

100 previous-year questions, questions only — solve them first. The official answer key is on the last page.

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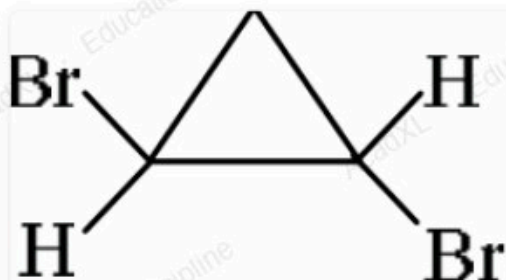
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NSEC 2007

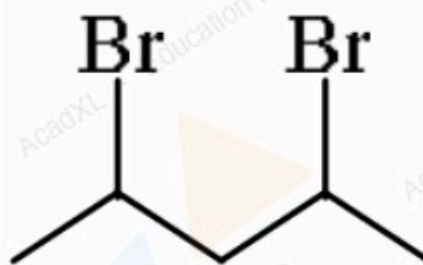
Time: 120 minutes · Maximum marks: 300 · Questions: 100

1. Identify the chiral species among the following

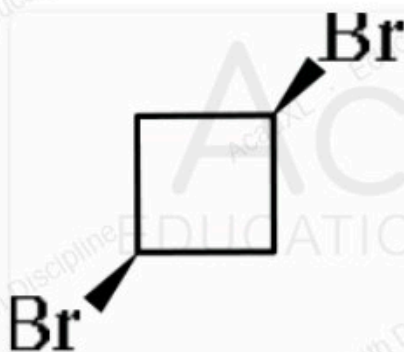
(A)



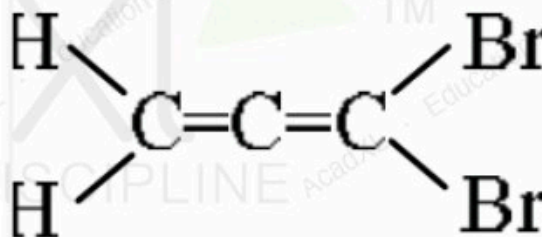
(B)



(C)



(D)



[3 marks, -1 for a wrong answer]

2. The achiral species among the following is :

(A) a car

(B) a screw driver

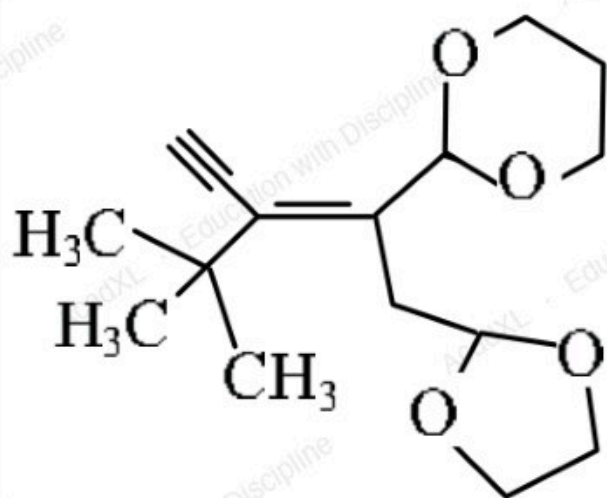
(C) a screw

(D) a hand

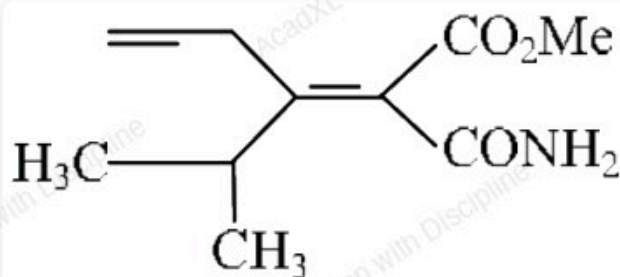
[3 marks, -1 for a wrong answer]

3. Which one of the following compounds has (Z) configuration about the C-C double bond?

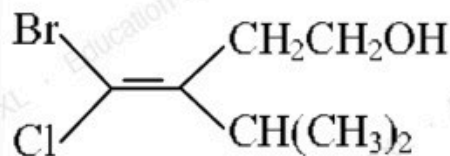
(A)



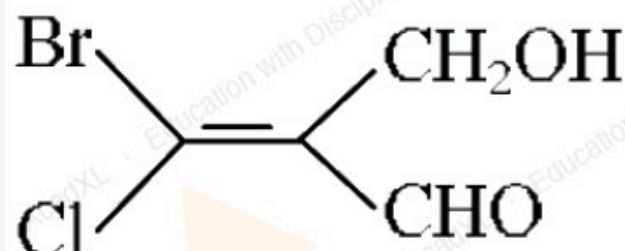
(B)



(C)

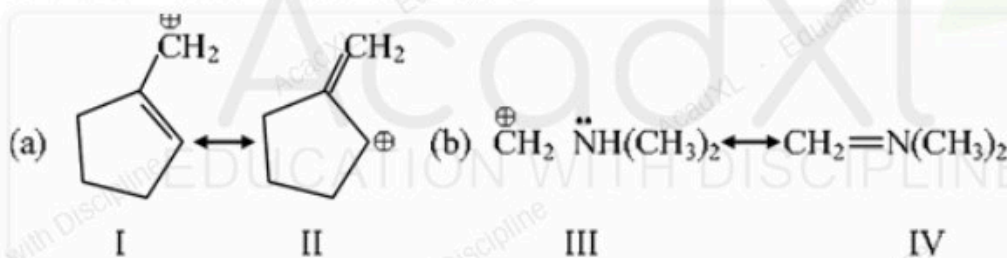


(D)



[3 marks, -1 for a wrong answer]

4. From the two pairs a and b of resonance structure given below, designate the ones that would contribute most to the resonance hybrid



(A) I & III

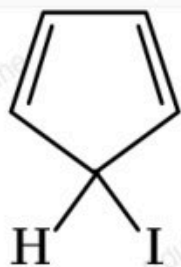
(B) I & IV

(C) II & III

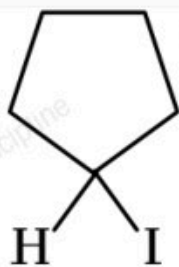
(D) II & IV

[3 marks, -1 for a wrong answer]

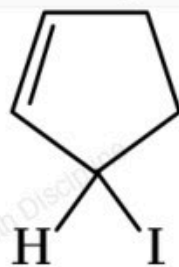
5. The order of the rate of formation of carbocations from the following iodo compounds is :



I



II



III

(A) I > II > III

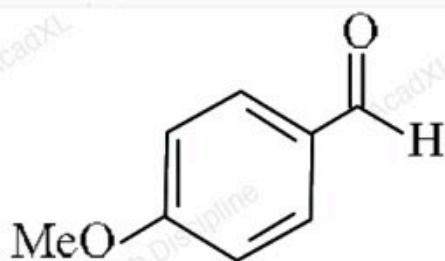
(B) I > III > II

(C) III > II > I

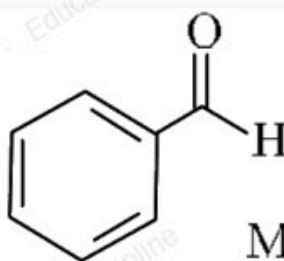
(D) II > III > I

[3 marks, -1 for a wrong answer]

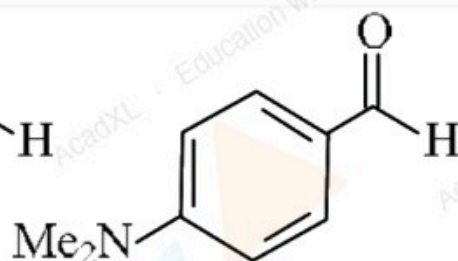
6. The K_{eq} values in HCN addition to following aldehydes are in the order :



