



D.U. M.Sc. CHEMISTRY ENTRANCE - 2017 (SET-A)

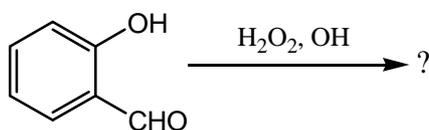
- The oxidation states of oxygen in O_2F_2 is
(a) +1 (b) +2 (c) +4 (d) -2
- Which among the following is a powerful oxidizer?
(a) F_2 (b) Cl_2 (c) Br_3 (d) I_2
- The most suitable in water among the following is
(a) $CsClO_4$ (b) $KClO_4$ (c) $NaClO_4$ (d) $LiClO_4$
- Dental filling is done by
(a) Portland cement (b) Sorrel cement
(c) Calcia (d) Double salt
- The polymeric nature of boric acid is due to
(a) its acidic nature (b) its gemetry
(c) presence of hydrogen bonds (d) monobasic nature
- Alkali metals form highly stable complexes with
(a) Cryptand-222 (b) Diethyl ether (c) Cyclopentadiene (d) Butadiene
- Of the following, which is a low expands one?
(a) Sodaline (b) Quartz (c) Vycor (d) Borosilicate
- Which of the following has centre of inversion?
(A) CO_2 (B) C_2H_2 (C) BF_3 (D) SO_4^{3-}
(a) A and B only (b) A and C only (c) A and D only (d) B and C only
- “Yellow when hot and white and cold is one of the characteristics observed for ZnO. It is due to
(a) Distortions (b) Cation defects (c) Anion defects (d) Deformations
- Which is a superconductor?
(a) $Bi_2CaSr_2Cu_2O_8$ (b) $Bi_2CaSr_2Co_2O_8$
(c) $Bi_2CdSr_2Cu_2O_8$ (d) $Bi_2CaSn_2Cu_2O_8$
- Electrophoresis refers to
(a) Separation (b) Identification (c) Digestion (d) Amalgamation
- Find the amphoteric one in the following:
(a) CO_2 (b) Mn_2O_2 (c) MgO (d) Sb_3O_3
- The reaction of O_3 with KI produces:
(a) HI (b) HIO_8 (c) I_8 (d) I_3^+



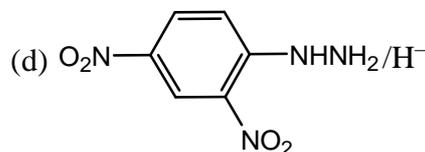
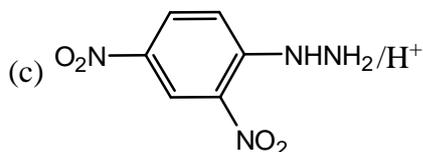
14. Which one of the following cannot show linkage isomerism?
 (a) NO_3^- (b) SCN (c) CN^- (d) NH_3
15. A metal X on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through CuSO_4 solution gives blue colour. Y is
 (a) $\text{Mg}(\text{NO}_3)_2$ (b) Mg_2N_3 (c) MgCl_2 (d) MgO
16. Hydrogen as fuel is stored as
 (a) gas (b) semi liquid (c) liquid (d) solid
17. Which of the following order is correct for scattering of X-rays?
 (a) $\text{F} < \text{O} < \text{Cl} < \text{Na} < \text{Tl}$ (b) $\text{F} < \text{Cl} < \text{Na} < \text{O} < \text{Tl}$
 (c) $\text{O} < \text{Cl} < \text{F} < \text{Na} < \text{Tl}$ (d) $\text{O} < \text{F} < \text{Na} < \text{Cl} < \text{Tl}$
18. The p-electronic configuration is equivalent to the term:
 (a) ^3P (b) ^2P (c) ^3F (d) ^4P
19. The anticancer drug cisplatin is
 (a) $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ (b) $\text{Pt}(\text{H}_2\text{O})_2\text{Cl}_2$ (c) $\text{Pt}(\text{NH}_3)_3\text{Cl}$ (d) $\text{Pt}(\text{NH}_3)\text{Cl}_3$
20. Wilson's disease arises from:
 (a) Excess accumulation of calcium in the body
 (b) Excess accumulation of copper in the body
 (c) Excess accumulation of selenium in the body
 (d) Excess accumulation of vanadium in the body
21. The structure shown by a tetra nuclear metal cluster having 62 electrons is
 (a) square plane (b) butterfly (c) tetrahedron (d) bicapped tetrahedron
22. The substitution reactions of a square planar complex proceeds by which one of the following rate law:
 (a) first order (b) pseudo first order (c) second order (d) zero order
23. $[\text{Zr}(\text{CH}_3)_6]$ exists in
 (a) Octahedral geometry (b) Trigonal prismatic geometry
 (c) Square pyramidal geometry (d) Distorted trigonal bipyramidal geometry
24. Which one of the following pair shows variable valence?
 (a) Zr, Ti (b) Bi, In (c) Lu, Gd (d) Pd, Cd
25. Which one of the following plays a major role in EDTA complexometric titrations?
 (a) concentration of metal ion (b) concentration of ligand
 (c) nature of buffer (d) temperature of the reaction
26. Monochromatic X-rays having a wave length of 10.4\AA are preferentially diffracted by a crystal at an angle 25.5° , assuming that this is the first order diffraction with a d-spacing between crystalline planes equal to 12.1\AA . What is the value of $\sin\theta$ for the angle for the second order diffraction?
 (a) 0.959 (b) 0.759 (c) 0.859 (d) 0.659
27. Addition of bismuth chloride to excess of water produces
 (a) clear solution (b) yellow solution (c) white precipitate (d) orange red precipitate



