

**PART B – CHEMISTRY**

31. 2 - Hexyne gives trans - 2 - Hexene on treatment with :

- (1) Li/NH<sub>3</sub>
- (2) Pd/BaSO<sub>4</sub>
- (3) Li AlH<sub>4</sub>
- (4) Pt/H<sub>2</sub>

32. Which of the following on thermal-decomposition yields a basic as well as an acidic oxide ?

- (1) KClO<sub>3</sub>
- (2) CaCO<sub>3</sub>
- (3) NH<sub>4</sub>NO<sub>3</sub>
- (4) NaNO<sub>3</sub>

33. Which one of the following statements is correct ?

- (1) All amino acids are optically active.
- (2) All amino acids except glycine are optically active.
- (3) All amino acids except glutamic acid are optically active.
- (4) All amino acids except lysine are optically active.

34. The density of a solution prepared by dissolving 120 g of urea (mol. mass = 60 u) in 1000 g of water is 1.15 g/mL. The molarity of this solution is :

- (1) 1.78 M
- (2) 1.02 M
- (3) 2.05 M
- (4) 0.50 M

35. The **incorrect** expression among the following is :

(1) In isothermal process,

$$W_{\text{reversible}} = -nRT \ln \frac{V_f}{V_i}$$

(2)  $\ln K = \frac{\Delta H^\circ - T\Delta S^\circ}{RT}$

(3)  $K = e^{-\Delta G^\circ/RT}$

(4)  $\frac{\Delta G_{\text{system}}}{\Delta S_{\text{total}}} = -T$

36. Which branched chain isomer of the hydrocarbon with molecular mass 72u gives only one isomer of mono substituted alkyl halide ?

- (1) Neopentane
- (2) Isohexane
- (3) Neohexane
- (4) Tertiary butyl chloride

37. According to Freundlich adsorption isotherm, which of the following is **correct** ?

(1)  $\frac{x}{m} \propto p^1$

(2)  $\frac{x}{m} \propto p^{1/n}$

(3)  $\frac{x}{m} \propto p^0$

(4) All the above are correct for different ranges of pressure.



38. In which of the following pairs the two species are **not** isostructural ?
- (1)  $\text{PCl}_4^+$  and  $\text{SiCl}_4$
  - (2)  $\text{PF}_5$  and  $\text{BrF}_5$
  - (3)  $\text{AlF}_6^{3-}$  and  $\text{SF}_6$
  - (4)  $\text{CO}_3^{2-}$  and  $\text{NO}_3^-$
39. How many chiral compounds are possible on monochlorination of 2 - methyl butane ?
- (1) 2
  - (2) 4
  - (3) 6
  - (4) 8
40. The increasing order of the ionic radii of the given isoelectronic species is :
- (1)  $\text{S}^{2-}$ ,  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$
  - (2)  $\text{Ca}^{2+}$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{S}^{2-}$
  - (3)  $\text{K}^+$ ,  $\text{S}^{2-}$ ,  $\text{Ca}^{2+}$ ,  $\text{Cl}^-$
  - (4)  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$ ,  $\text{S}^{2-}$
41. The compressibility factor for a real gas at high pressure is :
- (1) 1
  - (2)  $1 + pb/RT$
  - (3)  $1 - pb/RT$
  - (4)  $1 + RT/pb$
42. Which among the following will be named as dibromidobis(ethylene diamine) chromium (III) bromide ?
- (1)  $[\text{Cr}(\text{en})_2\text{Br}_2]\text{Br}$
  - (2)  $[\text{Cr}(\text{en})\text{Br}_4]^-$
  - (3)  $[\text{Cr}(\text{en})\text{Br}_2]\text{Br}$
  - (4)  $[\text{Cr}(\text{en})_3]\text{Br}_3$
43. In the given transformation, which of the following is the most appropriate reagent ?
- 
- (1)  $\text{Zn} - \text{Hg}/\text{HCl}$
  - (2)  $\text{Na}$ , Liq.  $\text{NH}_3$
  - (3)  $\text{NaBH}_4$
  - (4)  $\text{NH}_2\text{NH}_2, \overset{\ominus}{\text{O}}\text{H}$
44. Lithium forms body centred cubic structure. The length of the side of its unit cell is 351 pm. Atomic radius of the lithium will be :
- (1) 300 pm
  - (2) 240 pm
  - (3) 152 pm
  - (4) 75 pm
45.  $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$ . If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) must you add to get the freezing point of the solution lowered to  $-2.8^\circ\text{C}$  ?
- (1) 93 g
  - (2) 39 g
  - (3) 27 g
  - (4) 72 g