I



II



III

(A) I > II > III

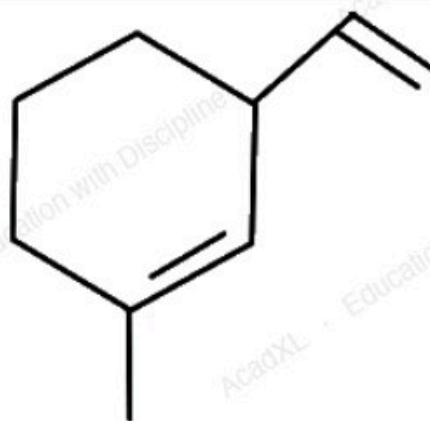
(B) II > III > I

(C) III > I > II

(D) II > I > III

[3 marks, -1 for a wrong answer]

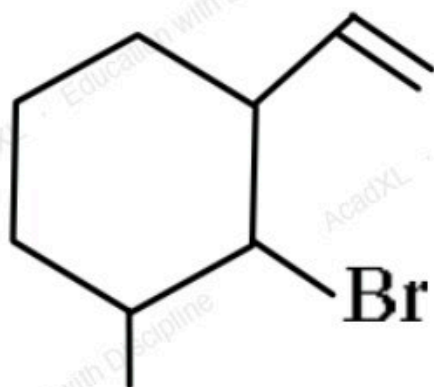
7. The major product formed upon addition of 1 mole of HBr in the following reactions is



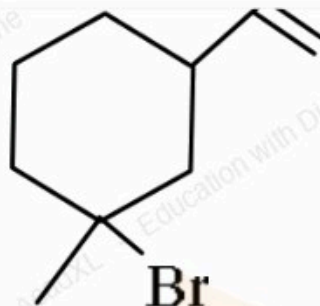
HBr (1 mole)



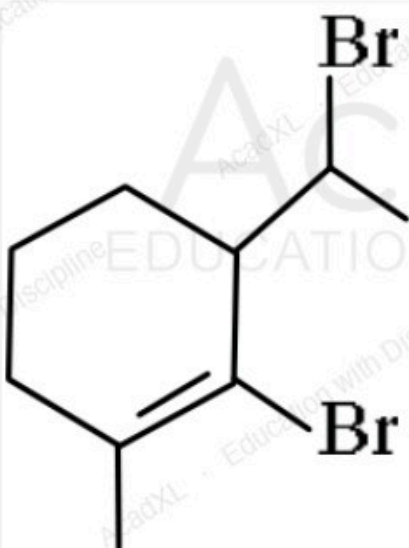
(A)



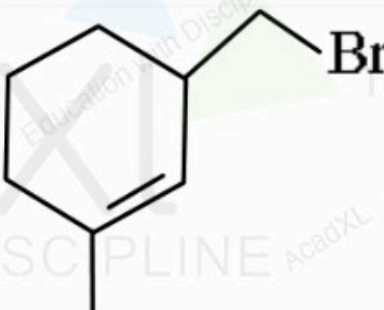
(B)



(C)

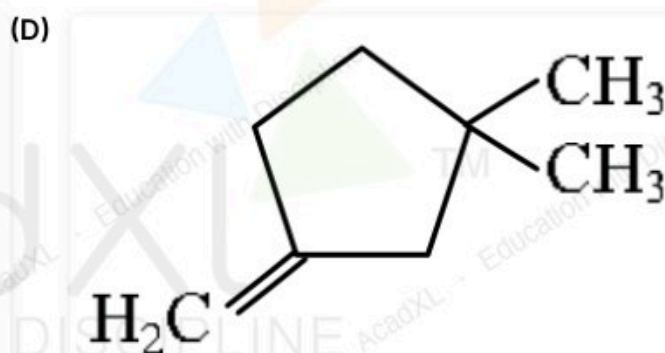
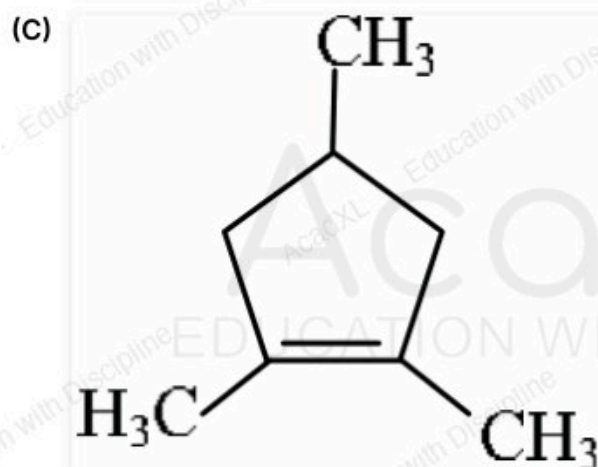
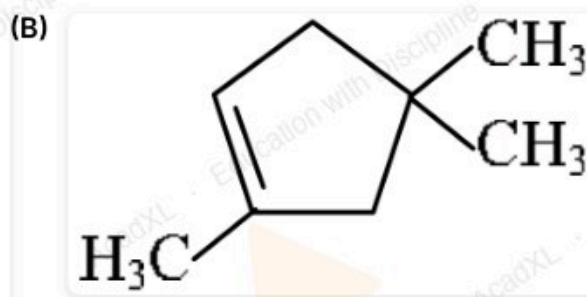
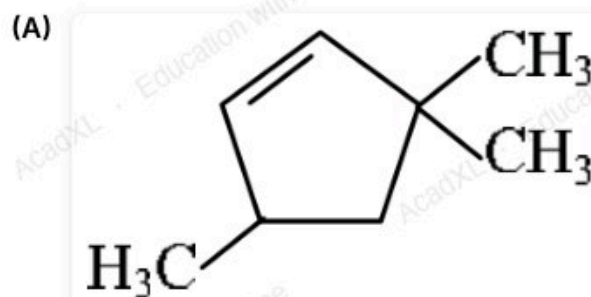
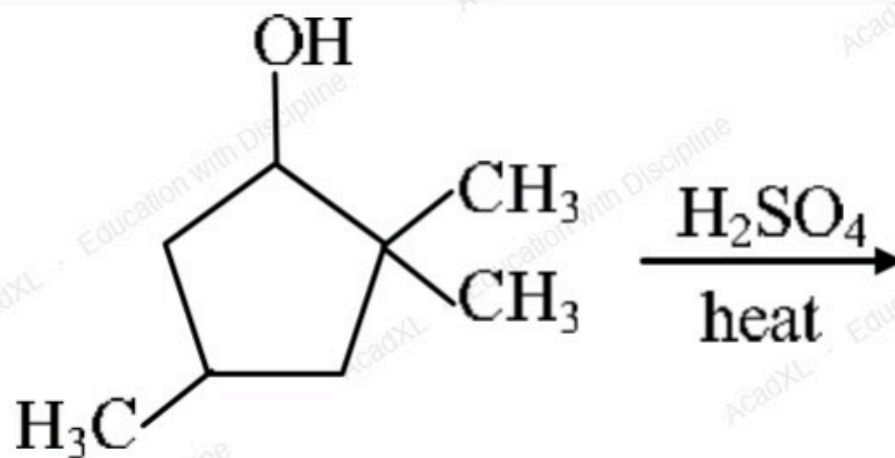


(D)



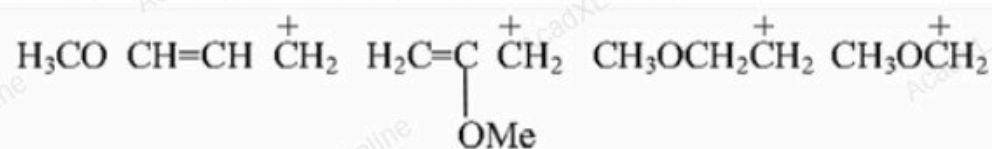
[3 marks, -1 for a wrong answer]

8. The major product formed in the following reaction is (alcohol with H_2SO_4 , heat) :



[3 marks, -1 for a wrong answer]

9. The relative stabilities of the following carbocations is :



(A) I > II > III > IV

(B) I > IV > II > III

(C) II > III > IV > I

(D) III > I > II > IV

[3 marks, -1 for a wrong answer]

10. The first nobel prize in chemistry was awarded to which one of the following scientists for his work on rates of reactions, chemical equilibrium and osmotic pressure.

