

044/2022

Maximum : 100 marks

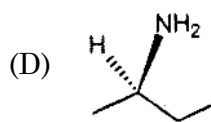
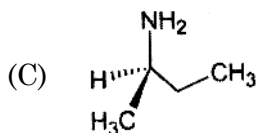
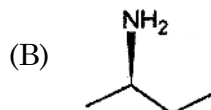
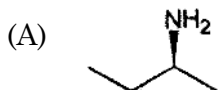
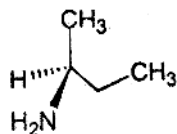
Time : 1 hour and 30 minutes

- The residual molar entropy of crystalline CO at absolute zero is:
(A) $R \ln 2$ (B) $-R \ln 2$
(C) $R \ln 4$ (D) $-R \ln 4$
- The rate constants of a reaction at 100K and 200K are $0.02 s^{-1}$ and $0.2 s^{-1}$. What will be the value of activation energy, E_a of this reaction?
(A) $2.303R \times 10^{-2}$ (B) 0
(C) $4.606R \times 10^2$ (D) $2.303R \times 10^2$
- Using molecular orbital theory the bond order of O^{2-} ion is found to be :
(A) 2 (B) 1
(C) $1\frac{1}{2}$ (D) $2\frac{1}{2}$
- Which among the following is not an example for liquid crystal?
(A) Ethyl *p*-Azoxy benzoate (B) Ethyl benzoate
(C) Cholesteryl benzoate (D) *p*-Azoxy phenetole
- For a particle in one dimensional box, the difference in energy between energy levels $n = 3$ and $n = 2$ was found to be 15 units. What will be the difference in energy for the levels $n = 2$ and $n = 1$ for this system :
(A) 6 (B) 9
(C) 0 (D) 15
- Zinc oxide exists as a white coloured substance at room temperature. On heating it turns yellow due to:
(A) Frenkel defect (B) Schottky defect
(C) Metal excess defect (D) Metal deficiency defect
- A character table of C_{2h} point group contains a one dimensional representation which is symmetric to the principal rotation axis and antisymmetric with respect to the centre of inversion, i . What Mullikan symbol should be assigned to the representation?
(A) B_u (B) A_g
(C) B_g (D) A_u

8. Which among the following is not a molecular mechanics force field?
 (A) AMBER (B) CHARMM
 (C) GROMOS (D) PM3
9. Select the correct statement regarding Langmuir adsorption isotherm :
 (A) Adsorption takes place in multilayer
 (B) Adsorption sites are equivalent and the surface is uniform
 (C) Adsorbed molecules interact with each other
 (D) None of these
10. The normalized wave functions ψ_1 and ψ_2 of the sp hybrid orbitals formed by the combination of one 2s and one 2p orbital are:
 (A) $\psi_1 = \frac{1}{\sqrt{2}}[\psi_{2s} + \psi_{2p}]$, $\psi_2 = \frac{1}{\sqrt{2}}[\psi_{2s} - \psi_{2p}]$ (B) $\psi_1 = \frac{1}{2}[\psi_{2s} + \psi_{2p}]$, $\psi_2 = \frac{1}{2}[\psi_{2s} - \psi_{2p}]$
 (C) $\psi_1 = \frac{1}{\sqrt{2}}[\psi_{2s} + \psi_{2p}]$, $\psi_2 = \frac{1}{2}[\psi_{2s} - \psi_{2p}]$ (D) $\psi_1 = \frac{1}{2}[\psi_{2s} + \psi_{2p}]$, $\psi_2 = \frac{1}{\sqrt{2}}[\psi_{2s} - \psi_{2p}]$
11. On mixing dilute AgNO_3 solution with dilute NaI solution, a negatively charged colloidal sol of AgI was obtained. Select the appropriate condition for the formation of this sol :
 (A) Addition of AgNO_3 to slight excess of NaI
 (B) Addition of NaI to slight excess of AgNO_3
 (C) Mixing equal amounts of AgNO_3 and NaI
 (D) None of these
12. The entropy change involved when volume of 1 mol of any perfect gas is tripled at constant temperature is :
 (A) $2.303R \log 3$ (B) $R \log 1/3$
 (C) $2.303R \log 1/3$ (D) $2.303R \log 3/2$
13. The rate of an enzyme catalysed reaction $[E] + [S] \rightarrow [ES]$ is obtained by Michaelis-Menten equation. If the concentration of the substrate $[S]$ is very small when compared to the Michaelis constant K_M , the rate of the reaction will be :
 (A) First order with respect to $[S]$
 (B) Zero order with respect to $[S]$
 (C) First order with respect to total enzyme concentration $[E_0]$
 (D) Both (A) and (C)
14. Using Debye Huckel Onsagar equation deduce the factor responsible for increasing the conductance ratio of a strong electrolyte :
 (A) decreasing concentration (B) increasing temperature
 (C) small dielectric constant of the solvent (D) increasing valence of the ions

