

- 46 Given below are two statements :  
**Statement I** : Ferromagnetism is considered as an extreme form of paramagnetism.  
**Statement II** : The number of unpaired electrons in a  $\text{Cr}^{2+}$  ion ( $Z = 24$ ) is the same as that of a  $\text{Nd}^{3+}$  ion ( $Z = 60$ ).

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

- (1) Both Statement I and Statement II are false
- (2) Statement I is true but Statement II is false
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are true

- 47 For the reaction  $\text{A(g)} \rightleftharpoons 2\text{B(g)}$ , the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K.

[Given :  $R = 0.0831 \text{ L atm mol}^{-1} \text{ K}^{-1}$ ]

$K_p$  for the reaction at 1000 K is

- (1)  $2.077 \times 10^5$
- (2) 0.033
- (3) 0.021
- (4) 83.1

- 48 Total number of possible isomers (both structural as well as stereoisomers) of cyclic ethers of molecular formula  $\text{C}_4\text{H}_8\text{O}$  is :

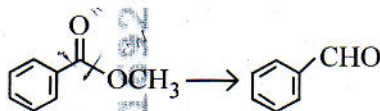
- (1) 8
- (2) 10
- (3) 11
- (4) 6

- 49 Given below are two statements :  
**Statement I** : A hypothetical diatomic molecule with bond order zero is quite stable.  
**Statement II** : As bond order increases, the bond length increases.

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

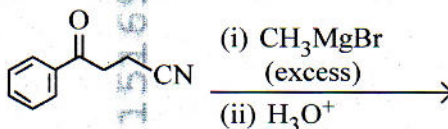
- (1) Both Statement I and Statement II are false
- (2) Statement I is true but Statement II is false
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are true

- 50 Identify the suitable reagent for the following conversion:



- (1) (i)  $\text{AlH}(\text{iBu})_2$  (ii)  $\text{H}_2\text{O}$
- (2) (i)  $\text{NaBH}_4$ , (ii)  $\text{H}^+/\text{H}_2\text{O}$
- (3)  $\text{H}_2 / \text{Pd-BaSO}_4$
- (4) (i)  $\text{LiAlH}_4$ , (ii)  $\text{H}^+/\text{H}_2\text{O}$

- 51 The major product of the following reaction is:



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

- 52 If the molar conductivity ( $\Lambda_m$ ) of a  $0.050 \text{ mol L}^{-1}$  solution of a monobasic weak acid is  $90 \text{ S cm}^2 \text{ mol}^{-1}$ , its extent (degree) of dissociation will be

[Assume  $\Lambda_+^\circ = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$  and

$\Lambda_-^\circ = 50.4 \text{ S cm}^2 \text{ mol}^{-1}$ .]

- (1) 0.125
- (2) 0.225
- (3) 0.215
- (4) 0.115

53 Which one of the following reactions does **NOT** belong to "Lassaigne's test"?

- (1)  $2\text{Na} + \text{S} \xrightarrow{\Delta} \text{Na}_2\text{S}$
- (2)  $\text{Na} + \text{X} \xrightarrow{\Delta} + \text{NaX}$
- (3)  $2\text{CuO} + \text{C} \xrightarrow{\Delta} 2\text{Cu} + \text{CO}_2$
- (4)  $\text{Na} + \text{C} + \text{N} \xrightarrow{\Delta} \text{NaCN}$

54 The correct order of decreasing acidity of the following aliphatic acids is:

- (1)  $\text{CH}_3\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{CCOOH} > \text{HCOOH}$
- (2)  $\text{HCOOH} > \text{CH}_3\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{CCOOH}$
- (3)  $\text{HCOOH} > (\text{CH}_3)_3\text{CCOOH} > (\text{CH}_3)_2\text{CHCOOH} > \text{CH}_3\text{COOH}$
- (4)  $(\text{CH}_3)_3\text{CCOOH} > (\text{CH}_3)_2\text{CHCOOH} > \text{CH}_3\text{COOH} > \text{HCOOH}$

55 Match List I with List II.

| List I<br>(Name of Vitamin) | List II<br>(Deficiency disease) |
|-----------------------------|---------------------------------|
| A. Vitamin B <sub>12</sub>  | I. Cheilosis                    |
| B. Vitamin D                | II. Convulsions                 |
| C. Vitamin B <sub>2</sub>   | III. Rickets                    |
| D. Vitamin B <sub>6</sub>   | IV. Pernicious anaemia          |

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

- (1) A-IV, B-III, C-I, D-II
- (2) A-II, B-III, C-I, D-IV
- (3) A-IV, B-III, C-II, D-I
- (4) A-I, B-III, C-II, D-IV

56 Out of the following complex compounds, which of the compound will be having the minimum conductance in solution?

- (1)  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$
- (2)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- (3)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}$
- (4)  $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$

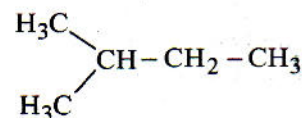
57 Sugar 'X'

- A. is found in honey.
- B. is a keto sugar.
- C. exists in  $\alpha$  and  $\beta$  - anomeric forms.
- D. is laevorotatory.