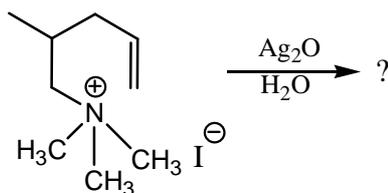
28. Oxidation state of nitrogen is correctly given for
 (a) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ (0) (b) NH_2OH (-1)
 (c) $(\text{N}_2\text{H}_5)_2\text{SO}_4$ (-2) (d) Mg_3N_2 (+3)
29. The equilibrium $\text{Cr}_2\text{O}_7^{2-} \rightleftharpoons 2\text{CrO}_4^{2-}$
 (a) exists in acidic medium (b) exists in basic medium
 (c) exists in neutral medium (d) does not exist
30. Of the following, which is acidic in nature?
 (a) MnO (b) Mn_2O_7 (c) Mn_2O_3 (d) MnO_2
31. Among pivaldehyde, furfural, formaldehyde and p-tolualdehyde, the aldehydes that undergo Cannizzaro reaction are
 (a) Formaldehyde only (b) p-tolualdehyde
 (c) furfural and formaldehyde (d) all four aldehyde
32. Product of the following reaction is



- (a) Catechol (b) Salicylic acid (c) o-benzoquinone (d) Salicyl alcohol
33. Which one of the following reagents are used as laboratory reagent for the identification of carbonyl group
 (a) $\text{NH}_2\text{OH}/\text{H}^+$ (b) $\text{C}_6\text{H}_5\text{-NH-NH}_2/\text{OH}^-$

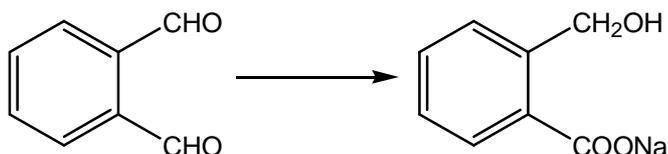


34. What is the major product alkene formed in the following reaction



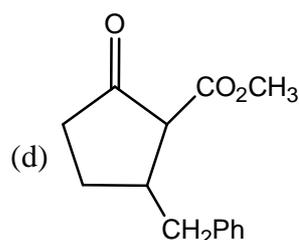
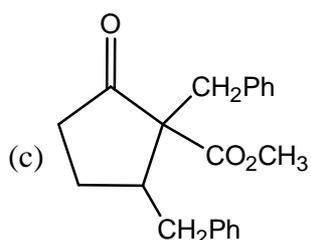
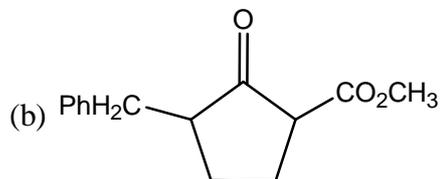
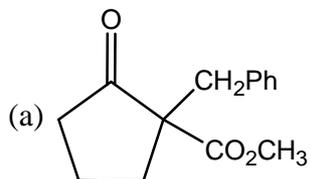
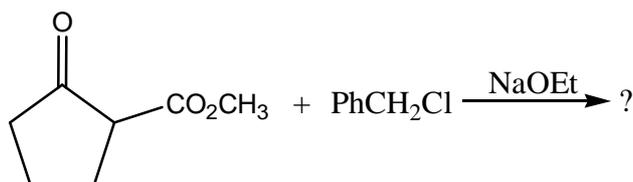
- (a) (b) (c) (d)

35. The suitable reagent(s) to bring about the given transformation

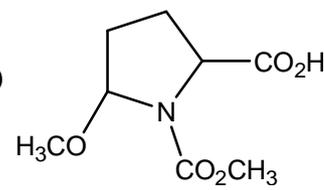
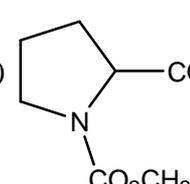
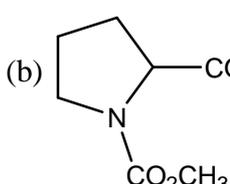
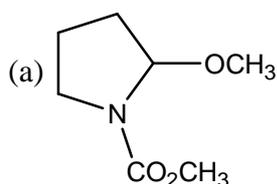
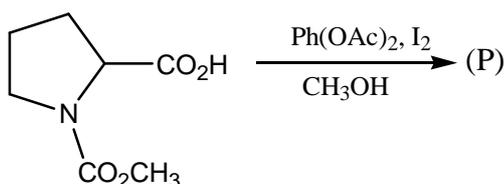


- (a) KCN (b) LiAlH_4 followed by Tollens reagents
 (c) Tollens reagents followed by NaBH_4 (d) 50% NaOH solution

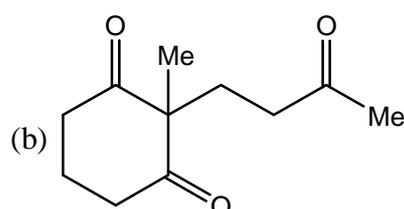
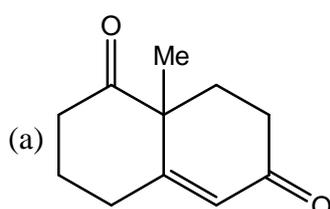
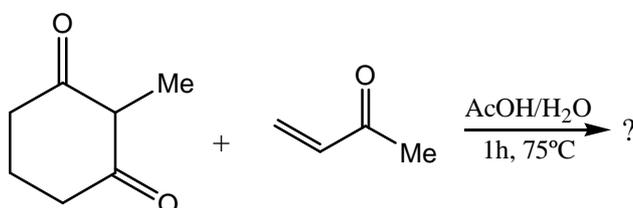
36. Complete the following reaction,