15. ESR spectra of benzene radical anion gives :
- (A) doublet lines (B) quartet lines
(C) septet lines (D) triplet lines
16. The number of degrees of freedom at the eutectic point of a two component system is :
- (A) 1 (B) 0
(C) 2 (D) 3
17. The source of error encountered in ab-initio calculations include :
- (A) Born – Oppenheimer approximation (B) Omission of relativistic effects
(C) Use of incomplete basis set (D) All of the above
18. Among the following symmetry elements, the element absent in trans-dichloroethylene is :
- (A) C_2 proper rotation axis (B) vertical plane of symmetry, σ_v
(C) horizontal plane of symmetry, σ_h (D) inversion centre, i
19. The rotational spectrum of rigid diatomic molecule consists of lines which are equally spaced. If B is the rotational constant the spacing between the lines is equal to:
- (A) $2B$ (B) B
(C) $4B$ (D) $3B$
20. The angular momentum operator, \hat{L}_x is:
- (A) $-i\frac{h}{2\pi}\left(y\frac{\partial}{\partial z}-z\frac{\partial}{\partial y}\right)$ (B) $-i\frac{h}{2\pi}\left(y\frac{\partial}{\partial z}-x\frac{\partial}{\partial y}\right)$
(C) $-i\frac{h}{2\pi}\left(x\frac{\partial}{\partial z}-z\frac{\partial}{\partial y}\right)$ (D) $-i\frac{h}{2\pi}\left(x\frac{\partial}{\partial z}-y\frac{\partial}{\partial y}\right)$
21. The factor which affects the diffusion current in polarography is :
- (A) number of electrons involved in electrode reaction
(B) diffusion coefficient of electroactive species
(C) bulk concentration of the electroactive material
(D) all of these

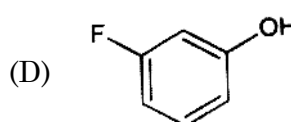
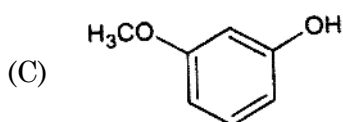
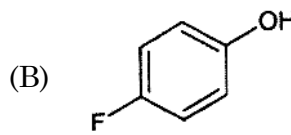
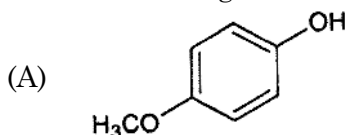
25. Which of the options shows the same compound as the following?



26. Which of the following statements is not correct for alkyl halide?

- (A) Order of reactivity of alkyl halides towards $E2$ dehydrohalogenation is found to be $3^\circ > 2^\circ > 1^\circ$
- (B) As branching at carbon increases, $E1$ mechanism is favored as compared to S_N1 mechanism
- (C) In $E2$ elimination different stereoisomer (diastereomer) converts into different stereo product
- (D) In most unimolecular reactions of alkyl halide $E1$ reaction is favored over S_N1 reaction

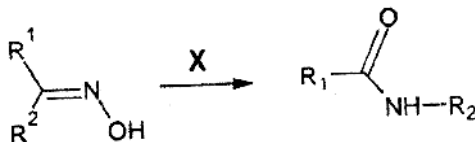
27. Which of the following is most acidic?



