INDIAN ASSOCIATION OF CHEMISTRY TEACHERS
NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2003-2004

Date of Examination: 23 November 2003 **Time: 13:00 to 15:00 Hr**

This question paper contains 100 multiple-choice questions. Each correct answer carries 3 marks and 1 mark will be deducted for each wrong answer. No weightage will be given to unattempted questions.

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1. In a titration experiment, 50.0 mL of 0.1N HCl is being titrated against 0.1N NaOH. The pH of the solution on addition of 49.9 mL of NaOH is approximately

   (A) 7.0

   (B) 6.0

   (C) 4.0

   (D) 3.0

2. The standard reduction potentials of Cu^{2+}, Zn^{2+}, Sn^{2+} and Ag^{+} are 0.34, –0.76, –0.14 and 0.80 V, respectively. The storage that is possible without any reaction is for

   (A) $CuSO_4$ solution in a zinc vessel

   (B) $AgNO_3$ solution in a zinc vessel

   (C) $AgNO_3$ solution in a tin vessel

   (D) $CuSO_4$ solution in a silver vessel

3. The atom of an element X contains 27 electrons. X is expected to be

   (A) a non-metal belonging to p-block

   (B) paramagnetic belonging to d-block

   (C) diamagnetic belonging to d-block

   (D) an s-block element

4. The number of hydrogen bonds formed by each H_2O molecule in an ice crystal is

   (A) 6

   (B) 4

   (C) 2

   (D) 3

5. Considering z –axis to be the internuclear axis, the combination of orbitals on Li and Cl atoms respectively, that can lead to a stable sigma bond is

   (A) 2s and $3p_y$

   (B) 1s and $3p_y$

   (C) 1s and $3p_z$

   (D) 2s and $3p_z$

6. $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{236}_{92}U \rightarrow X + ^{90}_{38}Sr + Y$

   In the above nuclear fission reaction, products are

   (A) $X = ^{140}_{56}Ba$, $Y = 3\,^{1}_{0}n$

   (B) $X = ^{144}_{55}Cs$, $Y = 2\,^{1}_{0}n$

   (C) $X = ^{144}_{54}Xe$, $Y = 2\,^{1}_{0}n$

   (D) $X = ^{145}_{54}Xe$, $Y = 2\,^{1}_{0}n$

7. For the reaction $N_2 + 3H_2 = 2NH_3$, the units of K_c and K_p respectively are

   (A) $mol^{-2}L^{2}$ and bar^{-2}

   (B) $mol^{-2}L^{2}$ and bar^{-1}

   (C) mol^{-1} L and bar^{-2}

   (D) $mol^{-1}L^{-1}$ and bar^{-1}

8. There is a mixture of Cu (II) chloride and Fe(II) sulphate. The best way to separate the metal ions from this mixture in qualitative analysis is by treating it with

   (A) hydrogen sulphide in mild acidic medium, where only Cu (II) sulphide will be precipitated

   (B) ammonium hydroxide buffer, where only Fe(II) hydroxide will be precipitated

(C) hydrogen sulphide in mild acidic medium, where only Fe(II) sulphide will be precipitated

(D) ammonium hydroxide buffer, where only Cu (II) hydroxide will be precipitated

9. The interhalogen compound that **cannot** exist is

(A) IBr_5

(B) ICl_7

(C) IF_4

(D) BrF_5

10. The solubility product of AgCl is 1.8×10^{-10}. The minimum volume (in L) of water, required to dissolve 1.9 mg of AgCl, is approximately

(A) 10

(B) 2

(C) 1

(D) 20

11. Consider a 20 W light source that emits monochromatic light of wavelength 600 nm. The number of photons ejected per second in terms of Avogadro's constant (N_A), is approximately

(A) N_A

(B) $10^{-2}\ N_A$

(C) $10^{-4}\ N_A$

(D) $10^{-6}\ N_A$

12. Common salt is important for the physiological activity of human body because it

(A) contains ions, each having eight electrons in its outermost shell and therefore acts as an inert nutrient

(B) is involved in the carbohydrate metabolism

(C) has a high lattice energy and is one of the sources of energy in the body

(D) helps in maintaining the osmotic balance among the body fluids

13. You are given a solution of an alkali. In order to estimate its concentration in terms of normality, you need to know

(A) the volume of the solution, the volume of the alkali present in it and its formula weight