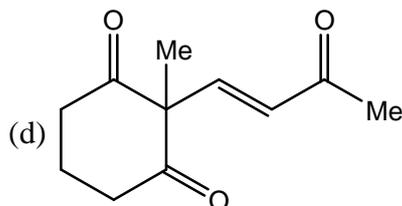
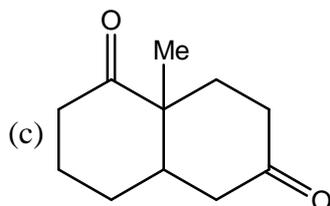


37. What is the product of this reaction?



38. Which one is the correct answer?





39. Match **List-(I)** with **List-(II)**

List-(I)

- (P) Claisen condensation
(Q) Friedal craft
(R) Holfmann
(S) Allylic bromination

List-(II)

- (1) Nitrene
(2) Free radical
(3) Carbanion
(4) Arenium ion

	P	Q	R	S
(a)	3	4	2	1
(b)	2	3	4	1
(c)	2	3	1	4
(d)	3	4	1	2

40. Match **List-(I)** with **List-(II)**

List-(I)

- (P) S_N2
(Q) S_N1
(R) E_2
(S) E_{1CB}

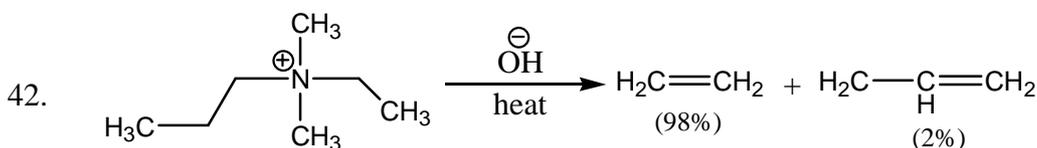
List-(II)

- (1) Walden inversion
(2) Carbanion intermediate
(3) Antiperiplanar configurations
(4) Carbocation intermediate

	P	Q	R	S
(a)	1	4	2	3
(b)	1	4	3	2
(c)	4	1	3	2
(d)	4	1	2	3

41. The configuration description of C_2 epimer of D-glucose is:

- (a) 2R, 3S, 4R, 5R
(b) 2S, 3S, 4R, 5R
(c) 2S, 3R, 4S, 5R
(d) 2R, 3S, 4R, 5S

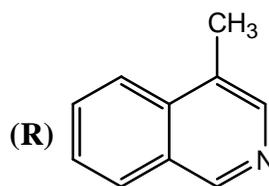
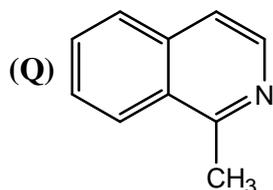
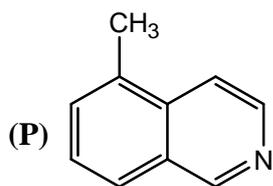
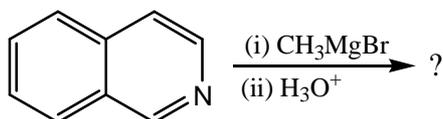


The above reaction is an example of

- (a) Hofmann's rule (b) Saytzeff's rule (c) Cope reaction (d) Curtius reaction

43. What is/are the product (s) of the following reaction?





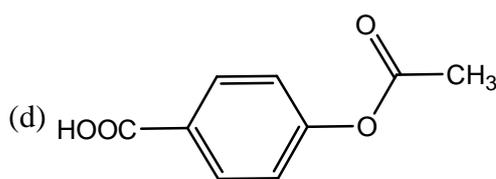
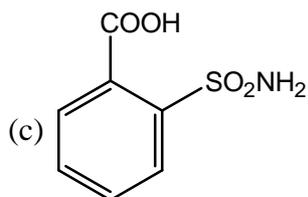
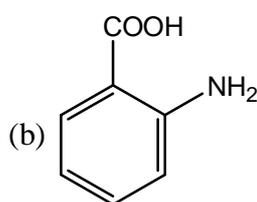
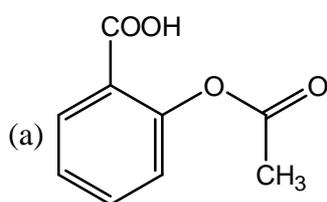
(a) P

(b) Q

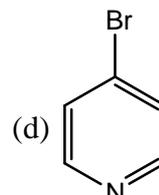
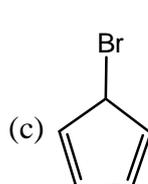
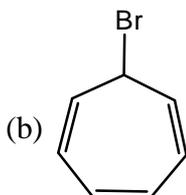
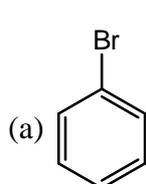
(c) R

(d) P and Q

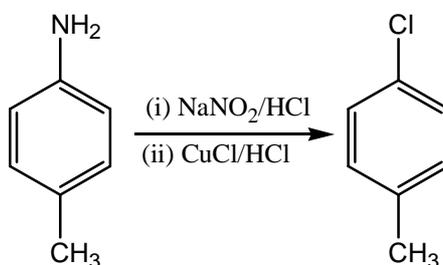
44. The structural formula of aspirin is



45. The compound that gives precipitate on warming with aqueous AgNO_3 is

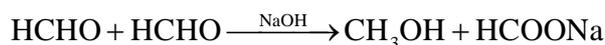


46. In the given reaction, name and the intermediate via which it is known to proceed are



- (a) Hunsdiecker and benzyne (b) Sandmeyer and free radical
 (c) Meerwein and a free radical (d) Sandmeyer and carbanion

