

QAD Series

Atomic structure, bonding, thermochemistry

- Which of the following gave the idea about nucleus?
a) Cathode ray experiment b) Oil drop experiment
c) α -ray/cattering experiment
d) Daviation and Germer's experiment
- Bohr's model can explain
a) spectrum of hydrogen atom only
b) Spectrum of any atom or ion having one electron only
c) Spectrum of hydrogen molecule
d) Solar spectrum
- In a given atom no two electrons can have the same values for all the four quantum numbers. This is called
a) Hund's rule b) Aufbau principle
c) Uncertainty principle d) Pauli's exclusion principle
- The quantum number which determines the shape of the orbital is
a) Principle quantum number
b) azimuthal quantum number
c) Magnetic quantum number
d) spins quantum number
- An e- has magnetic quantum number as -3, what is its principal quantum number?
a) 1 b) 2 c) 3 d) 4
- The order of increasing energies of the orbitals follows
a) $5p < 4f < 6s < 5d$ b) $5p < 6s < 4f < 5d$
c) $4f < 5p < 5d < 6s$ d) $5p < 5d < 4f < 6s$
- From the given set of quantum numbers the one that is inconsistent with the theory is
a) $n = 3, l = 2, m = -3, s = +1/2$
b) $n = 4, l = 3, m = 3, s = +1/2$
c) $n = 2, l = 1, m = 0, s = -1/2$
d) $n = 4, l = 3, m = 2, s = +1/2$
- 2p - orbitals have
a) $n = 1, l = 2$ b) $n = 1, l = 0$ c) $n = 2, l = 1$ d) $n = 2, l = 0$
- Maximum number of electrons in a sub shell of an atom is determined by the following:
a) $2l + 1$ b) $4l + 1$ c) $2n^2$ d) $4l + 2$
- Which of the following electron transitions will require largest amount of energy in a hydrogen atom?
a) From $n = 1$ to $n = 2$ b) from $n = 2$ to $n = 3$
c) from $n = \infty$ to $n = 1$ d) from $n = 3$ to $n = 5$
- The radius of which of the following orbit is same as that of 1st Bohr's orbit of hydrogen atom?
a) He^+ ($n = 2$) b) Li^{2+} ($n = 2$) c) Li^{2+} ($n = 3$) d) Be^{3+} ($n = 2$)
- The number of 2p electrons having spin quantum number $s = -1/2$ are:
a) 6 b) 0 c) 2 d) 3
- Which d - orbital has different shape from rest of all d - orbitals?
a) $d_{x^2-y^2}$ b) d_{z^2} c) d_{xy} d) d_{yz}
- If uncertainty in position of electron is zero, the uncertainty in its momentum would be
a) Zero b) $h/2\pi$ c) $h/4\pi$ d) infinity
- The paramagnetic character follows the order
a) $\text{Mn} > \text{Cr} > \text{Zn}$ b) $\text{Fe} > \text{Zn} > \text{Co}$
c) $\text{Cr} > \text{Fe} > \text{Zn}$ d) $\text{Hg} > \text{Mn} > \text{Fe}$
- The energy of an electron in n^{th} orbit of hydrogen atom is
a) $\frac{13.6}{n^2} \text{ eV}$ b) $\frac{13.6}{n} \text{ eV}$ c) $-\frac{13.6}{n^2} \text{ eV}$ d) $\frac{13.6}{n} \text{ eV}$
- According to Bohr theory, the angular momentum for an element of 5th orbit is
a) $5h/\pi$ b) $2.5h/\pi$ c) $15h/\pi$ d) $25h/\pi$
- The orbital angular momentum of an electron revolving in a p-orbital is
a) zero b) $h/\sqrt{2}\pi$ c) $(1/2)h/2\pi$ d) $h/2\sqrt{2}\pi$
- Which one is not true for the cathode rays?
