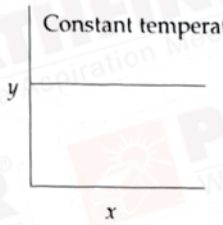
Section - A (Chemistry)

51. The given graph is a representation of kinetics of a reaction.



The y and x axes for zero and first order reactions, respectively are

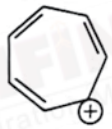
(1) zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)

(2) zero order (y = rate and x = concentration), first order ($y = t_{1/2}$ and x = concenration)

(3) zero order (y = rate and x = concentration), first order (y = rate and $x = t_{1/2}$)

(4) zero order (y = concentration and x = time), first order ($y = t_{1/2}$ and x = concentration)

52. Which compound amongst the following is not an aromatic compound ?

(1) 

(2) 

(3) 

(4) 

53. $RMgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^+} RCOOH$

What is Y in the above reaction ?

(1) $R_3CO^-Mg^+X$

(2) $RCOO^-X^+$

(3) $(RCOO)_2Mg$

(4) $RCOO^-Mg^+X$

54. Which of the following statement is **not** correct about diborane ?

(1) The four terminal B-H bonds are two centre two electron bonds.

(2) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.

(3) Both the Boron atoms are sp^2 hybridised.

(4) There are two 3-centre-2-electron bonds.

55. Gadolinium has a low value of third ionisation enthalpy because of

(1) high exchange enthalpy

(2) high electronegativity

(3) high basic character

(4) small size

56. Which one is **not** correct mathematical equation for Dalton's Law of partial pressure ? Here p = total pressure of gaseous mixture

(1) $p = n_1\frac{RT}{V} + n_2\frac{RT}{V} + n_3\frac{RT}{V}$

(2) $p_i = \chi_i p$, where p_i = partial pressure of i^{th} gas, χ_i = mole fraction of i^{th} gas in gaseous mixture

(3) $p_i = \chi_i p_i^o$, where χ_i = mole fraction of i^{th} gas in gaseous mixture, p_i^o = pressure of i^{th} gas in pure state

(4) $p = p_1 + p_2 + p_3$

57. Given below are two statements :

Statement I :

The boiling points of the following hydrides of group 16 elements increases in the order -

$H_2O < H_2S < H_2Se < H_2Te$.

Statement II :

The boiling points of these hydrides increase with increase in molar mass.

In the light of the above statements, choose the most **appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect

(2) **Statement I** is correct but **Statement II** is incorrect

(3) **Statement I** is incorrect but **Statement II** is correct

(4) Both **Statement I** and **Statement II** are correct

58. Given below are two statements :

Statement I :

The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II :

o-nitrophenol, *m*-nitrophenol and *p*-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

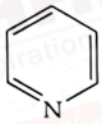
(1) Both **Statement I** and **Statement II** are incorrect.

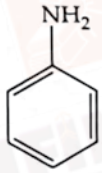
(2) **Statement I** is correct but **Statement II** is incorrect.

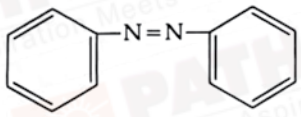
(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

59. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds ?

(1) 

(2) 

(3) 

(4) 

60. Match **List - I** with **List - II**.

	List - I (Drug class)		List - II (Drug molecule)
(a)	Antacids	(i)	Salvarsan
(b)	Antihistamines	(ii)	Morphine
(c)	Analgesics	(iii)	Cimetidine
(d)	Antimicrobials	(iv)	Seldane

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

(2) (a) - (i), (b) - (iv), (c) - (ii), (d) - (iii)

(3) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(4) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

61. The IUPAC name of an element with atomic number 119 is

(1) unnilennium

(2) ununnunnium

(3) ununoctium

(4) ununennium

62. Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions ?

(1) IF_5

(2) SF_4

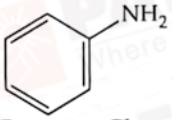
(3) XeF_2

(4) ClF_3

63. Which of the following sequence of reactions is suitable to synthesize chlorobenzene ?

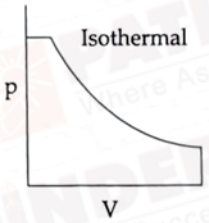
(1) Phenol, $NaNO_2$, HCl, CuCl

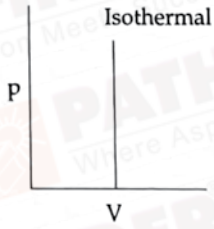
(2)  , HCl

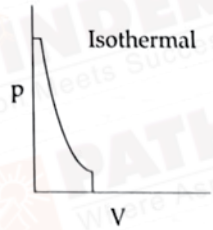
(3)  , HCl, Heating

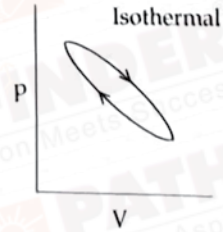
(4) Benzene, Cl_2, anhydrous $FeCl_3$

64. Which of the following p-V curve represents maximum work done ?

(1) 