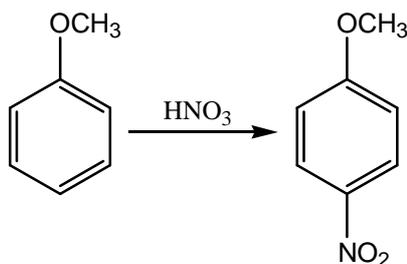
47. In the Cannizzaro reaction given below



The slower step is

- (a) the attack of OH^- at carbonyl group (b) The transfer of hydride ion to the carbonyl group
 (c) Deprotonation of $-\text{COOH}$ group (d) The deprotonation of $-\text{CH}_2\text{OH}$ group

48. In the given reaction, the structure of the σ complex is

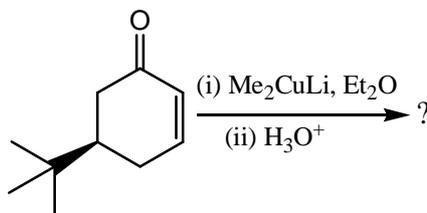


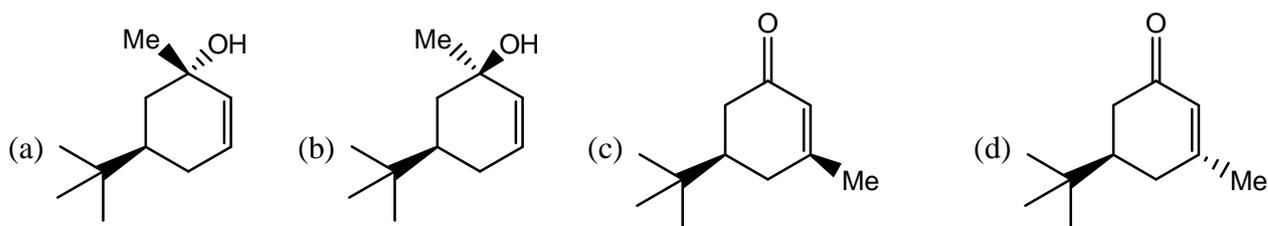
- (a) (b) (c) (d) all of these

49. How many non-equivalent protons are present in $\text{CH}_3\text{CHClCH}_2\text{CONH}_2$?
 (a) 6 (b) 5 (c) 4 (d) 3

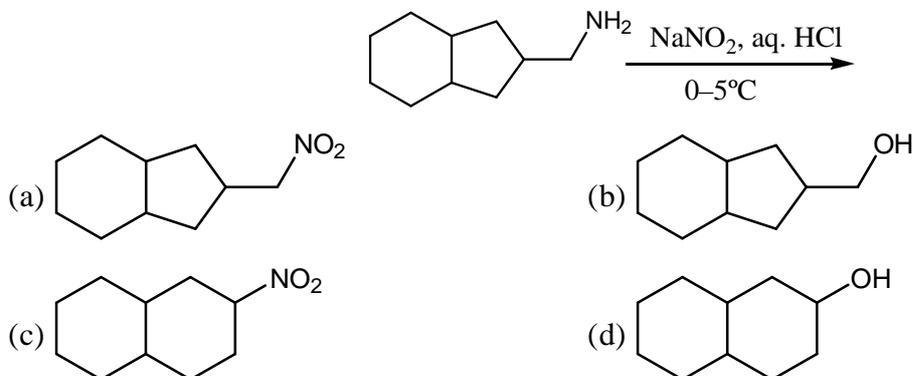
50. To check that a secondary alcohol has been completely oxidized to a ketone you can
 (a) check that the IR spectrum has absorption at 3500 cm^{-1} and 1650 cm^{-1}
 (b) check that the IR spectrum has no absorption around 3500 cm^{-1}
 (c) check that the IR spectrum has no absorption around 1650 cm^{-1}
 (d) check that the IR spectrum has no absorptions at 3500 cm^{-1} and 1650 cm^{-1}

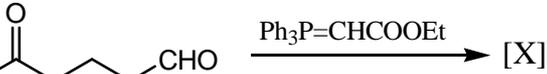
51. The major product formed in the reaction given below is

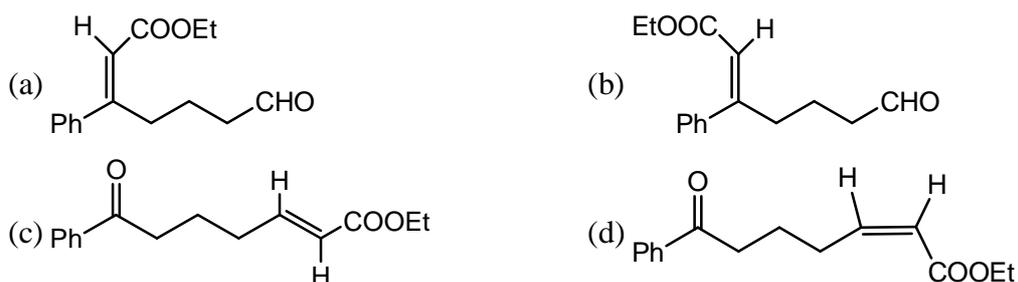




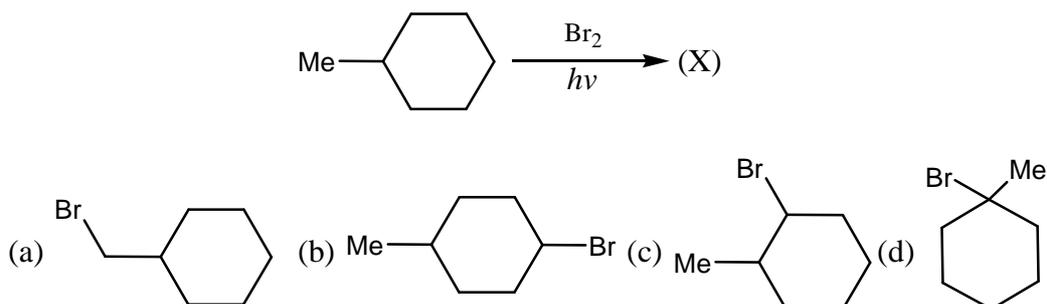
52. The major product formed in the reaction given below is