'X' is :

- (1) D-Fructose
- (2) Maltose
- (3) Sucrose
- (4) D-Glucose

58 How many products (including stereoisomers) are expected from monochlorination of the following compound?



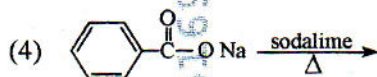
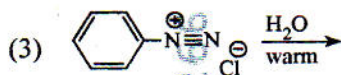
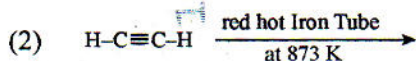
- (1) 3
- (2) 5
- (3) 6
- (4) 2

59 Which one of the following compounds can exist as cis-trans isomers?

- (1) 2-Methylhex-2-ene
- (2) 1,1-Dimethylcyclopropane
- (3) 1,2-Dimethylcyclohexane
- (4) Pent-1-ene



- 60 Which one of the following reactions does **NOT** give benzene as the product ?



- 61 Phosphoric acid ionizes in three steps with their ionization constant values

$K_{a_1}$ ,  $K_{a_2}$  and  $K_{a_3}$ , respectively,

while  $K$  is the overall ionization constant.

Which of the following statements are true?

- A.  $\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$
- B.  $\text{H}_3\text{PO}_4$  is a stronger acid than  $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^{2-}$ .
- C.  $K_{a_1} > K_{a_2} > K_{a_3}$
- D.  $K_{a_1} = \frac{K_{a_3} + K_{a_2}}{2}$

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

- (1) A and C only
- (2) B, C and D only
- (3) A, B and C only
- (4) A and B only

- 62 Among the following, choose the ones with equal number of atoms.

- A. 212 g of  $\text{Na}_2\text{CO}_3$  (s) [molar mass = 106 g]
- B. 248 g of  $\text{Na}_2\text{O}$  (s) [molar mass = 62 g]
- C. 240 g of  $\text{NaOH}$  (s) [molar mass = 40 g]
- D. 12 g of  $\text{H}_2$  (g) [molar mass = 2 g]
- E. 220 g of  $\text{CO}_2$  (g) [molar mass = 44 g]

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

- (1) A, B, and D only
- (2) B, C, and D only
- (3) B, D, and E only
- (4) A, B, and C only

- 63 Given below are two statements :

**Statement I :** Like nitrogen that can form ammonia, arsenic can form arsine.

**Statement II :** Antimony cannot form antimony pentoxide.

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

- 64 Dalton's Atomic theory could not explain which of the following?

- (1) Law of constant proportion
- (2) Law of multiple proportion
- (3) Law of gaseous volume
- (4) Law of conservation of mass

65 The correct order of decreasing basic strength of the given amines is :

- (1) N-ethylethanamine > ethanamine > benzenamine > N-methylaniline
- (2) N-ethylethanamine > ethanamine > N-methylaniline > benzenamine
- (3) benzenamine > ethanamine > N-methylaniline > N-ethylethanamine
- (4) N-methylaniline > benzenamine > ethanamine > N-ethylethanamine

66 Which of the following statements are true?

- A. Unlike Ga that has a very high melting point, Cs has a very low melting point.
- B. On Pauling scale, the electronegativity values of N and Cl are not the same.
- C. Ar,  $K^+$ ,  $Cl^-$ ,  $Ca^{2+}$ , and  $S^{2-}$  are all isoelectronic species.
- D. The correct order of the first ionization enthalpies of Na, Mg, Al, and Si is  $Si > Al > Mg > Na$ .
- E. The atomic radius of Cs is greater than that of Li and Rb.