28. Which of the following is the intermediate in Wolff's reaction?

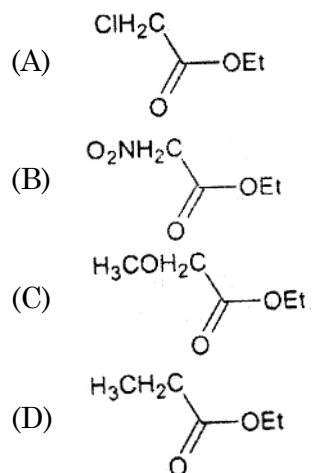
- (A) Ketene
- (B) Carbene
- (C) Carbocation
- (D) Free radical

29. Which among the options can function as 'X' in the following reaction?



- (A) Conc. H_2SO_4
- (B) PCl_5
- (C) $SOCl_2$
- (D) Any of the above

30. Which of the following ester is most reactive towards alkaline hydrolysis?



31. Which among the following is most basic?

- (A) $C_6H_5NH_2$ (B) $C_6H_5CH_2NH_2$
(C) $p-NO_2C_6H_4NH_2$ (D) $m-NO_2-C_6H_4NH_2$

32. Which is the highest energy conformation of cyclohexane?

- (A) Chair (B) Twist boat
(C) Half-chair (D) Boat

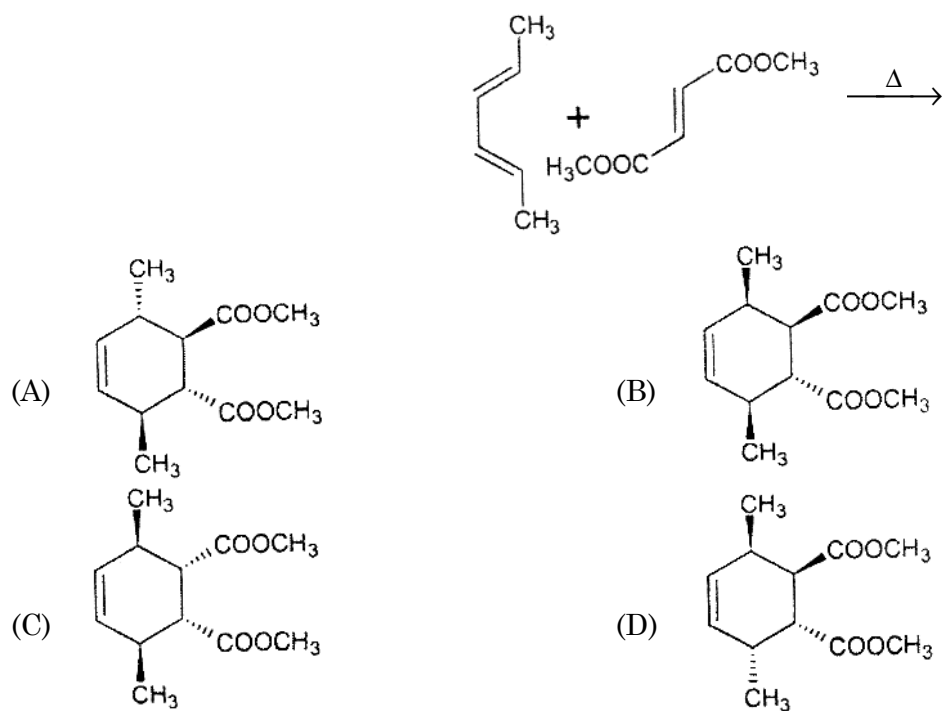
33. Which among the following is not aromatic?



