CHAPTER 6

CHEMICAL BONDING

MCQs

Q.1 An ionic compound A+ B– is most likely to be formed when

(a) The ionization energy of A is high and electron affinity of B is low

(b) The ionization energy of A is low and electron affinity of B is high

(c) Both the ionization energy and electron affinity of B are high

(d) Both the ionization energy of A and electron affinity of B are low

Q.2 The number of bonds in nitrogen molecules

(a) one σ and one π

(b) one σ and two π

(c) three sigma only

(d) two σ and one π

Q.3 Which of the following statements is not correct regarding bonding molecular orbitals?

(a) bonding molecular orbitals possess less energy than atomic orbitals from which they are formed

(b) bonding molecular orbitals have low electron density between the two nuclei

(c) every electron in the bonding molecular orbitals contributes to the attraction between atoms

(d) bonding molecular orbitals are formed when the electron waves undergo constructive interference

Q.4 Which of the following molecules has zero dipole moment?

(a) NH3 (b) CHCl3

(c) H2O (d) BF3

Q.5 Which of the hydrogen halides has the highest percentage of ionic character

(a) HF (b) HBr
(c) HCl (d) HI

Q.6 Which of the following molecules has unpaired electrons in anti–bonding molecular orbitals
(a) O2 (b) N2
(c) Br2 (d) F2

Q.7 Which of the following involve ionic bonding only?
(a) Li3N (b) NaCl
(c) NCl3 (d) O2

Q.8 Which of the following involve covalent bonding only?
(a) KF (b) KCl
(c) CH4 (d) MgCl2

Q.9 Which of the following molecules has a net dipole moment?
(a) CO2 (b) CS2
(c) SO2 (d) CCl4

Q.10 H2S has a net dipole moment while BeF2 has zero dipole moment, because
(a) H2S molecule is linear while BeF2 is angular
(b) H2S molecule is angular, while BeF2 molecule is linear
(c) Fluorine has more electronegativity than S
(d) Be is more electronegative than S

Q.11 Which of the following ions has larger ionic radius?
(a) Na+ (b) K+
(c) Mg2+ (d) Al3+

Q.12 Which of the following bonds is least polar?
(a) H–Se (b) P–Cl
(c) H–Cl (d) N–Cl

Q.13 Which one has the least bond angle?
(a) NH3 (b) CH4
(c) H2O (d) BF3

Q.14 Coordinate covalent bonds are formed by
(a) sharing of electrons
(b) donation of electrons

(c) transference of electrons
(d) none of these

Q.15 Which of the following molecules would be expected to have zero dipole moment?

(a) H2S (b) PF3
(c) TeF6 (d) H2O

Q.16 The bond formed between the elements of low ionization energy and elements of high electron affinity is

(a) ionic (b) covalent
(c) metallic (d) coordinate

Q.17 The side ways overlap of two–p orbitals to form a bond is called

(a) sigma bond (b) pi (π) bond
(c) ionic bond (d) covalent bond

Q.18 The head overlap of p–orbitals of two atoms give rise to bond called

(a) sigma bond (b) pi (π) bond
(c) ionic bond (d) covalent bond

Q.19 Which element would be the most electronegative element with

(a) high ionization energy (IE) and low electron affinity (EA)
(b) low ionization energy (IE) and high electron affinity (EA)
(c) low ionization energy and low electron affinity
(d) high ionization energy and high electron affinity

Q.20 Which element would be the least electronegative element with

(a) high I.E. and low E.A. (b) low I.E. and high E.A.
(c) low I.E. and low E.A. (d) high I.E. and low E.A.

Q.21 Which of the following substances has the least ionic character in its bond?

(a) CCl4 (b) KCl
(c) BeCl2 (d) MgCl2

Q.22 Which of the following best describes ionization energy?

(a) energy needed to remove the most loosely bound electron from its ground state

(b) it decreases from left to right across a period

(c) it increases down the periodic table

(d) it is represented by $x + e^- \rightarrow x^- +$ energy

Q.23 Which one of the following characteristics is not usually attributed to ionic substances

(a) high melting point (b) deform when struck

(c) crystalline in solid state

(d) well defined three dimensional structure

Q.24 Which of the following bond is less polar?

(a) B–Cl (b) C–Cl

(c) H–I (d) C–I

Q.25 Which type of the orbital hybridization and geometry is used by the central atom of NH_2^-?