(B) the mass of the solution, the mass of the alkali present in it and its equivalent weight

(C) the volume of the solution, the mass of the alkali present in it and its equivalent weight

(D) the mass of the solution, the volume of the alkali present in it and its equivalent weight

14. Goldsmiths use borax while making gold jewelry. They heat the mixture of a gold sample and borax on a flame, through which air is passed using a blow pipe because

(A) heat and air convert the impurities into their oxides that react with molten borax forming a slag which can be separated from gold

(B) gold oxide formed by heat and air gets reduced by borax to pure gold

(C) air increases the heating temperature at which gold dissolves in borax, and on cooling gets recrystallised in pure form

(D) borax reduces the hardness of gold at high temperature so that it can be stretched to form jewelry easily

15. Human blood has haemoglobin that contains iron. The function of iron in haemoglobin is to

(A) maintain the level of iron ions in the cells

(B) reversibly bind with oxygen, enabling the cells to get their requirement of oxygen

(C) catalyse different redox reactions as it can exist in more than one oxidation states

(D) align the cells, as it is ferromagnetic

16. The geometry of ammonia molecule can be best described as

(A) nitrogen at one vertex of a regular tetrahedron, the other three vertices being occupied by the three hydrogens

(B) nitrogen at the centre of a tetrahedron, three of the vertices being occupied by three hydrogens

(C) nitrogen at the centre of an equilateral triangle, three corners being occupied by three hydrogens

(D) nitrogen at the junction of a T, three open ends being occupied by three hydrogens

17. In the gold plating process, sodium cyanide solution is used as an electrolyte instead of nitric acid because

(A) cyanide forms a complex with gold and thus helps uniform deposition of gold

(B) sodium cyanide is a better solvent for gold ions

(C) cyanide binds with impurity ions and keeps the impurities in solution

(D) deposition of gold from nitric acid bath is slow

18. The molar concentration of pure water at 4°C and 1 atm pressure is

(A) 1

(B) 5.5

(C) 18

(D) 55.5

19. Sodium hydroxide **cannot** be used as a primary standard for acid base titration because

(A) it is corrosive and reacts with glass

(B) the dissolution of sodium hydroxide in water is highly exothermic, hence its concentration changes on dissolution

(C) it is hygroscopic and also reacts with atmospheric carbon dioxide

(D) hydroxides cannot be used as primary standards

20. The pK_a of acetic acid is 4.74, which implies that

(A) pH of 1 N acetic acid is 4.74

(B) at pH 4.74, the dissociation of acetic acid is maximum

(C) at pH 4.74, half of the acetic acid molecules are dissociated in the solution

(D) at pH 4.74, the dissociation of acetic acid is minimum

21. Aluminium oxide exists in nature as gems with different colours. The reason for the difference in colour is that

(A) the oxidation states of aluminium in these gems are different

(B) the extent of crystallinity in these gems is different

(C) the Al-O bonding is different in these gem structures

(D) there are different transition metal ions present as impurities in these gems

22. The diagonal relationship of elements in the periodic table arises because of similarity in

(A) ionic radius

(B) electronic configuration

(C) crystal structure

(D) charge/radius ratio of the corresponding ions

23. The metal that can be extracted from its oxide by reduction with carbon is

(A) sodium

(B) calcium

(C) iron

(D) aluminium

24. Chromium has the **lowest** oxidation state in

(A) chromium sulphate

(B) chromium trioxide

(C) potassium chromate

(D) potassium dichromate

25. The anhydride of nitric acid is

(A) nitric oxide

(B) nitrous oxide

(C) dinitrogen trioxide

(D) dinitrogen pentoxide

26. For a third order reaction 2A + B $\rightarrow$ 3C with rate constant k (in proper units), the correct rate law is

(A) $-\frac{d[A]}{dt} = k.[A]^2[B]$

(B) $-\frac{d[B]}{dt} = k.[A]^2[B]$

(C) $-\frac{d[C]}{dt} = k.[A]^2[B]$

(D) $-\frac{d[A]}{dt} = -k.2\,[A].[B]$

27. A catalyst increases the

(A) rate of forward reaction only

(B) free energy change in the reaction

(C) rates of both forward and reverse reactions

(D) equilibrium constant of the reaction

28. The quantity of electricity required to reduce 0.05 mol of MnO_4^- to Mn^{2+} in acidic medium would be

(A) 0.01 F

(B) 0.05 F

(C) 0.15 F

(D) 0.25 F

29. $Fe^{2+} + 2e \rightarrow Fe$ ……. (I)