(A) Arrthenius

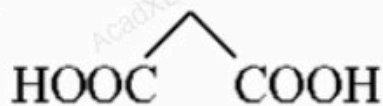
(B) van't Hoff

(C) Enuil

(D) Ramsay

[3 marks, -1 for a wrong answer]

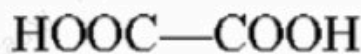
11. Indicate the correct order of acidity (first ionization) in the following dicarboxylic acids :



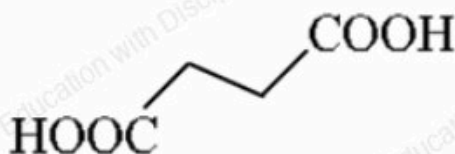
I



II



III



IV

(A) I > II > III > IV

(B) II < IV > I > III

(C) III > I IV > II

(D) IV > II > I > III

[3 marks, -1 for a wrong answer]

12. Arange the following compounds in order of decreasing reactivity in the elimination (bimolecular) reaction with C_2H_5ONa



(A) II > I > III > IV

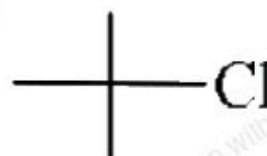
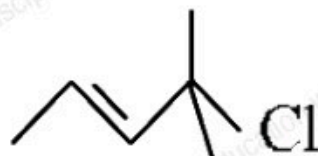
(B) IV > III > I > II

(C) III > I > II > IV

(D) I > III > IV > II

[3 marks, -1 for a wrong answer]

13. Indicate the order of reactivity of the following compounds in nucleophilic substitution (unimolecular) reaction.



(A) I > II > III

(B) II > III > I

(C) III > II > I

(D) II > I > III

[3 marks, -1 for a wrong answer]

14. Identify the ester which upon addition of excess Grignard's reagent will provide a secondary alcohol.

(A) $\text{CH}_3\text{CO}_2\text{Et}$

(B) $(\text{CH}_3)_2\text{CHCO}_2\text{Et}$

(C) HCO_2Et

(D) $\text{C}_6\text{H}_5\text{CO}_2\text{Et}$

[3 marks, -1 for a wrong answer]

15. Repeating isoprene units are present in

(A) alkaloids

(B) peptides

(C) nucleic acids

(D) terpenoids

[3 marks, -1 for a wrong answer]

16. The C-C-H bond angle in ethylene is

(A) 180°

(B) $109^\circ 28'$

(C) 120°

(D) 90°

[3 marks, -1 for a wrong answer]

17. The following symmetry element is present in the d as well as the l form of tartaric acid ($\text{CO}_2\text{HCH}(\text{OH})\text{CH}(\text{OH})\text{CO}_2\text{H}$)

(A) centre of symmetry

(B) axis of symmetry (C_2)

(C) Plane of symmetry

(D) None

[3 marks, -1 for a wrong answer]

18. The carbocation $(\text{CH}_3)_3\text{C}^+$ is stabilized primarily by

(A) hyperconjugation

(B) tautomerism

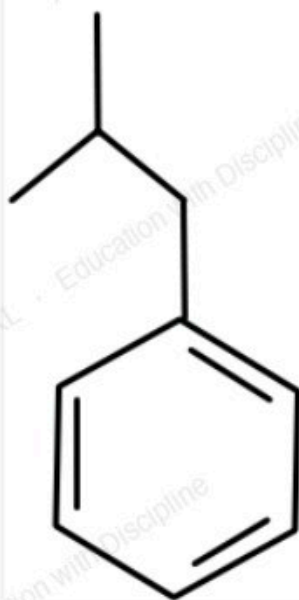
(C) resonance

(D) conjugation

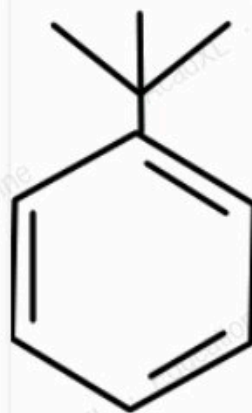
[3 marks, -1 for a wrong answer]

19. Predict the product formed in the following reaction (benzene + isobutyl group $\xrightarrow{\text{AlCl}_3}$ Product)

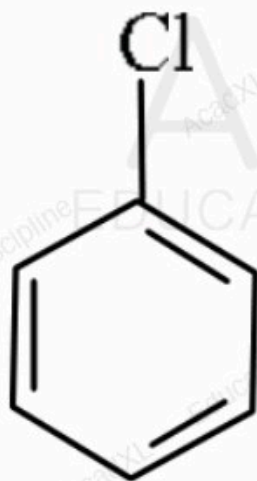
(A)



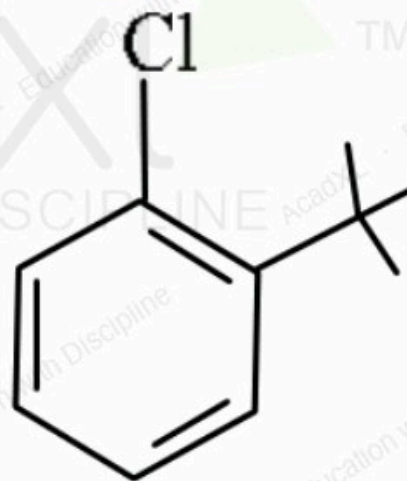
(B)



(C)



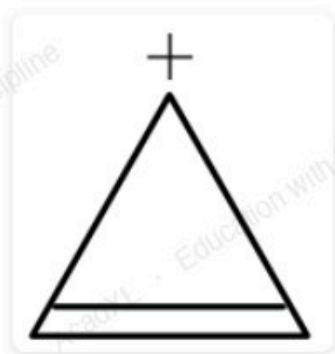
(D)



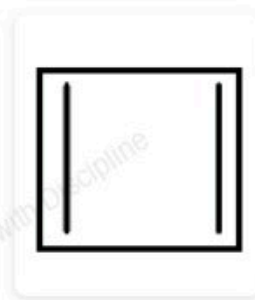
[3 marks, -1 for a wrong answer]

20. Identify the odd species out (Which of the species among the following is different from others ?)

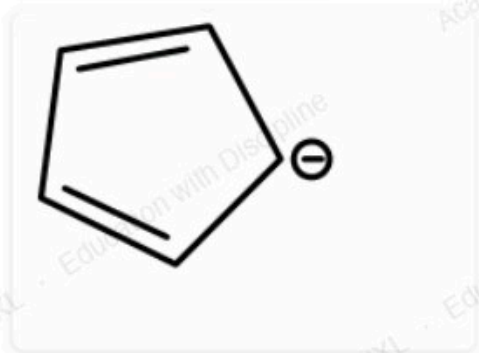
(A)



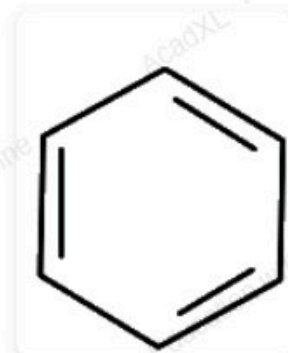
(B)



(C)

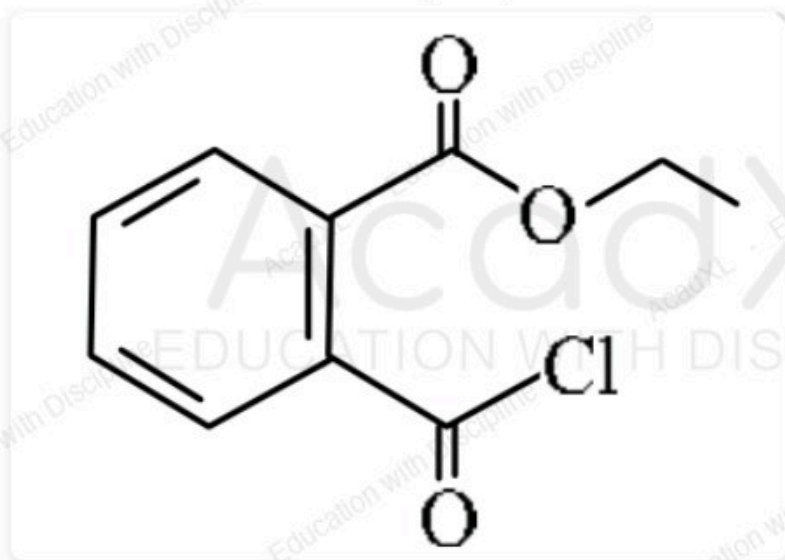


(D)