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

- (1) C and E only
- (2) C and D only
- (3) A, C, and E only
- (4) A, B, and E only

67 Match List - I with List - II

**List-I**

- A.  $XeO_3$
- B.  $XeF_2^-$
- C.  $XeOF_4$
- D.  $XeF_6$

**List-II**

- I.  $sp^3d$ ; linear
- II.  $sp^3$ ; pyramidal
- III.  $sp^3d^3$ ; distorted octahedral
- IV.  $sp^3d^2$ ; square pyramidal

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

- (1) A-II, B-I, C-III, D-IV
- (2) A-IV, B-II, C-III, D-I
- (3) A-IV, B-II, C-I, D-III
- (4) A-II, B-I, C-IV, D-III

68 The standard heat of formation, in kcal/mol of  $Ba^{2+}$  is :

[Given : standard heat of formation of

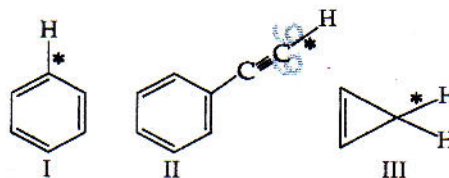
$SO_4^{2-}$  ion (aq) = -216 kcal/mol,

standard heat of crystallisation of

$BaSO_4(s)$  = -4.5 kcal/mol, standard heat of formation of  $BaSO_4(s)$  = -349 kcal/mol]

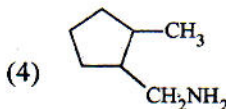
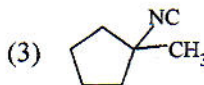
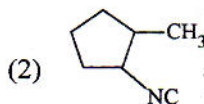
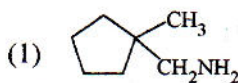
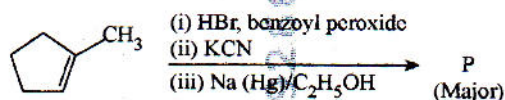
- (1) -133.0
- (2) +133.0
- (3) +220.5
- (4) -128.5

69 Among the given compounds I-III, the correct order of bond dissociation energy of C-H bond marked with \* is :



- (1) I > II > III
- (2) III > II > I
- (3) II > III > I
- (4) II > I > III

70 Predict the major product 'P' in the following sequence of reactions -





71 Match List - I with List - II

| List-I                | List-II                                             |
|-----------------------|-----------------------------------------------------|
| A. Haber process      | I. Fe catalyst                                      |
| B. Wacker oxidation   | II. $\text{PdCl}_2$                                 |
| C. Wilkinson catalyst | III. $[(\text{PPh}_3)_3\text{RhCl}]$                |
| D. Ziegler catalyst   | IV. $\text{TiCl}_4$ with $\text{Al}(\text{CH}_3)_3$ |

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

- (1) A-II, B-III, C-I, D-IV
- (2) A-I, B-II, C-III, D-IV
- (3) A-I, B-IV, C-III, D-II
- (4) A-I, B-II, C-IV, D-III

72 Energy and radius of first Bohr orbit of  $\text{He}^+$  and  $\text{Li}^{2+}$  are

[Given  $R_H = 2.18 \times 10^{-18} \text{ J}$ ,  $a_0 = 52.9 \text{ pm}$ ]

- (1)  $E_n(\text{Li}^{2+}) = -8.72 \times 10^{-18} \text{ J}$ ;  
 $r_n(\text{Li}^{2+}) = 26.4 \text{ pm}$
- (3)  $E_n(\text{He}^+) = -19.62 \times 10^{-18} \text{ J}$ ;  
 $r_n(\text{He}^+) = 17.6 \text{ pm}$
- (2)  $E_n(\text{Li}^{2+}) = -19.62 \times 10^{-16} \text{ J}$ ;  
 $r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$   
 $E_n(\text{He}^+) = -8.72 \times 10^{-16} \text{ J}$ ;  
 $r_n(\text{He}^+) = 26.4 \text{ pm}$
- (3)  $E_n(\text{Li}^{2+}) = -8.72 \times 10^{-16} \text{ J}$ ;  
 $r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$   
 $E_n(\text{He}^+) = -19.62 \times 10^{-16} \text{ J}$ ;  
 $r_n(\text{He}^+) = 17.6 \text{ pm}$
- (4)  $E_n(\text{Li}^{2+}) = -19.62 \times 10^{-18} \text{ J}$ ;  
 $r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$   
 $E_n(\text{He}^+) = -8.72 \times 10^{-18} \text{ J}$ ;  
 $r_n(\text{He}^+) = 26.4 \text{ pm}$

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

**Assertion (A)** :  I undergoes  $\text{S}_{\text{N}}2$  reaction faster than  Cl.

**Reason (R)** : Iodine is a better leaving group because of its large size.

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

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

74 If the half-life ( $t_{1/2}$ ) for a first order reaction is 1 minute, then the time required for 99.9% completion of the reaction is closest to :