53. In the reaction,  the major product X is:



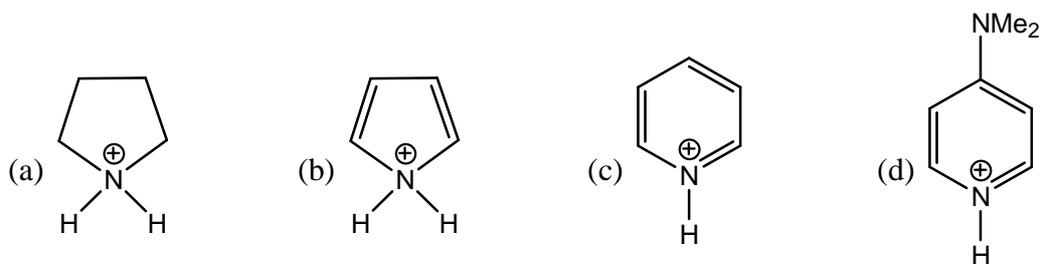
54. The major product (X) of the monobromination reaction is



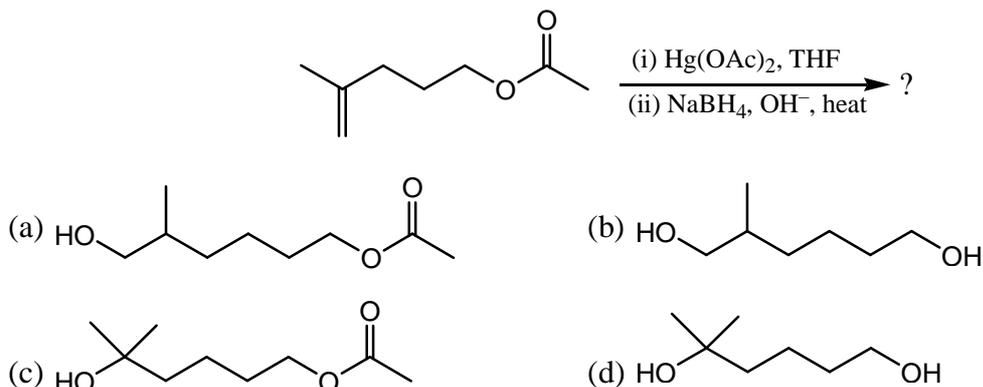
55. Aniline can be distinguished from methylamine by its reaction with :

- (a) p-toluene sulphonyl chloride/KOH (b) (i) NaNO_2/HCl (ii) alkaline β -naphthol
(c) Sn/HCl (d) acetyl chloride

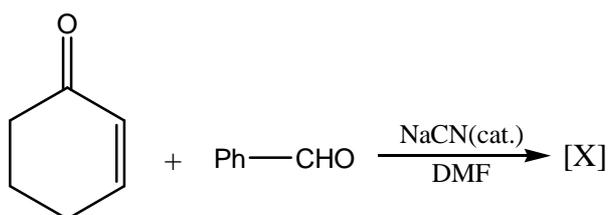
56. The most acidic species is



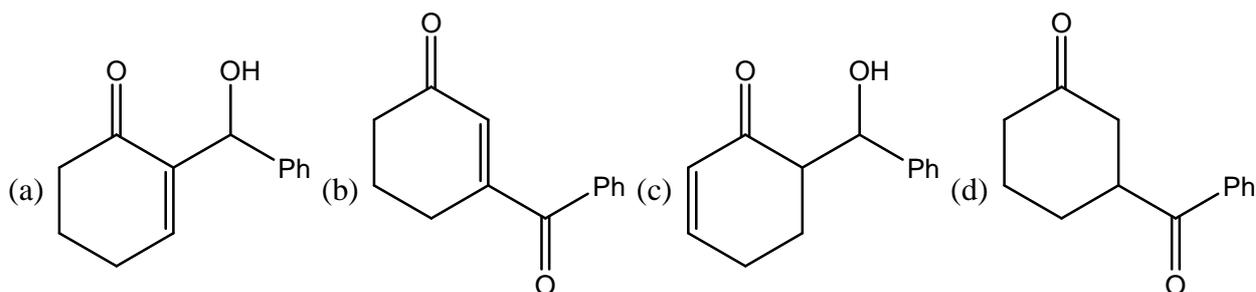
57. The major product of the following reactions is