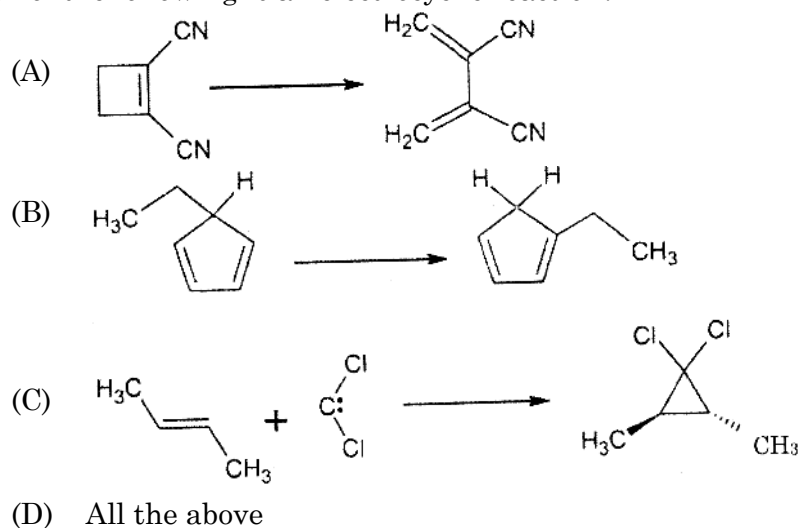
34. Which of the following will be correct if a reaction going in 80% enantiomeric excess?

- (A) The product contains 80% *R* enantiomer and 20% *S* enantiomer
(B) The product contains 50% *R* enantiomer and 30% *S* enantiomer
(C) The product contains 90% *R* enantiomer and 10% *S* enantiomer
(D) None of the above

35. Choose the major product of the following reaction :



36. Which of the following is an electrocyclic reaction?

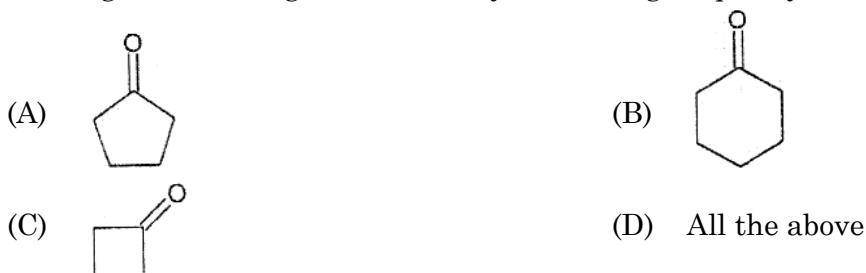



37. HOMO for hexa-1,3,5-triene under photochemical condition is :

- (A) ψ_5 (B) ψ_2
 (C) ψ_4 (D) ψ_3

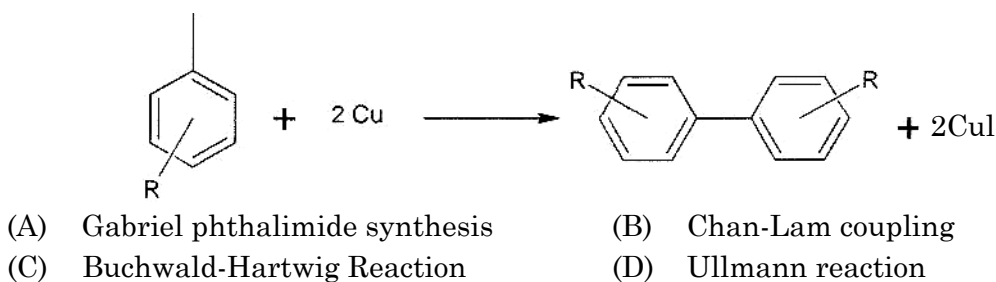
38. Which of the following is the application of ion exchange chromatography?
 (A) The softening of hard water (B) The demineralisation of water
 (C) Both (A) and (B) (D) None of the above
39. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) C-H (alkene), (3) C-H (alkyne), and (4) C-H (Arene)?
 (A) (1) < (4) \approx (2) < (3) (B) (4) < (3) \approx (2) < (1)
 (C) (1) < (2) \approx (3) < (4) (D) (3) < (4) \approx (2) < (1)