[3 marks, -1 for a wrong answer]

21. The IUPAC name of the following compound is



(A) 2-Chlorocarbonyl ethyl benzoate

(B) 2-Carboxyethylbenzoylchloride

(C) Ethyl-2-(chlorocarbonyl) benzoate

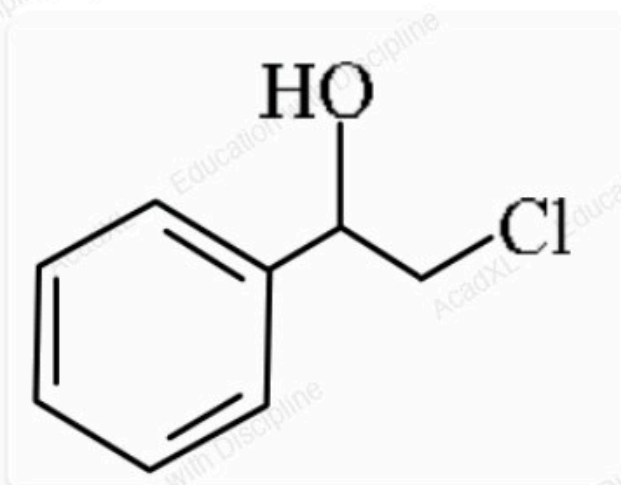
(D) Ethyl-1-(chlorocarbonyl) benzoate

[3 marks, -1 for a wrong answer]

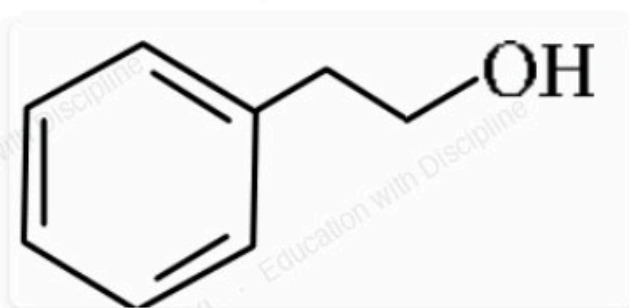
22. Consider the following reactions: $\text{benzene} + \text{CH}_2 = \text{CH}_2 + \text{Cl}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+, \text{heat}} \text{X} \xrightarrow{\text{NaOH(aq)}} \text{Y}$.

The major product (Y) of the reaction is :

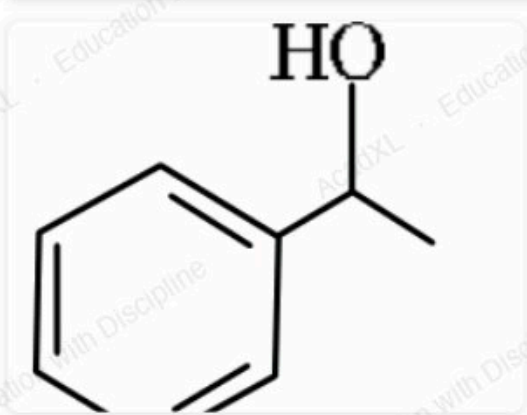
(A)



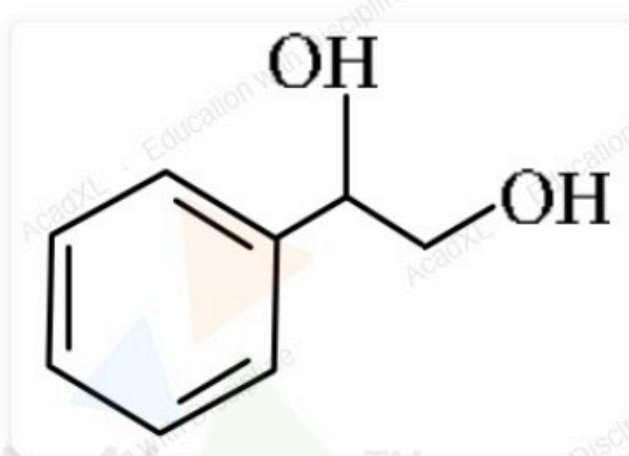
(B)



(C)

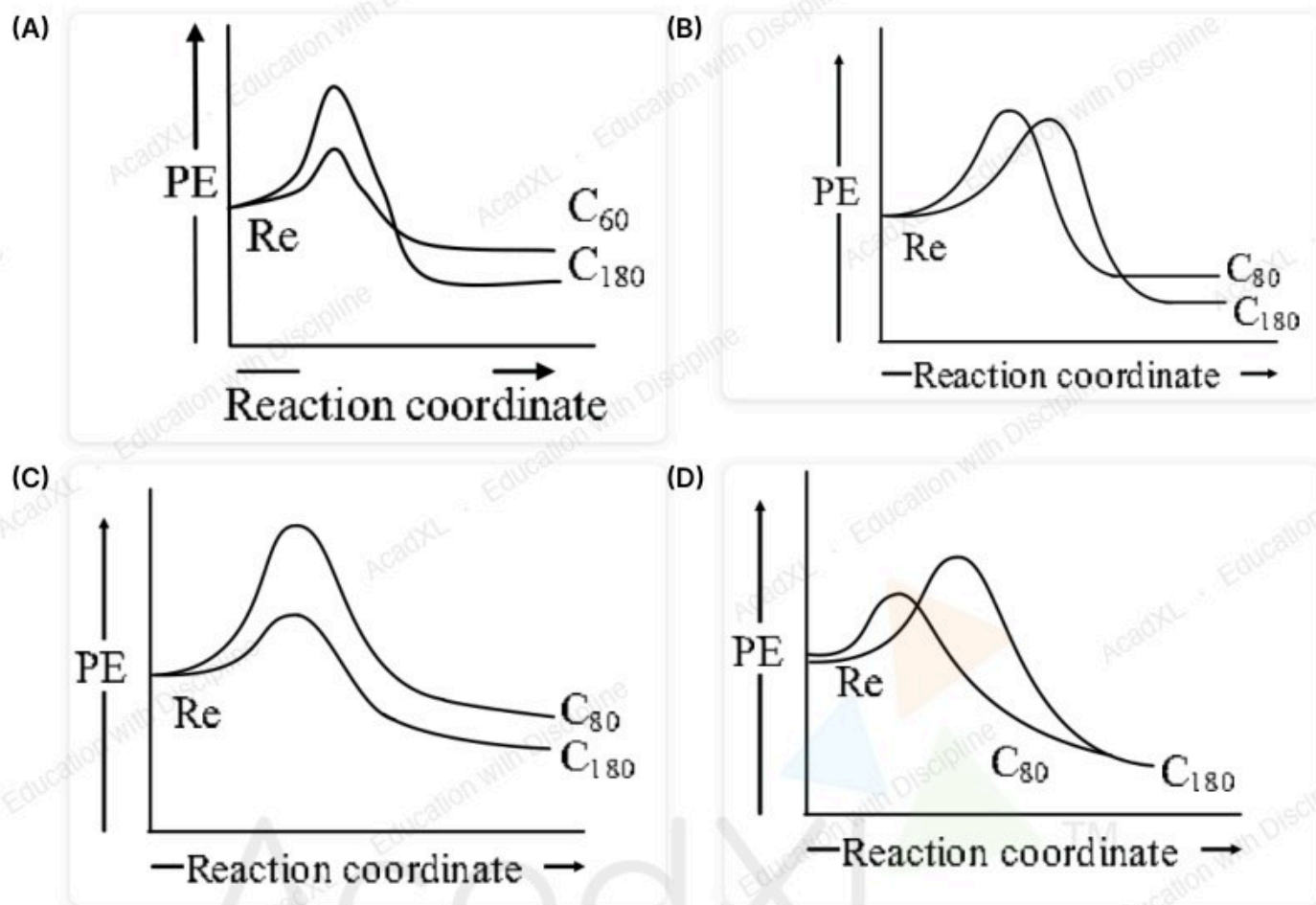


(D)



