IIT JEE MODEL TEST

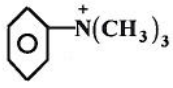
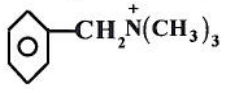
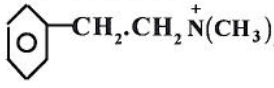
Time : 60 minute **M.M. : 84**

PAPER -1

No. of Ques.	Question Type	Marking Scheme	Max. Marks
9	Single Answer Type	2 marks for correct answer; -1 for wrong	18
5	Multiple Answer Type	3 marks for correct answer; -1 for wrong	15
9	Comprehension Type	3 marks for correct answer; -1 for wrong	27
1	Matrix- Matches	1 marks for each correct answer	4
5	Single Digit Integer Answer Type	4 marks for each correct answer	20

SECTION A

Single correct answer :

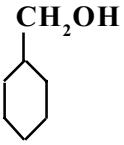
1. Pick up the incorrect statement
   (a) Cyanic acid (N≡C-OH) and isocyanic acid (HN=C=O) have the same conjugate base
   (b) Reverse process of heterocyclic cleavage of bond is called co-ordinate covalent bond formation.
   (c) A radical cation ($- \overset{\bullet}{\underset{+}{C}} -$) has sp hybridization.
   (d) BF_4^- and CH_4 possess regular tetrahedron geometry.
2. For the reaction : $N_2O_4 \rightleftharpoons 2NO_2$; $G^0_{N_2O_4}$ and $G^0_{NO_2}$ at 298K are 100kJ mol^{-1} and 50kJ mol^{-1} respectively. If 5 moles of each of N_2O_4 and NO_2 are taken in a container of one litre. The concentration of N_2O_4 and NO_2 at equilibrium will be
   (a) 4.75, 5.50 (b) 2.50, 6.25
   (c) 6.25, 2.50 (d) 5.50, 4.75
3. Chloride samples are prepared for analysis by using NaCl, KCl and NH_4Cl separately or as a mixture. The minimum volume of 5% by weight $AgNO_3$ solution (sp. gr 1.04 g/mL) which must be added to a sample of 0.3g in order to ensure complete precipitation of chloride in every possible case is :
   (a) 18.33 ml (b) 20.66 ml
   (c) 9.12 ml (d) None of these
4. Which of the following will give only meta electrophilic substitution?
   (a)  (b)  (c)  (d) All of these
5. Which of the following statement is incorrect about the reaction :
   $(CH_3)_2$ CH. $CH_2COOEt + CH_3COCH_3 \rightarrow CH_3COCH_2.COCH_2.CH(CH_3)_2$
   [β−diketones]
   (a) Most Carbanion source can initate a Claisen type condensation.
   (b) Esters are better carbanion than ketones
   (c) Ketones are better carbanion than esters because their α-H atom is acidic.
   (d) Esters are better acceptors than ketones
6. Which one is incorrect about Claisen condensation and aldol addition?
   (a) Both involve formation of an α -carbanion
   (b) In both corbanion adds to the C =O of another molecule generating a charge on the O atom
   (c) Both accept H^+ to give OH.
   (d) Both functional gp of the Claisen product are at higher oxidation state than the corresponding groups of the aldol product
7. Select the incorrect statements about SO_2 :
   (a) It acts as oxidant and redutant both
   (b) It acts as bleaching agent but bleaching action is temporary
   (c) Its bleaching action is weak and that too by nascent H-atom
   (d) Its bleaching action is due to oxidation of coloured matter in presence of moisture.

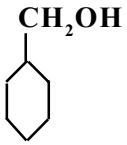
8. Select the incorrect statement :
   (a) Reactions in liquid NH_3 are analogous to those in aqueous solution.
   (b) Liquid NH_3 ionizes as : $NH_3 + NH_3 \rightleftharpoons NH_4^+ + NH_2^-$
   (c) NH_4Cl is an ammono acid in liquid NH_3 whereas $NaNH_2$ is a ammono base in liquid NH_3 like HCl an aquo acid in water and NaOH is an aquo base in water.
   (d) A liquid ammonia solution of phenolphthalein is pink
9. The density of vapours of a substance at 500K and 101.32kPa is 0.36kg m^{-3}. The molecular weight of substance is 18×10^{-3} kg. Which of the following statement is correct at these conditions:
   (a) The compressibility factor for vapours is < 1
   (b) The compressibility factor for vapours is > 1
   (c) The compressibility factor for vapours is = 1
   (d) Nothing can be said.