40. Which among the following shows carbonyl stretching frequency at 1715 cm^{-1} ?



41. Nuclei having both atomic number and mass number even have _____ spin.
 (A) Integral spin (B) Half integral spin
 (C) Zero spin (D) Positive spin
42. Which of the following has three types of hydrogens in the following compounds?
 (A) $\text{Br}-\text{CH}=\text{CH}_2$ (B) 
 (C) $\text{CH}_3-\text{CH}_2-\text{OH}$ (D) All the above

43. Identify the reaction :



44. Fmoc is :
 (A) 6-fluorenylmethoxycarbonyl (B) 7-fluorenylmethoxycarbonyl
 (C) 9-fluorenylmethoxycarbonyl (D) 7-fluorenylethoxycarbonyl

45. The precursor of lanosterol is :
 (A) Homoserine (B) Asparagines
 (C) Squalene (D) Tryptophan
46. In maltose, the glucose units are connected through :
 (A) $\beta(1 \rightarrow 4)$ glycosidic bond (B) $\alpha(1 \rightarrow 4)$ glycosidic bond
 (C) $\alpha, \beta(1 \rightarrow 4)$ glycosidic bond (D) $\alpha, \beta(1 \rightarrow 2)$ glycosidic bond
47. Which of the following is not an organometallic compound?
 (A) $C_6H_5 Mg Br$ (B) $CH_2 = CHNa$
 (C) $(CH_3 COO)_2 Pb$ (D) $(C_2H_5)_4 Pb$
48. Zerevitinov method is used to estimate the number of which group in organic compound?
 (A) $-NH_2$ (B) $-OH$
 (C) $-SH$ (D) All of these
49. Grignard reagent does not react with the following functional group :
 (A) $>C=O$ (B) $>C=C<$
 (C) $-OH$ (D) $-X$
50. Organo zinc compounds are involved in the reaction :
 (A) Reformatsky reaction (B) Gattermann reaction
 (C) Friedel-Crafts reaction (D) Knoevenagel reaction
51. Which is the organometallic compound capable of adding on to a Carbon-Carbon Double bond is :
 (A) $R ZnX$ (B) $RzZn$
 (C) $R Li$ (D) $R MgX$
52. Which of the following does not have an α, β unsaturated Carbonyl group?
 (A) Androsterone (B) Testosterone
 (C) Progesterone (D) Cortisone
53. Which of the following acts as a quenching gas in Geiger Muller Counter?
 (A) Argon gas (B) Krypton gas
 (C) Hydrogen gas (D) Alcohol
54. Which of the following material is used as the insulation between inner and outer electrodes of the ion Chamber?
 (A) Poly acryl amide (B) Polytetrafluoroethylene
 (C) Ceramic (D) Plastic

55. Liquid samples must be counted using ionisation Chamber by placing them in which of the following?
- (A) Test tube (B) Cuvette
(C) Ampoules (D) Faraday Cup
56. Neutron activation analysis is used to estimate the amount of an element in samples of :
- (A) Jewels (B) Precious stones
(C) Ancient Coins (D) All of these
57. Which of the following acting as an Usanovich acid?
- (A) Na_2O (B) Na
(C) $(\text{NH}_4)_2\text{S}$ (D) Sb_2S_5
58. _____ is an amphoteric solvent.
- (A) $\text{C}_2\text{H}_5\text{OH}$ (B) $\text{C}_6\text{H}_5\text{N}$
(C) HF (D) Liquid NH_3
59. Which Physical property is not used in thermal methods of analysis of the samples?
- (A) Mass (B) Temperature
(C) Volume (D) Pressure
60. Among the isopoly anions of V^{5+} , Nb^{5+} , Ta^{5+} , Cr^{6+} , Mo^{6+} and W^{6+} , only _____ is found to have tetrahedral MO_4^{2-} units joined through the corner.
- (A) Mo^{6+} (B) Cr^{6+}
(C) Nb^{5+} (D) Ta^{5+}
61. Assume the accepted value to be 1.45, which of the following options correctly describes the students experimental data? Trial 1 measurement 1.29, Trial 2 measurement 1.93, Trial 3 measurement 0.88 :
- (A) Accurate but not precise (B) Precise but not accurate
(C) Both accurate and precise (D) Neither accurate nor precise
62. In Mohr's method, if acidic solution is used :
- (A) Chromate ions are decreased (B) Chromate ions are increased
(C) Both (A) and (B) (D) None of the above
63. Which one of the following do not have a permanent dipole?
- (A) SO_2 (B) SO_3
(C) CS_2 (D) H_2S