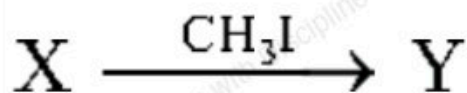
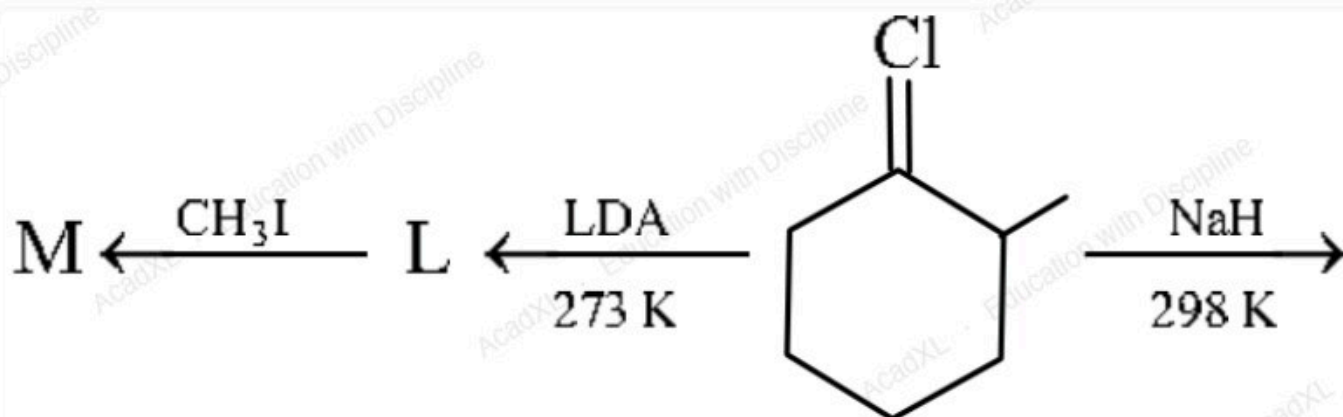
[3 marks, -1 for a wrong answer]

23. Fullerenes are generated on a very rapid scale typically in milliseconds. In all techniques, C_{60} is produced in much greater quantities than C_{180} though latter is more stable. Which of the following graph represents the following two processes ? (i) $\text{Reactant (Re)} \rightleftharpoons 3C_{60}$ (ii) $\text{Reactants (Re)} \rightleftharpoons C_{180}$



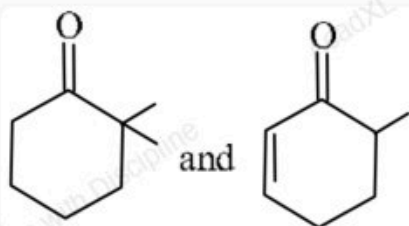
[3 marks, -1 for a wrong answer]

24. Consider the following reactions (LDA = lithiumdiisopropyl amide). The products M and Y respectively are

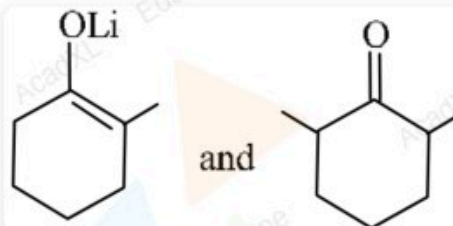


(LDA = lithiumdiisopropyl amide)

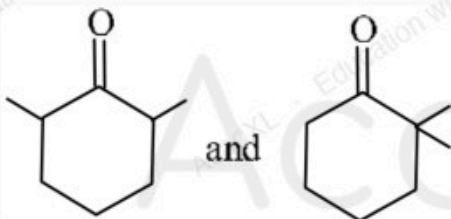
(A)



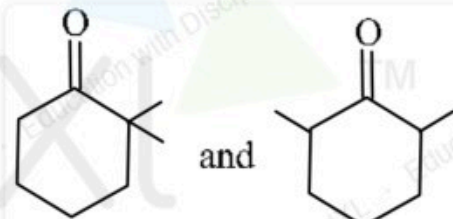
(B)



(C)



(D)



[3 marks, -1 for a wrong answer]

25. What is the major product obtained from the following reaction ?



(A) $\text{HOCH}_2\text{COOCH}_3$

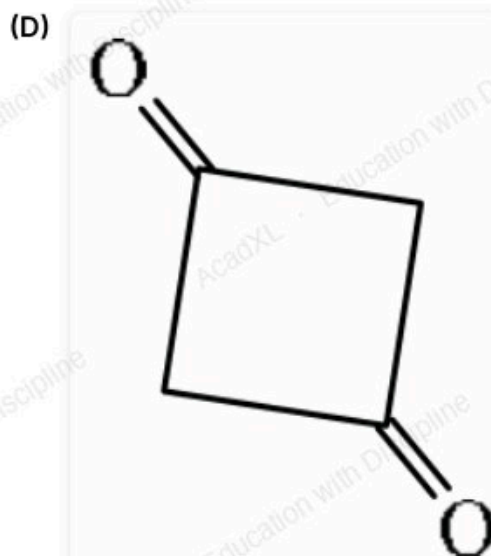
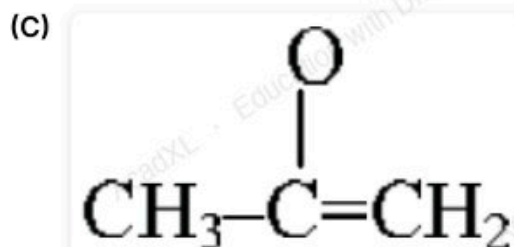
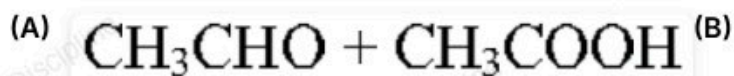
(B) $\text{CH}_3\text{OCH}_2\text{COOCH}_3$

(C) $\text{ClCH}_2\text{COOCH}_3$

(D) $\text{CH}_3\text{OCH}_2\text{COOH}$

[3 marks, -1 for a wrong answer]

26. What is the major product obtained from the following reaction ? $\text{CH}_3\text{COCH}_2\text{COOH} \xrightarrow{\text{heat}}$ Product



[3 marks, -1 for a wrong answer]

27. The correct order of acidity of the C-H proton is -

(A) acetylene > ethylene > ethane

(B) ethylene > acetylene > ethane

(C) ethane > ethylene > acetylene

(D) acetylene > ethane > ethylene

[3 marks, -1 for a wrong answer]

28. In the petroleum industry, crude oil is separated into different fractions by

(A) differential extraction

(B) fractional distillation

(C) chromatography

(D) leaching

[3 marks, -1 for a wrong answer]

29. The percentage of oxygen in a compound is determined by

(A) Dumas method

(B) Kjeldahl's method

(C) Carius method

(D) subtracting the sum of percentages of all other elements present from 100

[3 marks, -1 for a wrong answer]

30. Conformational changes in a molecule leads to change in

(A) torsional angle

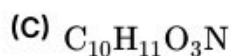
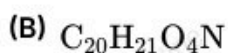
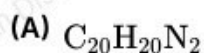
(B) bond angle

(C) bond length

(D) all of the above

[3 marks, -1 for a wrong answer]

31. A qualitative analysis of papaverine, an opium alkaloid showed carbon, hydrogen and nitrogen. A quantitative analysis gave 70.8% carbon 6.2% hydrogen and 4.1% nitrogen. The empirical formula of papaverine is :



[3 marks, -1 for a wrong answer]

32. Vision, the process of seeing, depends mainly on one reaction, namely the transformation of -

(A) rods cells into cone cells in the eye

(B) β -carotene into retinol

(C) 11-cis-retinal into 11-trans-retinal

(D) 7-cis-retinol into 7-trans-retinol

[3 marks, -1 for a wrong answer]

33. Ethyl propanoate has a pineapple like odour and is used as a flavoring agent in fruit syrups. It is prepared as follows : $C_2H_5OH_{(aq)} + C_2H_5COOH_{(aq)} \rightarrow C_2H_5COOC_2H_{5(aq)} + H_2O(l)$. In an experiment, 349 grams of ethyl propanoate form 250 grams of ethanol, with propanoic acid in excess. (M.W. of ethyl propanoate : 102, M.W. of ethanol : 46) The percentage yield of the above reaction is

(A) 48.2

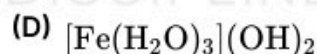
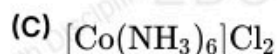
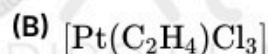
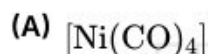
(B) 62.9