a) They have KE
b) the cause certain substance to show fluorescence
c) They travel in st. line
d) they are electromagnetic wave
- Non - directional orbital is
a) 3s b) 4f c) 4d d) 4p
- The wavelength of radiation emitted when an electron drops from 3rd to 2nd orbit in H-atom will be nearly
a) 3300Å b) 6600Å c) 9900Å d) 11000Å
- Which of the following series of lines is found in the UV region of the atomic spectrum of hydrogen?
a) Balmer series b) Paschen series
c) Brackett series d) Lyman series
- An orbital can have maximum two electrons with opposite spin is:
a) Aufbau principle
b) Heisenberg's uncertainty principle
c) Hund's rule d) Pauli's exclusion principle
- In the absence of exclusion principle, the ground state configuration of Li is:
a) $1s^2 2s^1$ b) $1s^2 s^2$ c) $1s^3$ d) $1s^1 2s^1 2p^1$
- The magnetic quantum number of valence electron of sodium atom is:
a) 0 b) -1 c) +1 d) -2
- The lightest elementary particle is:
a) neutrino b) electron c) meson d) positron
- In the radioactive transition, ${}_{92}^{238}\text{U} \rightarrow {}_{82}^{206}\text{U}$. The number of α - and β -particles emitted are:
a) 4 α , 6 β b) 7 α , 8 β c) 8 α , 6 β d) 4 α , 6 β
- In the nuclear reaction, ${}_{15}^{30}\text{P} \rightarrow {}_{14}^{30}\text{Si} + X$, X is
a) neutron b) positron c) electron d) proton
- The correct order of O-O bond length is:
a) $\text{O}_2 < \text{O}_3 < \text{H}_2\text{O}_2$ b) $\text{H}_2\text{O}_2 < \text{O}_3 < \text{O}_2$
c) $\text{O}_3 < \text{O}_2 < \text{H}_2\text{O}_2$ d) $\text{H}_2\text{O}_2 < \text{O}_2 < \text{O}_3$
- The formation of chemical bond is accompanied by
a) Increase in energy b) decrease in energy
c) Neither decrease nor increase in energy
d) can't be predicted
- The low solubility of BaSO_4 in water is due to
a) Dissociation energy b) Low lattice energy
c) High lattice energy d) Ionic bonds
- A molecule in which sp^2 hybrid orbitals are used by the central atom in forming covalent bonds is
a) ClO_2^- b) SO_2 c) PCl_5 d) N_2
- Which of the following involves sp^3d^2 hybridization?
a) SF_4 b) I_3^- c) IF_3 d) XeF_6
- Which of the following contains co - ordinate covalent bond?
a) N_2H_5^+ b) BaCl_2 c) HCl d) H_2O
- Which has the least bond angle?
a) NH_3 b) BeF_2 c) H_2O d) CH_4
- The octet rule is not valid for the molecule
a) CO_2 b) H_2O c) O_2 d) CO
- The pair of species having identical shapes for molecules of both species is
a) CF_4, SF_4 b) $\text{BF}_3, \text{PCl}_3$ c) PF_5, IF_5 d) $\text{XeF}_2, \text{CO}_2$
- Which of the following is a polar molecule?
a) BF_3 b) SF_4 c) SiF_4 d) XeF_4
- KF combines with HF to form KHF_2 . The compound contains species
a) K^+F^- and H^+ b) K^+ , F^- and HF
c) K^+ and $[\text{HF}_2]^-$ d) $[\text{KHF}]^+$ and F^-

40. Among the following molecules, which one is planar?
a) BCl_3 b) SO_2Cl_2 c) NH_3 d) NF_3
41. Which of the following groupings represent isoelectronic species?
a) NO , CN^- , N_2 , O_2^- b) NO^+ , C_2^{2-} , O_2^- , CO
c) N_2 , C_2^{2-} , CO , NO d) CO , NO^+ , CN^- , C_2^{2-}
42. In NO_2^- ion, number of bond pairs and lone pair of electrons on nitrogen atom are
a) 2, 2 b) 3, 1 c) 1, 3 d) 3, 0
43. The sequence that correctly describes the relative bond strength pertaining to oxygen molecule and its cation or anion is
a) $\text{O}_2^- > \text{O}_2^{2-} > \text{O}_2 > \text{O}_2^+$ b) $\text{O}_2 > \text{O}_2^+ > \text{O}_2^{2-} > \text{O}_2^-$
c) $\text{O}_2^+ > \text{O}_2 > \text{O}_2^{2-} > \text{O}_2^-$ d) $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$