46. The molecule having smallest bond angle is :
- (1)  $\text{AsCl}_3$
  - (2)  $\text{SbCl}_3$
  - (3)  $\text{PCl}_3$
  - (4)  $\text{NCl}_3$
47. What is DDT among the following :
- (1) A fertilizer
  - (2) Biodegradable pollutant
  - (3) Non - biodegradable pollutant
  - (4) Greenhouse gas
48. The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionization constant,  $K_a$  of this acid is :
- (1)  $1 \times 10^{-3}$
  - (2)  $1 \times 10^{-5}$
  - (3)  $1 \times 10^{-7}$
  - (4)  $3 \times 10^{-1}$
49. Very pure hydrogen (99.9%) can be made by which of the following processes ?
- (1) Mixing natural hydrocarbons of high molecular weight
  - (2) Electrolysis of water
  - (3) Reaction of salt like hydrides with water
  - (4) Reaction of methane with steam
50. Aspirin is known as :
- (1) Phenyl salicylate
  - (2) Acetyl salicylate
  - (3) Methyl salicylic acid
  - (4) Acetyl salicylic acid
51. Which of the following compounds can be detected by Molisch's test ?
- (1) Sugars
  - (2) Amines
  - (3) Primary alcohols
  - (4) Nitro compounds
52. The standard reduction potentials for  $\text{Zn}^{2+}/\text{Zn}$ ,  $\text{Ni}^{2+}/\text{Ni}$ , and  $\text{Fe}^{2+}/\text{Fe}$  are  $-0.76$ ,  $-0.23$  and  $-0.44$  V respectively. The reaction  $\text{X} + \text{Y}^{2+} \rightarrow \text{X}^{2+} + \text{Y}$  will be spontaneous when :
- (1)  $\text{X} = \text{Ni}$ ,  $\text{Y} = \text{Zn}$
  - (2)  $\text{X} = \text{Fe}$ ,  $\text{Y} = \text{Zn}$
  - (3)  $\text{X} = \text{Zn}$ ,  $\text{Y} = \text{Ni}$
  - (4)  $\text{X} = \text{Ni}$ ,  $\text{Y} = \text{Fe}$
53. Ortho - Nitrophenol is less soluble in water than p - and m - Nitrophenols because :
- (1) o - Nitrophenol shows Intramolecular H - bonding
  - (2) o - Nitrophenol shows Intermolecular H - bonding
  - (3) Melting point of o - Nitrophenol is lower than those of m - and p - isomers.
  - (4) o - Nitrophenol is more volatile in steam than those of m - and p - isomers.
54. Iodoform can be prepared from all except :
- (1) Isopropyl alcohol
  - (2) 3 - Methyl - 2 - butanone
  - (3) Isobutyl alcohol
  - (4) Ethyl methyl ketone