$Fe^{3+} + e \rightarrow Fe^{2+}$……. (II)

The standard potentials (in volt) corresponding to the reactions (I) and (II) are E_1 and E_2 respectively. The value (in volt) of the standard potential corresponding to the reaction $Fe^{3+} + 3e \rightarrow Fe$ is

(A) $(E_1 + E_2)$

(B) $(2E_1 + E_2)/3$

(C) $(E_1 + 2E_2)/2$

(D) $(E_1 + E_2)/3$

30. The following equilibrium exists in a saturated solution of NH_4Cl

$NH_4Cl(s) \bullet NH_4^+(aq) + Cl^-(aq)$,
$\Delta H_{25°C} = 3.5$ kcal mol^{-1}

A change that will shift the equilibrium to the right is

(A) decrease in temperature

(B) increase in temperature

(C) addition of NH_4Cl crystals to the reaction mixture

(D) addition of NH_4OH solution to the reaction mixture

31. The molar conductivities of H^+, Li^+ and Na^+ ions in aqueous solutions at infinite dilution are in the order

(A) $H^+ > Li^+ > Na^+$

(B) $H^+ < Li^+ < Na^+$

(C) $H^+ > Na^+ > Li^+$

(D) $Na^+ > H^+ > Li^+$

32. Sodium chloride crystallizes in a face centered cubic lattice in which each

(A) sodium ion is tetrahedrally surrounded by 4 chloride ions and each chloride ion is tetrahedrally surrounded by 4 sodium ions

(B) sodium ion is tetrahedrally surrounded by 4 chloride ions and each chloride ion is octahedrally surrounded by 6 sodium ions

(C) sodium ion is octahedrally surrounded by 6 chloride ions and each chloride ion is surrounded by 4 sodium ions

(D) sodium ion is octahedrally surrounded by 6 chloride ions and each chloride ion is octahedrally surrounded by 6 sodium ions

33. The species which has its fifth ionisation potential equal to 340 eV is

(A) B^+

(B) C^+

(C) B

(D) C

34. Considering air as a 4:1 mixture of nitrogen and oxygen, the mass of air in a hall with dimensions 5m $\times$ 5 m $\times$ 5m at STP is approximately

(A) 160 g

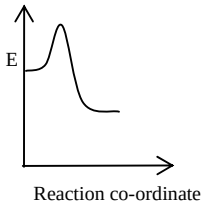
(B) 160 kg

(C) 16 g

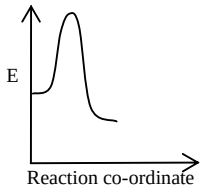
(D) 1.60 kg

35. Which energy diagram corresponds to exothermic reaction and highest value of the rate constant?

(A)



(C)



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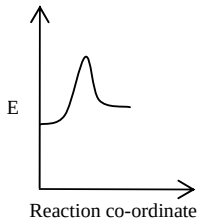
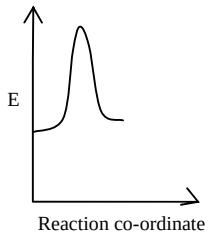


(D)



36. In nature, ammonia is synthesized by *nitrifying bacteria* using enzymes while in industry it is manufactured from N_2 and H_2 using iron oxide catalyst at 550^0C. Under the same industrial conditions, enzymes **cannot** be used because

(A) enzymes get deactivated at high temperature

(B) enzymes catalyze reactions only in living systems

(C) the reaction becomes vigorous and uncontrollable

(D) the enzymes use nitrates in place of N_2

37. Gadolinium (^{153}Gd), which has a half-life of 242 days, is used to detect osteoporosis. The percentage of ^{153}Gd left in a patient's system after 2 years will be

(A) 33.0

(B) 25.0

(C) 12.5

(D) 6.25

38. Generation of a blue colour which is **not** due to metal-ammonia complex formation is seen when

(A) sodium is dissolved in liquid ammonia

(B) copper (II) sulphate is reacted with ammonium hydroxide

(C) cobalt (II) chloride is reacted with ammonium hydroxide

(D) formaldehyde is reacted with ammonium hydroxide

39. Iron articles get rusted on weathering due to the formation of

(A) FeO

(B) Fe_2O_3

(C) Fe_3O_4

(D) $Fe(OH)_3$

40. Calcium gluconate syrup and calcium phosphate tablets are calcium supplements used to treat calcium deficiency. However, calcium gluconate is preferred over the latter because it is