58. In the following reaction,



The major product (X) is



59. Correct statement about cis and transstilbene is

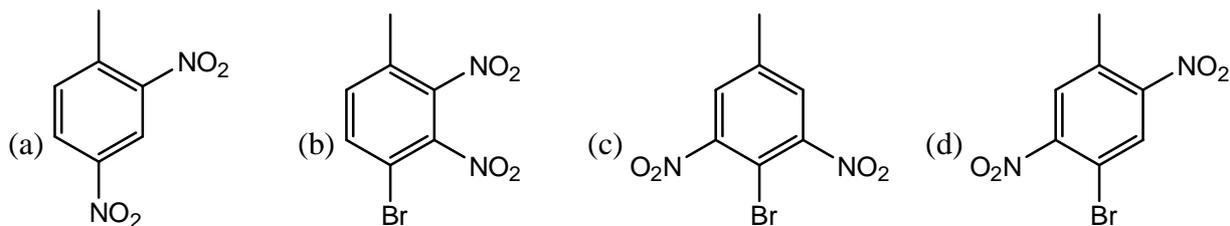
- (a) Trans-stilbene has higher coupling constant than cis-stilbene
 (b) Cis-stilbene has higher coupling constant than trans-stilbene
 (c) Vinylic protons of cis-stilbene are more deshielded than trans-stilbene
 (d) Vinylic protons of trans-stilbene are more deshielded than cis-stilbene

60. Victor Meyer test is used for the confirmation of

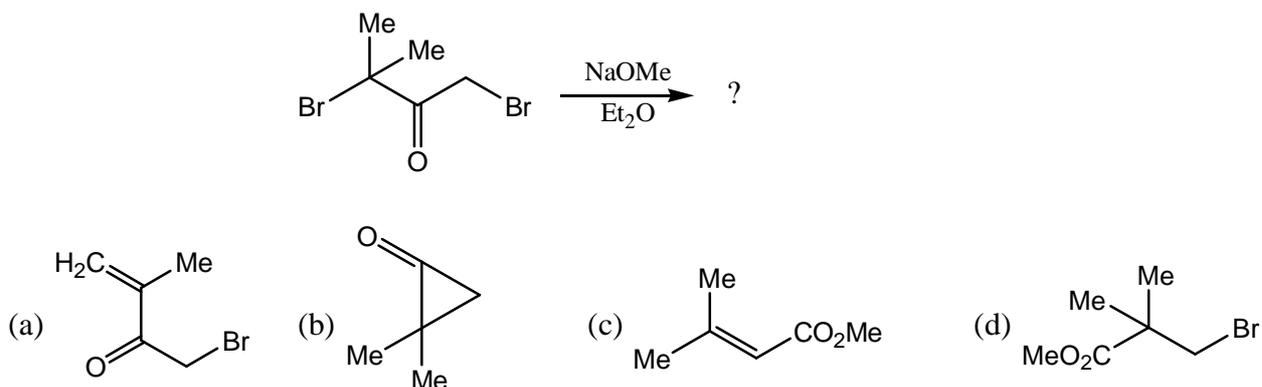
- (a) 1°, 2°, 3°, Amines
 (b) 1°, 2°, 3° Alcohols
 (c) Carbonyl group
 (d) 2° and 3° Alcohols only



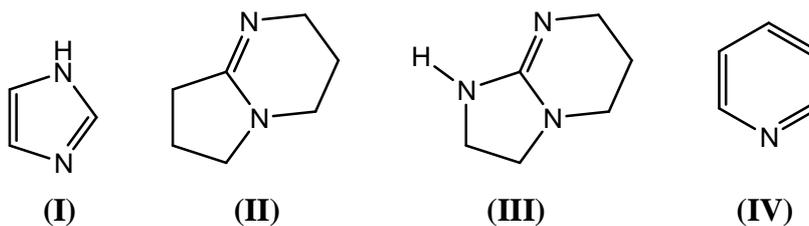
61. The major product formed in the dinitration of 4-bromotoluene is



62. The major product in the following reaction is

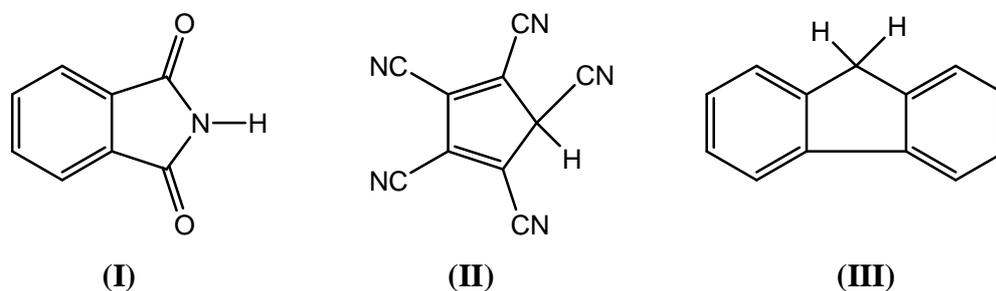


63. The decreasing order of basicity of the following compounds is



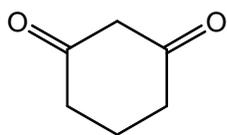
- (a) I > II > III > IV (b) IV > I > II > III
(c) III > II > I > IV (d) IV > III > II > I

64. The correct order of pK_a values for compounds I, II and III is

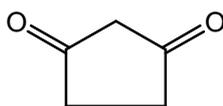


- (a) I > II > III (b) II > III > I (c) III > I > II (d) II > I > III

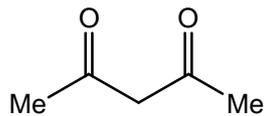
65. The correct order of the acidity for the following compounds is



(I)



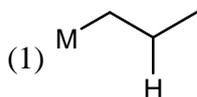
(II)



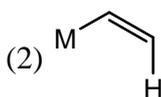
(III)

- (a) II > III > I (b) III > II > I (c) II > I > III (d) III > I > II

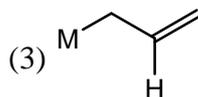
66. The H-hydrogen elimination will be facile in :



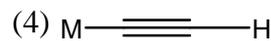
(a) 2



(b) 1



(c) 3



(d) 4

67. What is the degeneracy and corresponding energy for the second excited level of a particle of mass m in a cubic box of edge L ?

