula of this organic compound is (A, of C=12, H=1.008 and O=16)
A) C_6H_6O  C) C_3H_3O  C) C_9H_9O  D) C_6H_6O

Q.4 When 8 grams (4 moles) of H_2 react with 2 moles of O_2, how many moles of water will be formed?
A) Five  B) Four  C) Six  D) Three

2013
Q.5 Hydrogen burns in chlorine to produce hydrogen chloride. The ratio of masses of reactants in chemical reaction is: H_2 + Cl_2-------- 2HCl
A) 1:35.5  B) 2:35.5  C) 1:71  D) 2:70

Q.6 A sample of Neon is found to exist as ^{20}Ne, ^{21}Ne, ^{22}Ne. Mass spectrum of 'Ne' is as follow: What is the relative atomic mass (A, value) of Neon?
A) 20.18  C) 20.10
B) 20.28  D) 20.22

2014
Q.7 A polymer of empirical formula CH_2 has molar mass of 28000 g mol^-1. Its molecular formula will be
A) 100 times that of its empirical formula  C) 500 times that of its empirical formula
B) 200 times that of its empirical formula  D) 2000 times that of its empirical formula

Q.8 The number of molecules in 9 g of ice (H_2O) is
A) 6.02 x 10^24  C) 3.01 x 10^24
B) 6.02 x 10^23  D) 3.01 x 10^23

2015
Q.9 How many moles of sodium are present in 0.1 g of sodium?
A) 4.3 × 10^-3  B) 4.03 × 10^-1  C) 4.01 × 10^-2  D) 4.3 × 10^-2

Q.10 With the help of spectral data given calculate the mass of Neon and encircle the best option. (Percentage of ^{10}Ne_20, ^{10}Ne_21 and ^{10}Ne_22 are 90.92%, 0.26% and 8.82% respectively).
A) 22.18 amu  B) 21.18 amu  C) 20.18 amu  D) 22.20 amu

2016
Q.11 The substance for the separation of isotopes is firstly converted into the:
A) Neutral state  B) Free state  C) Vapour state  D) Charged state

Q.12 The number of moles of CO_2 which contain 8.00 gm of oxygen is:
A) 0.75  B) 1.50  C) 0.25  D) 1.00

ANSWERS
Q.1 C  Q.2 D  Q.3 A  Q.4 B  Q.5 A  Q.6 B  Q.7 D  Q.8 D  Q.9 A  Q.10 C  Q.11 C  Q.12 C
STATES OF MATTER

2011
Q.1 Melting point of water is higher than petrol, because intermolecular forces in water are:
A) Weaker than petrol  
B) Stronger than petrol  
C) Same as in petrol  
D) Negligible

Q.2 DNA molecule is double stranded, in which two chains of DNA are twisted around each other by:
A) Hydrogen bonds  
B) Vander Waal's force  
C) Covalent bonds  
D) Dative bonds

2012
Q.3 The number of molecules in 22.4 dm$^3$ of H$_2$ gas at 0 °C and 1 atm are
A) 60.2 x 10$^{23}$  
B) 6.02 x 10$^{22}$  
C) 6.02 x 10$^{25}$  
D) 6.02 x 10$^{22}$

Q.4 Correct order of boiling points of the given liquid is
A) H$_2$O > HF > HCl > NH$_3$  
B) H$_2$O > HCl > NH$_3$ > HF  
C) H$_2$O > HF > NH$_3$ > HCl  
D) HF > H$_2$O > NH$_3$ > HCl

2013
Q.5 The coordination number of Na$^+$ in NaCl crystal is:
A) 6  
B) 2  
C) 4  
D) 8

Q.6 There are four gases H$_2$, He, N$_2$ and CO$_2$ at 0 °C. Which gas shows greater non-ideal behavior?
A) He  
B) CO$_2$  
C) H$_2$  
D) N$_2$

2014
Q.7 Ice is less dense than water at:
A) 0 oC  
B) 4 oC  
C) -4 oC  
D) 2 oC

Q.8 At a given temperature and pressure, the one which shows marked deviation from ideal behavior is
A) N$_2$  
B) N$_3$  
C) CO$_2$  
D) He

2015
Q.9 If the volume of a gas collected at a temperature of 600 oC and pressure of 1.05 x 10$^5$ Nm$^{-2}$ is 60 dm$^3$, what would be the volume of gas at STP (P=1.01 x 10$^3$ Nm$^{-2}$, T = 273 K)?
A) 25 cm$^3$  
B) 75 cm$^3$  
C) 100 cm$^3$  
D) 51 cm$^3$

Q.10 Which graph represents Boyle's law?
A)  
B)  
C)  
D)

2016
Q.11 London dispersion forces are the only forces present among the:
A) Molecules of H$_2$O in liquid state  
B) Molecules of HCl gas  
C) Atoms of helium in gaseous state at high temperature  
D) Molecules of solid chlorine

Q.12 Electrical conductivity of graphite is greater in one direction that in other due to:
A) Isomorphism  
B) Cleavage plane  
C) Anisotropy  
D) Symmetry

ANSWERS
Q.1 B  Q.2 A  Q.3 D  Q.4 C  Q.5 A  Q.6 B  Q.7 A  Q.8 C  Q.9 D  Q.10 B  Q.11 C  Q.12 C
A TOMIC STRUCTURE

2011

Q.1 The elements for which the value of ionization energy is low, can:
A) Gain electrons readily  C) Loss electrons less readily
B) Gains electron with difficulty  D) Lose electrons readily

Q.2 The nature of cathode rays in discharge tube:
A) Depends on the nature of gas taken in the discharge tube
B) Depends upon the nature of cathode in discharge tube
C) Is independent of the nature pf the gas in discharge tube
D) Depends upon the nature of anode in the discharge tube

2012

Q.3 The relative energies of 4s, 4p and 3d orbitals are in the order
A) 3d < 4p < 4s  C) 4p < 4s < 3d
B) 4s < 3d < 4p  D) 4p < 3d < 4s

Q.4 With increase in the value of Principal Quantum Number ‘n’, the shape of the s-orbitals remains
the same although their sizes
A) Decrease  C) Remain the same
B) Increase  D) May or may not remain the same

2013

Q.5 Correct order of energy in the given subshells is:
A) 5s > 3d > 3p > 4s  C) 3p > 3d > 5s > 4s
B) 5s > 3d > 4s > 3p  D) 3p > 3d > 4s > 5s

Q.6 Number of electrons in the outermost shell of chloride ion (Cl\(^-\)) is:
A) 17  B) 3  C) 1  D) 8

2014

Q.7 According to the number of protons, neutrons and electrons given in the table, which one of the
following options is correct?

<table>
<thead>
<tr>
<th>Species</th>
<th>Proton</th>
<th>Neutron</th>
<th>Electron</th>
</tr>
</thead>
<tbody>
<tr>
<td>As</td>
<td>33</td>
<td>42</td>
<td>30</td>
</tr>
<tr>
<td>Ga</td>
<td>31</td>
<td>39</td>
<td>28</td>
</tr>
<tr>
<td>Ca</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

A) As\(^{+3}\), Ga\(^{+3}\), Ca
B) As\(^{+1}\), Ga, Ca\(^{+2}\)
C) As\(^{+3}\), Ga\(^{+3}\), Ca\(^{+2}\)
D) As\(^{+1}\), Ga\(^{+2}\), Ca

Q.8 If the e/m value of electron is 1.7588 x 10\(^{11}\) coulombs Kg\(^{-1}\), then what would be the mass of
electron in grams (charge on electron is 1.6022 x 10\(^{-19}\) coulombs)?
A) 9.1095 x 10\(^{-31}\) g  C) 9.1095 x 10\(^{-28}\) g
B) 91.095 x 10\(^{-31}\) g  D) 0.919095 x 10\(^{-33}\) g

2015

Q.9 Which one of the following pairs has the same electronic configuration as possessed by Neon
(\text{Ne}^{10})?
A) Na\(^{+}\), Cl\(^-\)  B) K\(^+\), Cl\(^-\)  C) Na\(^{+}\), Mg\(^{2+}\)  D) Na\(^{+}\), F\(^-\)

Q.10 There are four orbitals s, p, d and f. Which order is correct with respect to the increasing energy
of the orbitals?
A) 4s < 4p < 4d < 4f  C) 4s < 4f < 4p < 4d
B) 4p < 4s < 4f < 4d  D) 4f < 4s < 4d < 4p

2016

Q.11 Number of neutrons in 30 Zn 66 will be:
A) 30  B) 35  C) 38  D) 36

Q.12 The maximum number of electrons in electronic configuration can be calculated by using
formula:
A) 2l + 1  C) 2n\(_2\)
B) 2n\(_2\) + 2  D) 2n\(_2\) + 1
ANSWERS
Q.1 D Q.2 C Q.3 B Q.4 B Q.5 B Q.6 D Q.7 A Q.8 A Q.9 D Q.10 A Q.11 C Q.12 A