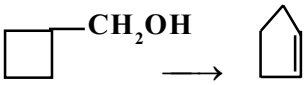
SECTION B

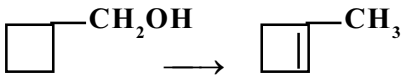
More than one correct answers :

10. Pick up the correct statements :
   (a) The electronic configuration $1s^2, 2s^2, 2p^6, 3s^2\ 3p^6\ 3d^5, 4s^1$ represents only ground state of an element.
   (b) Ritz formula : $\frac{1}{\lambda} = R_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$ was based on theoretical ground to explain the experimental facts obtained by Balmer & Lyman.
   (c) Number of subshells in a shell are equal to number of shell was derived by Pauli.
   (d) No jump is possible for electron from 4d to 3s orbital.
11 Select the correct statements :
   (a) Dehalogenation of $CH_2Br\ CH_2Br$ is a redox change
   (b) Dehydrogenation of ethane is a redox change
   (c) Dehydrohalogenation of C_2H_5Br is redox change
   (d) All these are redox changes
12. Dehydration process in which reaction are correctly reported

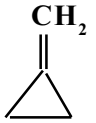
(a)  ⟶ 2-methyl cyclohexene

(b)  ⟶ 1-methyl cyclohexene

(c) 

(d) 

13. Which of the following possess 2^0 unsaturation?

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

14. Which statements are correct ?
   (a) Radioactive transient equilibrium is noticed if $\lambda_A << \lambda_B$ between A and B if A ⟶ B
   (b) K_3 [Fe $(CN)_6$] is used as external indicator
   (c) Each acid salt has acidity as well as basicity
   (d) Two solutions having osmotic pressure 4 atm and 3 atm are separated through semi-permeable membrane show net flow of solvent from 3 atm to 4 atm

SECTION C

Comprehension type problems

Passage 1 : A buffer solution is one which shows no significant change in pH on addition of small amount of acid or base. The buffer mixtures may be an acidic buffer mixture or basic buffer mixture. An acidic buffer mixture consists of a weak acid and its conjugate base. The buffer capacity is maximum in the range of $p^{Ka}\pm1$ or $p^{Kb}\pm1$ for respective buffers.

15. Pick up the incorrect statement :

(a) 10 mole of NH_4CN and 10 mole of HCN mixture acts as acidic buffer in aqeous medium and pH = pKa of HCN

(b) 20 mole of NH_4OH and 5 mole of H_2SO_4 acts as basic buffer mixture and pH = pKa of NH^+_4

(c) An acidic buffer mixture always have pH less than 7

(d) An acidic buffer mixture can have pH $\gtrless$ 7

16. A buffer mixture have 3 mole of NH_4OH and 1 mole of $(NH_4)_3PO_4$ in 10 litre solution. If p^{ka} for NH^+_4 is 9.2553 then pH of buffer mixture is :

(a) 9.7324 (b) 9.2553 (c) 8.7782 (d) 4.2675

17. Addition of 1 mole of HCl to the buffer mixture reported in problem 16 shows the pH

(a) 9.5563 (b) 8.9543 (c) 1.5228 (d) 1.4772

Passage 2:- Equilibrium constant is dimensionless if measured under standard conditions and is expressed as K^0_p or K^0_C. Standard condition refers when pressure is 1 bar or molar concentration is 1M. Given that for the decomposition of PCl_5 in a closed container at 100 kPa if

$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$; $K^0_p = 1.80$ at 523K

18. The degree of disociation of PCl_5 is :

(a) 0.20 (b) 0.470 (c) 0.60 (d) 0.80

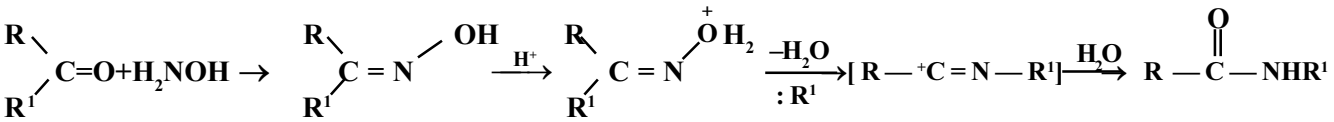
19. The molecular weight of mixture at equilibrium is

(a) 173.75 (b) 148.93 (c) 130.31 (d) 115.83

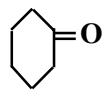
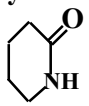
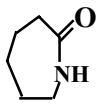
20. The density of mixture at equilibrium in g/dm^3 is

(a) 2.70 (b) 3.03 (c) 3.47 (d) 4.05

Passage 3: Oximes of Carbonyl compounds usually undergoes Beckman's rearrangement on heating in presence of acids. The function of acidic reagent is to convert - OH gp to a better leaving gp. Loss of H_2O occurs with simultaneous migration of the trans : R