(A) more easily absorbed into the blood

(B) released slowly in the body

(C) less toxic

(D) more tasty

41. Milk of magnesia used as a medicine for treating indigestion is a substance that

(A) helps in disintegration of food products leading to their facile metabolism

(B) combines with gastric hydrochloric acid thereby enhancing the latter's efficiency

(C) improves the enzymatic activities inside the stomach

(D) neutralizes excess acidity, providing a buffered medium inside the stomach

42. Glycogen, a storage form of carbohydrate, in liver

(A) acts as a reservoir of antioxidant activity

(B) helps in digestion by secreting enzymes

(C) acts as a source of energy during starvation

(D) acts as a reservoir to neutralize acidic food

43. Transport of oxygen is an important function of blood. Partial pressure of O_2 in the highest and lowest, respectively, in

(A) muscles and heart

(B) lungs and muscles

(C) heart and lungs

(D) muscles and lungs

44. Metal ions are known to interact with amino acid residues of proteins. The amino acids with larger number of metal binding sites are

(A) cysteine, alanine

(B) methionine, tryptophan

(C) glutamic acid, cysteine

(D) arginine, isoleucine

45. In an enzymatic redox reaction occurring in a buffer with NAD^+ as a coenzyme, the reaction stops when urea is introduced into the reaction mixture. This is due to

(A) modification of amino acid residues in the enzyme

(B) change in pH

(C) change in NAD^+ function

(D) change in three dimensional structure of protein

46. The number of hydrogen bonds present in the sequence of a stretch of a double helical DNA 5′ATGCCTAA3′ is

(A) 16

(B) 19

(C) 24

(D) 20

47. A polysaccharide used to make fruit jelly is

(A) amylose

(B) cellulose

(C) pectin

(D) glycogen

48. In sickle cell anaemia, the basis of malfunction of haemoglobin molecule is

(A) faulty binding of the heme groups

(B) incorrect secondary structure

(C) reduced affinity for oxygen

(D) substitution of a single amino acid

49. $[FAD] + 2\ Cyt\ c\ (Fe^{2+}) + 2H^+ \rightarrow [FADH_2] + 2\ Cyt\ c\ (Fe^{3+})$

For the above reaction, the electron donor and the reduced product are respectively

(A) 2 Cyt c (Fe^{2+}) and $[FADH_2]$

(B) [FAD] and $[FADH_2]$

(C) 2 Cyt c (Fe^{2+}) and 2 Cyt c (Fe^{3+})

(D) [FAD] and 2 Cyt c (Fe^{3+})

50. The portions of proteins having the highest mobility are

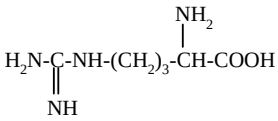
(A) α-helices

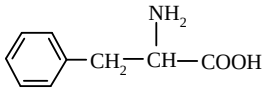
(B) β-sheets

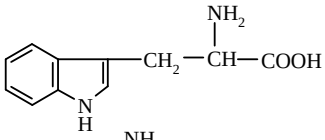
(C) peptide bonds

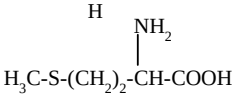
(D) surface side chains

51. The amino acid absorbing at the longest wavelength is

(A) 

(B) 

(C) 

(D) 

52. Carbon dioxide is gaseous, while SiO_2 is solid because

(A) CO_2 is a linear molecule, while SiO_2 is an angular one

(B) the van der waal's forces are very strong in SiO_2

(C) CO_2 is covalent, while SiO_2 is ionic

(D) unlike C, Si cannot form stable bonds with O, hence S has to form a 3D lattice

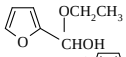
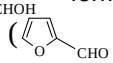
53. An ideal gas, on adiabatic expansion, gets cooled because

(A) the average distance between the gas molecules increases and hence the intermolecular interaction decreases

(B) the internal energy of the gas is used in doing the work of expansion

(C) the temperature of the gas is lower than the inversion temperature corresponding to Joule -Thomson effect