CHEMICAL BONDING

2011
Q.1 The ability of an atom in a covalent bond to attract the bonding electrons is called:
A) Ionization energy  C) Electronegativity
B) Ionic bond energy  D) Electron affinity
Q.2 The paramagnetic character of a substance is due to:
A) Bond pairs of electrons  C) Unpaired electrons in atom or molecule
B) Lone pairs of electrons  D) Paired electrons in valence shells of electrons

2012
Q.3 The angle between unhybridized p-orbital and three sp2 hybrid orbitals of each carbon atom in ether is:
A) 120°  B) 90°  C) 109.5°  D) 180°
Q.4 In 'H-F' bond electronegativity difference is '1.9'. What is the type of this bond?
A) Polar covalent bond  C) Pi (π) bond
B) Non-polar covalent bond  D) Co-ordinate covalent bond

2013
Q.5 According to valence shell electron pair repulsion theory, the repulsive forces between the electron pair of central atom of molecule are in the order:
A) Lone Pair - Lone-Pair > Lone Pair - Bond Pair > Bond Pair - Bond Pair
B) Lone Pair - Bond Pair > Lone Pair - Lone Pair > Bond Pair - Bond Pair
C) Bond Pair - Bond Pair > Lone Pair - Lone Pair > Lone Pair - Bond Pair
D) One Pair - Bond Pair > Bond Pair - Bond Pair > Lone Pair - Lone Pair
Q.6 In crystal lattice of ice, each O-atom of water molecule is attached to:
A) Four H-atoms  C) One H-atom
B) Three H-atoms  D) Two H-atoms

2014
Q.7 The suitable representation of dot structure of chlorine molecule is:
A)  
B)  
C)  
D)  
Q.8 When the two partially filled atomic orbitals overlap in such a way that the probability of finding electron is maximum around the line joining the two nuclei, the result is the formation of
A) Sigma Bond  B) Pi-Bond  C) Hydrogen Bond  D) Metallic Bond

2015
Q.9 Which one of the following hydrogen bonds is stronger than others?
A) N\textsubscript{3}⁻—H\textsubscript{3}⁺  C) O\textsubscript{3}⁻—H\textsubscript{3}⁺
B) F\textsubscript{3}⁻—H\textsubscript{3}⁺  D) N\textsubscript{3}⁻—H\textsubscript{3}⁺
Q.10 Which of the following is the correct dot and cross diagram of bonding between two chlorine atoms?
A)  
B)  
C)  
D)  

2016
Q.11 Choose the right molecule.
A) CH\textsubscript{3}  C) H\textsubscript{2}O
B) CO  D) NH\textsubscript{3}
Q.12 Calculate the number of σ bonds and π bonds in the molecule.
A) 1σ and 5π bonds  C) 3π and 3σ bonds
B) 2σ and 4π bonds  D) 6σ and 6π bonds
ANSWERS
Q.1 C Q.2 C Q.3 B Q.4 A Q.5 A Q.6 A Q.7 B Q.8 A Q.9 B Q.10 C Q.11 D Q.12 A

CHEMICAL ENERGETICS

2011
Q.1 Lattice energy of an ionic crystal is the enthalpy of:
A) Combustion B) Dissociation C) Dissolution D) Formation
Q.2 In standard enthalpy of atomization, heat of the surrounding:
A) Remains unchanged B) Increases C) Increases than decreases D) Decreases

2012
Q.3 'ΔH' will be given a negative sign in
A) Exothermic reactions B) Decomposition reactions
C) Dissociation reaction D) Endothermic reactions
Q.4 Lattice energy of an ionic crystal is the enthalpy of:
A) Combustion B) Dissociation C) Dissolution D) Formation

2013
Q.5 Heat of formation (ΔH⁰) for CO₂ is:
A) -394 kJ/mole B) +394 kJ/mole
C) -294 kJ/mole D) -390 kJ/mole
Q.6 Reactants have high energy than products in:
A) Exothermic reactions B) Endothermic reactions
C) Photochemical reactions D) Non-spontaneous reactions

2014
Q.7 2H₂ + O₂ 2H₂O ΔH = +285.5 kJ mol⁻¹
What will be the enthalpy change in the above reaction?
A) 205.5 kJ/mol B) Zero kJ/mol
C) -205.5 kJ/mol D) 1 kJ/mol
Q.8 Combustion of graphite to form CO₂ can be done by two ways. Reactions are given as follows:
C + O₂ -------- CO₂ ΔH = -393.7 kJ mol⁻¹
C + ½O₂ -------- CO ΔH = ?
CO + ½O₂ -------- CO₂ ΔH = -283 kJ mol⁻¹
What will be enthalpy of formation of CO?
A) -676 kJ mol⁻¹ B) -110 kJ mol⁻¹
C) 110 kJ mol⁻¹ D) 676 kJ mol⁻¹

2015
Q.9 The equation that represents standard enthalpy of atomization of hydrogen is:

Q.10 Standard enthalpy of combustion of graphite at 25 °C is -393.51 kJ mol⁻¹ and that of diamond is -395.41 kJ mol⁻¹. The enthalpy change for graphite is:
A) −1.91 B) +2.1
C) −2.1 D) +1.91

2016
Q.11 ½ H₂(g) H(g) ΔH = 218 kJmol⁻¹
In this reaction, ΔH will be called:
A) Enthalpy of atomization B) Enthalpy of decomposition
C) Enthalpy of formation D) Enthalpy of the dissociation

Q.12 Mg + 1/2O₂(g) MgO(s) + -692 kJmol⁻¹ at STP. Enthalpy of the above reaction will be called:
A) ΔH² at B) ΔH°s
C) ΔH°sol D) ΔH°li
SOLUTIONS

2011

Q.1 Mole fraction of any compound us the ratio of moles of all components in a:
A) Compound B) Solution C) Molecule D) Solid
Q.2 Molarity is defined as the number of moles of any substance dissolved:
A) Per dm³ of water B) In one gram of water C) Per m³ of water D) In 100 ml of water

2012

Q.3 As number of solute particles increases, freezing point of the solution:
A) Remains the same B) Increases C) First increases, then decreases D) Decreases
Q.4 Boiling point constants help us to determine
A) Molar masses B) Volumes C) Pressures D) Masses

2013

Q.5 If 18.0 g of glucose is dissolved in 1 kg of water, boiling point of this solution should be:
A) 100.52 °C B) 100.00 °C C) 100.052 °C D) Less than 100 °C
Q.6 Molal freezing point constant of water is:
A) 1.86 B) 2.86 C) 11.86 D) 0.52

2014

Q.7 The vapor pressure lines for pure as well as solutions of different concentrations are shown.
Which line represents pure water?

A) (i) B) (ii) C) (iii) D) (iv)

Q.9 10.0 grams of glucose are dissolved in water to make 100 cm³ of its solution, its molarity is:
A) 0.55 B) 0.1 C) 10 D) 1
Q.10 Given solution contains 16.0 g of CH₃OH, 92.0 g of C₂H₅OH and 36 g of water. Which statement about mole fraction of the components is true?
A) Mole fraction of CH₃OH is highest among all B) Mole fraction of CH₃OH and C₂H₅OH is same components
C) Mole fraction of C₂H₅OH and H₂O is the same D) Mole fraction of H₂O is the lowest among all

2016

Q.11 Freezing point will also be defined as that temperature at which its solid and liquid phases have the same:
A) Concentration B) Ratio between the particles C) Vapour pressure D) Attraction between the phases

Q.12 What mass of NaOH is present in 0.5 mol of sodium hydroxide?
A) 40 gm B) 2.5 gm C) 15 gm D) 20 gm

ANSWERS

Q.1 D Q.2 D Q.3 A Q.4 D Q.5 A Q.6 A Q.7 C Q.8 B Q.9 C Q.10 D Q.11 A Q.12 D
ELECTROCHEMISTRY

2011

Q.1 In electrolytic cell, a salt bridge is used in order to:
A) Pass the electric current
B) Prevent the flow of ions
C) Mix solution of two half cells
D) Allow movement of ions b/w two half cells

Q.2 In all oxidation reactions, atoms of an element in a chemical species lose electrons and increase their:
A) Oxidation states
B) Reductions
C) Electrode
D) Negative charges

2012

Q.3 In electrolysis of aqueous CuCl₂, the metal deposited at cathode is
A) Sodium
B) Aluminium
C) Lead
D) Copper

Q.4 In MgCl₂, the oxidation state of ‘Cl’ is
A) Zero
B) +2
C) -2
D) -1

2013

Q.5 In the figure given below, the electron flow in external circuit is from:
A) Copper to zinc electrode
B) Right to left
C) Porous partition to zinc electrode
D) Zinc to copper electrode