55. The species which can best serve as an initiator for the cationic polymerization is :
- (1)  $\text{HNO}_3$
  - (2)  $\text{AlCl}_3$
  - (3)  $\text{BuLi}$
  - (4)  $\text{LiAlH}_4$
56. The equilibrium constant ( $K_c$ ) for the reaction  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$  at temperature T is  $4 \times 10^{-4}$ . The value of  $K_c$  for the reaction,  $\text{NO}(\text{g}) \rightarrow \frac{1}{2}\text{N}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$  at the same temperature is :
- (1)  $2.5 \times 10^2$
  - (2)  $4 \times 10^{-4}$
  - (3) 50.0
  - (4) 0.02
57. For a first order reaction,  $(\text{A}) \rightarrow \text{products}$ , the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01M, is :
- (1)  $3.47 \times 10^{-4}$  M/min
  - (2)  $3.47 \times 10^{-5}$  M/min
  - (3)  $1.73 \times 10^{-4}$  M/min
  - (4)  $1.73 \times 10^{-5}$  M/min
58. Which method of purification is represented by the following equation :
- $$\text{Ti}(\text{s}) + 2\text{I}_2(\text{g}) \xrightarrow{523 \text{ K}} \text{TiI}_4(\text{g}) \xrightarrow{1700 \text{ K}} \text{Ti}(\text{s}) + 2\text{I}_2(\text{g})$$
- (1) Cupellation
  - (2) Poling
  - (3) Van Arkel
  - (4) Zone refining
59. Iron exhibits +2 and +3 oxidation states. Which of the following statements about iron is **incorrect** ?
- (1) Ferrous compounds are relatively more ionic than the corresponding ferric compounds.
  - (2) Ferrous compounds are less volatile than the corresponding ferric compounds.
  - (3) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds.
  - (4) Ferrous oxide is more basic in nature than the ferric oxide.
60. The electrons identified by quantum numbers n and l :
- (a)  $n=4, l=1$
  - (b)  $n=4, l=0$
  - (c)  $n=3, l=2$
  - (d)  $n=3, l=1$
- can be placed in order of increasing energy as :
- (1) (d) < (b) < (c) < (a)
  - (2) (b) < (d) < (a) < (c)
  - (3) (a) < (c) < (b) < (d)
  - (4) (c) < (d) < (b) < (a)

**PART C – MATHEMATICS**

61. Let  $X = \{1, 2, 3, 4, 5\}$ . The number of different ordered pairs  $(Y, Z)$  that can be formed such that  $Y \subseteq X, Z \subseteq X$  and  $Y \cap Z$  is empty, is :

- (1)  $3^5$
- (2)  $2^5$
- (3)  $5^3$
- (4)  $5^2$

62. The population  $p(t)$  at time  $t$  of a certain mouse species satisfies the differential equation  $\frac{dp(t)}{dt} = 0.5 p(t) - 450$ . If  $p(0) = 850$ , then the time at which the population becomes zero is :

- (1)  $\ln 9$
- (2)  $\frac{1}{2} \ln 18$
- (3)  $\ln 18$
- (4)  $2 \ln 18$

63. If  $f : \mathbb{R} \rightarrow \mathbb{R}$  is a function defined by  $f(x) = [x] \cos\left(\frac{2x-1}{2}\right)\pi$ , where  $[x]$  denotes the greatest integer function, then  $f$  is :

- (1) discontinuous only at  $x=0$ .
- (2) discontinuous only at non-zero integral values of  $x$ .
- (3) continuous only at  $x=0$ .
- (4) continuous for every real  $x$ .

64. Let  $P$  and  $Q$  be  $3 \times 3$  matrices with  $P \neq Q$ . If  $P^3 = Q^3$  and  $P^2Q = Q^2P$ , then determinant of  $(P^2 + Q^2)$  is equal to :

- (1) 1
- (2) 0
- (3) -1
- (4) -2

65. If the integral

$$\int \frac{5 \tan x}{\tan x - 2} dx = x + a \ln |\sin x - 2 \cos x| + k$$

then  $a$  is equal to :