- (a) Degeneracy = 3 and $E = 9\pi^2 h^2 / 2mL^2$ (b) Degeneracy = 3 and $E = 4\pi^2 h^2 / 2mL^2$
 (c) Degeneracy = 2 and $E = 4\pi^2 h^2 / 2mL^2$ (d) Degeneracy = 2 and $E = 9\pi^2 h^2 / 2mL^2$

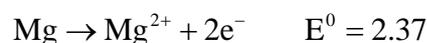
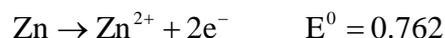
68. Which of the following statements is NOT true in relation to the triple point on a single component phase diagram?

- (a) The point at which the solid, liquid and gaseous phases for a substance co-exist
 (b) The triple point exists at a single temperature and is independent of pressure
 (c) The triple point exists for a substance occurs at a specific temperature and pressure
 (d) The system must be enclosed so that no vapour can escape

69. The relative ratio of at a given temperature is

- (a) $\sqrt{3} : \sqrt{56/22} : \sqrt{2}$ (b) $\sqrt{56/22} : \sqrt{2} : \sqrt{3}$
 (c) $\sqrt{3} : \sqrt{2} : \sqrt{56/22}$ (d) $\sqrt{2} : \sqrt{56/22} : \sqrt{3}$

70. The standard potential at 25°C for the half reactions given against them below



When zinc dust is added to a solution of MgCl_2

- (a) Magnesium is precipitated (b) Zinc dissolves in the solution
 (c) Zinc chloride is formed (d) No reaction takes place

71. Rate constant for the substitution reaction,



increases by a factor of 10.6 when the temperature is increased from 298K to 308K. Calculate the activation energy of the reaction,

- (a) 78.2 kJ mol⁻¹ (b) 180 kJ mol⁻¹ (c) 809 kJ mol⁻¹ (d) 2.14 kJ mol⁻¹

72. At 20°C, Ag ion concentration in a saturated solution Ag_2CrO_4 in water is 1.5×10^{-4} M. At 20°C, the



solubility product of Ag_2CrO_4 will be

- (a) 3.3750×10^{-12} (b) 1.6875×10^{-16} (c) 1.6875×10^{-12} (d) 1.6875×10^{-12}

73. Use the following data to calculate the lattice enthalpy at 298K of potassium iodide, $\text{KI}(s)$. All values refer to a temperature of 298K.

Enthalpy of sublimation of $\text{K}(s)$: + 81 kJ mol^{-1}

Ionization of enthalpy of $\text{K}(g)$: +418 kJ mol^{-1}

Enthalpy of atomization of $\text{I}_2(g)$: +214 kJ mol^{-1}

Enthalpy of electron attachment to $\text{I}(g)$: -295 kJ mol^{-1}

Enthalpy of formation of $\text{KI}(s)$ from $\text{K}(s)$ and $\frac{1}{2}\text{I}_2(g)$: -328 kJ mol^{-1}

- (a) 746 kJ mol^{-1} (b) 680 kJ mol^{-1} (c) 573 kJ mol^{-1} (d) 639 kJ mol^{-1}

74. Which of the following functions are acceptable as a wave function over the indicated intervals?

- (a) $e^{-|x|}(-\infty, \infty)$ (b) $e^{-x^2}(-\infty, \infty)$ (c) $e^{-x}(0, \infty)$ (d) $\sin^{-1}x(-1, 1)$

75. The thermodynamics Gibb's function G in an isothermal, isobaric, reversible process:

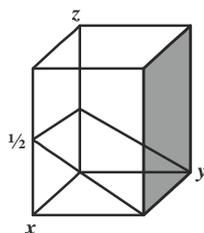
- (a) varies linearly (b) varies non-linearly (c) is zero (d) remains constant but not zero

76. The electrical conductivity of a new material was measured at different temperatures and found to vary as below. What is the best description of the conduction properties of the material?

T/K	300	400	500	600
Conductivity/ Sm^{-1}	0.004	0.047	0.202	0.535

- (a) insulator (b) semiconductor (c) conductor
(d) it is not possible to inter anything about the properties of the material

77. What miller index plane is shown below?



- (a) (0 2 1) (b) (0 4 1) (c) (0 1 2) (d) (0 0 0)

78. If uncertainties in the measurement of position and momentum are equal, calculate uncertainty in the measurement of velocity

- (a) $6.96 \times 10^8 \text{ m/s}$ (b) $7.98 \times 10^{12} \text{ m/s}$ (c) $7.98 \times 10^{14} \text{ m/s}$ (d) $7.98 \times 10^{-12} \text{ m/s s}$

79. Following are the terms about activity and selectivity:

(I) Activity is the ability of catalyst to accelerate chemical reaction and selectivity is the ability of the catalysts to direct to reaction to yield particular products

(II) Activity is the ability of catalyst to direct reaction to yield particular products and selectivity is the ability of the catalysts to accelerate chemical reaction.

Select correct term :

- (a) I (b) II (c) I and II both (d) None of these

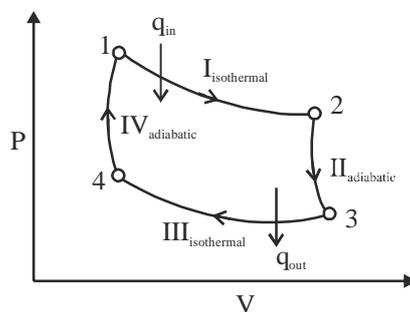
80. Which statement is incorrect about CO_2 ?