2014

Q.6 Which one of the following is a redox reaction?
A) NaCl + AgNO₃ ————NaNO₃ + AgCl₂
B) 2Cl⁻ ————Cl₂ + 2e⁻
C) 2Na + Cl₂ ————2NaCl
D) Na⁺ + 1e⁻ ————Na

Q.7 In SO₄²⁻ the oxidation number of Sulphur is
A) -8
B) +8
C) -6
D) +6

Q.8 Coinage metals Cu, Ag, and Au are the least reactive because they have:
A) Negative reduction potential
B) Positive reduction potential
C) Negative oxidation potential
D) Positive oxidation potential

2015

Q.9 Study the following facts
Zn ———— Zn²⁺ + 2e⁻ E₀ = +0.76 V
Cu ———— Cu²⁺ + 2e⁻ E₀ = −0.34 V

A) Cu + Zn²⁺ ————Cu²⁺ + Zn
B) Cu²⁺ + Zn²⁺ ————Cu + Zn
C) Cu²⁺ + Zn ———— Cu + Zn²⁺
D) Cu²⁺ + Zn²⁺ ———— Cu + Zn²⁺

Q.10 Keeping in mind the electrode potential, which one of the following reactions is feasible?
A) Zn²⁺ + Cu Cu²⁺ + Zn
B) Zn + MgSO₄ ZnSO₄ + Mg
C) Fe + CuSO₄ FeSO₄ + Cu
D) Cd + MgSO₄ CdSO₄ + Mg

2016

Q.11 The diagram shows a galvanic cell. The current will flow from:
A) Hydrogen electrode to copper electrode
B) Copper electrode to hydrogen electrode
C) Hydrogen electrode to HCl solution
D) CuSO₄ solution to hydrogen electrode

Q.12 Study the following redox reaction:
10Cl⁻ + 16H⁺ + 2MnO₄⁻ ————5Cl₂ + 2Mn²⁺ + 8H₂O

A) Manganese is oxidized from +7 to +2
B) Chlorine ions are reduced from -1 to zero
C) Chlorine is reduced from zero to -1
D) Manganese is reduced from +7 to +2

ANSWERS
Q.1 D Q.2 A Q.3 D Q.4 D Q.5 D Q.6 C Q.7 D Q.8 B Q.9 C Q.10 C Q.11 A Q.12 D
CHEMICAL EQUILIBRIUM

2011

Q.1 In 'AgCl' solution. Some salt of NaCl is added, 'AgCl' will be precipitated due to:
A) Solubility  B) Electrolyte  C) Unsaturation effect  D) Common ion effect

Q.2 'Ka' for an acid is higher, the stronger is the acid; relate the strength an acid with 'pKa'
A) Higher pKa, weaker the acid  C) pKa has no relation with acid strength
B) Lower pKa, stronger the acid  D) Both A and B

2012

Q.3 Formation of NH₃ is reversible and exothermic process, what will happen on cooling?
A) More reactant will form  C) More H₂ will be formed
B) More N₂ will be formed  D) More product (NH₃) will be formed

Q.4 A buffer solution is that which resists/minimizes the change in
A) pOH  B) pH  C) pKa  D) pKb

2013

Q.5 The chemical substance, when dissolved in water, gives "H⁺" is called:
A) Acid  B) Base  C) Amphoteric  D) Neutral

Q.6 The 'pH' of our blood is:
A) 6.7 – 8  B) 7.9  C) 7.5  D) 7.35 – 7.4

Q.7 The value of equilibrium constant (Kₑ) for the reaction 2HF(s) ⇌ H₂(g) + F₂(g) is 10⁻¹³ at 2000 °C. Calculate the value of Kₚ for this reaction:
A) 2 x 10⁻¹³  B) 10⁻¹³  C) 186 x 10⁻¹³  D) 3.48 x 10⁻⁹

Q.8 What will be the pH of a solution of NaOH with a concentration of 10⁻³ M?
A) 3  B) 14  C) 11  D) 7

Q.11 Human blood maintains its pH between:
A) 6.50 - 7.00  B) 7.20 - 7.25  C) 7.50 - 7.55  D) 7.35 - 7.40

Q.12 Value of Kₛₚ for PbSO₄ system at 25 °C is equal to:
A) 1.6 x 10⁻⁵ mol dm⁻³  B) 1.6 x 10⁻⁶ mol dm⁻³  C) 1.6 x 10⁻⁸ mol dm⁻³  D) 1.6 x 10⁻⁷ mol dm⁻³

ANSWERS
Q.1 D  Q.2 D  Q.3 D  Q.4 B  Q.5 A  Q.6 D  Q.7 B  Q.8 C  Q.9 B  Q.10 B  Q.11 D  Q.12 C

REACTION KINETICS

2011

Q.1 It is experimentally found that a catalyst is used to:
A) Lower the activation energy  C) Lower the pH
B) Increase the activation energy  D) Decrease the temp of the reaction

Q.2 According to collision theory of bimolecular reaction sin gas phase, the minimum amount of energy required for an effective collision is known as:
A) Heat of reaction  C) Has no effect on the reaction
B) Rate of reaction  D) Energy of activation

2012

Q.3 In some reactions, a product formed acts as a catalyst. The phenomenon is called
A) Negative Catalysis  C) Heterogeneous catalysis
B) Activation of Catalyst  D) Autocatalysis

Q.4 The reaction rate in forward direction decreases with the passage of time because
A) Concentration of reactants decrease  C) The order of reaction changes
B) Concentration of product decreases  D) Temperature of the system changes
Q.5 By considering Arrhenius equation, the graph between

Q.6 In zero order reactions, the rate is independent of:
A) Concentration of the product
B) Concentration of the reactant
C) Temperature of the reaction
D) Surface area of the product

2014

Q.7 If the reactant or product of a chemical reaction can absorb ultraviolet, visible or infrared radiation, then the rate of a chemical reaction can best be measured by which one of the following methods?
A) Chemical method
B) Spectrometry
C) Graphical method
D) Differential method

Q.8 For the reaction \( 2\text{NO} + \text{O}_2 \rightleftharpoons 2\text{NO}_2 \), the rate equation for the forward reaction is
A) \( \text{Rate} = k [\text{NO}] [\text{O}_2] \)
B) \( \text{Rate} = k [\text{NO}_2][\text{O}] \)
C) \( \text{Rate} = k [\text{NO}_2]^2 \)
D) \( \text{Rate} = k [\text{NO}_2]^2 \)

2015

Q.9 The half-life of \( \text{N}_2\text{O}_5 \) at 0 °C is 24 minutes. How long will it take for a sample of \( \text{N}_2\text{O}_5 \) to decay to 25% of its original concentration?
A) 24 minutes
B) 72 minutes
C) 120 minutes
D) 48 minutes

Q.10 When the change in concentration is \( 6 \times 10^{-4} \text{ mol dm}^{-3} \) and time for that change is 10 seconds, the rate of reaction will be
A) \( 6 \times 10^{-3} \text{ mol dm}^{-3} \sec^{-1} \)
B) \( 6 \times 10^{-4} \text{ mol dm}^{-3} \sec^{-1} \)
C) \( 6 \times 10^{-2} \text{ mol dm}^{-3} \sec^{-1} \)
D) \( 6 \times 10^{-5} \text{ mol dm}^{-3} \sec^{-1} \)

2016

Q.11 \( 2\text{A} + \text{B} \rightarrow \text{Product} \) If the reactant ‘B’ is in excess, the order of reaction with respect to ‘A’ in given rate law, \( \text{Rate} = k[\text{A}]_2[\text{B}] \) is:
A) 2\text{nd} order reaction
B) 1\text{st} order reaction
C) Pseudo 1\text{st} order reaction
D) 3\text{rd} order reaction

Q.12 The rate constant ‘k’ is 0.693 min\(^{-1}\). The half-life for the 1\text{st} order reaction will be:
A) 1 min
B) 2 min
C) 0.693 min
D) 4 min

ANSWERS
Q.1 A Q.2 D Q.3 D Q.4 A Q.5 B Q.6 B Q.7 B Q.8 B Q.9 D Q.10 D Q.11 A Q.12 A

PERIODS

2011

Q.1 Carbon exists as allotropes, which are different crystalline or molecular forms of the same substance. Graphite and diamond are allotropes of carbon. Diamond is a non-conductor whereas graphite is a good conductor because:
A) Graphite has a layered structure
B) In graphite, all valence electrons are tetrahedrally bound
C) In graphite one of valence electron is free to move
D) Graphite is soft and greasy

Q.2 The diagram below is a plot of melting points of elements of second period against their atomic numbers. Lithium and fluorine are placed at the extreme ends of the plot, on the basis of melting points where will you place Carbon among the empty slots on the plot?
A) 1
B) 2
C) 4
D) 3