(C) 54.6

(D) 32.7

[3 marks, -1 for a wrong answer]

34. In which of the following compounds is the oxidation number of the transition metal zero ?



[3 marks, -1 for a wrong answer]

35. As the number of electrons in d orbitals of transition elements increases, the screening effect on the valence electrons -

(A) increases

(B) decreases greatly

(C) is not observed

(D) decreases slightly

[3 marks, -1 for a wrong answer]

36. $[NiCl_4]^{2-}$ is paramagnetic and therefore its geometry is

(A) pyramidal

(B) bi-pyramidal

(C) tetrahedral

(D) square planar

[3 marks, -1 for a wrong answer]

37. The magnetic moment of $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$ is :

(A) 1.73 BM

(B) 3.87 BM

(C) 4.90 BM

(D) 5.92 BM

[3 marks, -1 for a wrong answer]

38. dsp^2 hybridization represents

(A) octahedral geometry

(B) square-planar geometry

(C) trigonal-bipyramidal geometry

(D) square-pyramidal geometry

[3 marks, -1 for a wrong answer]

39. Which type of bond exists between the two boron atoms in a diborane molecule ?

(A) 2-center-2-electron

(B) 2-center-3-electron

(C) 3-center-3-electron

(D) 4-center-4-electron

[3 marks, -1 for a wrong answer]

40. Which isomerism is exhibited by $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ and $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$?

(A) Ionization

(B) Linkage

(C) Coordination

(D) Polymerization

[3 marks, -1 for a wrong answer]

41. The complex pentaamminecarbonatocobalt (III) chloride is

(A) $[\text{Co}(\text{NH}_3)_5\text{CO}_3]\text{Cl}$

(B) $[\text{Co}(\text{NH}_2)_5\text{CO}_3]\text{Cl}$

(C) $[\text{Co}(\text{NH}_2)_5\text{CO}_2]\text{Cl}$

(D) $[\text{Co}(\text{NH}_3)_5\text{CO}_2]\text{Cl}$

[3 marks, -1 for a wrong answer]

42. According to molecular orbital theory, the oxygen molecule is -

(A) Diamagnetic

(B) Paramagnetic

(C) Ferromagnetic

(D) Non magnetic

[3 marks, -1 for a wrong answer]

43. Which of the following has zero dipole moment ?

(A) NH_3

(B) NF_3

(C) BF_3

(D) CHCl_3

[3 marks, -1 for a wrong answer]

44. Thallium forms stable chloride, TlCl , unlike Aluminum which forms chloride AlCl_3 . This is because :

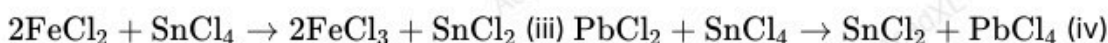
- (A) Insert pair effect makes Tl^+ more stable than Tl^{3+} (B) Tl is not a group 13 element

Tl^{3+}

- (C) Tl-X bond is covalent while Al-Cl bond is ionic. (D) Tl-X bond is ionic while Al-Cl bond is covalent

[3 marks, -1 for a wrong answer]

45. Which two of the following reactions are possible ? (i) $2\text{FeCl}_3 + \text{SnCl}_2 \rightarrow 2\text{FeCl}_2 + \text{SnCl}_4$ (ii)



- (A) i and ii

- (B) i and iii

- (C) i and iv

- (D) ii and iv

[3 marks, -1 for a wrong answer]

46. Silicones are water repelling in nature because -

- (A) they have highly covalent Si-O-Si linkages

- (B) they have organic groups forming hydrophobic exterior.

- (C) they are polymeric in nature.

- (D) they have Si-H bonds as in hydrocarbons

[3 marks, -1 for a wrong answer]

47. Which of the following compounds is most basic in nature ?

- (A) $\text{Si}(\text{OH})_4$

- (B) $\text{Al}(\text{OH})_3$

- (C) $\text{Mg}(\text{OH})_2$

- (D) $\text{P}(\text{OH})_3$

[3 marks, -1 for a wrong answer]

48. Aqueous solutions having equimolar quantities of $\text{Pb}(\text{NO}_3)_2$, AgNO_3 , AgSO_4 , BaCl_2 and K_2CrO_4 are allowed to react and the reaction mixture is then altered. Which ions will be present in the filtrate in appreciable quantity

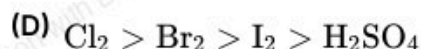
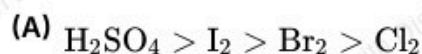
- (A) Pb^{2+} , Ag^+ , Ba^{2+} , K^+ , NO_3^- , SO_4^{2-} , CrO_4^{2-} , Cl^- (B) Ba^{2+} , K^+ , NO_3^- , CrO_4^{2-}

- (C) Pb^{2+} , Ba^{2+} , K^+ , NO_3^- , CrO_4^{2-}

- (D) K^+ , NO_3^-

[3 marks, -1 for a wrong answer]

49. Concentrated sulphuric acid on reaction with NaCl, NaBr and NaI produces HCl, bromine and iodine, respectively. What order of oxidizing of halogens with reference of sulphuric acid can be established on the basis of this reaction



[3 marks, -1 for a wrong answer]

50. According to the Crystal field theory, the energy of d_{xy} orbital is lower than $d_{x^2-y^2}$ in an octahedral complex because

(A) the d_{xy} orbital is near the ligands.

(B) the repulsion between the d_{xy} electrons and ligand electrons is less than that between $d_{x^2-y^2}$ and ligand electrons

(C) the repulsion between the d_{xy} electrons and ligand electrons is more than that between $d_{x^2-y^2}$ and ligand electrons.

(D) the $d_{x^2-y^2}$ orbital is away from the ligands

[3 marks, -1 for a wrong answer]

51. The orbitals of iron involved in the hybridization in $\text{Fe}(\text{CO})_5$ are

(A) s, p_x , p_x , p_z and $d_{x^2-y^2}$

(B) s, p_x , p_x , d_{z^2} and $d_{x^2-y^2}$

(C) s, p_x , p_y , p_z and d_{z^2}

(D) s, p_x , p_z , d_{xy} and $d_{x^2-y^2}$

[3 marks, -1 for a wrong answer]

52. The crystal field stabilization energy (CFSE) in $[\text{Co}(\text{SCN})_6]^{3-}$ is

(A) $-24 Dq$

(B) $-18 Dq$

(C) $-4 Dq$

(D) $0 Dq$

[3 marks, -1 for a wrong answer]

53. Element having $(4, 0, 0, +1/2)$ as a set of four quantum numbers for its valence electron is -

(A) Na

(B) Ca

(C) K

(D) Br

[3 marks, -1 for a wrong answer]

54. What is the correct order of stability of the complexes, $[\text{Ni}(\text{NH}_3)_6]^{2+}$, $[\text{Ni}(\text{en})_3]^{2+}$, $[\text{Ni}(\text{DET})_2]^{2+}$?
 [en = 1, 2 diaminoethane, $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$; DET = Diethylenetriamine, $\text{H}_2\text{NCH}_2\text{CH}_2\text{NHCH}_2\text{NH}_2$]
- (A) $[\text{Ni}(\text{NH}_3)_6]^{2+} \approx [\text{Ni}(\text{en})_3]^{2+} \approx [\text{Ni}(\text{DET})_2]^{2+}$ (B) $[\text{Ni}(\text{NH}_3)_6]^{2+} < [\text{Ni}(\text{en})_3]^{2+} \approx [\text{Ni}(\text{DET})_2]^{2+}$
 (C) $[\text{Ni}(\text{NH}_3)_6]^{2+} < [\text{Ni}(\text{en})_3]^{2+} < [\text{Ni}(\text{DET})_2]^{2+}$ (D) $[\text{Ni}(\text{NH}_3)_6]^{2+} > [\text{Ni}(\text{en})_3]^{2+} > [\text{Ni}(\text{DET})_2]^{2+}$

[3 marks, -1 for a wrong answer]

55. How many isomers are possible for a compound with formula, $[\text{Rh}(\text{en})\text{Cl}(\text{NO}_2)]$?

- (A) 2 (B) 4
 (C) 6 (D) 8

[3 marks, -1 for a wrong answer]