(2) 

(3) 

(4) 

65. Given below are half cell reactions :

$MnO_4^- + 8\,H^+ + 5\,e^- \rightarrow Mn^{2+} + 4\,H_2O$,

$E^\circ_{Mn^{2+}/MnO_4^-} = -1.510\ V$

$\frac{1}{2}\,O_2 + 2\,H^+ + 2\,e^- \rightarrow H_2O$,

$E^\circ_{O_2/H_2O} = +\,1.223\ V$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

(1) No, because $E^\circ_{cell} = -0.287\ V$

(2) Yes, because $E^\circ_{cell} = +2.733\ V$

(3) No, because $E^\circ_{cell} = -2.733\ V$

(4) Yes, because $E^\circ_{cell} = +0.287\ V$

66. The IUPAC name of the complex - $[Ag(H_2O)_2][Ag(CN)_2]$ is :

(1) diaquasilver(II) dicyanidoargentate(II)

(2) dicyanidosilver(I) diaquaargentate(I)

(3) diaquasilver(I) dicyanidoargentate(I)

(4) dicyanidosilver(II) diaquaargentate(II)

67. Identify the **incorrect** statement from the following

(1) The oxidation number of K in KO_2 is +4.

(2) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

(3) Lithium is the strongest reducing agent among the alkali metals.

(4) Alkali metals react with water to form their hydroxides.

68. What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction ?

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$

[Calculate upto second place of decimal point]

(1) 1.32 g

(2) 3.65 g

(3) 9.50 g

(4) 1.25 g

69. Given below are two statements :

Statement I :
Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.

Statement II :
Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect.

(2) **Statement I** is correct but **Statement II** is incorrect.

(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

70. Which statement regarding polymers is **not correct** ?

(1) Fibers possess high tensile strength.

(2) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

(3) Thermosetting polymers are reusable.

(4) Elastomers have polymer chains held together by weak intermolecular forces.

71. The **incorrect** statement regarding chirality is :

(1) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

(2) Enantiomers are superimposable mirror images on each other.

(3) A racemic mixture shows zero optical rotation.

(4) S_N1 reaction yields 1 : 1 mixture of both enantiomers.

72. Given below are two statements :

Statement I :
In the coagulation of a negative sol, the flocculating power of the three given ions is in the order -
$Al^{3+} > Ba^{2+} > Na^+$

Statement II :
In the coagulation of a positive sol, the flocculating power of the three given salts is in the order -
$NaCl > Na_2SO_4 > Na_3PO_4$

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect.

(2) **Statement I** is correct but **Statement II** is incorrect.

(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

73. Match List - I with List - II.

	List - I (Hydrides)		List - II (Nature)
(a)	MgH_2	(i)	Electron precise
(b)	GeH_4	(ii)	Electron deficient
(c)	B_2H_6	(iii)	Electron rich
(d)	HF	(iv)	Ionic

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
(2) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)
(3) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(4) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

74. Match List - I with List - II.

	List - I		List - II
(a)	Li	(i)	absorbent for carbon dioxide
(b)	Na	(ii)	electrochemical cells
(c)	KOH	(iii)	coolant in fast breeder reactors
(d)	Cs	(iv)	photoelectric cell

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(2) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)
(3) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)
(4) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

75. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :
In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R) :
In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(2) **(A)** is correct but **(R)** is not correct
(3) **(A)** is not correct but **(R)** is correct
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

76. The **incorrect** statement regarding enzymes is :

(1) Like chemical catalysts enzymes reduce the activation energy of bio processes.
(2) Enzymes are polysaccharides.
(3) Enzymes are very specific for a particular reaction and substrate.
(4) Enzymes are biocatalysts.