2012

Q.3 Which one remains same along a period?
A) Atomic radius  B) Melting point  C) Number of shells (orbits)  D) Electrical conductivity

Q.4 More the ionization energy of an element:
A) More the electronegativity  C) Less the metallic character
B) More the reducing power  D) Bigger the atomic radius

2013

Q.5 What is the trend of melting and boiling point of the elements of short periods as we move from left to right in a periodic table?
A) Melting and boiling points first decrease then increase  C) Melting and boiling points first increase then decrease
B) Melting and boiling points increase gradually  D) Melting and boiling points decrease gradually

Q.6 Along a period, atomic radius decreases. This gradual decrease in radius is due to:
A) Increase in number of electrons in valence shells  C) Decrease in number of shells
B) Increase in number of protons in the nucleus  D) Increase in number of shells

2014

Q.7 The trends, in melting points of the elements of 3rd period, are depicted in figure below.
The sharp decrease observed from 'Si' to 'P' is due to
A) Decrease in atomic radius from 'Si' to 'P'  C) Different universities of two elements
B) Change in bonding and structure of two elements  D) Increase in electron density from 'Si' to 'P'

Q.8 Arrange the following elements according to the trend of ionization energies. (C, N, Ne, B)
A) Ne < N < C < B  C) B < C < N < Na
B) B < N < C < Na  D) Ne < B < C < N

2015

Q.9 Which one of the following will have the smallest radius?
A) Al<sup>++</sup>  B) Si<sup>++</sup>  C) Mg<sup>++</sup>  D) Na<sup>++</sup>

Q.10 Keeping in view the size of atoms, which order is correct?
A) N > C  B) P > Si  C) Ar > Cl  D) Li > Be

2016

Q.11 Melting points of group II-A elements are higher than those of group I-A because:
A) Atoms of II-A elements have smaller size  C) Atoms of II-A elements provide two binding electrons
B) II-A elements are more reactive  D) I-A elements have smaller atomic radius

Q.12 The ionic radius of fluoride ion is:
A) 72 pm  B) 95 pm  C) 136 pm  D) 157 pm

ANSWERS
Q.1 C  Q.2 D  Q.3 C  Q.4 C  Q.5 C  Q.6 D  Q.7 B  Q.8 C  Q.9 B  Q.10 D  Q.11 C  Q.12 C

GROUPS

2011

Q.1 When elements of group II-A (alkaline earth metals) are exposed to air, they quickly become coated with a layer of oxide. What is the purpose of this oxide layer?
A) The oxide layer exposes the metal to Atmospheric attack  B) The oxide layer increases the reactivity of metal
C) The oxide layer protects the metal from further atmospheric attack  D) The oxide layer gives the metal a shiny silvery appearance

Q.2 In silicon dioxide each silicon atom is tetrahedrally bonded to four oxygen atoms and each oxygen atom is bonded to two silicon atoms. The ratio of silicon to oxygen atoms is:
A) 2:2  B) 1:2  C) 2:1  D) 1:4

2012

Q.3 Alkaline earth metal hydroxides decompose on heating. Which of the following reactions is a correct representation of this decomposition?
Q.4 Carbon has the unique ability to form long chains by bonding with other carbon atoms. This property of self-linking in carbon is known as:
A) Condensation  
B) Polymerization  
C) Cyclization  
D) Catenation

2013
Q.5 Alkaline earth metal oxides react with water to give hydroxides. The solubility of alkaline earth metal oxides in water increases as we move from top to bottom in a group. Which of the following alkaline earth metal oxides is least soluble in water?
A) MgO  
B) CaO  
C) BaO  
D) SrO

Q.6 The electronic structure of carbon monoxide is represented as:
A)  
B)  
C)  
D)

2014
Q.7 Radon is _______ emitter and being radioactive is used in ________ treatment in radiotherapy:
A) β, cancer  
B) α, cancer  
C) α, kidney stone  
D) β, kidney stone

Q.8 Which one of the following noble gases is used for providing an inert atmosphere for welding?
A) Helium  
B) Neon  
C) Argon  
D) Krypton

2016
Q.11 2NaOH(aq) + Cl₂(g)---------- NaCl + NaClO + H₂O proceed at:
A) 500 °C  
B) 200 °C  
C) -10 °C  
D) 15 °C

Q.12 Which halogen molecule ‘X₂’ has lowest dissociation energy?
A) Cl₂  
B) Br₂  
C) I₂  
D) F₂

ANSWERS
Q.6 Oxidation state of ‘Fe’ in K₃[Fe(CN)₆] is:
A) +2  B) +3  C) -6  D) -3

2014

Q.8 The percentage of carbon in different types of iron products is in the order of
A) Cast Iron > Wrought Iron > Steel  C) Cast Iron > Steel > Wrought Iron

2015

Q.9 \([\text{Ti(H}_2\text{O)}_6]^{+3}\) transmits
A) Yellow and Red light  C) Red and white light
B) Yellow and Blue light  D) Red and blue light

Q.10 Electronic configuration of Gold [Au79] is
A) \([\text{Xe}] \, 4f^{14}, \, 5d^9, \, 6s^2\)  C) \([\text{Xe}] \, 4f^{14}, \, 5d^{10}, \, 6s^2\)
B) \([\text{Xe}] \, 4f^{10}, \, 5d^{10}, \, 6s^2\)  D) \([\text{Xe}] \, 4f^{14}, \, 5d^{10}, \, 6s^2\)

2016

Q.11 The anomalous electronic configuration shown by chromium and copper among 3-d series of elements is due to:
A) Colour of ions of these metals  C) Stability associated with this configuration
B) Variable oxidation states of metals  D) Complex formation tendency of metals

Q.12 Which element of 3d series of periodic table shows the electronic configuration of 3d⁶, 4s²?
A) Copper  B) Cobalt  C) Zinc  D) Nickel

ANSWERS
Q.1 A  Q.2 A  Q.3 C  Q.4 D  Q.5 C  Q.6 A  Q.7 X  Q.8 C  Q.9 D  Q.10 A  Q.11 C  Q.12 D

ELEMENTS OF BIOLOGICAL IMPORTANCE

2011

Q.1 In contact process, the catalyst used for the conversion of Sulphur dioxide to Sulphur trioxide is
A) Magnesium oxide  B) Aluminum oxide  C) Silicon dioxide  D) Vanadium pentoxide

Q.2 The unpolluted natural rain water is slightly acidic due to the reaction of rain water with:
A) Sulphur dioxide  C) Carbon dioxide
B) Oxides of nitrogen  D) Hydrogen present in air

Q.3 In the Haber's process for the manufacturing of ammonia, nitrogen is taken from:
A) Proteins occurring in living bodies  B) Ammonium salts obtained industrially  C) Air
D) Mineral containing nitrates

Q.4 In comparison with oxygen gas, a strong triple bond is present between two nitrogen atoms in a molecule and therefore nitrogen gas is:
A) Highly reactive gas  B) Completely inert like noble gases  C) Very less reactive gas
D) Moderately reactive gas

2012

Q.5 The acid rain water has pH:
A) Below 5  B) 7  C) Between 5 and 7  D) Between 7 and 14

Q.6 In Contact Process for manufacturing sulphuric acid, Sulphur trioxide (SO₃) is not absorbed in water because
A) The reaction does not go to completion  C) The reaction is quite slow
B) The reaction is highly exothermic  D) SO₃ is insoluble in water

Q.7 In modern Haber Process Plants, the temperature maintained during the process is
A) 670 – 770 K (400 °C – 500 °)  C) 370 – 470 K (100 °C – 200 °C)
B) 270 – 370 K (0 °C – 100 °C)  D) 570 – 600 K (300 °C – 380 °C)
Q.8 In the Haber process for manufacturing of ammonia, Nitrogen is taken from
A) Proteins occurring in living bodies C) Air
B) Ammonium salts obtained industrially D) Minerals containing nitrates

2013

Q.9 The nature of an aqueous solution of ammonia (NH₃) is:
A) Amphoteric B) Neutral C) Acidic D) Basic

Q.10 Unpolluted rain water has a pH of:
A) 4.9 B) 5.6 C) 5.3 D) 7.0

Q.11 In comparison with oxygen gas, a strong triple bond is present between two nitrogen atoms in a molecule and therefore nitrogen gas is:
A) Highly reactive gas B) Completely inert like noble gases C) Moderately reactive gas D) Very less reactive gas

2014

Q.12 The catalyst used in the Haber’s process is:
A) Magnesium oxide B) Aluminium oxide C) Silicon oxide D) Iron crystals with metal oxide promoters

Q.13 Which one of the following is correct equation of 1st ionization of sulphuric acid?
A) H₂SO₄(aq) + H₂O(l) ----> 2H⁺ + SO₄²⁻ C) H₂SO₄(aq) + H₂O(l) ----> 2H⁺ + SO₄²⁻
B) H₂SO₄(aq) + H₂O(l) ----> H⁺(aq) + HSO₄⁻ D) H₂SO₄(aq) + H₂O(l) ----> H⁺(aq) + SO₄²⁻