- (1) -2
- (2) 1
- (3) 2
- (4) -1

66. If  $g(x) = \int_0^x \cos 4t dt$ , then  $g(x + \pi)$  equals :

- (1)  $g(x) + g(\pi)$
- (2)  $g(x) - g(\pi)$
- (3)  $g(x) \cdot g(\pi)$
- (4)  $\frac{g(x)}{g(\pi)}$

67. An equation of a plane parallel to the plane  $x - 2y + 2z - 5 = 0$  and at a unit distance from the origin is :

- (1)  $x - 2y + 2z + 1 = 0$
- (2)  $x - 2y + 2z - 1 = 0$
- (3)  $x - 2y + 2z + 5 = 0$
- (4)  $x - 2y + 2z - 3 = 0$

68. A spherical balloon is filled with  $4500\pi$  cubic meters of helium gas. If a leak in the balloon causes the gas to escape at the rate of  $72\pi$  cubic meters per minute, then the rate (in meters per minute) at which the radius of the balloon decreases 49 minutes after the leakage began is :

- (1)  $7/9$
- (2)  $2/9$
- (3)  $9/2$
- (4)  $9/7$

69. If the line  $2x + y = k$  passes through the point which divides the line segment joining the points  $(1, 1)$  and  $(2, 4)$  in the ratio  $3 : 2$ , then  $k$  equals :

- (1) 5
- (2) 6
- (3)  $11/5$
- (4)  $29/5$

70. Let  $\hat{a}$  and  $\hat{b}$  be two unit vectors. If the vectors  $\vec{c} = \hat{a} + 2\hat{b}$  and  $\vec{d} = 5\hat{a} - 4\hat{b}$  are perpendicular to each other, then the angle between  $\hat{a}$  and  $\hat{b}$  is :

- (1)  $\frac{\pi}{2}$
- (2)  $\frac{\pi}{3}$
- (3)  $\frac{\pi}{4}$
- (4)  $\frac{\pi}{6}$

71. **Statement 1 :** An equation of a common tangent to the parabola  $y^2 = 16\sqrt{3}x$  and the ellipse  $2x^2 + y^2 = 4$  is  $y = 2x + 2\sqrt{3}$ .

**Statement 2 :** If the line  $y = mx + \frac{4\sqrt{3}}{m}$ , ( $m \neq 0$ ) is a common tangent to the parabola  $y^2 = 16\sqrt{3}x$  and the ellipse  $2x^2 + y^2 = 4$ , then  $m$  satisfies  $m^4 + 2m^2 = 24$ .

- (1) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
- (2) Statement 1 is true, Statement 2 is true, Statement 2 is **not** a correct explanation for Statement 1.
- (3) Statement 1 is true, Statement 2 is false.
- (4) Statement 1 is false, Statement 2 is true.

72. Three numbers are chosen at random without replacement from  $\{1, 2, 3, \dots, 8\}$ . The probability that their minimum is 3, given that their maximum is 6, is :

- (1)  $\frac{1}{5}$
- (2)  $\frac{1}{4}$
- (3)  $\frac{2}{5}$
- (4)  $\frac{3}{8}$

73. A line is drawn through the point (1, 2) to meet the coordinate axes at P and Q such that it forms a triangle OPQ, where O is the origin. If the area of the triangle OPQ is least, then the slope of the line PQ is :

- (1) -4
- (2) -2
- (3)  $-\frac{1}{2}$
- (4)  $-\frac{1}{4}$

74. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is :

- (1) 629
- (2) 630
- (3) 879
- (4) 880

75. **Statement 1 :** The sum of the series  $1 + (1 + 2 + 4) + (4 + 6 + 9) + (9 + 12 + 16) + \dots + (361 + 380 + 400)$  is 8000.

**Statement 2 :**  $\sum_{k=1}^n (k^3 - (k-1)^3) = n^3,$

for any natural number n.

- (1) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
- (2) Statement 1 is true, Statement 2 is true; Statement 2 is **not** a correct explanation for Statement 1.
- (3) Statement 1 is true, Statement 2 is false.
- (4) Statement 1 is false, Statement 2 is true.