- (a) CO_2 is linear

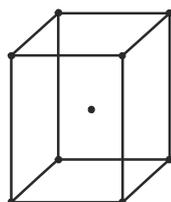


- (b) CO_2 has two degenerate bending modes of vibration
 (c) The IR spectrum of CO_2 shows four absorptions
 (d) CO_2 has two stretching modes of vibration

81. From the Carnot cycle (given below) undergoes by an ideal gas, identify the processes in which the change in internal energy is non-zero



- (a) II and III (b) I and II (c) II and IV (d) I and IV
82. For a liquid, which is rising in a capillary tube, the angle of contact is:
 (a) 90° (b) Acute (c) 180° (d) Obtuse
83. Assign the Bravais lattice type for the following unit-cell structure

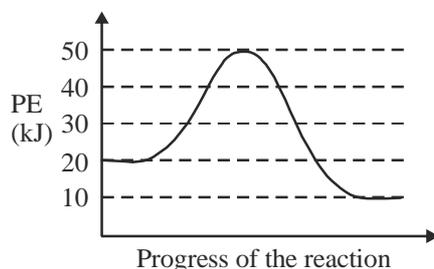


- (a) Tetragonal I (b) Cubic I (c) Orthorhombic I (d) Monoclinic
84. Given the following reaction at equilibrium $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$. Some inert gas is added at constant volume. Predict which of the following facts will be affected?
 (a) Less of $2\text{NH}_3(\text{g})$ is produced
 (b) No affect on the degree of advancement of the reaction at equilibrium
 (c) More of the $2\text{NH}_3(\text{g})$ is produced
 (d) K_p of the reaction is increased.
85. On what factor fluidity of a liquid is depending
 (a) size of molecules (b) Shape of the molecules
 (c) impurities (d) all of these
86. Which of the following statements is correct about the principal moments of inertia of an XY molecules that lies on the A-axis?
 (a) $I_A = 0$ and $I_B = I_C$ (b) $I_A > I_B$ and $I_B = I_C$
 (c) $I_A > I_B$ and $I_C = 0$ (d) $I_A = I_B = I_C$
87. Two van der Waals gases have the same value of b but different a values. (i) Which of these would occupy greater volume under identical conditions? If the gases have the same a value but different values of b, (ii)

which would be more compressible?

- (a) (i) gas with smaller a value (ii) gas with smaller b vlaue
 (b) (i) gas with smaller a value (ii) gas with larger b value
 (c) (i) gas with smaller a value (ii) gas with smaller b value
 (d) (i) gas with larger a value (ii) gas with larger b value

88. Consider the following Potential energy diagram for a reversible reaction



Which of the following describes this reaction:

	Directions	Activation energy (kJ)	ΔH (kJ)
(a)	Reverse	30	-10
(b)	Forward	40	-10
(c)	Forward	30	+10
(d)	Reverse	40	+10

89. Which of the following statements are true about the Eutectic point on a two component (components A and B) phase diagram?

- (a) Both compounds are solid
 (b) The melting point of the mixture is lower than the melting points of either of the individual compounds
 (c) One compound is in the liquid phase while the other is in the solid phase
 (d) It always occurs when the ratio of compound A to compound B is 50.50

90. The reference potential of a silver-silver chloride electrode is determined by the

- (a) Concentration of potassium chloride filling solution
 (b) Surface area of the electrode
 (c) Activity of total anion in the paste covering electrode
 (d) Concentration of silver in the paste covering electrode

91. Which statement is not correct about three equilibrium constants, K_c , K_p and K_x

- (a) $K_p = K_x (P)^{\Delta n} = K_c (RT)^{\Delta n}$
 (b) K_c and K_p are independent of pressure and K_x is dependent on pressure.
 (c) All constants are temperature dependent
 (d) Catalysts change the equilibrium

92. pH of the solution produced by mixing equal volumes of 2.0×10^{-3} M HClO_4 and 1.0×10^{-3} M KClO_4 is :

- (a) 3.0 (b) 2.7 (c) 2.3 (d) 1.0

93. The degree of dissociation (α) of a weak electrolyte, A_xB_x is related to van't Hof factor (s) by the expressions:



$$(a) \alpha = \frac{i-1}{(x+y+1)} \quad (b) \alpha = \frac{i-1}{(x+y-1)} \quad (c) \alpha = \frac{x+y-1}{i-1} \quad (d) \alpha = \frac{x+y+1}{i-1}$$

94. For a reaction involving two steps given below



Assume that the first step attains equilibrium rapidly. The rate of formation of P is proportional to

(a) $[G]^{1/2}$ (b) $[G]^2$ (c) $[G]^{3/2}$ (d) $[G]$

95. 1g of ^{86}Sr gets converted to 0.953g after 2 year. The half life of ^{90}Sr and the amount of ^{85}Sr remaining after 5 years are

(a) 28.8 yr and 0.887 g (b) 1.44 yr and 0.75g
(c) 57.6 yr and 0.75 g (d) 100 yr and 0.982 g

96. The normality of 0.3 M phosphorous acid (H_3PO_3) is

(a) 0.9 (b) 0.6 (c) 0.3 (d) 0.1

97. Lattice energy is decreased when size of anion is

(a) decreased (b) increased (c) remains same (d) no change

98. One of angle in monoclinic crystal system is

(a) less than 90 degree (b) greater than 90 degree
(c) less than 30 degree (d) less than 10 degree

99. An oxidation number can be

(a) positive (b) negative (c) zero (d) all of the above

100. Liquid in an electrolyte cell should always flow towards

(a) anode (b) cathode (c) all around (d) nowhere