64. Which is the reason for $\text{Fe}_2(\text{CO})_9$ being diamagnetic?
- (A) Presence of the CO as bridge group
 (B) Presence of Monodentate ligand
 (C) Metal-Metal (Fe – Fe) bond in molecule
 (D) Resonance hybridisation of CO
65. Geometrical isomerism is exhibited by :
- (A) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (B) $[\text{Zn}(\text{NH}_3)_2\text{Cl}_2]$
 (C) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ (D) $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$
66. The degree of _____ between the metal ion and the ligand directly influences the stability of the complex in solution.
- (A) Association (B) Dissociation
 (C) Ionisation (D) Freedom
67. Actinides have higher tendency to form complexes than lanthanides, due to :
- (A) Smaller charge and larger size (B) Higher charge and smaller size
 (C) They are radioactive (D) They are electropositive
68. _____ is a *Z* dimensional nanomaterial.
- (A) Quantum dot (B) Quantum wire
 (C) Quantum well (D) Carbon nanotube
69. Reaction with CH_3CN with CH_3MgI excess will finally result in the formation of :
- (A) CH_3CHO (B) $\text{C}_2\text{H}_5\text{CHO}$
 (C) CH_3COCH_3 (D) $(\text{CH}_3)_3\text{COH}$
70. Which of the following is an example of top down approach of synthesis of the nanomaterials?
- (A) Physical Vapour Deposition (B) Chemical Vapour Deposition
 (C) Sputtering (D) None of these
71. Nanosized polymer built from branched units are called :
- (A) Dendrimers (B) Composites
 (C) Carbon based materials (D) Metal based materials
72. Regarding nanomaterials, consider the following statements :
- (1) They have reduced imperfection compared to the bulk material
 (2) They are used in fuel cells
 (3) They have high surface energy
 (4) They have a large fraction of surface atoms
- Out of these statements
- (A) (1), (2), (3), (4) are correct (B) (1), (2), (3) are correct
 (C) (1), (2), (4) are correct (D) (2), (3), (4) are correct

73. Nanoscale titanium Oxide increases the :
(A) Resistance (B) Stability
(C) Conductivity (D) Ductility
74. The green synthesis methods should have :
(A) Low atom efficiency (B) High efficiency
(C) High energy requirements (D) High harmful products
75. In green Chemistry, we must use feed stock derived from annually renewable resources or from :
(A) Plants (B) Chemicals
(C) Organic Compounds (D) Abundant wastes
76. An ideal solvent facilitates the :
(A) Dissolving property (B) Mass transfer
(C) Titration (D) Combustion
77. IUPAC name of repeating unit of crown ethers is :
(A) Ethyleneoxy (B) Dimethyl eneoxy
(C) Ethoxy (D) Diethylether
78. Which of the following statements is not true about Cyclodextrins?
(A) They are polysaccharides
(B) They have a hydrophilic outer surface
(C) They are useful for formulating hydrophilic APIs
(D) They are useful for formulating hydrophobic APIs
79. _____ are macropolycyclic poly aza – poly ethers.
(A) Cyclophanes (B) Cryptands
(C) Rotaxanes (D) Crown ethers
80. A Calixarene is a cyclic oligomer based on a methylene-linked :
(A) Acids (B) Phenols
(C) Aldehyde (D) Ketones
81. Read the following literary works in Malayalam. Select the book not written by Lalithambika Antharjanam :
(A) Agnisakshi
(B) Athma Kadhakkoru Aamugham
(C) Ambalamani
(D) Seethamuthal Sathyavathi Vare