(a) sp2 hybridization and trigonal planar

(b) sp hybridization and tetrahedral geometry

(c) sp2 hybridization and trigonal planar

(d) sp3 hybridization and tetrahedral geometry

Q.26 Which of the following compounds has most likely been formed by covalent bonding of atoms

(a) CaF_2 (b) MgO

(c) SiH_4 (d) NaCl

Q.27 Identify the compound below which has bonds formed by an overlap of sp and p–orbitals

(a) BF_3 (b) $BeCl_2$

(c) NH_3 (d) H_2O

Q.28 The most electronegative of these group I element is

(a) Na (b) K

(c) Li (d) Cs

Q.29 The type of bonding in HBr is

(a) ionic (b) polar covalent

(c) non–polar covalent (d) coordinate covalent

Q.30 Which of the following statement is not correct
(a) sigma bond is weaker than a pi bond
(b) sigma bond is stronger than a pi bond
(c) double bond is stronger than a single bond
(d) double bond is shorter than a single bond

Q.31 Which of the following molecules has a pyramidal structure?
(a) CH4 (b) NH3
(c) H2O (d) C2H4

Q.32 The bond angle in water is
(a) 109–5o (b) 104.5o
(c) 107.0o (d) 120o

Q.33 During the formation of chemical bond, the potential energy of the system
(a) decreases (b) increases
(c) does not change (d) none of these

Q.34 H2O molecule has
(a) no lone pair (b) one lone pair
(c) two lone pairs (d) none of these

Q.35 NH3 molecule has
(a) no lone pair (b) one lone pair
(c) two lone pairs (d) three lone pairs

Q.36 In NH3 the covalent bond formed are due to
(a) s–sp overlap (b) s–sp2 overlap
(c) s–sp3 overlap (d) sp2–sp2 overlap

Q.37 Which of the following is largest atom
(a) Mg (b) Be
(c) Sr (d) Ca

Q.38 As compared to covalent compounds, ionic compounds generally have
(a) low melting points and low boiling points
(b) low melting points and high boiling points
(c) high melting points and high boiling points
(d) high melting points and low boiling points

Q.39 The attractive force that holds atoms together in a molecule is called

(a) force of attraction (b) electrostatic force
(c) bond (d) chemical bond

Q.40 Which of the following bonds will be formed between alkali metals and halogens

(a) ionic (b) covalent bond
(c) metallic bond (d) coordinate covalent bond

Q.41 The bond formed between the atoms by mutual sharing of electrons is

(a) ionic (b) coordinate covalent bond
(c) covalent (d) metallic

Q.42 A chemical bond formed between two similar atoms is purely

(a) ionic (b) covalent
(c) metallic (d) coordinate

Q.43 On the basis of VSEPR model the geometry of BeCl2 is

(a) linear (b) trigonal
(c) tetrahedral (d) angular

Q.44 On the basis of VSEPR theory, a molecule with three bond pair and no lone pair of electrons will have a structure

(a) linear (b) trigonal planar
(c) tetrahedral (d) trigonal pyramidal

Q.45 The geometry of NH3 on the basis of VSEPR model is

(a) trigonal planar (b) trigonal pyramidal
(c) tetrahedral (d) linear

Q.46 In which of the following theories the hybridization is considered

(a) VSEPR (b) Lewis
(c) molecular orbital (d) valence bond

Q.47 The angle between 3 sp2 hybrid orbital is

(a) 90o (b) 120o
(c) 130o (d) 180o

Q.48 The unhybridized “p” orbital in sp2 hybridization is

(a) parallel to sp2 (b) in the same plane

(c) perpendicular to sp2 orbitals
(d) out of plane

Q.49 Which of the following theories gives the idea of delocalization of electrons
(a) Lewis theory (b) VSEPR theory
(c) valence bond theory (d) molecular orbital theory

Q.50 The tandency of an atom to attract, a shared electron pair towards itself is called
(a) electron affinity (b) electronegativity
(c) dipole moment (d) ionization potential

Q.51 Energy needed to remove an electron from its gaseous atom is called
(a) electron affinity (b) ionization energy
(c) lattice energy (d) electronegativity

Q.52 A bond having partial positive and negative charges is
(a) ionic (b) covalent
(c) polar covalent (d) non–polar covalent

Q.53 A bond formed by the linear overlap of atomic orbitals is called
(a) sigma (b) ionic
(c) pi (d) polar

Q.54 Which of the following elements is the most electronegative
(a) Li (b) F
(c) O (d) Cl

Q.55 Some covalent compounds dissolve in water due to
(a) hydrolysis (b) hydration
(c) hydrogen bonding (d) metallic bonding

Q.56 Which of the following compounds will have the lowest boiling point?
(a) PH3 (b) ASH3
(c) NH3 (d) SbH3

Q.57 Which of the following molecules has a coordinate bond?
(a) NH4Cl (b) NaCl
(c) HCl (d) AlCl3

Q.58 The half of the difference between the number of electrons in bonding MO and antibonding MO is called

(a) molecule order (b) bond order
(c) proton order (d) electron order

Q.59 The bond order for He2 molecule is

(a) zero (b)
(c) 1 (d) 2

Q.60 The bond order for H2 is

(a) zero (b)
(c) 1 (d) 1.5

Q.61 The bond order in N2 molecule is

(a) zero (b) 1
(c) 2 (d) 3

Q.62 The bond order in O2 molecule is

(a) 1 (b) 2
(c) 3 (d) zero

Q.63 Which one of the following is diamagnetic

(a) B2 (b) C2
(c) N2 (d) O2–

Q.64 Which one of the following molecule is paramagnetic

(a) B2 (b) C2
(c) N2 (d) F2

Q.65 Which of the following ions is diamagnetic

(a) O (b) O
(c) O (d) N

Q.66 Pi bond consists of two regions of electron cloud density

(a) along the bond axis
(b) along and perpendicular to bond axis
(c) above and below the bond axis
(d) none of these