Q.14 Which one of the following is the correct chemical reaction for Ammonia formation by Haber process?
A) N₂(g) + 3H₂(g) ----> 2NH₃(g) C) 2N₂(g) + 3H₂(g) ----> 2NH₃(g)
B) 2N₂(g) + 3H₂(g)⇌ 2NH₃(g) D) N₂(g) + 3H₂(g)⇌ 2NH₃(g)

Q.15 The pH of acid rain is
A) 7 B) Between 5 and 7 C) Below 5 D) Between 7 and 14

Q.16 Which one of the following products is obtained when sulphur trioxide is absorbed in concentrated sulphuric acid?
A) Oleum B) Aqua Regia C) Hydrogen sulphide D) Sulphate ion

2015

Q.17 About 80% of ammonia is used for the production of:
A) Explosives B) Fertilizers C) Nylon D) Polymers

Q.18 Urea is the most widely used nitrogen fertilizer in Pakistan. Its composition is:
A) NH₂CO B) N₂H₅CO₂ C) N₂H₄CO₂ D) N₂H₄CO

Q.19 During the manufacture of nitric acid, nitric oxide is oxidized to nitrogen dioxide. This reaction is given as:
2NO(g) + O₂(g) ⇌ 2NO₂(g) ΔH = −114 kJ/mol
According to Le Chatelier’s Principle
A) Reaction must not be temperature dependent C) Reaction must be carried out at low temperature
B) Reaction must be carried out at room temperature D) Reaction must be carried out at high temperature

Q.20 What is the percentage of nitrogen in NH₃NO₃?
A) 65% B) 35% C) 20% D) 58%

2016

Q.21 The percentage of nitrogen in ammonium nitrate is:
A) 46% B) 82% C) 33% D) 13%

Q.22 Which one of the following is anhydride of sulphuric acid?
A) Sulphur (II) oxide B) Sulphur (VI) oxide C) Iron pyrite D) Sulphur (VI) oxide

Q.23 During contact process of H₂SO₄ synthesis, the following reaction occurs:
2SO₂(g) + O₂(g) ⇌ 2SO₃(g) ΔH = −96 kJmol⁻¹
Which step is used to increase the yield of SO₃?
A) Temperature is raised to very high degree B) SO₃ formed is removed very quickly
C) Both temperature and pressure are kept very low D) An excess of air is used to drive the equilibrium to the right side

Q.24 Synthesis of ammonia by Haber’s process is a reversible reaction. What should be done to increase the yield of ammonia in the following reaction?
\[ \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) \quad \Delta H = -92 \text{ kJmol}^{-1} \]

A) Pressure should be decreased  
B) Ammonia should remain in reaction mixture  
C) Pressure should be increased  
D) Concentration of nitrogen should be decreased

**ANSWERS**


**FUNDAMENTAL PRINCIPLES**

**2011**

Q.1 The compound with an atom, which has unshared pair of electrons is called:

A) Nucleophile  
B) Electrophile  
C) Protophile  
D) None of the above

Q.2 1-chloropropane and 2-chloropropane are isomers of each other, the type of isomerism in these two is called:

A) Cis-trans isomerism  
B) Chain isomerism  
C) Position isomerism  
D) Functional group isomerism

**2012**

Q.3 Ethene on polymerization, gives the product polyethylene. This reaction may be called as

A) Addition  
B) Condensation  
C) Substitution  
D) Pyrolysis

Q.4 In the following, which one is free radical?

A) Cl  
B) Cl+  
C) Cl2  
D) Cl0

**2013**

Q.5 The cis-isomerism is shown by:

**2014**

Q.6 Select the nucleophile from the following examples:

A) NO2  
B) NH3  
C) NO2+  
D) N+H4

Q.7 Which one of the following compound is a ketone?

A) CH3 — O — CH2 — CH3  
B) CH3 — CO — CH2 — CH3  
C) CH3COCOOH  
D) CH3 — CH2CHO

Q.8 Which one of the following pair of compounds is cis and trans isomers of each other?

**2015**

Q.9 The structural formula of 2,3,4 trimethylpentane is:

**2016**

Q.10 Which one of the following is a powerful electrophile used to attack on the electrons of benzene ring?

A) FeCl2  
B) FeCl4—  
C) Cl+  
D) C2

Q.11 Skeletal formula of an organic compound is given below:

It is a hydrocarbon. IUPAC name of the compound is:

A) 3, 3-dimethyl-3-hexene  
B) 3, 4-dimethyl-3-hexene  
C) 3-hexene  
D) 2,3-dimethyl-1-hexene
Q.12 Which one of the following pairs can be cis-trans isomer to each other?
A) CHCl=CCl and CH₂=CH₂
B) CHCl=CH₂ and CH₂=CHCl
C) CH₃=CH-CH₃ and H₃C-CH=CH-CH₃
D) CH₃-CH₃ and CH₂=CH₂

ANSWERS
Q.1 A Q.2 C Q.3 A Q.4 D Q.5 C Q.6 B Q.7 B Q.8 A Q.9 A Q.10 C Q.11 B Q.12 C

HYDROCARBONS

2011
Q.1 Benzene in the presence of AlCl₃ produces acetophenone when reacts with:
A) Acetyl chloride B) Acetic acid C) Ethyl benzene D) Ethanoic acid
Q.2 The substitution of a '-H' by '-NO₂' group in benzene is called:
A) Nitration B) Ammonolysis C) Sulphonation D) Reduction of benzene

2012
Q.3 The introduction of group in benzene is called
A) Acylation C) Alkylation B) Carbonyl reduction D) Formylation
Q.4 In the reaction of ethane with bromine the intermediate formed is

2013
Q.5 The introduction of an alkyl group in benzene takes place in the presence of AlCl₃ and:
Q.6 What is the product formed when propene reacts with HBr?

2014
Q.7 Addition of unsymmetrical reagent to an unsymmetrical alkene is governed by:
A) Cannizzaro’s Reaction B) Kirchhoff Rule C) Aldol Condensation D) Markownikov’s Rule
Q.8 Ethylene glycols are used as
A) Anesthetic B) Knocking agent C) Freezing agent D) Anti-freezing agent

2015
Q.9 Order of reactivity of alkenes with hydrogen halide is:
A) HBr > HI > HCl C) HF > HI > HCl
B) HI > HBr > HF D) HI > HBr > HCl
Q.10 The given three hydrocarbons are Benzene , Naphthalene , Anthracene
A) Alicyclic hydrocarbons C) Acyclic Hydrocarbons
B) Aromatic hydrocarbons D) Heterocyclic hydrocarbons

2016
Q.11 Which one of the following reactions shows combustion of a saturated hydrocarbon?
Q.12 The average bond energy of C-Br is:
A) 228 kJmol⁻¹ B) 200 kJmol⁻¹ C) 250 kJmol⁻¹ D) 290 kJmol⁻¹
ANSWERS
Q.1 A Q.2 A Q.3 A Q.4 A Q.5 B Q.6 D Q.7 D Q.8 D Q.9 D Q.10 B Q.11 B Q.12 D

ALKYL HALIDES

2011
Q.1 When purely alcoholic solution of sodium/potassium hydroxide and halogenoalkanes are reacted an alkene is formed, what is the mechanism of reaction?
A) Elimination   B) Dehydration   C) Debromination   D) Reduction of benzene

Q.2 The organic compound carbon tetrachloride is used as:
A) Lubricant   B) Solvent   C) Oxidant   D) Plastic

2012
Q.3 The alkaline hydrolysis of bromoethane shown below gives alcohol as the product:
\[ \text{H}_2\text{C}—\text{CH}_2—\text{Br} \longrightarrow \text{H}_2\text{C}—\text{CH}_2—\text{OH} \]
The reagent and the condition used in this reaction may be:
A) H₂O at room temperature   C) KOH in alcohol   B) Ethanol, heat   D) Dilute NaOH\(_{(aq)}\) warm

Q.4 In substitution reactions, dihaloalkane or secondary halogenoalkane give / show:
A) S\(_{N1}\) Mechanism   C) Both E\(_1\) and E\(_2\)   B) S\(_{N2}\) Mechanism   D) Both S\(_{N1}\) and S\(_{N2}\)

2013
Q.5 The order of reactivity of alkyl halides towards nucleophile is:
A) RI > RBr > RF > RCl   C) RF > RCI > RBr > RI   B) RI > RBr > RCI > RF   D) RF > RBr > RCI > RI

Q.6 Consider the reaction given below:

Which statement is true?
A) Reagent for I is KOH in alcohol   C) Reaction I is Debromination   B) Reagent for II is KOH in aqueous medium   D) Reaction II is elimination