82. Choose the correct pairs :

1. Kumaran Asan (a) Nair Service Society
 2. K. Kelappan (b) Sree Narayana Dharma Paripalana Yogam
 3. Swami Vagbhatananda (c) Sudharma Suryodaya Sabha
 4. Pandit K.P. Karuppan (d) Athma Vidhya Sangam
- (A) 1-(d), 2-(b), 3-(c), 4-(a) (B) 1-(a), 2-(c), 3-(b), 4-(d)
(C) 1-(b), 2-(a), 3-(d), 4-(c) (D) 1-(a), 2-(d), 3-(c), 4-(b)

83. Choose the correctly matched Biography :

- (A) Jeevitha Samaram – V.T. Bhattathirippadu
- (B) Kazhinja Kalam – C. Kesavan
- (C) Kannirum Kinavum – K.P. Kesavamenon
- (D) Ormmayude Olangalil – G. Sankara Kuruppu

84. Who among the following is not a winner of Jyan Preed Puraskar?

- (A) Vaikom Muhammed Basheer (B) Thakazhi Siva Sankara Pillai
- (C) S.K. Pottakadu (D) G. Sankara Kuruppu

85. Choose leader associated with Ezhava Memorial?

- (A) K. Kelappan (B) Dr. Palpu
- (C) Chattambi Swamikal (D) T.K. Madhavan

86. Assertion : The Election and Electoral College for the President of India is same as that of the Vice President of India.

Reason (R): Vice President of India is the highest dignitary of India next after the President.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

87. Assertion : In a parliamentary democracy the President cannot function without the aid and advice of the cabinet Headed by the Prime Minister.

Reason (R) : Parliamentary system of government represents the whole Nation.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

88. Assertion : 'Preventive Detention' is included in the chapter on Fundamental Rights mentioned in the Indian Constitution.

Reason (R) : Preventive Detention without trial can subsist only as long as the legislature permits.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

89. Assertion : The people of India enjoy the Fundamental Rights of Equality, Liberty Religion and Right to Education and Culture.

Reason (R) : The Judiciary cannot enforce the state to implement fundamental rights.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

90. Assertion : The normal tenure of Lok Sabha is 5 years but it may be dissolved earlier by the president of India.

Reason (R) : The Parliament shall meet at least once a year and the interval between two consecutive sessions shall be 5 months.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

91. Assertion : Article 312 of the constitution provides that any proposal to create an All India Service should originate from the Council of States (Rajya Sabha)

Reason (R) : Rajya Sabha is the upper chamber of the Parliament.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

92. Assertion : No minimum age is prescribed for the appointment as a judge of the supreme court.

Reason (R): The original jurisdiction of the supreme court is mentioned in article 149 of the Constitution.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

93. Assertion : The President of India can declare National Emergency under article 352 of the Indian Constitution due to war or external aggression or armed rebellion.

Reason (R): National Emergency is imposed in India in 1962, 1971, 1975 and in 1999.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

94. Assertion : The Governor consults High Court and Public Service Commission before posting District judges in the judicial service of the state.

Reason (R): Direct control over district courts are vested in the supreme court.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

95. Assertion : Amendment procedure of Indian constitution is mentioned in Article 362 of the constitution.

Reason (R): There are three methods for the Amendment of the Indian Constitution.

- (A) Both assertion and reason are true and R is the correct explanation of Assertion
- (B) Both assertion and reason are true but the reason given is not the correct explanation of Assertion
- (C) Assertion is true but reason is false
- (D) Assertion is false but reason is true

SPACE FOR ROUGH WORK

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