Q.67 Sigma bond consists of one region of electron density

(a) along the bond axis
(b) along and perpendicular to bond axis

(c) above and below the bond axis
(d) none of these

Q.68 The electron cloud density is symmetrical along the bond axis in
(a) sigma bond (b) pi bond
(c) both sigma and pi bond
(d) neither sigma nor pi bond

Q.69 The electron cloud density is not symmetrical along the bond axis in
(a) sigma bond (b) pi bond
(c) both sigma and pi bond
(d) neither sigma nor pi bond

Q.70 Covalent bonds are
(a) rigid and directional
(b) rigid and non–directional
(c) neither rigid nor directional
(d) non–rigid and directional

Q.71 Ionic bonds are
(a) rigid and directional
(b) rigid and non–directional
(c) non rigid non directional
(d) non–rigid and directional

Q.72 Which of the following statements is correct regarding the covalent compounds
(a) covalent compounds do not exhibit isomerism
(b) covalent compounds exhibit isomerism
(c) covalent compounds are soluble in water
(d) covalent compounds are insoluble in non–polar solvents

Q.73 The C–C bond length in ethane (C_2H_6) is
(a) 154 pm (b) 133 pm
(c) 120 pm (d) 105 pm

Q.74 The C–C bond length in ethene (C_2H_4) is
(a) 154 pm (b) 133 pm
(c) 120 pm (d) 105 pm

Q.75 The C–C bond length in ethyne is

(a) 154 pm (b) 133 pm
(c) 120 pm (d) 105 pm

Q.76 The atomic radii of the elements have a general trend of fluctuating periodically throughout the

(a) group (b) period
(c) periodic table (d) series

Q.77 Which of the following atom has the shortest atomic radius

(a) N (b) F
(c) O (d) B

Q.78 The half of the single bond length between two atoms in a molecule is called

(a) ionic radius of an element
(b) covalent radius of an element
(c) both ionic and covalent
(d) none of these

Q.79 Octet rule is not followed in the formation of

(a) CH4 (b) NF3
(c) BCl3 (d) H2O

Q.80 Select the atom with the largest ionization energy in the following atoms

(a) N (b) P
(c) AS (d) Sb

Q.81 Select the largest atom in the following atoms

(a) O (b) S
(c) Se (d) Te

Q.82 Which of the following group of elements on the average has the highest ionization energies

(a) IA (b) IIIA
(c) IVA (d) VIIIA

Q.83 Molecular orbital theory has

(a) the superiority over the VB theory
(b) the inferiority over the VB theory
(c) neither superiority nor inferiority over VB theory

(d) none of these

Q.84 The bond between H–H is

(a) stronger than the bond between H–Cl

(b) weaker than the bond between H–Cl

(c) neither stronger nor weaker than the bond between H–Cl

(d) none of these

Q.85 In which of the following molecules, the value of bond order in maximum

(a) H2 (b) O2

(c) N2 (d) Cl2

Q.86 When the S–character of hybridized orbital decreases the bond angle

(a) decreases (b) increases

(c) does not change (d) becomes zero

Q.87 One of the causes of reactions is that the systems attains the energy state which is of

(a) higher in energy (b) lower in energy

(c) balanced in energy (d) equal in energy

Q.88 The increase in the bond energy of a covalent bond is due to

(a) electronegativity (b) ionization energy

(c) polarity (d) symmetry

Q.89 The polarity of a molecule is expressed by

(a) bond strength (b) dipole moment

(c) bond length (d) shape

Q.90 Dipole moment of H2O is

(a) 1.85 (b) 1.82

(c) 1.87 (d) 1.83

ANSWERS

Questions	1	2	3	4	5
Answers	b	b	b	d	a
Question	6	7	8	9	10

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Answers	a	a	c	c	b
Questions	11	12	13	14	15
Answers	b	d	c	b	c
Questions	16	17	18	19	20
Answers	a	b	a	d	c
Questions	21	22	23	24	25
Answers	a	a	b	d	d
Questions	26	27	28	29	30
Answers	c	b	c	b	b
Questions	31	32	33	34	35
Answers	b	b	a	c	b
Questions	36	37	38	39	40
Answers	c	b	c	d	a
Questions	41	42	43	44	45
Answers	c	b	a	b	b
Questions	46	47	48	49	50
Answers	d	b	d	d	b
Questions	51	52	53	54	55
Answers	b	b	a	b	c
Questions	56	57	58	59	60
Answers	c	a	b	a	b
Question	61	62	63	64	65

s					
Answers	d	b	d	a	c
Questions	66	67	68	69	70
Answers	c	a	a	b	a
Questions	71	72	73	74	75
Answers	c	d	b	b	c
Questions	76	77	78	79	80
Answers	c	b	b	c	a
Questions	81	82	83	84	85
Answers	d	d	a	b	c
Questions	86	87	88	89	90
Answers	a	b	c	b	a