56. Metal carbonyls have the metal ions in zero or unusually lower oxidation states. This is because

- (A) carbonyl ligand is reducing in nature (B) carbonyl is a highly electron rich ligand
 (C) carbonyl is a strongly σ -bonding ligand (D) carbonyl is a strongly π -acidic ligand

[3 marks, -1 for a wrong answer]

57. Europium forms stable Eu^{2+} ions because

- (A) Europium is a lanthanide (B) 2^+ is the common oxidation state of lanthanides
 (C) Eu^{2+} has f^7 valence electronic configuration (D) All of the above reasons

[3 marks, -1 for a wrong answer]

58. Which of the following molecules contains the maximum % of sulphur by mass?

- (A) Na_2SO_4 (B) H_2SO_4
 (C) Li_2SO_4 (D) PbSO_4

[3 marks, -1 for a wrong answer]

59. 17.1 grams of aluminum sulfate, $\text{Al}_2(\text{SO}_4)_3$ is dissolved in enough water to prepare 1.00 L of solution. What the molarity of the sulfate ion in this solution? (Neglect any hydrolysis)

- (A) $1.67 \times 10^2 \text{ M}$ (B) $5.00 \times 10^2 \text{ M}$
 (C) $1.50 \times 10^1 \text{ M}$ (D) $2.50 \times 10^1 \text{ M}$

[3 marks, -1 for a wrong answer]

60. Calculate the pH of a solution made by mixing 150 cm^3 of $0.10 \text{ M CH}_3\text{COONa}$ and 250 cm^3 of $0.10 \text{ CH}_3\text{COOH}$ [K_a of $\text{CH}_3\text{COOH} = 1.8 \times 10^{-5}$]

(A) 2.37

(B) 4.52

(C) 4.74

(D) 4.97

[3 marks, -1 for a wrong answer]

61. The solubility product constant, K_{sp} , of Ag_3PO_4 is 1.8×10^{-18} . What is the molar solubility of Ag_3PO_4 in water (neglect any hydrolysis)

(A) 1.6×10^{-5}

(B) 8.4×10^{-7}

(C) 1.3×10^{-9}

(D) 4.5×10^{-19}

[3 marks, -1 for a wrong answer]

62. Chlorine can be prepared by reacting HCl with MnO_2 . The reaction is represented by the equation $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \rightarrow \text{Cl}_2(\text{g}) + \text{MnCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$. Assuming the reaction goes to completion. What mass of concentrated HCl solution (36.0% HCl by mass) needed to produce 2.50 g of Cl_2

(A) 5.15 g

(B) 14.3 g

(C) 19.4 g

(D) 26.4 g

[3 marks, -1 for a wrong answer]

63. In the unit cell of the crystal formed by the ionic compound of X and Y, the corners are occupied by X and Y centers of the faces by Y. The empirical formula of the compound is:

(A) XY

(B) X_2Y

(C) XY_3

(D) X_5Y_6

[3 marks, -1 for a wrong answer]

64. Which of the following pairs is a lewis acid & lewis base?

(A) Cl & Ag^+

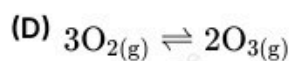
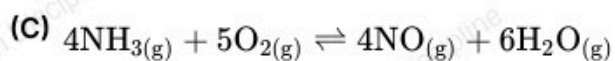
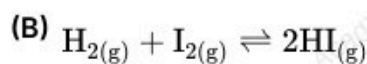
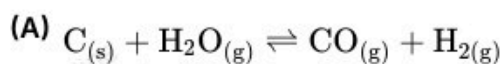
(B) NH_3 & BF_3

(C) SO_4^{2-} & HSO_4^-

(D) H^+ & OH^-

[3 marks, -1 for a wrong answer]

65. In which of the following reactions will an increase in system pressure favor the formation of the products?



[3 marks, -1 for a wrong answer]

66. What is the total pressure inside a 2 L vessel containing 1 g of He, 14 g of CO and 10 g of NO at 27 °C?

(A) 0.25 atm

(B) 13.2 atm

(C) 1.24 atm

(D) 21.6 atm

[3 marks, -1 for a wrong answer]

67. Assuming a Lewis structure for SO_2 in which all the atoms obey the octet rule, the formal charge on S is:

(A) +1

(B) 0

(C) +2

(D) -2

[3 marks, -1 for a wrong answer]

68. Which of the following will have the slowest rate of reaction with HCl?

(A) Marble chips at 40 °C

(B) Powdered marble at 25 °C

(C) Marble chips at 25 °C

(D) Powdered marble at 40 °C

[3 marks, -1 for a wrong answer]

69. How many moles of Na^+ ions are there in 20 mL of 0.40 M solution of Na_3PO_4 ?

(A) 0.008

(B) 0.020

(C) 0.024

(D) 0.008

[3 marks, -1 for a wrong answer]

70. The solubility of a gas in a liquid is directly proportional to the partial pressure of the gas over the solution. This statement is known as:

(A) Raoult's law

(B) Henry's law

(C) Boyle's law

(D) Charles and Gay Lussac's law

[3 marks, -1 for a wrong answer]

71. How many sigma bonds and pi bonds are present in $\text{CH}_2=\text{C}=\text{CH}_2$?

- (A) 6 sigma and 1 pi
(B) 8 sigma and 0 pi
(C) 4 sigma and 4 pi
(D) 6 sigma and 2 pi

[3 marks, -1 for a wrong answer]

72. A first-order reaction has a rate constant of 0.003 s^{-1} . The time required for completion of 75% reaction is

- (A) 231 s
(B) 201 s
(C) 41.7 s
(D) 462 s

[3 marks, -1 for a wrong answer]

73. The activation energy of a reaction is given by

- (A) $-R/(\text{slope of a plot of } \ln k \text{ vs } 1/T)$
(B) $-(\text{slope of a plot of } \ln k \text{ vs } 1/T) R$
(C) $-(\text{slope of a plot of } \ln k \text{ vs } 1/T) \times R$
(D) $+(\text{slope of a plot of } \ln k \text{ vs } 1/T) \times R$

[3 marks, -1 for a wrong answer]

74. The activation energy

- (A) decreases with increasing temperature
(B) increases with increasing temperature
(C) remains constant with temperature
(D) shows linear relation (with positive slope) with temperature

[3 marks, -1 for a wrong answer]

75. Which of the following is not a colligative property?

- (A) solubility
(B) vapor pressure lowering
(C) boiling point elevation
(D) osmotic pressure

[3 marks, -1 for a wrong answer]

76. Which of the following has the lowest freezing point and the highest boiling point?

- (A) 1.5 m magnesium phosphate
(B) 1.0 m sodium chloride
(C) 1.5 m aluminum nitrate
(D) 1.5 m calcium chloride

[3 marks, -1 for a wrong answer]

77. Which of the following changes the value of the equilibrium constant?

- (A) change in concentration
(B) change in pressure
(C) change in volume
(D) none of these

[3 marks, -1 for a wrong answer]

78. The change in free energy accompanied by the isothermal expansion of 1 mol of an ideal gas when it double its volume is ΔG_1 . The change in free energy accompanied by sudden isothermal inversible doubling of volume of 1 mol of the same gas is ΔG_2 . Ratio of ΔG_1 to ΔG_2 is:

- (A) 1 (B) $\frac{1}{2}$
(C) -1 (D) $-\frac{1}{2}$

[3 marks, -1 for a wrong answer]

79. By observing the reaction between gases A and B, the following data was obtained: $[A]$ mol L⁻¹, $[B]$ mol L⁻¹, Initial rate mol L⁻¹ s⁻¹: $(2.16 \times 10^5, 1 \times 10^5, 1 \times 10^8)$; $(2.14 \times 10^5, 2.01 \times 10^6, 2 \times 10^9)$; $(2.18 \times 10^5, 3.2 \times 10^5, 3.25 \times 10^5)$; $(4.31 \times 10^5, 1.1 \times 10^5, 4.3 \times 10^9)$; $(8.60 \times 10^5, 2.1 \times 10^5, 3.3 \times 10^8)$. The reaction order with respect to A and B respectively are:

- (A) 1 and 2 (B) 0 and 2
(C) 2 and 1 (D) both are 1

[3 marks, -1 for a wrong answer]