77. Match List - I with List - II.

	List - I (Products formed)		List - II (Reaction of carbonyl compound with)
(a)	Cyanohydrin	(i)	NH_2OH
(b)	Acetal	(ii)	RNH_2
(c)	Schiff's base	(iii)	alcohol
(d)	Oxime	(iv)	HCN

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(2) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)
(3) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(4) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

78. In one molal solution that contains 0.5 mole of a solute, there is

(1) 500 g of solvent
(2) 100 mL of solvent
(3) 1000 g of solvent
(4) 500 mL of solvent

79. Choose the **correct** statement :

(1) Diamond is covalent and graphite is ionic.
(2) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.
(3) Both diamond and graphite are used as dry lubricants.
(4) Diamond and graphite have two dimensional network.

80. Which amongst the following is **incorrect** statement ?

(1) C_2 molecule has four electrons in its two degenerate π molecular orbitals.
(2) H_2^+ ion has one electron.
(3) O_2^+ ion is diamagnetic.
(4) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

81. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : ICl is more reactive than I_2.
Reason (R) : I-Cl bond is weaker than I-I bond.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**.
(2) **(A)** is correct but **(R)** is not correct.
(3) **(A)** is not correct but **(R)** is correct.
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

82. Given below are two statements

Statement I :

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statement II :

The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect.

(2) **Statement I** is correct but **Statement II** is incorrect.

(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

83. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is

[Given pK_a of $CH_3COOH = 4.57$]

(1) 3.57

(2) 4.57

(3) 2.57

(4) 5.57

84. Identify the **incorrect** statement from the following.

(1) All the five 4*d* orbitals have shapes similar to the respective 3*d* orbitals.

(2) In an atom, all the five 3*d* orbitals are equal in energy in free state.

(3) The shapes of d_{xy}, d_{yz}, and d_{zx} orbitals are similar to each other ; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.

(4) All the five 5*d* orbitals are different in size when compared to the respective 4*d* orbitals.

85. At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^{+}/Ag are 0.34 V, −0.76 V, −0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction can not occur ?

(1) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

(2) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

(3) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

(4) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

Section - B (Chemistry)

86. The order of energy absorbed which is responsible for the color of complexes

(A) $[Ni(H_2O)_2(en)_2]^{2+}$

(B) $[Ni(H_2O)_4(en)]^{2+}$ and

(C) $[Ni(en)_3]^{2+}$

is

(1) (C) > (B) > (A)

(2) (C) > (A) > (B)

(3) (B) > (A) > (C)

(4) (A) > (B) > (C)

87. A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is

(Given R = 0.0831 L bar K^{-1} mol^{-1})

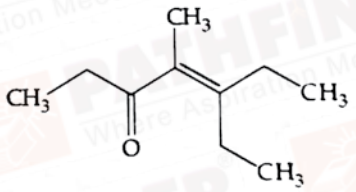
(1) 498.6

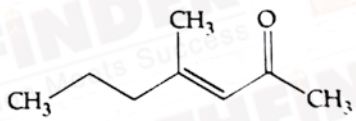
(2) 49.8

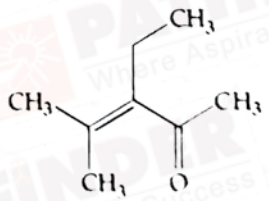
(3) 4.9

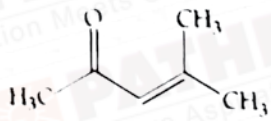
(4) 2.5

88. Which one of the following is **not** formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating ?

(1) 

(2) 

(3) 

(4) 

89. Find the emf of the cell in which the following reaction takes place at 298 K

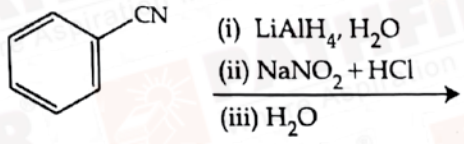
$Ni(s) + 2Ag^+ (0.001\ M) \rightarrow Ni^{2+} (0.001\ M) + 2Ag(s)$

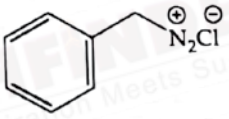
(Given that $E^\circ_{cell} = 10.5\ V$, $\frac{2.303\ RT}{F} = 0.059$ at 298 K)

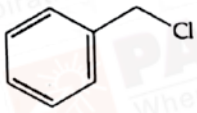
(1) 1.385 V
(2) 0.9615 V
(3) 1.05 V
(4) 1.0385 V

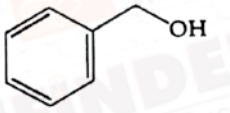
Bonus(All option incorrect due to misprinting)

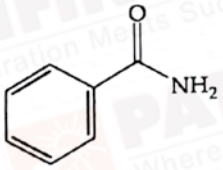
90. The product formed from the following reaction sequence is



(1) 

(2) 

(3) 

(4) 

91. Copper crystallises in fcc unit cell with cell edge length of 3.608×10^{-8} cm. The density of copper is 8.92 g cm^{-3}. Calculate the atomic mass of copper.