(D) the pressure decreases and temperature is proportional to the pressure

54. Compound  formed by the reaction of furfural () with ethanol is

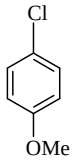
(A) an aldol

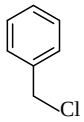
(B) an acetal

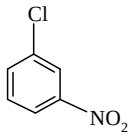
(C) a hemiacetal

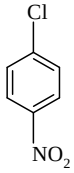
(D) a ketal

55. Compound which undergoes nucleophilic substitution reactions most readily is

(A) 

(B) 

(C) 

(D) 

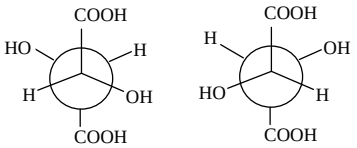
56. The maximum amount of CH_3Cl that can be prepared by reacting 20.0 g of CH_4 with 10.0 g of Cl_2 is

(A) 30.0 g

(B) 7.1 g

(C) 63.1 g

(D) 31.6 g

57. 

The above pair represents

(A) enantiomers

(B) diastereomers

(C) identical compounds

(D) positional isomers

58. $CH_3(CH_2)_5CH_3 \longrightarrow$ 

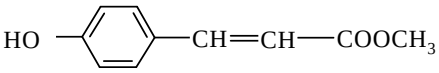
The reaction involved in the above conversion is

(A) cracking

(B) refining

(C) Fisher-Tropsch synthesis

(D) reforming

59. 

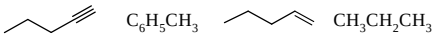
The number of moles of bromine required for **complete** reaction with one mole of the above compound is

(A) 1

(B) 2

(C) 3

(D) 4

60. 

a b c d

The correct order of acidic character in the above compounds is

(A) a > b > c > d

(B) c > a > d > b

(C) b > c > a > d

(D) a > c > b > d

61. The IUPAC name of $HOCH_2CH{=}C{-}(CH_3)_2$

(A) 2-methyl-2-buten-4-ol

(B) 3-methyl-2-buten-1-ol

(C) 2-methyl-2-butenol

(D) 3-methyl-2-butenol

62. Out of the four pK_a values 3.75, 9.89, 15.54 and 19.30, the **highest** pK_a value corresponds to

(A) acetone

(B) formic acid

(C) phenol

(D) methanol

63. The reagent which can react with 1-chlorobutane to give substitution reaction is

(A) $AlCl_3$

(B) KOH-MeOH

(C) NaCN

(D) Mg-Ether

64. The aprotic polar solvent is

(A) isopropanol

(B) 1,2-dichloroethane

(C) nitrobenzene

(D) chloroform

65. $K_2S_2O_8$, acidic $K_2S_2O_8$ and acidic MnO_2 oxidise I^-, Br^-, Cl^- to I_2, Br_2 and Cl_2, respectively. From the given data, the sequence that represents the correct order of increasing oxidising ability is

(A) $I_2 > K_2S_2O_8 > Br_2$

(B) acidic $MnO_2 > K_2S_2O_8 > Cl_2$

(C) $K_2S_2O_8 > I_2 > Br_2$

(D) $Cl_2 > K_2S_2O_8 > Br_2$

66. The most **unstable** compound is

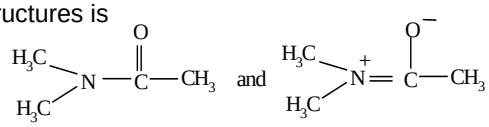
(A) 2-oxobutanoic acid

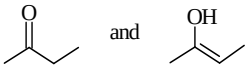
(B) 3-oxobutanoic acid

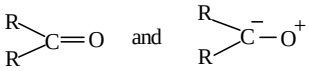
(C) 3-amino-2-butanone

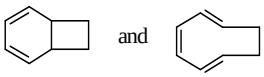
(D) 2-hydroxybutanal

67. The pair representing valid resonance structures is

(A) 

(B) 

(C) 

(D) 

68. The group which contains a Lewis acid, a nucleophile and a radical is

(A) C_2H_6, Br^+, Cl atom

(B) NH_3, $AlCl_3$, H atom

(C) H^+, BF_3, H_2O^+

(D) C_6H_6, CH_3^+, Cl_2

69. The compound that on treatment with benzene sulphonyl chloride, forms a precipitate soluble in alkali, is

(A) $(C_2H_5)_2NH$

(B) $C_6H_5NHCOCH_2CH_3$

(C) C_6H_5-CH_2-NH_2

(D) CH_3-$CONH_2$

70. In the conversion, CH_3-CH_2-C ≡ N → CH_3-CH_2-CH_2-$NHCOCH_3$, the nitrogen atom changes its state of hybridization from