44. Which of the following has $\pi\pi - d\pi$ bonding?
a) NO_3^- b) SO_3^{2-} c) BO_3^{3-} d) CO_3^{2-}
45. Which of the following order is correct regarding their dipole moments?
a) $\text{BF}_3 > \text{NF}_3 > \text{NH}_3$ b) $\text{NF}_3 > \text{BF}_3 > \text{NH}_3$
c) $\text{NH}_3 > \text{BF}_3 > \text{NF}_3$ d) $\text{NH}_3 > \text{NF}_3 > \text{BF}_3$
46. The bonds in N_2O_5 are:
a) Only ionic b) only covalent
c) Covalent and ionic d) covalent and coordinate
47. Which is covalent bond?
a) Na_2S b) SnCl_4 c) NaH d) MgCl_2
48. Intramolecular H-bonding is present in:
a) o-Nitrophenol b) Salicylaldehyde
c) m-Nitrophenol d) Both a and b
49. Incorrect order of decreasing boiling points is:
a) $\text{HF} > \text{HI} > \text{HBr} > \text{HCl}$ b) $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$
c) $\text{Br}_2 > \text{Cl}_2 > \text{F}_2$ d) $\text{CH}_4 > \text{GeH}_4 > \text{SiH}_4$
50. Identify the intensive property from the following:
a) Volume b) Mass c) Enthalpy d) Temperature
51. For which of the following reaction will ΔH be equal to ΔE :
a) $\text{H}_2(\text{g}) + 1/2\text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$ b) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g})$
c) $2\text{NO}_2(\text{g}) \rightarrow \text{N}_2\text{O}_4(\text{g})$ d) $2\text{SO}_3(\text{g}) \rightarrow 2\text{SO}_2(\text{g}) + \text{O}_2(\text{g})$
52. For an endothermic reaction where ΔH represents the enthalpy of reaction, the minimum value for the energy of activation will be:
a) Less than ΔH b) Zero
c) Equal to ΔH d) More than ΔH
53. The bond dissociation energy of C-H in CH_4 from the equation, $\text{C}(\text{g}) + 4\text{H}(\text{g}) \rightarrow \text{CH}_4$; $\Delta H = -397.8 \text{ kcal}$ is:
a) +99.45 kcal b) -99.45 kcal c) +397.8 kcal d) +198.9 kcal
54. A process is spontaneous at all temperature if:
a) $\Delta H > 0$ & $\Delta S < 0$ b) $\Delta H > 0$ & $\Delta S > 0$
c) $\Delta H = 0$ & $\Delta S < 0$ d) $\Delta H < 0$ & $\Delta S > 0$
55. $\text{S} + 3/2\text{O}_2 \rightarrow \text{SO}_3 + 2x \text{ kcal}$
 $\text{SO}_2 + 1/2\text{O}_2 \rightarrow \text{SO}_3 + y \text{ kcal}$, the heat of formation of SO_2 is:
a) $y-2x$ b) $2x+y$ c) $x+y$ d) $2x/y$
56. Identify the state function among the following
a) w b) w c) q/w d) $q + w$
57. 78. For the process $2\text{F}(\text{g}) \rightarrow \text{F}_2(\text{g})$. The sign of ΔH and ΔS respectively are
a) +, - b) +, + c) -, - d) -, +
58. Entropy change involved in the conversion of 1 mole of liquid water at 373 K to vapour at the same temperature will be ($\Delta H_{\text{vap}} = 2.257 \text{ kJ/g}$)