(1) 31.55 u
(2) 60 u
(3) 65 u
(4) 63.1 u

92. $3O_2(g) \rightleftharpoons 2O_3(g)$

for the above reaction at 298 K, K_c is found to be 3.0×10^{-59}. If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

(1) 1.9×10^{-63}
(2) 2.4×10^{31}
(3) 1.2×10^{21}
(4) 4.38×10^{-32}

93. Given below are two statements :

Statement I :
In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $HCl + ZnCl_2$, known as Lucas Reagent.

Statement II :
Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect.
(2) **Statement I** is correct but **Statement II** is incorrect.
(3) **Statement I** is incorrect but **Statement II** is correct.
(4) Both **Statement I** and **Statement II** are correct.

94. In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

(1) +6 to +4
(2) +7 to +3
(3) +6 to +5
(4) +7 to +4

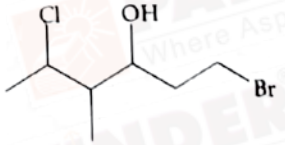
95. Match List - I with List - II.

	List - I (Ores)		List - II (Composition)
(a)	Haematite	(i)	Fe_3O_4
(b)	Magnetite	(ii)	$ZnCO_3$
(c)	Calamine	(iii)	Fe_2O_3
(d)	Kaolinite	(iv)	$[Al_2(OH)_4Si_2O_5]$

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
(2) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)
(3) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)
(4) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

96. The correct IUPAC name of the following compound is :



(1) 6-bromo-2-chloro-4-methylhexan-4-ol
(2) 1-bromo-4-methyl-5-chlorohexan-3-ol
(3) 6-bromo-4-methyl-2-chlorohexan-4-ol
(4) 1-bromo-5-chloro-4-methylhexan-3-ol

97. If radius of second Bohr orbit of the He^+ ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion ?
(1) 15.87 pm
(2) 1.587 pm
(3) 158.7 Å
(4) 158.7 pm

98. Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is :
(1) 2-Methylbut-1-ene
(2) 2-Methylbut-2-ene
(3) Pent-2-ene
(4) 3-Methylbut-1-ene

99. For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is
(1) 0.9212
(2) 0.4606
(3) 0.2303
(4) 1.3818

100. The pollution due to oxides of sulphur gets enhanced due to the presence of :
(a) particulate matter
(b) ozone
(c) hydrocarbons
(d) hydrogen peroxide
Choose the **most appropriate** answer from the options given below :
(1) (a), (b), (d) only
(2) (b), (c), (d) only
(3) (a), (c), (d) only
(4) (a), (d) only

Section - A (Biology : Botany)

101. Which of the following is **not** a method of *ex situ* conservation ?
(1) National Parks
(2) Micropropagation
(3) Cryopreservation
(4) *In vitro* fertilization

102. Given below are two statements :
Statement I :
The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.
Statement II :
Mesophyll cells of C_4 plants lack RuBisCo enzyme.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **Statement I** and **Statement II** are incorrect
(2) **Statement I** is correct but **Statement II** is incorrect
(3) **Statement I** is incorrect but **Statement II** is correct
(4) Both **Statement I** and **Statement II** are correct

103. XO type of sex determination can be found in :
(1) Birds
(2) Grasshoppers
(3) Monkeys
(4) *Drosophila*

104. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :
(a) secretion of secondary metabolities and their deposition in the lumen of vessels.
(b) deposition of organic compounds like tannins and resins in the central layers of stem.
(c) deposition of suberin and aromatic substances in the outer layer of stem.
(d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
(e) presence of parenchyma cells, functionally active xylem elements and essential oils.
Choose the **correct answer** from the options given below :
(1) (c) and (d) Only
(2) (d) and (e) Only
(3) (b) and (d) Only
(4) (a) and (b) Only

105. Which of the following is **not** observed during apoplastic pathway ?
(1) The movement does not involve crossing of cell membrane
(2) The movement is aided by cytoplasmic streaming
(3) Apoplast is continuous and does not provide any barrier to water movement.
(4) Movement of water occurs through intercellular spaces and wall of the cells.