(A) sp^2 to sp^3

(B) sp to sp^3

(C) sp to sp^2

(D) sp^2 to sp

71. The compound that readily undergoes decarboxylation is

(A) HOOC-$(CH_2)_4$-COOH

(B) C_6H_5-COOH

(C) HOOC-CH_2-COOH

(D) $CH_3CH_2CH_2COOH$

72. In the nitration of an aromatic compound using a mixture of concentrated nitric acid and sulphuric acid, the acids respectively function as

(A) an oxidising agent and an acid

(B) a Brϕnsted and a Lewis acid

(C) a base and an acid

(D) an acid and an oxidizing agent

73. The compound which **does not** react with lithium aluminium hydride is

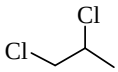
(A) 3-penten-2-one

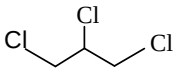
(B) methyl benzoate

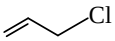
(C) 2-pentanol

(D) propanenitrile

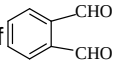
74. In the reaction of chlorine with propene at 450°C, the **major** product is

(A) 

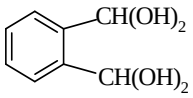
(C) 

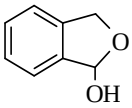
(B) 

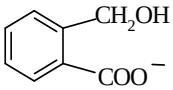
(D) 

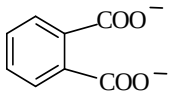
75. The treatment of 

with conc. NaOH gives

(A) 

(C) 

(B) 

(D) 

76. The compound that gives a lactone on heating is

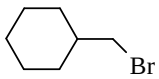
(A) pentanedioic acid

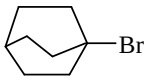
(B) 4-hydroxypentanoic acid

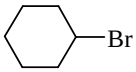
(C) 4-aminopentanoic acid

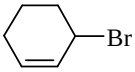
(D) 2-hydroxypentanoic acid

77. The compound which undergoes S_N^1 reaction most rapidly is

(A) 

(C) 

(B) 

(D) 

78. The number of possible mononitro isomers on nitration of 2,3-dichloronaphthalene is

(A) 3

(B) 6

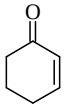
(C) 4

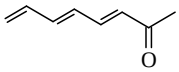
(D) 5

79. The compound having the **highest** dipole moment is

(A) 

(C) 

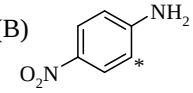
(B) 

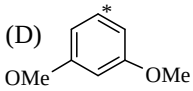
(D) 

80. The most favourable position (indicated by *) for an electrophilic attack is

(A) 

(C) 

(B) 

(D) 

81. Isosteres are compounds having similar geometry and isoelectronic species are species having the same number of electrons. The pair of species CO_2 and NO_2^+ is

(A) isosteric and isoelectronic

(B) isosteric, but not isoelectronic

(C) isoelectronic, but not isosteric

(D) neither isosteric nor isoelectronic

82. An isotope of a radioactive element is produced with the emission of

(A) one α- and one β-particle

(B) one α- and two β-particles

(C) two α- and one β-particle

(D) two α- and two β-particles

83. 1.00 g of a pure element contains 4.39×10^{21} atoms. The element is

(A) U

(B) Ce

(C) Ba

(D) Au

84. The reaction $3O_2(g) \rightarrow 2O_3(g)$ is endothermic. What can be concluded about the average energy per bond in O_2 and O_3?