76. Let  $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$ . If  $u_1$  and  $u_2$  are

column matrices such that  $Au_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$  and

$Au_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ , then  $u_1 + u_2$  is equal to :

(1)  $\begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$

(2)  $\begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}$

(3)  $\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$

(4)  $\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}$

77. The area bounded between the parabolas

$x^2 = \frac{y}{4}$  and  $x^2 = 9y$ , and the straight line  $y = 2$  is :

(1)  $\frac{10\sqrt{2}}{3}$

(2)  $\frac{20\sqrt{2}}{3}$

(3)  $10\sqrt{2}$

(4)  $20\sqrt{2}$

78. Let  $x_1, x_2, \dots, x_n$  be  $n$  observations, and let  $\bar{x}$  be their arithmetic mean and  $\sigma^2$  be their variance.

**Statement 1 :** Variance of  $2x_1, 2x_2, \dots, 2x_n$  is  $4\sigma^2$ .

**Statement 2 :** Arithmetic mean of  $2x_1, 2x_2, \dots, 2x_n$  is  $4\bar{x}$ .

- (1) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
- (2) Statement 1 is true, Statement 2 is true, Statement 2 is **not** a correct explanation for Statement 1.
- (3) Statement 1 is true, Statement 2 is false.
- (4) Statement 1 is false, Statement 2 is true.

79. If  $n$  is a positive integer, then

$(\sqrt{3} + 1)^{2n} - (\sqrt{3} - 1)^{2n}$  is :

- (1) an odd positive integer
- (2) an even positive integer
- (3) a rational number other than positive integers
- (4) an irrational number

80. If 100 times the 100<sup>th</sup> term of an AP with non zero common difference equals the 50 times its 50<sup>th</sup> term, then the 150<sup>th</sup> term of this AP is :

- (1) 150 times its 50<sup>th</sup> term
- (2) 150
- (3) zero
- (4) -150

81. The length of the diameter of the circle which touches the  $x$ -axis at the point  $(1, 0)$  and passes through the point  $(2, 3)$  is :

- (1)  $3/5$
- (2)  $6/5$
- (3)  $5/3$
- (4)  $10/3$

82. Let  $a, b \in \mathbb{R}$  be such that the function  $f$  given by  $f(x) = \ln|x| + bx^2 + ax$ ,  $x \neq 0$  has extreme values at  $x = -1$  and  $x = 2$ .

**Statement 1 :**  $f$  has local maximum at  $x = -1$  and at  $x = 2$ .

**Statement 2 :**  $a = \frac{1}{2}$  and  $b = \frac{-1}{4}$ .

- (1) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
- (2) Statement 1 is true, Statement 2 is true; Statement 2 is **not** a correct explanation for Statement 1.
- (3) Statement 1 is true, Statement 2 is false.
- (4) Statement 1 is false, Statement 2 is true.

83. Let ABCD be a parallelogram such that  $\vec{AB} = \vec{q}$ ,  $\vec{AD} = \vec{p}$  and  $\angle BAD$  be an acute angle. If  $\vec{r}$  is the vector that coincides with the altitude directed from the vertex B to the side AD, then  $\vec{r}$  is given by :

$$(1) \quad \vec{r} = -\vec{q} + \left( \frac{\vec{p} \cdot \vec{q}}{\vec{p} \cdot \vec{p}} \right) \vec{p}$$

$$(2) \quad \vec{r} = \vec{q} - \left( \frac{\vec{p} \cdot \vec{q}}{\vec{p} \cdot \vec{p}} \right) \vec{p}$$

$$(3) \quad \vec{r} = -3\vec{q} + \frac{3(\vec{p} \cdot \vec{q})}{(\vec{p} \cdot \vec{p})} \vec{p}$$

$$(4) \quad \vec{r} = 3\vec{q} - \frac{3(\vec{p} \cdot \vec{q})}{(\vec{p} \cdot \vec{p})} \vec{p}$$