- (1) 4 minutes
- (2) 5 minutes
- (3) 10 minutes
- (4) 2 minutes

75 Which of the following aqueous solution will exhibit highest boiling point?

- (1) 0.01M  $\text{KNO}_3$
- (2) 0.01M  $\text{Na}_2\text{SO}_4$
- (3) 0.015M  $\text{C}_6\text{H}_{12}\text{O}_6$
- (4) 0.01M Urea

76 Higher yield of NO in  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$  can be obtained at

[ $\Delta H$  of the reaction =  $+180.7 \text{ kJ mol}^{-1}$ ]

- A. higher temperature
- B. lower temperature
- C. higher concentration of  $\text{N}_2$
- D. higher concentration of  $\text{O}_2$

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

- (1) B, C only
- (2) B, C, D only
- (3) A, C, D only
- (4) A, D only

77 Match List I with List II

| List I<br>(Ion)     | List II<br>(Group Number<br>in Cation Analysis) |
|---------------------|-------------------------------------------------|
| A. $\text{Co}^{2+}$ | I. Group-I                                      |
| B. $\text{Mg}^{2+}$ | II. Group-III                                   |
| C. $\text{Pb}^{2+}$ | III. Group-IV                                   |
| D. $\text{Al}^{3+}$ | IV. Group-VI                                    |

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

- (1) A-III, B-IV, C-I, D-II  
 (2) A-III, B-II, C-IV, D-I  
 (3) A-III, B-II, C-I, D-IV  
 (4) A-III, B-IV, C-II, D-I

78 The ratio of the wavelengths of the light absorbed by a Hydrogen atom when it undergoes  $n = 2 \rightarrow n = 3$  and  $n = 4 \rightarrow n = 6$  transitions, respectively, is

- (1)  $\frac{1}{16}$  (2)  $\frac{1}{9}$   
 (3)  $\frac{1}{4}$  (4)  $\frac{1}{36}$

79 The correct order of the wavelength of light absorbed by the following complexes is,

- A.  $[\text{Co}(\text{NH}_3)_6]^{3+}$  B.  $[\text{Co}(\text{CN})_6]^{3-}$   
 C.  $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$  D.  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$

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

- (1)  $B < A < D < C$  (2)  $C < D < A < B$   
 (3)  $C < A < D < B$  (4)  $B < D < A < C$

80 Identify the correct orders against the property mentioned

- A.  $\text{H}_2\text{O} > \text{NH}_3 > \text{CHCl}_3$  – dipole moment  
 B.  $\text{XeF}_4 > \text{XeO}_3 > \text{XeF}_2$  – number of lone pairs on central atom  
 C.  $\text{O-H} > \text{C-H} > \text{N-O}$  – bond length  
 D.  $\text{N}_2 > \text{O}_2 > \text{H}_2$  – bond enthalpy

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

- (1) B, D only (2) A, C only  
 (3) B, C only (4) A, D only

81 Match List I with List II

| List I<br>(Mixture)                                  | List II<br>(Method of Separation)      |
|------------------------------------------------------|----------------------------------------|
| A. $\text{CHCl}_3 + \text{C}_6\text{H}_5\text{NH}_2$ | I. Distillation under reduced pressure |
| B. Crude oil in petroleum industry                   | II. Steam distillation                 |
| C. Glycerol from spent-lye                           | III. Fractional distillation           |
| D. Aniline - water                                   | IV. Simple distillation                |

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

- (1) A-IV, B-III, C-II, D-I  
 (2) A-III, B-IV, C-I, D-II  
 (3) A-III, B-IV, C-II, D-I  
 (4) A-IV, B-III, C-I, D-II

82 If the rate constant of a reaction is  $0.03 \text{ s}^{-1}$ , how much time does it take for  $7.2 \text{ mol L}^{-1}$  concentration of the reactant to get reduced to  $0.9 \text{ mol L}^{-1}$ ?

(Given:  $\log 2 = 0.301$ )

- (1) 23.1 s (2) 210 s  
 (3) 21.0 s (4) 69.3 s



- 83 Which among the following electronic configurations belong to main group elements?