2014
Q.7 The halothane used in hospitals as an anesthetic is chemically
A) 1-Bromo-1-chloro-2, 2, 2-trifluoroethane   C) 1, 1, 1-Trifluoro-2-bromo-2-chloroethane   B) 2-Bromo-2-chloro-1, 1, 1-trifluoroethane   D) 2-Chloro-2-bromo-1, 1, 1-trifluoroethane

Q.8 If halogenoalkanes are mixed with an excess of ethanoic ammonia and heated under pressure, amine are formed. Which amine is formed in the following reaction? \[ \text{CH}_2\text{CH}_3\text{Br} + \text{NH}_3 \longrightarrow \text{Amine} \]
A) CH₃—CH₂—NH—CH₂—CH₃   C) CH₃—CH₂—CH₂—NH₂   B) CH₃—CH₂—NH₂   D) H₂N—CH₂—CH₂—NH₂

2015
Q.9 The IUPAC name of the given compound is
A) 1-Chloro-2-methylpropane   C) Isobutyl chloride   B) 1-Chloro-2-methylbutane   D) 2-Methyl-3-chloropropane

Q.10 In the below reaction, the configuration of product is

A) 100% same of the configuration of reactant   C) 50% inverted   B) 50% retained   D) 100% opposite from configuration of reactant

2016
Q.11 Consider the reaction given below:
\[ \text{CH}_3\text{CH}_2\text{Br} \text{ KOH}_{(\text{alcohol})} \longrightarrow \text{H}_2\text{C}—\text{CH}_2 + \text{HBr} \]
Mechanism followed by the reaction is:
A) E₂   B) E₁   C) Sₙ₁   D) Sₙ₂
Q.12 Which one of the following is NOT a nucleophile:
A) NH$_2^-$
B) H$_2$O
C) BF$_3$
D) CH$_3^-$

ANSWERS
Q.1 A Q.2 B Q.3 D Q.4 D Q.5 B Q.6 D Q.7 B Q.8 B Q.9 A Q.10 D Q.11 A Q.12 C

ALCOHOLS AND PHENOLS

2011
Q.1 An alcohol is converted to an aldehyde with same number of carbon atoms as that of alcohol in the presence of K$_2$Cr$_2$O$_7$/H$_2$SO$_4$ the alcohol is:
A) CH$_3$Cl(CH)$_3$OH
B) CH$_3$CH$_2$CH$_2$OH
C) (CH$_3$)$_3$:COH
D) (CH$_3$)$_3$:CHOH
Q.2 Which of the following is a secondary alcohol?

Q.3 Which enzyme is involved in the fermentation of glucose:
A) Zymase
B) Invertase
C) Urease
D) Diastase

Q.4 Relative acidic strength of alcohol, phenol, water and carboxylic acid is:
A) Carboxylic acid > Alcohol > Phenol > Water
B) Carboxylic acid > Phenol > Water > Alcohol
C) Phenol > Carboxylic acid > Alcohol > Water
D) Water > Alcohol > Phenol > Carboxylic acid

2012
Q.5 The dehydration of ethyl alcohol with concentrated H$_2$SO$_4$ at 140°C gives:
A) Ethene
B) Diethyl ether
C) Alcohol
D) Carboxylic acid
Q.6 Ethanol can be converted into ethanoic acid by:
A) Oxidation
B) Fermentation
C) Hydration
D) Hydrogenation
Q.7 The following structure is of:
A) Secondary alcohol
B) Primary alcohol
C) Tertiary alcohol
D) Carboxylic acid

Q.8 When ethanol is warmed with ethanoic acid in the presence of strong acid catalyst, an ester ethyl ethanoate is formed. $\text{CH}_3\text{CH}_2\text{OH} + \text{CH}_3\text{CO}_2\text{H} \overset{\text{Catalyst}}{\rightarrow} \text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3$
During this reaction:
A) Alcohol is reduced
B) O–H bond in ethanol is broken
C) O–H bond in ethanoic acid is broken
D) Acid is oxidized

2013
Q.9 Consider the following reaction:
$\text{C}_2\text{H}_5\text{OH} + \text{PCl}_3 \rightarrow ?$
What product(s) may be formed?
A) $\text{C}_2\text{H}_5\text{Cl}$ only
B) $\text{C}_2\text{H}_5\text{Cl}$ and HCl
C) $\text{C}_2\text{H}_5\text{Cl}$, POCl$_3$ and HCl
D) $\text{C}_2\text{H}_5\text{Cl}$ and POCl$_3$
Q.10 is named as:
A) Picric acid
B) Nitro phenol
C) Benzoic acid
D) Malonic acid
Q.11 Aqueous phenol decolorizes bromine water to form a white precipitate. What is the structure of the white precipitate formed?
Q.12 The relative strength of carboxylic acid, water, ethanol and phenol has the following order of increasing acid strength:
A) Carboxylic Acid > Phenol > Ethanol > Water  
B) Carboxylic Acid > Phenol > Water > Ethanol  
C) Phenol > Carboxylic Acid > Ethanol > Water  
D) Water > Ethanol > Phenol > Carboxylic Acid

2014

Q.13 Primary, secondary and tertiary alcohols can be identified and distinguished by
A) Lucas test  
B) Iodoform test  
C) Baeyer’s test  
D) Silver mirror test

Q.14 Which one of the following alcohol is indicated by formation of yellow crystals in Iodoform test?
A) Methanol  
B) Ethanol  
C) Butanol  
D) Propanol

Q.15 The formula of 2, 4, 6-tribromo phenol is

Q.16 Which one of the following groups is indicated when HCl is formed by reaction of ethanol with phosphorous pentachloride?
A) Amino group  
B) Hydroxyl group  
C) Halide group  
D) Hydride group

2015

Q.17 Which one of the following was used as one of the earliest antiseptic and disinfectant?
A) Phenol  
B) Ether  
C) Ethanol  
D) Methanol

Q.18 Which one of the following is NOT able to denature the ethanol?
A) Methanol  
B) Lactic acid  
C) Pyridine  
D) Acetone

Q.19 How will you distinguish between methanol and ethanol?
A) By Lucas test  
B) By silver mirror test  
C) By oxidation  
D) By Iodoform test

Q.20 To produce absolute alcohol (100%) from rectified spirit (95.6% alcohol), the remaining 4.4% water must be removed by a drying agent such as
A) Calcium oxide  
B) Calcium chloride  
C) Calcium carbonate  
D) Carbon monoxide

2016

Q.21 Which one of the following is an appropriate indication of positive iodoform test?
A) Formation of H₂O  
B) Release of H₂ gas  
C) Brick red precipitate  
D) Yellow crystal

Q.22 Which one of the following is the proper classification of above formula:
A) Primary  
B) Secondary  
C) Tertiary  
D) Polyhydride

Q.23 Which one of the following is an appropriate structure of product of bromination?

ANSWERS
**ALDEHYDES AND KETONES**

2011

Q.1 Consider the following reaction: \( R-\text{CHO} + 2[\text{Ag(NH}_3\text{)}_2]\text{OH} \rightarrow \text{R-COONH}_4 + 2\text{Ag} + 2\text{NH}_3 + \text{H}_2\text{O} \)

This reaction represents one of the following tests.
A) Fehling test  B) Benedict test  C) Ninhydrin test  D) Tollens test

Q.2 In the below reaction, the nucleophile is:

A) CN—  B) HCl  C) Cl—  D) OH

Q.3 Which one of the following compound belongs to the homologous series of aldehydes?

2012

Q.4 Formaldehyde reacts with HCN (NaCN + HCl) to give a compound:

Q.5 Iodoform test will not be positive with:

Q.6 When CH₃—CH₂—OH is oxidized in the presence of K₂Cr₂O₇ and H₂SO₄, the product formed is

2013

Q.7 Which group gives a yellow precipitate of triiodo methane when warmed with alkaline aqueous iodine?

Q.8 What is the structure of alcohol which on oxidation with acidified Na₂Cr₂O₇ gives

Q.9 Which of the following is the structure of ketone?

2014

Q.10 A student mixed ethyl alcohol with small amount of sodium dichromate and added it to the hot
solution of dilute sulphuric acid. A vigorous reaction took place. He distilled the product formed immediately. What was the product?
A) Acetone  C) Dimethyl ether  
B) Acetic acid  D) Acetaldehyde

Q.11 The structural formula of the product of reaction of acetone with 2, 4-dinitrophenyl hydrazine

Q.12 For the reaction:

A) C₂H₅COCH₃  C) CH₃COCH₃  
B) C₂H₅CH(HT)OH  D) C₂H₅CH₂CHO

2015

Q.13 Which one of the following is also called silver mirror test?
A) Fehling’s solution test  C) Tollens’s reagent  
B) Iodiform test  D) Benedict’s solution tests

Q.14 When acetaldehyde reacts with 2,4-dinitrophenylhydrazine (2,4-DNPH), which one of the following products is formed?