80. If each of the following salts has $K_{sp} = 1 \times 10^9$, which of them is the least soluble in water?

- (A) XY (B) XY₂
(C) X₂Y (D) X₃Y

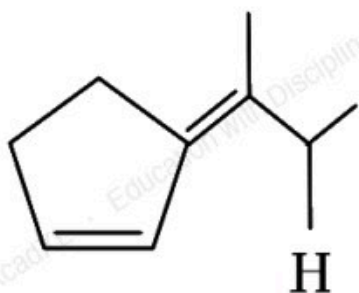
[3 marks, -1 for a wrong answer]

81. The pH of a 0.01 M solution of ammonium acetate can be changed by changing

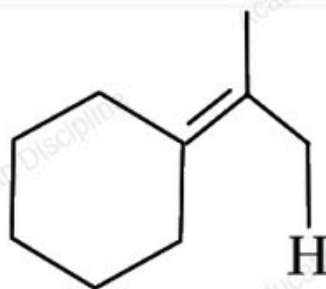
- (A) the temperature (B) the volume of solution
(C) the concentration (D) the pressure on solution

[3 marks, -1 for a wrong answer]

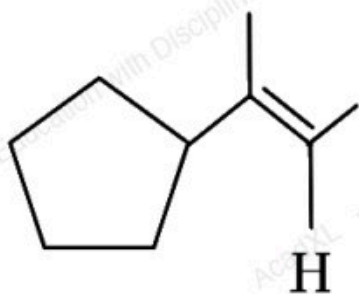
82. Which of the following represents the true order of dissociation energy of the indicated C-H bond of the following molecules (I, II, III, IV)?



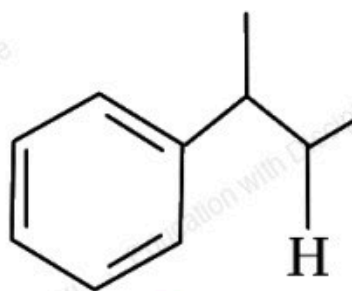
I



II



III



IV

(A) $\text{I} < \text{II} < \text{IV} < \text{III}$

(B) $\text{III} < \text{IV} < \text{II} < \text{I}$

(C) $\text{IV} < \text{II} < \text{I} < \text{III}$

(D) $\text{III} < \text{IV} < \text{II} < \text{I}$

[3 marks, -1 for a wrong answer]

83. For a reaction of the n th order, the time required for half reaction is inversely proportional to

(A) a

(B) $a^{(n-1)}$

(C) $a^{(n+1)}$

(D) $\sqrt{a}$

[3 marks, -1 for a wrong answer]

84. Consider the equilibrium reaction: $4\text{NH}_{3(g)} + 3\text{O}_{2(g)} \rightleftharpoons 2\text{N}_{2(g)} + 6\text{H}_2\text{O}_{(g)}$ ($\Delta H = -1268 \text{ kJ}$). Which change will cause the reaction to shift to the right?

(A) Increases the temperature

(B) Decreases the volume of the container

(C) Add a catalyst to speed up to reaction

(D) Remove the gaseous water by allowing it to react and be absorbed by KOH

[3 marks, -1 for a wrong answer]

85. The heat of combustion of glucose is -2840 kJ . Therefore the energy required for the production of 0.18 g of glucose is:

(A) -5.68 kJ

(B) $+5.68 \text{ kJ}$

(C) -2.84 kJ

(D) $+2.84 \text{ kJ}$

[3 marks, -1 for a wrong answer]

86. For the reaction shown below, which statement is true? $2\text{Fe} + 3\text{CdCl}_2 \rightleftharpoons 2\text{FeCl}_3 + 3\text{Cd}$

(A) Fe is the oxidizing agent

(B) Cd undergoes oxidation

(C) Cd is the reducing agent

(D) Fe undergoes oxidation

[3 marks, -1 for a wrong answer]

87. The voltage for the cell: $\text{Fe}/\text{Fe}^{2+} (0.001 \text{ M}) // \text{Cu}^{2+} (0.10 \text{ M})/\text{Cu}$ is 0.807 V at 25°C . What is the value of E° ?

(A) 0.629 V

(B) 0.689 V

(C) 0.748 V

(D) 0.866 V

[3 marks, -1 for a wrong answer]

88. A current of 2.0 A is used to plate Ni(s) from 500 mL of a 1.0 M Ni^{2+} aqueous solution. What is the $[\text{Ni}^{2+}]$ after 3.0 hours?

(A) 0.39 M

(B) 0.46 M

(C) 0.78

(D) 0.89 V

[3 marks, -1 for a wrong answer]

89. The number of amino acid residue of a polypeptide with molecular weight 55 kD may be

(A) 110

(B) 240

(C) 500

(D) 550

[3 marks, -1 for a wrong answer]

90. Titration of the amino acid lysine has three pK_a values viz., pK_{a1} (2.18), pK_{a2} (8.95) and pK_{a3} (10.53). The pH at which this amino acid will show no net migration in an electric field is

(A) 5.57

(B) 9.74

(C) 6.35

(D) 7.22

[3 marks, -1 for a wrong answer]

91. Increase in cell membrane fluidity with increasing temperature is due to change in the structure of

- (A) Protein
- (B) lipid
- (C) polysaccharide
- (D) DNA

[3 marks, -1 for a wrong answer]

92. Proteins present inside the cell membrane are stabilized by

- (A) hydrogen bond
- (B) disulfide bond
- (C) hydrophobic force
- (D) phosphor-diester bond

[3 marks, -1 for a wrong answer]

93. Synthesis of amino acids that will be affected due to prolonged uptake of food with no sulfur content is:

- (A) lysine
- (B) tyrosine
- (C) aspartic acid
- (D) cysteine

[3 marks, -1 for a wrong answer]

94. Presence of higher number of GC pairs in a DNA molecule makes it more stable at

- (A) high temperature
- (B) low temperature
- (C) high pH
- (D) high salt concentration

[3 marks, -1 for a wrong answer]

95. A polypeptide chain with 60 amino acids residue will have number of nucleotides in its DNA?

- (A) 60
- (B) 120
- (C) 180
- (D) 360

[3 marks, -1 for a wrong answer]

96. Electrophoretic mobility (without change in primary structure) of a multi-subunit protein sample with interchain disulfide bond will be affected if it is treated with

- (A) performic acid
- (B) trypsin
- (C) NaCl
- (D) CNBr

[3 marks, -1 for a wrong answer]

97. The molecule that cannot undergo esterification reaction is

- (A) hemoglobin
- (B) adenine
- (C) fatty acid
- (D) glycogen

[3 marks, -1 for a wrong answer]

98. Normally carbohydrates are not present as a part of molecule in the cell.

(A) lipid

(B) protein

(C) DNA

(D) vitamin

[3 marks, -1 for a wrong answer]

99. The molecule that shows increase in absorbance in the UV region with increasing temperature is

(A) DNA

(B) RNA

(C) Protein

(D) chlorophyll

[3 marks, -1 for a wrong answer]

100. Proteins undergo degradation during starvation to act as a carbon source. The final byproduct of this reaction is

(A) glucose

(B) ammonia

(C) ATP

(D) amino acid

[3 marks, -1 for a wrong answer]

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Answer key

1. A	2. B	3. B	4. D	5. C	6. D
7. B	8. C	9. B	10. B	11. C	12. A
13. B	14. C	15. D	16. C	17. D	18. A
19. B	20. B	21. C	22. C	23. A	24. C
25. C	26. B	27. A	28. B	29. D	30. A
31. B	32. C	33. B	34. A	35. A	36. C
37. D	38. B	39. B	40. C	41. A	42. B
43. C	44. A	45. D	46. B	47. C	48. D
49. B	50. B	51. C	52. A	53. C	54. C
55. C	56. D	57. C	58. B	59. C	60. B
61. A	62. B	63. C	64. D	65. A	66. B
67. A	68. C	69. C	70. B	71. D	72. D
73. C	74. A	75. A	76. A	77. D	78. A
79. C	80. D	81. A	82. A	83. B	84. D
85. D	86. D	87. C	88. C	89. C	90. B
91. B	92. D	93. D	94. A	95. D	96. A
97. B	98. D	99. A	100. B		

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