84. If the lines  $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$  and  $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$  intersect, then k is equal to :

$$(1) \quad \frac{2}{9}$$

$$(2) \quad \frac{9}{2}$$

$$(3) \quad 0$$

$$(4) \quad -1$$

85. An ellipse is drawn by taking a diameter of the circle  $(x-1)^2 + y^2 = 1$  as its semi-minor axis and a diameter of the circle  $x^2 + (y-2)^2 = 4$  as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is :

$$(1) \quad x^2 + 4y^2 = 8$$

$$(2) \quad 4x^2 + y^2 = 8$$

$$(3) \quad x^2 + 4y^2 = 16$$

$$(4) \quad 4x^2 + y^2 = 4$$

86. The negation of the statement

"If I become a teacher, then I will open a school", is :

(1) Either I will not become a teacher or I will not open a school.

(2) Neither I will become a teacher nor I will open a school.

(3) I will not become a teacher or I will open a school.

(4) I will become a teacher and I will not open a school.

87. Consider the function,  
 $f(x) = |x-2| + |x-5|, x \in \mathbb{R}$ .

**Statement 1 :**  $f'(4) = 0$

**Statement 2 :**  $f$  is continuous in  $[2, 5]$ , differentiable in  $(2, 5)$  and  $f(2) = f(5)$ .

- (1) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
- (2) Statement 1 is true, Statement 2 is true; Statement 2 is **not** a correct explanation for Statement 1.
- (3) Statement 1 is true, Statement 2 is false.
- (4) Statement 1 is false, Statement 2 is true.

88. If  $z \neq 1$  and  $\frac{z^2}{z-1}$  is real, then the point represented by the complex number  $z$  lies :

- (1) on a circle with centre at the origin.
- (2) either on the real axis or on a circle not passing through the origin.
- (3) on the imaginary axis.
- (4) either on the real axis or on a circle passing through the origin.

89. The equation  $e^{\sin x} - e^{-\sin x} - 4 = 0$  has :

- (1) no real roots.
- (2) exactly one real root.
- (3) exactly four real roots.
- (4) infinite number of real roots.

90. In a  $\Delta PQR$ , if  $3 \sin P + 4 \cos Q = 6$  and  $4 \sin Q + 3 \cos P = 1$ , then the angle  $R$  is equal to :

- (1)  $\frac{\pi}{6}$
- (2)  $\frac{\pi}{4}$
- (3)  $\frac{3\pi}{4}$
- (4)  $\frac{5\pi}{6}$

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SPACE FOR ROUGH WORK

# AIEEE-2012 PAPER-I KEY

## BOOKLET - CODE -A

1) 2	2) 3	3) 4	4) 2	5) 3
6) 2	7) 4	8) 3	9) 2	10) 3
11) 2	12) 3	13) 3	14) 2	15) 2
16) 4	17) 4	18) 2	19) 4	20) 4
21) 3	22) 4	23) 3	24) 1	25) 4
26) 3	27) 1	28) 4	29) 1	30) 2
31) 1	32) 2	33) 2	34) 3	35) 2
36) 1	37) 4	38) 2	39) 2	40) 2
41) 2	42) 1	43) 4	44) 3	45) 1
46) 2	47) 3	48) 2	49) 3	50) 4
51) 1	52) 3	53) 1	54) 3	55) 2
56) 3	57) 1	58) 3	59) 3	60) 1
61) 1	62) 4	63) 4	64) 2	65) 3
66) 1 <sup>or</sup> 2	67) 4	68) 2	69) 2	70) 2
71) 1	72) 1	73) 2	74) 3	75) 1
76) 3	77) 2	78) 3	79) 4	80) 3
81) 4	82) 1	83) 1	84) 2	85) 3
86) 4	87) 1	88) 4	89) 1	90) 1