(A) the average energy per bond in O_2 is greater than that in O_3

(B) the average energy per bond in O_2 is less than that in O_3

(C) the average energy per bond in O_2 is equal to that in O_3

(D) no conclusions can be drawn about the average bond energies from this information alone

85. In an experiment, lead from drinking water is adsorbed onto activated carbon. This adsorption is a first order process with rate constant $1.8 \times 10^{-5}\ s^{-1}$. If the initial concentration of lead in water is 0.3 M, the time required to remove 90% of the initial lead is

(A) 1.3×10^{5} s

(B) 2.4×10^{4} s

(C) 1.8×10^{7} s

(D) 2.7×10^{6} s

86. When H_2S is passed through a solution containing Cu^{2+}, Cd^{2+} and an excess of cyanide ions, cadmium sulphide precipitates while copper ions remain in solution. This is because

(A) Cu^{2+} forms a stable complex with cyanide while Cd^{2+} does not

(B) Cu^{2+} forms a more stable complex with cyanide than Cd^{2+}

(C) Cu^{2+} does not form a sulphide

(D) both CdS and CuS are formed, but CuS is soluble

87. The acidic hydroxide is

(A) $Ca(OH)_2$

(B) $Al(OH)_3$

(C) $B(OH)_3$

(D) TlOH

88. The blue pigment *prussian blue* is an iron complex with formula

(A) $K_4[Fe(CN)_6]$

(B) $K_2[Fe(CN)_4(NH_3)_2]$

(C) $Fe_4[Fe(CN)_6]_3$

(D) $Na_2[Fe(CN)_5NO]$

89. A solution containing Co^{2+}, Zn^{2+} and Al^{3+} is mixed with an excess of KSCN solution. The resulting solution, besides the unreacted ions, should contain

(A) $[Co(SCN)_6]^{4-}$

(B) $[Zn(NCS)_6]^{2-}$

(C) $Al(SCN)_3$

(D) $Zn(SCN)_2$

90. A coordination complex of type MX_2Y_2 [M = metal ion; X,Y = monodentate ligands], can have either a tetrahedral or a square planar geometry. The maximum number of possible isomers in these two cases are respectively

(A) 1 and 2

(B) 2 and 1

(C) 1 and 3

(D) 3 and 2

91. The aqueous solution of a salt of a transition metal ion changes colour from pink to blue, when conc. hydrochloric acid is added to it. The change in colour is due to

(A) evolution of hydrogen that changes the oxidation state of the metal ion

(B) change in the coordination number of the metal ion from 6 to 4 and formation of new species in solution

(C) formation of a coordination complex of the metal ion with hydrochloric acid

(D) protonation of the metal ion

92. A 2% solution of glucose has the same elevation in the boiling point as that of a 5% solution of a non-volatile solute. The molar mass of the solute is

(A) 180

(B) 450

(C) 72

(D) 18

93. Platinum metal (Pt) dissolves in aqua-regia but not in concentrated HCl or HNO_3 because

(A) HCl oxidizes Pt in the presence of HNO_3

(B) HNO_3 reacts with HCl to form chlorine which attacks Pt

(C) HNO_3 oxidizes Pt which is followed by formation of a chloro complex

(D) HCl and HNO_3 together give O_2 that oxidizes Pt

94. The **least** stable metal carbonyl as per the bonding considerations should be

(A) $Cr(CO)_6$

(B) $Mn(CO)_6$

(C) $Fe(CO)_5$

(D) $Ni(CO)_4$

95. A $[M(H_2O)_6]^{2+}$ complex typically absorbs at around 600 nm. It is allowed to react with ammonia to form a new complex $[M(NH_3)_6]^{2+}$ that should have absorption at

(A) 800 nm

(B) 580 nm

(C) 620 nm

(D) 320 nm

96. Dimethyl glyoxime forms a square planar complex with Ni^{2+}. This complex should be

(A) diamagnetic

(B) paramagnetic having 1 unpaired electron

(C) paramagnetic having 2 unpaired electrons

(D) ferromagnetic

97. The compound that **cannot** be formed by xenon is

(A) XeO_3

(B) XeF_4

(C) $XeCl_4$

(D) $XeOF_4$

98. $SnCl_2$ acts as a reducing agent because

(A) $SnCl_2$ can accept electrons readily

(B) Sn^{3+} is more stable than Sn^{2+}

(C) Sn^{4+} is more stable than Sn^{2+}

(D) Sn^{2+} can be readily converted to metallic tin

99. A gas cylinder was found unattended in a public place. The investigating team took the cylinder and collected samples from it. The density of the gas was found to be 2.380 g L^{-1} at 15^0C and 736 mm Hg pressure. Hence the molar mass of the gas is

(A) 83

(B) 71

(C) 32

(D) 58

100. The correct figure representing isothermal and adiabatic expansions of an ideal gas from a particular initial state is