- A.  $[\text{Ne}]3s^1$  B.  $[\text{Ar}]3d^3 4s^2$   
 C.  $[\text{Kr}]4d^{10} 5s^2 5p^5$  D.  $[\text{Ar}]3d^{10} 4s^1$   
 E.  $[\text{Rn}]5f^0 6d^2 7s^2$

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

- (1) A and C only  
 (2) D and E only  
 (3) A, C and D only  
 (4) B and E only

- 84 Match List - I with List - II

| List-I<br>(Example) | List-II<br>(Type of Solution) |
|---------------------|-------------------------------|
| A. Humidity         | I. Solid in solid             |
| B. Alloys           | II. Liquid in gas             |
| C. Amalgams         | III. Solid in gas             |
| D. Smoke            | IV. Liquid in solid           |

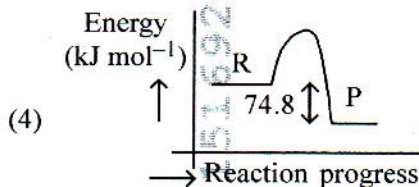
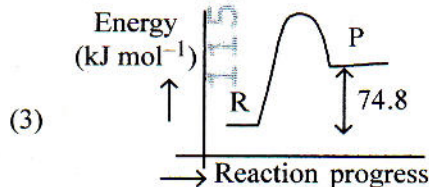
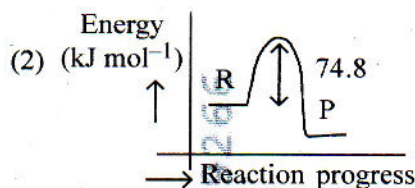
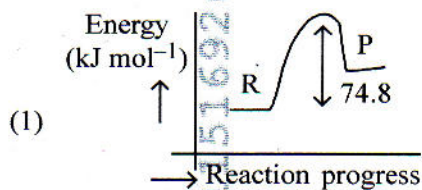
Choose the **correct** answer from the options given below :

- (1) A-II, B-I, C-IV, D-III  
 (2) A-III, B-I, C-IV, D-II  
 (3) A-III, B-II, C-I, D-IV  
 (4) A-II, B-IV, C-I, D-III

- 85 5 moles of liquid X and 10 moles of liquid Y make a solution having a vapour pressure of 70 torr. The vapour pressures of pure X and Y are 63 torr and 78 torr respectively. Which of the following is true regarding the described solution?

- (1) The solution shows negative deviation.  
 (2) The solution is ideal.  
 (3) The solution has volume greater than the sum of individual volumes.  
 (4) The solution shows positive deviation.

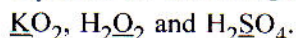
- 86  $\text{C(s)} + 2\text{H}_2\text{(g)} \rightarrow \text{CH}_4\text{(g)}$ ;  $\Delta H = -74.8 \text{ kJ mol}^{-1}$   
 Which of the following diagrams gives an accurate representation of the above reaction?  
 [R  $\rightarrow$  reactants; P  $\rightarrow$  products]



- 87 Which one of the following compounds **does not** decolourize bromine water?

- (1) c1ccccc1O  
 (2) c1ccccc1C=C  
 (3) c1ccccc1N  
 (4) C1CCCCC1

88 Consider the following compounds :



The oxidation states of the underlined elements in them are, respectively,

- (1) +2, -2, and +6
- (2) +1, -2, and +4
- (3) +4, -4, and +6
- (4) +1, -1, and +6

89 Given below are two statements :

**Statement I :** Benzenediazonium salt is prepared by the reaction of aniline with nitrous acid at 273 - 278 K. It decomposes easily in the dry state.

**Statement II :** Insertion of iodine into the benzene ring is difficult and hence iodobenzene is prepared through the reaction of benzenediazonium salt with KI.

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

90 Which of the following are paramagnetic?

- A.  $[\text{NiCl}_4]^{2-}$
- B.  $\text{Ni}(\text{CO})_4$
- C.  $[\text{Ni}(\text{CN})_4]^{2-}$
- D.  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
- E.  $\text{Ni}(\text{PPh}_3)_4$

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

- (1) B and E only
- (2) A and D only
- (3) A, D and E only
- (4) A and C only

91 Match List - I with List - II.

**List - I**

**List - II**

- |                                   |                      |
|-----------------------------------|----------------------|
| A. Progesterone                   | I. Pars intermedia   |
| B. Relaxin                        | II. Ovary            |
| C. Melanocyte stimulating hormone | III. Adrenal Medulla |
| D. Catecholamines                 | IV. Corpus luteum    |

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

- (1) A-IV, B-II, C-III, D-I
- (2) A-II, B-IV, C-I, D-III
- (3) A-III, B-II, C-IV, D-I
- (4) A-IV, B-II, C-I, D-III

92 The blue and white selectable markers have been developed which differentiate recombinant colonies from non-recombinant colonies on the basis of their ability to produce colour in the presence of a chromogenic substrate.

Given below are two statements about this method:

**Statement I :** The blue coloured colonies have DNA insert in the plasmid and they are identified as recombinant colonies.

**Statement II :** The colonies without blue colour have DNA insert in the plasmid and are identified as recombinant colonies.

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