21. The product formed on Beckmann's rearrangement of cyclohexanone oxime is :

(a)  **(b)**  **(c)**  **(d)** 

22. The Major product formed on Beckmann's rearrangement of propanal oxime is

(a) $HCONHCH_2CH_3$ (b) $CH_3CH_2CONH_2$ (c) $CH_3CONHCH_3$ (d) $HCON(CH_3)_2$

23. Beckmann's rearrangement of oxime can be made in presense of

(a) H_2SO_4 (b) PCl_5 (c) $C_6H_5SO_2Cl$ (d) All of these

SECTION D

Matrix Match type problems :

24. One or more than one match are possible.

(a) $BF_3 + HNO_3$	**(1) Nitration mixture**
(b) Orthoboric acid	**(2) Strong monobasic acid in glycerol**
(c) $HClO_4 + HNO_3$	**(3) Chelate complex formation**
(d) $HClO_4$	**(4) Good conductor of current**

SECTION E

Single Integer answer type

S.1 A cresol on heating with Br_2 gives rapidly $C_7H_5OBr_3$. The CH_3 gp in cresol is at C^a with respect to C^1 — OH. The value of a is :

IIT JEE MODEL TEST

Time : 60 minute **M.M. : 84**

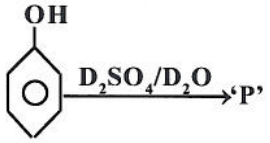
PAPER -2

No. of Ques.	Question Type	Marking Scheme	Max. Marks
9	Single Answer Type	2 marks for correct answer; -1 for wrong	18
5	Multiple Answer Type	3 marks for correct answer; -1 for wrong	15
2	Matrix- Matches	1 marks for each correct answer	8
4	Assertion Reason Type	4 marks for each correct answer	16
9	Single Digit Integer Answer Type	3 marks for each correct answer	27

SECTION - A

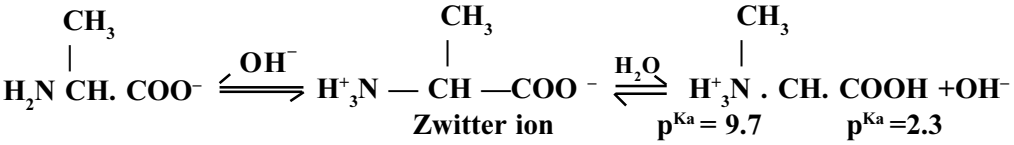
Single correct answer -

1. Which of the following does not exist as dimer ?
   (a) AlF_3 (b) $AlCl_3$ (c) $AlBr_3$ (d) AlI_3
2. One mole of which compound gives maximum moles of gas on heating :
   (a) $Pb(NO_3)_2$ (b) $FeSO_4$ (c) Ag_2CO_3 (d) $Fe_2(SO_4)_3$
3. Which of the following statement is incorrect about diamond ?
   (a) It can not be scratched by boron carbide
   (a) It is transparent to X-rays
   (b) It is about 140 times harder than corundum
   (c) It dissolves in molten iron
4. 50 ml of 0.1 M $Al_2(SO_4)_3$ solution is mixed with 50 ml of 0.1 M $BaCl_2$ solution. The total ionic strength is :
   (a) 0.8 (b) 0.7 (c) 0.9 (d) 1.0
5. The percentage of free volume available when 1 mole of liquid water having density 0.958 g/ml placed in a container is converted to vapour state at 1.0atm and 100^0C.
   (a) 0.0614 (b) 20.22 (c) 10.11 (d) 99.94
6. Select the incorrect statement :
   (a) Formation of N_2O from NH_4NO_3 is dis-proportionation.
   (b) Valence factor for N_2 in the reaction : $N_2 + 3H_2 \longrightarrow 2NH_3$ is six.
   (c) Valence factor represents number of equivalent of a substance in one mole.
   (d) Valence factor for ferric oxalate on oxidation by acidified $KMnO_4$ is six.
7. Which of the product is obtained on reaction of cyclopentanone and ethyl nitrite in presence of NaOEt and EtOH followed by hydrolysis ?
   (a) 2- nitroso cyclopentanone (b) 2- nitro cyclopentanone
   (c) 2- nitroso cyclopentanol (d) Cyclopentan -1, 2- dione
8. Which of the following product is correct in the reaction ?



   (a) C_6H_5OD (b) 2, 4 - di D C_6H_3OH (c) 2-D C_6H_4OH (d) 2, 4, 6-tri D C_6H_2OD
9. CCl_3 is a stable intermediate because of
   (a) p - p π bond (b) sp^2 hybridisation (c) – I.E. (d) p - d π bond

S.2 Alanine is  **and exists as zwitter ion**



The pH at isoelectric point is :

S.3 The ratio of H_2O molecules in monoclinic form of borax and octahedral form of borax is :

S.4 Oxidation number of Au in fulminating gold is

S.5 The covalence of Al in $[Al\ Cl\ (H_2O)_5]^{2+}$ is

SECTION - B

More than are correct answers :