Q.15 Both aldehydes and ketones are planer to the neighborhoods of carbonyl (C=O) group. Which one of the following bonds is distorted towards the oxygen atoms?
A) π-bond of C and O  C) Sigma bond of C and O  
B) Sigma bond of C and H  D) Sigma bond of C and C

2016

Q.16
It is the general formula of:

A) 2, 4-Dinitrophenyl hydrazine  C) Phenyl hydrazone  
B) 1, 3-Dinitrophenyl hydrazine  D) 2, 4-Dinitrophenyl hydrazone

Q.17 Which one of the following is the IUPAC name of above given structure:
A) Propionaldehyde  B) Methanone  C) Acetaldehyde  D) Methanal

Q.18 Which one of the following test is given by both aldehyde and ketone?
A) Silver mirror test  C) 2, 4 DNPH test  
B) Fehling’s solution test  D) Benedict’s solution test

ANSWERS

Q.16 D  Q.17 D  Q.18 C

CARBOXYLIC ACIDS

2011

Q.1 CH₃COOH + PCls ------- ?
The products of the above reaction are:
A) CH₃COI + POCl₃ + HCl  C) CH₃Cl + POCl₃ + HCl  
B) CH₃COI + POCl₂ + HCl  D) CH₃COCI + POCl₃ + H₂

Q.2 CH₃CN + HCl--------- A + B (in the presence of water)
In the above reaction, A and B are:
A) Acetic acid and acid amide  
B) Acetic acid and ammonia  
C) Acetic acid and methyl chloride  
D) Acetic acid and ammonium chloride

Q.3 Consider the following reaction:
\[
\text{CH}_3\text{COOH} + \text{Mg (metal)} \rightarrow ?
\]
What product will form?
A) Magnesium formate  
B) Magnesium acetate  
C) Magnesium ion  
D) Carboxylate ion

2012

Q.4 In the below reaction the nucleophile which attacks on the carbon atom of acid is:
\[
\text{CH}_3\text{COOH} + \text{PCl}_5 \rightarrow \text{CH}_3\text{COCl} + \text{POCl}_3 + \text{HCl}
\]
A) OH\text{--}  
B) P  
C) Cl\text{--}  
D) H\text{--}

Q.5 When ethanol chloride reacts with methylamine, an amide is formed. What is the structure of the amide formed?

Q.6 Primary alcohols normally give us aldehydes when oxidized in the presence of \(\text{Na}_2\text{Cr}_3\text{O}_7\), what the product will be, when the secondary alcohols are oxidized in same conditions?
A) Alkenes  
B) Alkynes  
C) Alkyl halides  
D) Ketones

2013

Q.7 The formation of ester from acetic acid in presence of acid and ethanol is a:
A) Nucleophilic substitution reaction  
B) Nucleophilic addition reaction  
C) Electrophilic substitution reaction  
D) Electrophilic addition reaction

Q.8 Methyl cyanides, on boiling with mineral acids or alkalis yield:
A) Acetic acid  
B) Formic acid  
C) Propanoic acid  
D) Butanoic acid

Q.9 The final products formed are:

2014

Q.10 Ethyl butyrate and butyl butanoate are esters with the flavor of
A) Pear  
B) Banana  
C) Pineapple  
D) Apple

Q.11 Acetamide is formed by dehydration of
A) Oxalic acid  
B) Ethanoic acid  
C) Butanoic acid  
D) Propanoic acid

Q.12 Organic compounds ‘X’ and ‘Y’ both can react with Na-Metal to evolve hydrogen gas. If ‘X’ and ‘Y’ react with each other form an organic compound ‘Z’ which gives fruity smell. What type of compound ‘X’, ‘Y’ and ‘Z’ are?
A) Alcohol  
B) Alcohol  
C) Alcohol  
D) Alcohol

Q.13 ‘\(K_a\)’ values of few organic acids are given:
\[
\begin{align*}
\text{CH}_3\text{COOH} &\quad 1.85 \times 10^{-5} \\
\text{CCl}_3\text{COOH} &\quad 2.3 \times 10^{-2} \\
\text{CHCl}_2\text{COOH} &\quad 5.0 \times 10^{-3} \\
\text{CH}_2\text{CICOOH} &\quad 1.3 \times 10^{-3}
\end{align*}
\]
The order of acid strength is:
A) \(\text{CCl}_3\text{COOH} > \text{CHCl}_2\text{COOH} > \text{CH}_3\text{CICOOH} > \text{CH}_3\text{COOH}\)  
B) \(\text{CH}_3\text{COOH} > \text{CHCl}_2\text{COOH} > \text{CCl}_3\text{COOH} > \text{CH}_2\text{CICOOH}\)
C) CHCl₃COOH > CH₃COOH > CCl₃COOH > CH₂Cl(COOH)
D) CCl₃COOH > CH₃COOH > CHCl₃COOH > CH₂Cl(COOH)

Q.14 An organic acid ‘z’ reacts separately with sodium bicarbonate, sodium hydroxide and sodium carbonate. Which one of the following represent the structure of ‘z’?
A) HCOOC₃H₅
B) CH₃—CH=CH₂
C) CH₃CH₂OH
D) H₃C—CH₂—COOH

Q.15 Carboxylic acids are rather hard to reduce, which powerful reducing agent can be used to convert them to the corresponding primary alcohol:
A) H₂SO₄/HgSO₄
B) V₂O₅
C) LiAlH₄
D) K₂Cr₂O₇/H₂SO₄

2016

Q.16 CH₃COOH + CH₃CH₂OH ⇌ CH₃COOC₂H₅ + H₂O
Which one of the following will act as a catalyst in above reaction?
A) HNO₃
B) H₃SO₄
C) Acidified potassium dichromate
D) SOCl₂

Q.17 CH₃COOH + PCl₅
Which one of the following options shows the products of above reaction?
A) POCl₃ + CH₃COCl₂ + HCl
B) POCl₃ + CH₃COCl₂ + H₂
C) CH₃COCI + POCl₂ + HCl
D) POCl₃ + CH₃COCI + HCl

Q.18 Which one of the following reaction of carboxylic acid is reversible?
A) Esterification
B) Salt formation
C) Reaction with PCl₅
D) Reaction with SOCl₂

2011

Amino Acids

Q.1 The ─NH—CO is called:
A) Amide group
B) Amino group
C) Protein linkage
D) Peptide linkage

Q.2 Which one of the following is an alpha amino acid?

Q.3 Which of the following has an amino R-group?
A) Lysine
B) Proline
C) Valine
D) Alanine

Q.4 At intermediate value of pH, amino acids form Zwitter ions containing:
A) ─N⁺H₃ and COO⁻
B) ─NH₃ and COOH
C) ─N⁺H₃ and COOH
D) ─NH₃ and COO⁻

Q.5 A polymer in which the number of amino acid residue is greater than 100 or molecular mass is greater than 1000, is known as:
A) Protein
B) Polypeptide
C) Dipeptide
D) Tripeptide

Q.6 Aspartic acid is an acidic amino acid, which has chemical formula:

2012

Q.7 Organic compound containing both amine and carboxyl group is known as
A) Amino acid
B) Fatty acid
C) Saccharide
D) Amide

Q.8 Alanine is an amino acid which shows neutral effect on litmus paper, the formula of alanine may be
Q.9 Which of the following structures is not an alpha amino acid?

Q.10 The skeletal formula of dipeptide formed between aspartic acid and phenylalanine is given

How many functional groups are present in its formula?
A) 1  B) 2  C) 4  D) 3

Q.11 In basic conditions, amino acid exists in which of the following forms?

Q.12 Structure of dipeptide is

This is called:
A) Glycyl glycine  C) Glycyl alanine  C) Alaninyl alanine  D) Alaninyl glycine

Q.13 The amino acids which largely exist in dipolar ionic form are:
A) Acidic amino acids  B) Basic amino acids  C) Beta amino acids  D) Alpha amino acids

Q.15 Two or more amino acids condensed to form protein by a peptide linkage which is resent between two atoms:
A) C and C  B) O and C  C) C and N  D) C and H

Q.16 \( \alpha \)-amino acids are compounds having carboxylic acid as well as amino functional groups attached to:
A) Any H-atom in the molecule  B) Same carbon atom  C) Alternate carbon atoms  D) Neighboring carbon atoms

Q.18 What is the name of amino acid, \( R \) where \( R \) is CH₃ group?
A) Glycine  B) Lysine  C) Aspartic acid  D) Alanine

Q.19 The amino acids which are not prepared in human body are called
A) Essential amino acids  C) Alpha amino acids  B) Non-essential amino acids  D) Beta amino acids

Q.20 Indicate the cyclic amino acid from the following:
A) Cysteine  B) Serine  C) Haloamine  D) Proline

Q.21 Which one of the following is Glutamic Acid?

Q.22 At low pH or in acidic condition amino acid exists as
A) Anion  B) Cation  C) Zwitter ion  D) Neutral specie

Q.23 The structure shown below represents:

A) Proline  B) Histidine  C) Glycin  D) Lysine

Q.24 Which one of the following reagent is used for identification of amino acids?
A) Fehling’s solution  C) Ninhydrin  B) Benedict’s solution  D) Copper (II) Sulphate
This structure is
A) Gly-Ala (dipeptide)  C) Gly-Val (dipeptide)
B) Asp-Gly (dipeptide)  D) Asp-Val (dipeptide)

Q.26 Which one of the following amino acids is basic in nature?
A) Glycine  B) Alanine  C) Lysine  D) Glutamic acid

2016

Q.31 In the formation of Zwitter ion which one of the following donates the proton?
A) COOH  B) NH₂  C) CH₃COO⁻  D) OH⁻

Q.34 Which one of the following is simplest amino acid?
A) Glycine  B) Alanine  C) Lysine  D) Glutamic acid

Q.36 When acid is added to an amino acid, which one of the following will act as a base?
A) NH₃⁺  B) COO⁻  C) H⁺  D) R group

ANSWERS

MACROMOLECULES

2011

Q.1 When hexane dioic acid is heated with hexamethylene diamine, the compound formed is:
A) Polypeptide  B) Addition polymer  C) Ester  D) Nylon 6,6

Q.2 Glucose and fructose are common examples of:
A) Pentoses  B) Hexoses  C) Heptoses  D) Butoses

Q.3 The reaction between fats and caustic soda is called:
A) Hydrogenolysis  B) Fermentation  C) Carboxylation  D) Saponification

Q.4 Macromolecules are described as large molecules built up from small repeating units known as:
A) Monomers  B) Isomers  C) Metamers  D) Tautomers

Q.5 Polyvinyl chloride is an example of:
A) Addition polymer  B) Condensation polymer  C) Biopolymer  D) Thermosetting polymer

Q.6 Terylene, a polyester is an example of:
A) Biopolymer  B) Lipids  C) Condensation polymer  D) Addition polymer

2012

Q.7 The principle energy storage carbohydrate in animal’s is
A) Glucose  B) Starch  C) Protein  D) Glycogen

Q.8 Starch is a polymer of
A) β–D–glucose  B) α–glucose  C) γ–D–glucose  D) α–L–glucose

Q.9 The reaction between fats and caustic soda is called
A) Hydrogenolysis  B) Fermentation  C) Esterification  D) Saponification

Q.10 Adipic acid and hexamethylene diamine both of which have ________ carbon atoms:
A) Seven  B) Eight  C) Six  D) Four

Q.11 Lactose is a sugar present in milk. It is an example of
A) Disaccharides  B) Monosaccharides  C) Polysaccharides  D) Starch

Q.12 Macromolecules are described as large molecules built up from small repeating units called:
A) Monomers  B) Isomers  C) Metamers  D) Tautomers

2013

Q.13 Polyvinyl acetate (PVA) is colourless and non-toxic resin used as an adhesive and as a binder for making:
A) Toys  B) Gramophone recorders  C) Compact discs  D) Emulsion pains

Q.14 Both ribose and deoxyribose are monosaccharides containing ________ carbon atoms.
Q.15 The increased quantities of cholesterol in blood make plaque like deposits in the arteries causing:
A) Cholera  B) Down’s syndrome  C) Heart attack  D) Phenylketonuria

Q.16 Polyvinyl chloride is an example of:
A) Condensation polymer  B) Addition polymer  C) Biopolymer  D) Thermosetting polymer

Q.17 Collagen is a fibrous protein present most abundantly in:
A) Hair  B) Nail  C) Tendons  D) Arteries

Q.18 Animals store glucose in the form of glycogen in:
A) Stomach  B) Mouth  C) Liver and muscles  D) Small intestine

Q.19 Which one of the following is an example of condensation polymer?
A) Polyvinylchloride  B) Polystyrene  C) Polyethene  D) Polyamide

Q.20 Among the most common disaccharides, which one of the followings is present in the milk?
A) Sucrose  B) Maltose  C) Fructose  D) Lactose

Q.21 Fats are a type of lipid called glycerides. They are esters of long chain carboxylic acids:
A) Propene-1, 2, 3-triol  B) Propene-1, 2, 3-diol  C) Propene-1, 2, 3-trio  D) Propene-1, 2, 3-dio1

Q.22 Which one of the following base is NOT present in RNA?
A) Cytosine  B) Adenine  C) Thymine  D) Guanine

Q.23 Collagen proteins are present in _____________ throughout the body
A) Muscle  B) Red blood cells  C) Tendons  D) Blood plasma

Q.24 Polystyrene is an addition polymer. Which one of the following structures represents the monomer of polystyrene?
A) CH₂=CH₂  B) CH₂=CH−CH₃  C) CH₂=CH−CH₃  D) CH₂=CH−C₆H₅

Q.25 The specific substances (metabolite) that fits on the enzyme surface and is converted to products is called
A) Co-factor  B) Prosthetic group  C) Isoenzyme  D) Substrate

Q.26 Polyamide is formed due to the condensation od hexane-dioic acid with
A) Hexane-1,5-diamine  B) Hexane-1,6-diamine  C) Hexane-1,4-diamine  D) Hexane-2,5-diamine

Q.27 Haemoglobin is a
A) Genetic protein  B) Building protein  C) Transport protein  D) Structural protein

Q.28 Which one of the following polymer is polystyrene?

Q.29 Out of these which nitrogen base is NOT present in DNA?
A) Adenine  B) Guanine  C) Uracil  D) Thymine

Q.30 Which one of the following is an example of co-polymer?
A) Polyamide  B) Polystyrene  C) Polyvinyl acetate  D) Polyvinyl chloride

Q.31 Which one of the following polymer is called as Nylon 6,6?
A) Polyester  B) Polyvinyl chloride  C) Polyamide  D) Polyvinyl acetate

Q.32 Which one of the following is an exact composition of a carbohydrates?

Q.33 Which one of the following nitrogen base is NOT present in DNA?
A) Adenine  B) Guanine  C) Uracil  D) Cytosine

Q.34 In the woody parts of trees, the %age of cellulose is:
A) 50%  B) 10%  C) 30%  D) 100%
Q.35 In laboratory experiment an unknown compound was added in test tube containing iodine, the colour became intense blue. What could be the unknown compound?
A) Cellulose  B) Raffinose  C) Ribose  D) Starch

ANSWERS

ENVIRONMENTAL CHEMISTRY

2011
Q.1 The suspected liver carcinogen which also has negative reproduction and developmental effect on humans is:
A) Iodoform  B) Bromoform  C) Tropoform  D) Chloroform
Q.2 Peroxyacetyl nitrate is an irritant to human beings and it effects:
A) Nose  B) Stomach  C) Ears  D) Eyes

2012
Q.3 The increase in concentration of oxidizing agents in smog like H₂O₂, HNO₃, PAN and ozone in the air is called
A) Carbonated smog  B) Nitrated smog  C) Photochemical smog  D) Sulphonated smog
Q.4 Which is the metal, whose elevated concentration is harmful for fish as it clogs the gills thus causing suffocation?
A) Sodium  B) Lead  C) Zinc  D) Aluminium

2013
Q.5 Aerobic decomposition of organic matter i.e. glucose by bacteria in water sediments produces:
A) Propene  B) Ethane  C) Methane  D) Butane
Q.6 The yellowish-brown color in photochemical smog is due to the presence of:
A) Sulphur dioxide  C) Carbon dioxide  B) Carbon monoxide  D) Nitrogen dioxide

2014
Q.7 ___________ is an eye irritant.
A) Peroxyacetyl nitrate  C) Peroxymethoxy aniline  B) Peroxyacetyl nitrite  D) Peroxacycyl aniline
Q.8 Which one of the following pollutants can cause death of a person by binding with haemoglobin of red blood cells?
A) Chlorofluorocarbons  C) Carbon monoxide  B) Oxides of Sulphur  D) Oxides of nitrogen

2015
Q.9 The biggest source of acid rain is the oxide of
A) N  B) S  C) O  D) C
Q.10 Burning of which one of the following waste is considered as useful industrial fuel or to produce electricity
A) Metals  B) Grass  C) Paper  D) Plastic

2016
Q.11 Ozone concentration is measured in:
A) Debye units  B) Dupont units  C) Debacle units  D) Dobson units
Q.12 The gas which is mainly produced in landfills from the waste is:
A) CH₄  B) CO₂  C) SO₂  D) Cl₂

ANSWERS
Q.1 D  Q.2 D  Q.3 C  Q.4 D  Q.5 C  Q.6 D  Q.7 A  Q.8 C  Q.9 B  Q.10 D  Q.11 D  Q.12 A