a) 0.019 kJ b) 0.109 kJ c) 0.229 kJ d) 0.320 kJ
59. For an adiabatic process, which of the following is correct?
a) $P\Delta V = 0$ b) $Q = +W$ c) $\Delta E = 0$ d) $Q = 0$
60. According to first law of thermodynamics:
a) $\Delta E = Q + W$ b) $\Delta E = W - Q$ c) $W = Q + \Delta E$ d) None
61. Enthalpy of a compound is equal to its:
a) Heat of combustion b) heat of formation
c) Heat of reaction d) heat of solution
62. Bond energy of H - H and Cl - Cl are 430 kJ mol^{-1} and 240 kJ mol^{-1} . Bond enthalpy of HCl is
a) 245 kJ mol^{-1} b) 290 kJ mol^{-1} c) 380 kJ mol^{-1} d) 425 kJ mol^{-1}
63. Heat of combustion is always
a) Positive b) negative c) neutral d) all of these
64. The total entropy change for a system and its surroundings increases, if the process is
a) reversible b) irreversible
c) exothermic d) endothermic
65. In which of the following change entropy decreases
a) Melting of ice b) Dissolving sucrose in water
c) Vaporization of camphor
d) Crystallization of sucrose from solution
66. For the precipitation, reaction of Ag^+ ions with NaCl which of the following statements is true?
a) ΔH is zero for the reaction b) ΔG is zero for the reaction
c) ΔG is -ve for the reaction d) $\Delta G = \Delta H$
67. Heat of combustion ΔH° for $\text{C}(\text{s})$, $\text{H}_2(\text{g})$ and $\text{CH}_4(\text{g})$ are -94, -68 and -213 kcal/mol . Then ΔH° for $\text{C}(\text{s}) + 2\text{H}_2(\text{g}) \rightarrow \text{CH}_4(\text{g})$ is:
a) -17 kcal b) -111 kcal c) -170 kcal d) -85 kcal
68. The enthalpy of formation of NH_3 is $-46.0 \text{ kJ mol}^{-1}$. The enthalpy change for the following reaction is:
 $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$
a) 42.0 kJ b) 64.0 kJ c) 86.0 kJ d) 92.0 kJ
69. 4.6 kJ heat is liberated on burning 0.5 g of sulphur. The enthalpy of formation of SO_2 is [molecular weight of S = 32, O = 16]
a) +294.4 kJ b) -294.4 kJ c) +462.4 kJ d) -462.4 kJ
70. What is not zero for elementary substances at their standard state?
a) S° b) H° c) G° d) Both H° & S°
71. Absorption of heat occurs when
a) carbon burns in air
b) sulphur dioxide is oxidised to sulphur trioxide
c) ammonium chloride dissolves in water
d) cooking gas is burnt
72. In reversible adiabatic expansion of ideal gas
a) $w = 0$ b) $\Delta E = 0$ c) $\Delta V = 0$ d) $\Delta S = 0$
73. Which of the following the pair contain only extensive properties?
a) Enthalpy, refractive index b) Volume, temperature
c) Enthalpy, volume d) Viscosity, volume
74. Total heat released by complete reaction of 1 mole of H_2SO_4 with excess of KOH solution is
a) 57.1 kJ b) $57.1 \times 2 \text{ kJ}$ c) $\frac{57.1}{2} \text{ kJ}$ d) None
75. The process; $\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COO}^- + \text{H}^+$, should be
a) exothermic b) endothermic
c) neither exothermic nor endothermic
d) exothermic or endothermic depending upon temperature.
76. The mixing of gases is generally accompanied by
a) decrease in entropy b) decrease in free energy
c) change in heat content d) increase in free energy
77. Work done in vaporization of one mol of water at 373 K against the pressure of 1 atmosphere is approximately.
a) -3100.0 J b) 31.20 J c) -20.2 J d) +20.2 J
79. When enthalpy and entropy change for a chemical reaction are $-2.5 \times 10^3 \text{ cal}$ and 7.4 cal deg^{-1} respectively. Predict that reaction at 489 K is
a) spontaneous b) reversible
c) irreversible d) non-spontaneous
80. For an endothermic spontaneous reaction which two parameters are greater than zero?
a) ΔG , ΔH b) ΔS , ΔG c) ΔH , ΔS d) ΔG , ΔE