10. Pick up the incorrect statements :

(a) Negative catalyst increases the activation energy

(b) Rate of exothermic reaction decreases with increase in temperature

(c) The process of adsorption does not attain equilibrium

(d) Surfactants forms cationic, anionic or non ionic micelles

11. Which order for stability of complex is correct ?

(a) Cu^{2+} complexes are more stable than Zn^{2+} complexes

(b) Cu^{2+} complexes are more stable than Ni^{2+} complexes

(c) Fe^{2+} complexes are more stable than Mn^{2+} complexes

(d) Fe^{2+} complexes are more stable than Co^{2+} complexes

12. Select the correct statements :

(a) XeO_3 and IO_3^- are isoelectronic and isostructural

(b) XeF_4 and ICl_4^- are isoelectronic and isostructural

(c) XeF_2 and $IBrCl^-$ are isoelectronic and isostructural

(d) NH_4^+ and H_3O^+ are isoelectronic and isostructural

13. Select the correct statements :

(a) All the oxides of nitrogen are endothermic compounds

(b) $N_2 + ½\ O_2 \rightarrow N_2O$; ΔH = +ve

(c) Except N_2O_5 all oxides of nitrogen are gases.

(d) $N_2 + \frac{5}{2}\ O_2 \rightarrow N_2O_5$; ΔH = –ve

14. The reaction : $HC \equiv CH + NaH \rightarrow HC \equiv CNa + H_2$ is an example of :

(a) Acid - Base reaction

(b) Intramolecular redox

(c) Disproportionation

(d) Intermolecular redox

SECTION - C

Matrix Match type problems :

15. More than one match are possible -

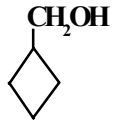
List A	List B
(a) White phosphorus	**(1) Soluble in CS_2**
(b) Black phosphorus	**(2) Most stable form of element**
(c) Carbon graphite	**(3) $\Delta_f H = 0$**
(d) Sulphur rhombic	**(4) Good conductor of current**

16. Only one match possible :

(a) 2eq .of Hex-1-ene + Cyclohexene $\xrightarrow[Pd]{\Delta}$ (1) Transfer Hydrogenation

(b) $C_6H_5CH_2OH + H_2 \xrightarrow[Pd]{}$ (2) Hydrogenolysis

(c) $CH_3.CH_2.CH_2.CH_2OH \xrightarrow[\text{dehydration}]{\text{Acid catalysed}}$ (3) Hydride shift

(d)  **$\xrightarrow{\text{Dehydration}}$ (4) 2^0 carbocation**

SECTION - D

Assertion - Reason type Problems :

(a) Statement 1 is correct but statement 2 is wrong

(b) Statement 1 is wrong but statement 2 is correct

(c) Both statement 1 and statement 2 are correct and statement 2 is correct explanation of statement 1

(d) Both statement 1 and statement 2 are correct but statement 2 is not correct explanation of statement 1

17. Statement - 1 The process occuring in closed system is always isochoric.

Statement - 2 Expansion or compression of a gas can be made in a closed system.

18. Statement - 1 Amorphous silica is photovoltaic substance

Statement - 2 Photovoltaic substances converts light into electrical energy

19. Statement - 1 At critical temperature, the meniscus between liquid and vapour phase disappears

Statement - 2 Liquefaction is a continous process

20. Statement - 1 Alcohols do not undergo base induced dehydration ($-H_2O$) in the same way as RX's are dehydrohalogenated

Statement - 2 In alcohols leaving gp (-OH) is weaker base and do not allow to proceed reaction.

SECTION - E

Single Integer answer type

S-1 The number of configurational isomers of C_5H_9Br formed by the addition of HBr on 2-pentyne are.

S-2 The total number of different substitution products possible when ethane and bromine are allowed to react.

S-3 Four moles of ammonium hydrogen fluoride (NH_4F) on fusion gives how much mole of NH_3.

S-4 Tri sulphide ion is S_3^{a-}. The value of a is :

S-5 Number of isomers of $C_2BrClF(CH_3)$ are

S-6 The potential for the reaction : $O_2+4H^+ + 4e \rightarrow 2H_2O$ is 1.23 V in 0.1 N strong acid solution at one atm of O_2. If potential measured in aqueous solution is 0.994V, the pH of solution would be

S-7 Two acid solutions A and B are titrated separately each with 25 ml of 0.5M Na_2CO_3 solution. The volume of each acid used for titration is 10 ml and 40 ml respectively for complete neutralisation. The volume ratio of V_B and V_A which should be mixed to prepare one litre of 1 N acid mixture in solution.

S-8 Empirical formula for K_{SP} of $K_2SO_4.Al_2(SO_4)_3.24H_2O$ is given by = $A.S^B$. the value of A/B^3 is.

S-9 Acidity of $Al_2(HPO_4)_3$ is: