Instructions to Candidate:

1) Write your number in the space provided at the top of this page of the main booklet and also on the response sheet (Computer marked answer sheets) given along with the booklet.
2) The answers are to be indicated in the response sheet provided along with this booklet.
3) Attempt all questions (100 multiple choice questions). The response sheet has been devised to convert the answers given by you into computer data. Check that the response sheet is filled up as per instructions.
4) Question paper will be supplied to the candidates 10 minutes before the commencement of examination. and details should be written on the sheet.
5) Use ball pen (blue or black) to write your seat number and to shade and darken the appropriate oval area indicating your option (choice) as the correct answer.
6) Write seat number, in the provided boxes appropriately on the response sheet. For example if seat number is 1275 then put it in the table for seat number on the response sheet as shown below:

0	1	2	7	5

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

Area shaded by the black lead pencil / ball pen.

7) If the 'marking' is put at any other place than the square in the response sheet, or two more squares are marks for the same item, the answer will not be evaluated. There will be no negative marking for wrong answers.
8) Blank sheets are attached at the end of booklet for rough work.
9) If you write your name or put any special mark on any part of the test booklet which may disclose your identity, you will render yourself liable for disqualification.
10) You should **return the Main booklet to the invigilator at the end of the examination along with the OMR sheet and should not carry any paper with you outside the examination hall**.
11) Use of log table and calculator is allowed.

Signature of the Examiner

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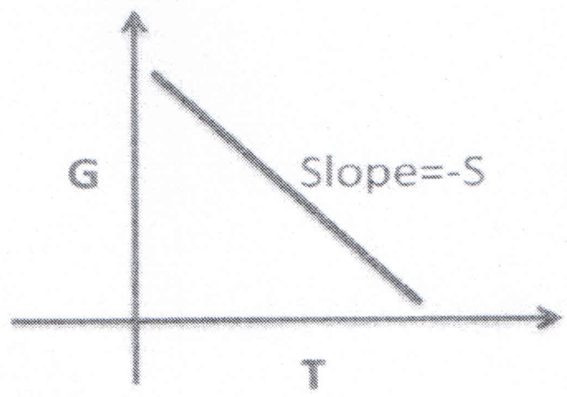
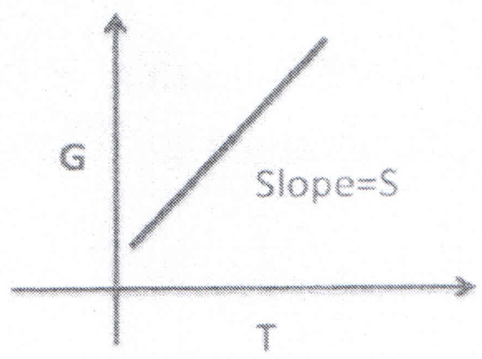
(1) For the pure substance, a plot of Gibb's free energy (G) against temperature at constant pressure is

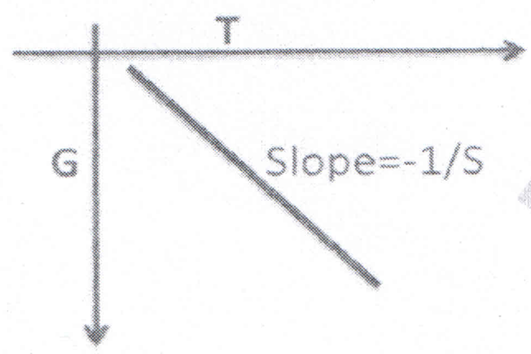
[A]



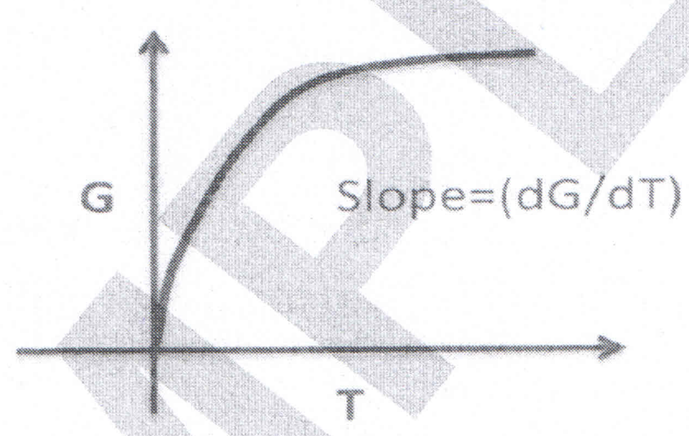
[B]



[C]



[D]



(2) The single electrode Potential of H_2 electrode, $Pt / H_2(1\ atm.) / H^+(aq.)$ at pH =10 and room temperature is

[A] 0.59V

[C] -0.59V

[C] 0.00V

[D] -0.059V

SAMPLE COPY

(3) In the electrolysis of $CuCl_2$ solution using two Cu electrodes, the weight of Cu cathode increased by 2.0g, at anode,

[A] 0.2 moles of Cu^{2+} will go into the solution

[B] 560mL of O_2 will be liberated.

[C] No loss in weight

[D] 2.0 g of copper will go into solution as Cu^{2+} .

(4) The inversion of cane-sugar proceeds with half-life of 500 minutes at pH 5 , for any concentration of sugar. However, if pH=6, the half life changes to 50 minutes. The rate of inversion of cane-sugar is written as

[A] $R = k[sugar]^2[H]^{10}$

[B] $R = k[sugar]^0[H]^1$

[C] $R = k[sugar]^2[H]^2$

[D] $R = k[sugar]^0[H]^6$

(5) The reaction, $C \xleftarrow{k_1} A \xrightarrow{k_2} D$ follow first order kinetics. The reaction is started with only A. The concentration of C always equal to D at any time. What will be the time when all the three concentrations are equal ?

[A] $t = \frac{1}{2k_1}\ln 2$

[B] $t = \frac{1}{2k_2}\ln 2$

[C] $t = \frac{1}{2k_1}\ln 3$

[D] $t = \frac{1}{k_1 + k_2}\ln 2$

SAMPLE COPY

(6) Which of the following reactions is accompanied by a decrease of entropy?

[A] $2H_2(g) + O_2(g) \rightarrow 2H_2O\ (l)$

[B] $C\ (graphite) + H_2O\ (g) \rightarrow CO\ (g) + H_2(g)$

[C] $H_2(g) + I_2(g) \rightarrow 2HI(g)$

[D] $2\ C\ (graphite) + O_2\ (g) \rightarrow 2CO\ (g)$

(7) What is the deBroglie wavelength of the electron in the ground state of the hydrogen atom (in pm), given that its kinetic energy is 13.6 eV?

[A] 0.3328

[B] 33.28

[C] 3.328

[D] 332.8

(8) The bond orders in N_2^+ and CO are, respectively

[A] 2.5 and 3

[B] 2.5 and 2.5

[C] 2 and 3

[D] 3 and 3

(9) The state of hybridization of oxygen in OF_2 is

[A] sp

[B] sp^2

[C] sp^3

[D] dsp

(10) If the frequency of vibration in H_2 molecule is 4400 cm^{-1} what will be the frequency of vibration in HD if the force constants in these two molecules were the same?

[A] 2200 cm^{-1}

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[B] 3300 cm^{-1}

[C] 3740 cm^{-1}

[D] 6600 cm^{-1}

(11) The number of vibrational and rotational degrees of freedom in BF_3 molecule, respectively, is

[A] 6 and 3

[B] 7 and 3

[C] 7 and 2

[D] 2 and 6

(12) The half-life period of a radioactive element is 21 hours, hence the fraction of radioactive element disintegrated after 84 hours will be

[A] 0.0625

[B] 0.125

[C] 0.912

[D] 0.9375

(13) The bond enthalpies of H_2, X_2 and HX are in the ratio of 2:1:2. If enthalpy of formation of HX is –50 kJ mol^{-1}, the bond enthalpy of X_2 is

[A] 100 kJ mol^{-1}

[B] 200 kJ mol^{-1}

[C] 300 kJ mol^{-1}

[D] 50 kJ mol^{-1}

(14) Which of the following is not correctly matched?

[A] ClF_3 : T-shaped

[B] XeO_3 : trigonal bipyramidal

[C] $XeOF_4$: square pyramidal

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[D] XeF_2 : linear

(15) Which of the following nuclear reaction has an characterized in-correctly?

[A] ${}^{209}_{83}Bi + {}^{4}_{2}\alpha \longrightarrow {}^{211}_{85}Al + 2\,{}^{1}_{0}n$ fission

[B] ${}^{2}_{1}H + {}^{3}_{1}H \longrightarrow {}^{4}_{2}He + {}^{1}_{0}n$ fusion

[C] ${}^{14}_{7}N + {}^{4}_{2}\alpha \longrightarrow {}^{17}_{8}O + {}^{1}_{1}p$ bombardment

[D] ${}^{234}_{90}Th \longrightarrow {}^{0}_{-1}\beta + {}^{234}_{91}Pa$ decay

(16) The polymers those cannot be recycled are:

[A] Thermoplastics

[B] Thermosets

[C] Elastomers

[D] Resins

(17) Tetraalkyl ammonium bromides can be classified as

[A] cationic surfactants

[B] anionic surfactants

[C] non-ionic surfactants

[D] Polymers

(18) The isoelectric point of the protein bovine serum albumin (BSA) is 4.7. At pH = 7 the overall charge on BSA will be

[A] Negative

[B] Positive

[C] Neutral

[D] None of the above

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(19) What is the molar concentration of silver ions when 0.156 g of silver sulphate is dissolved in 1.0L of water ? . The relative molar mass of silver sulphate is 312.

[A] 1 M

[B] 5×10^{-4} M

[C] 1×10^{-2} M

[D] 1×10^{-3} M

(20) How many nearest neighbours are there for an atom in a hexagonal close-packed crystal structure?

[A] 6

[B] 12

[C] 18

[D] 24

(21) 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	300
Conductivity	0.535	0.202	0.047	0.004

[A] Insulator

[B] Semiconductor

[C] metal

[D] Semi-metal

(22) Under which of the following conditions the Langmuir adsorption isotherm equation can be applied ?

[A] Low temperature and high pressure

[B] High pressure and moderately high temperature

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[C] Low temperature and low pressure

[D] Moderately high temperature and low pressure

(23) From the Arrhenius equation a plot of

[A] ln k vs. T is a straight line

[B] ln T vs. 1/k is a straight line

[C] ln T vs. k is a straight line

[D] ln k vs. 1/T is a straight line

(24) The unit of equilibrium constant in the equation for Langmuir adsorption Isotherm is

[A] s^{-1}

[B] $(conc.)^{-1}$

[C] $(bar)^{-1}$

[D] $L\ mol\ s^{-1}$

(25) Which of the following molecules/ions exhibit largest dipole moment

[A] BF_3

[B] $CHCl_3$

[C] CH_3Cl

[D] CHI_3

(26) The expected electronic configuration of lanthanides is

[A] $(n-2)f^{1-14}\ (n-1)s^2\ p^6\ d^{0-1}\ ns^2$

[B] $(n-2)f^{0-14}\ (n-1)\ d^{0-1}\ ns^2$

[C] $(n-2)f^{0-14}\ (n-1)d^{10}\ ns^2$

[D] $(n-2)^{0-1}\ (n-1)f^{1-14}\ ns^2$

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(27) Which of the following gas is used as antioxidants

[A] H_2

[B] O_2

[C] N_2

[D] SO_2

(28) Which one of the following ions is predicted to be diamagnetic?

[A] Mn^{2+}

[B] Cu^{+}

[C] Co^{3+}

[D] Cr^{2+}

(29) AgCl is not precipitated when $AgNO_3$ is added to

[A] $[Co(NH_3)_4Cl_2]Cl$

[B] $[Co(NH_3)_5Cl]Cl_2$

[C] $[Co(NH_3)_6]Cl_3$

[D] $[Co(NH_3)_3Cl_3]$

(30) 50 grams of limestone ($CaCO_3$) is heated strongly for complete decomposition. The weight of quicklime (CaO) obtained will be

[A] 56 g

[B] 28 g

[C] 14 g

[D] 7 g

(31) In the manufacture of H_2SO_4 by contact process the catalyst used is

[A] Iron Oxide

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[B] Zinc Oxide

[C] Vanadium pentoxide

[D] Finely divided iron

(32) Choose the set of stoichiometric coefficients that correctly balance the equation:

$(?)MnO_4^- + (?)C_2O_4^{2-} + (?)H^+ \rightarrow (?)Mn^{2+} + (?)CO_2 + (?)H_2O$

[A]	1	8	5	2	2	4
[B]	2	8	5	2	1	4
[C]	2	5	16	2	10	8
[D]	2	5	10	2	16	5

(33) $Be_3Al_2(Si_6O_{18})$ (Beryl) Silicate is an example of

[A] Amphibolic

[B] Cyclic silicate

[C] Sheet silicate

[D] Network silicate

(34) In $Fe(CO)_5$, the F-C bond possesses

[A] π-character only

[B] both σ and π characters

[C] ionic character

[D] σ-character only

(35) The CFSE for high spin d^4 octahedral complex is

[A] -0.6 Δoct

[B] -1.8 Δoct

[C] -1.6 $\Delta oct + P$

SAMPLE COPY

[D] -1.2 Δoct

(36) The main constituent of egg shell is

[A] $CaCO_3$

[B] $CaSO_4$

[C] $CaSiO_3$

[D] CaO

(37) Which of the following complex ions is tetrahedral?

[A] $[PdCl_4]^{2-}$

[B] $[PtCl_4]^{2-}$

[C] $[NiCl_4]^{2-}$

[D] $[AuCl_4]^-$

(38) In oxy haemoglobin the iron center is best described by which of the following

[A] high spin Fe(III)

[B] high spin Fe(II)

[C] low spin Fe(III)

[D] low spin Fe(II)

(39) The oxidation state of Xe in $[HXeO_4]^-$ is

[A] +6

[B] +8

[C] +4

[D] +7

SAMPLE COPY

(40) Ziegler- Natta catalyst is associated with

[A] alkene hydrogenation

[B] alkene polymerization

[C] alkene metathesis

[D] alkene hydroformylation

(41) Which is a not a property of a salt?

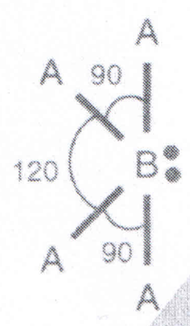
[A] They have ordered packing arrangements called lattices

[B] They conduct electricity when dissolved in water or molten

[C] They have a low melting point but a high boiling point

[D] They are brittle

(42) Which of the following molecules will have a see-saw structure as shown below:



[A] CF_4

[B] XeF_4

[C] $TeCl_4$

[D] PCl^{4+}

(43) According to the 18-electron rule, which of the following is NOT a correct formula of a stable metal carbonyl (V=23, Mn=25, Fe=26, Co=27, Ni=28)

[A] $[V(CO)_6]^-$

[B] $[Mn(CO)_5]^-$

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[C] $[Fe(CO)_4]^{2-}$

[D] $[Co(CO)_4]^{+}$

(44) Which of the following reaction DOES NOT represent the formation of a Lewis acid-base aduct:

[A] $Me_3N + BF_3 \longrightarrow Me_3NBF_3$

[B] $Al(OH)_3 + OH^- \longrightarrow Al(OH)_4^-$

[C] $PF_3 + F_2 \longrightarrow PF_5$

[D] $SnCl_2 + Cl^- \longrightarrow SnCl_3^-$

(45) The relative M-Cl bond strengths of Group 14 halides will be

[A] Si-Cl > C-Cl > Ge-Cl > Sn-Cl

[B] C-Cl > Si-Cl > Ge-Cl > Sn-Cl

[C] C-Cl < Si-Cl < Ge-Cl < Sn-Cl

[D] Si-Cl < C-Cl < Ge-Cl < Sn-Cl

(46) Which of the following complexes exist as a pair of enantiomers?

[A] *trans*-$[Co(H_2NCH_2CH_2NH_2)_2Cl_2]^+$

[B] $[Co(NH_3)_4Cl_2]^+$

[C] $[Co\{P(C_2H_5)_3\}_2ClBr]$

[D] $[Cr(H_2NCH_2CH_2NH_2)_3]^{3+}$

(47) A Jahn-Teller distortion of $[Ti(H_2O)_6]^{3+}$ acts to

[A] Raise its symmetry

[B] Remove the electronic degeneracy

[C] Cause loss to a H_2O ligand.

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[D] Promote a d-electron to an anti-bonding MO

(48) Which of the following halides does not exist

[A] SbF_5

[B] PF_5

[C] NF_5

[D] AsF_5

(49) There is no S-S bond in

[A] $S_2O_4^{2-}$

[B] $S_2O_5^{2-}$

[C] $S_2O_3^{2-}$

[D] $S_2O_7^{2-}$

(50) A unit cell has a=5°A, b=8°A, c=3°A, $\alpha = 90^\circ$, $\beta = 65^\circ$ and $\gamma = 54^\circ$. The space lattice for this unit cell is

[A] orthorhombic

[B] monoclinic

[C] rhombohedral

[D] triclinic

(51) The iron obtained from blast furnace is called

[A] Wrought iron

[B] Pig iron

[C] Cast iron

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[D] Mild steel

(52) One liter of an aqueous solution contains 20 grams of an organic acid. If the distribution ratio for the extraction is 10 what amount of the acid will be extracted in single extraction with 100 ml ether?

[A] 5 g

[B] 10 g

[C] 15 g

[D] 20 g

(53) In biological systems, the metal ion involved in the dioxygen transport besides Fe is

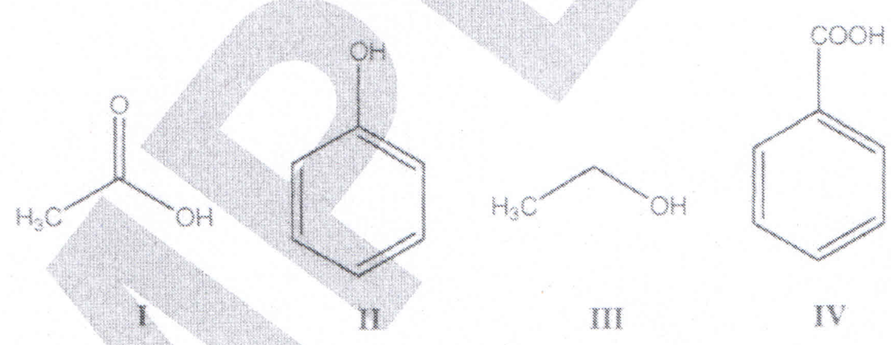
[A] Cobalt

[B] Zinc

[C] Magnesium

[D] Copper

(54) The correct order of pKa values of following compounds is



[A] II < III < I < IV

[B] IV < I < II < III

[C] III < II < I < IV

[D] I < IV < II < III

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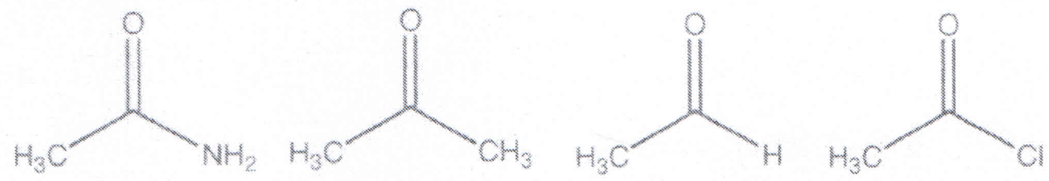
(55) The decreasing order for the carbonyl group stretching frequency in the IR spectra of the following compounds is:



I II III IV

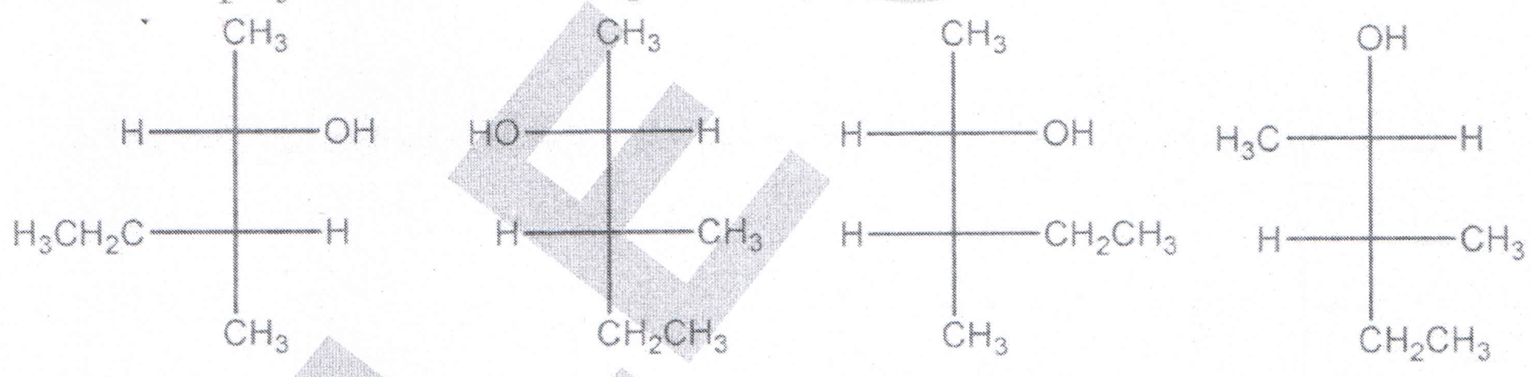
[A] I > IV > III > II

[B] II > III > IV > I

[C] III > IV > I > II

[D] IV > III > II > I

(56) Which two projection formulae represent a pair of enantiomers ?



I II III IV

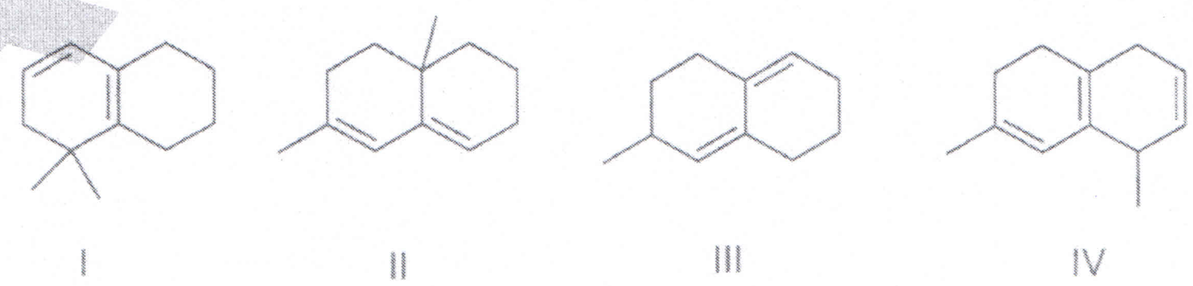
[A] II & IV

[B] II & III

[C] I & IV

[D] I & III

(57) Which of the following compound will show the absorbance at 279nm in UV spectrum?



I II III IV

[A] I

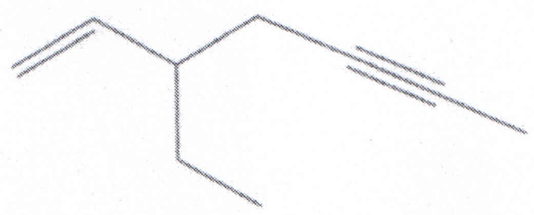
SAMPLE COPY

[B] II

[C] III

[D] IV

(58) The IUPAC name of the following compound is,



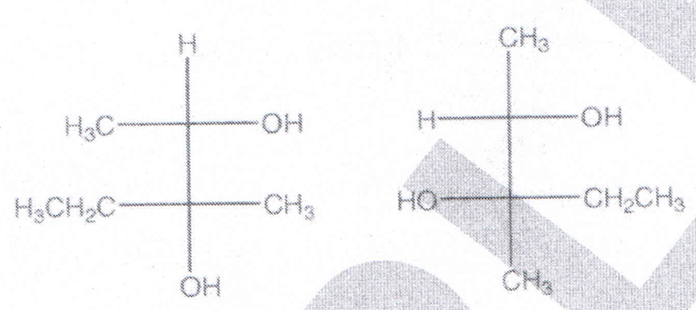
[A] 3-ethylhept-1-en-5-yne

[B] 5-ethylhept-6-en-2-yne

[C] 5-ethylhept-2-en-3-yne

[D] 3-ethylhept-2-en-6-yne

(59) What is the stereochemical relationship between the two molecules shown below?



[A] Enantiomers

[B] Identical

[C] Diastereomers

[D] Meso compounds

(60) Which of the following sugar has highest sweetness?

[A] D- glucose

[B] Sucrose

[C] D- fructose

[D] Invert sugar

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(61) The compound which will show one singlet in ^{1}H-NMR spectrum is,

[A] 1,1,2-trichloroethane

[B] 1-bromopropane

[C] 2-bromobutane

[D] 1,2-dichloroethane

(62) Addition of NaOH to 4- nitrophenol will result in

[A] no change in wavelength and intensity

[B] no change in wavelength but increased intensity

[C] hypsochromic shift

[D] bathochromic shift

(63) Which of the following compounds is chiral?

[A] Methyl cyclohexane,

[B] 4, 5-Dimethyl-2,6-octadiyne;

[C] 2, 4-Dimethylheptane ;

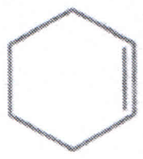
[D] trans-1,4-dichlorocyclohexane

(64) Cis-trans isomerism is shown by,

(I) $CH_3CH{=}CHCH_3$

(II) $H_2C{=}CHCH_2CH_3$

(III) $(CH_3)_2C{=}C(CH_3)_2$

(IV) 

[A] I

SAMPLE COPY

[B] II

[C] III

[D] IV

(65) Which of the following compounds has highest nucleophilicity character?

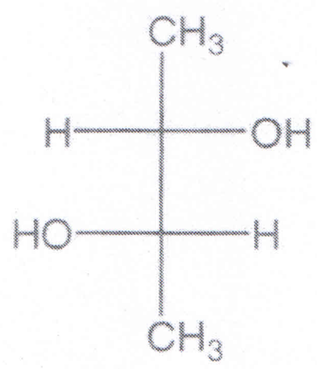
[A] F^-

[B] –OH

[C] $-CH_3$

[D] $-NH_2$

(66) What are the absolute configurations at the chiral centers in the molecule shown below?



[A] 2R and 3R

[B] 2R and 3S

[C] 2S and 3R

[D] 2S and 3S

(67) What is the correct order of stability of carbocations given below?

$CH_3\overset{\oplus}{C}HCH_3$ I $CH_3\overset{\oplus}{C}HOCH_3$ II $CH_3\overset{\oplus}{C}HCOCH_3$ III

[A] I > II > III

[B] III > II > I

[C] III > II > I

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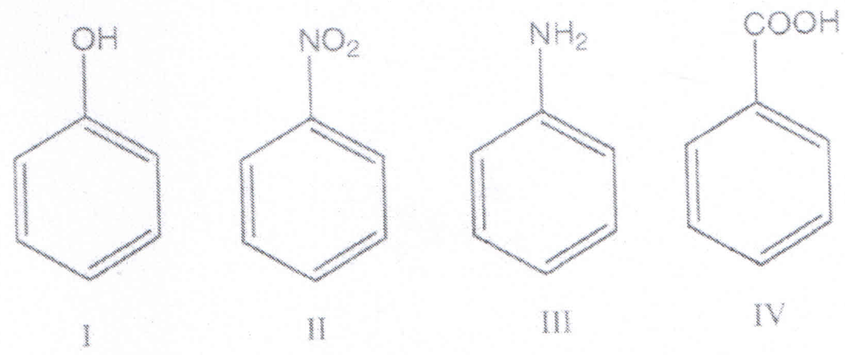
[D] II > I > III

(68) Which of the following compounds is/are soluble in aqueous NaOH?



[A] I only

[B] I and II only

[C] II and IV only

[D] I and IV only

(69) What is the correct order of strength of following bases?

I. –OH

II. $-NH_2$

III. $HC{\equiv}C^-$

IV. $-CH_2CH_3$

[A] IV > III > I > II

[B] I > III > II > IV

[C] III > IV > I > II

[D] IV > II > III > I

(70) The preferred conformation of cis-1,4-dimethylcyclohexane is,

[A] Chair with both methyl groups in axial position

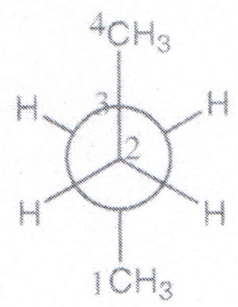
[B] Chair with both methyl groups in equatorial position

[C] Chair with one methyl group in axial position and the other methyl group in equatorial position

SAMPLE COPY

[D] Boat form

(71) Consider the following Newman projection,



If C_2 is rotated about C_2-C_3 bond in anticlockwise direction by an angle of 120°, then the conformation obtained is,

[A] Fully eclipsed

[B] Partially eclipsed

[C] Gauche conformation

[D] Staggered conformation

(72) Synthetic transformation of >C=O to $>CH_2$ can be achieved by

[A] Clemmensen's reduction

[B] Wolf-Kishner reduction

[C] Both Clemmensen's reduction and Wolf-Kishner reduction

[D] Neither Clemmensen's reduction nor Wolf-Kishner reduction

(73) What is the correct order of rate of nitration of following compounds?

I. Benzene

II. Chlorobenzene

III. Nitrobenzene

IV. Toluene

[A] IV > I > II > III

[B] III > II > I > IV

[C] II > III > IV > I

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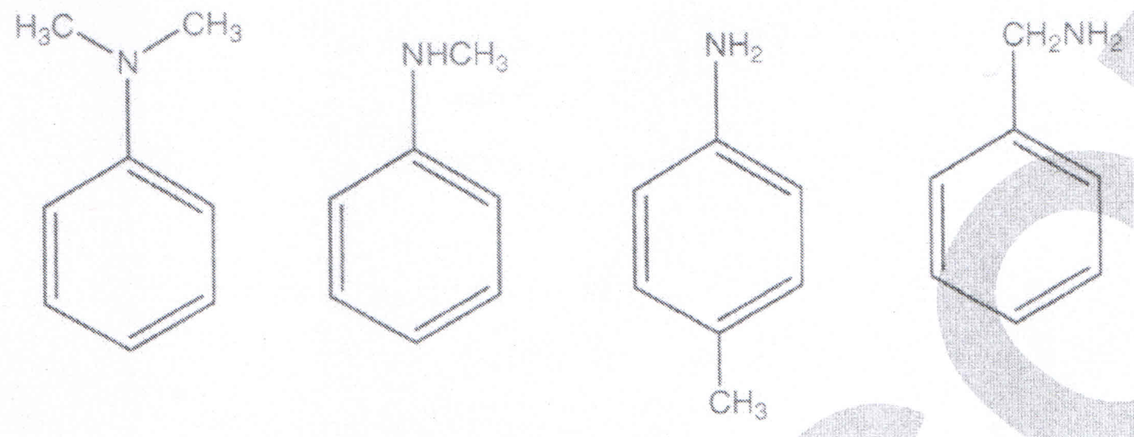
[D] I > IV > III > II

(74) Which of the following compound/S would form orange dye stuff on treatment with $NaNO_2$ in dil. HCl followed by addition to an alkaline solution of β–naphthol?



I II III IV

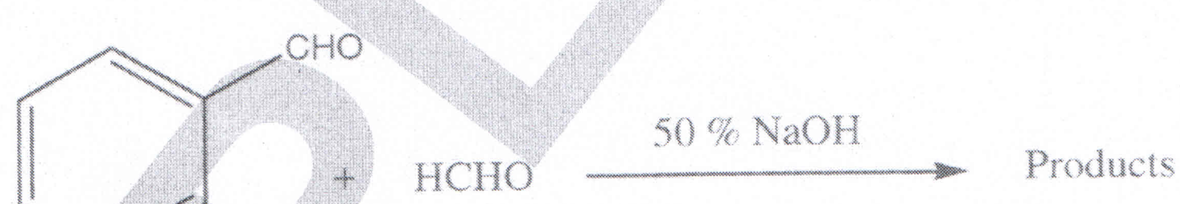
[A] I only

[B] II and IV only

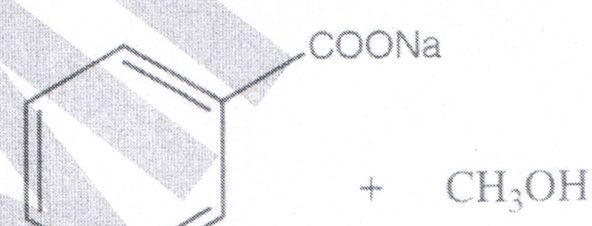
[C] III only

[D] I and II only

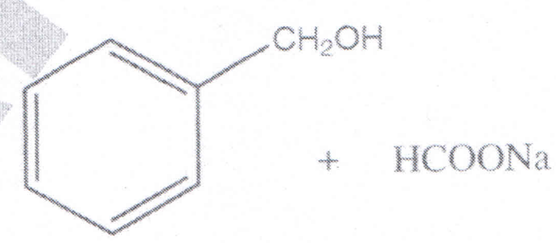
(75) Predict the correct products of following reaction,



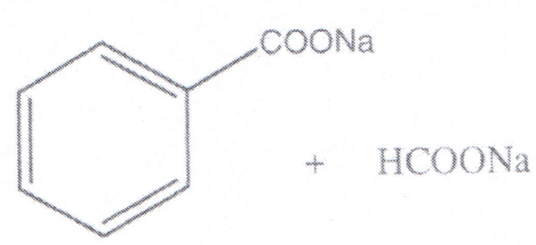
[A]



[B]



[C]



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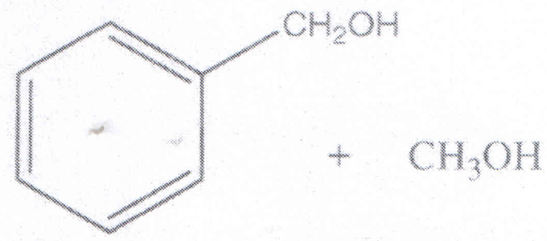
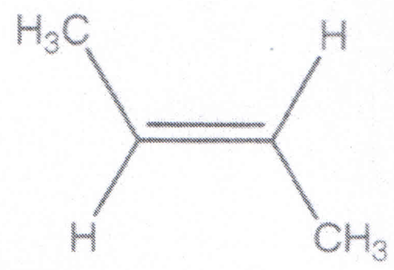
[D] 

(76) The number of signals that appear in the ^{1}HNMR spectrum of,



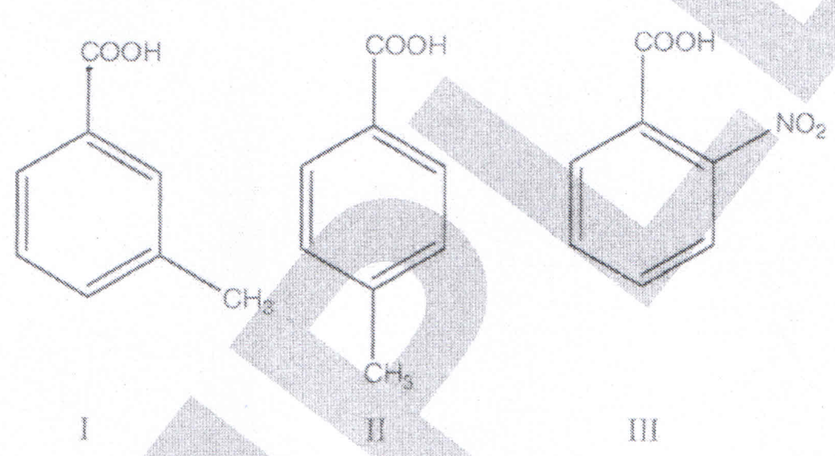
[A] Five

[B] Two

[C] Three

[D] Eight

(77) What is the correct order of acidity of following compounds?



[A] I > II > III

[B] III > II > I

[C] III > II > I

[D] II > I > III

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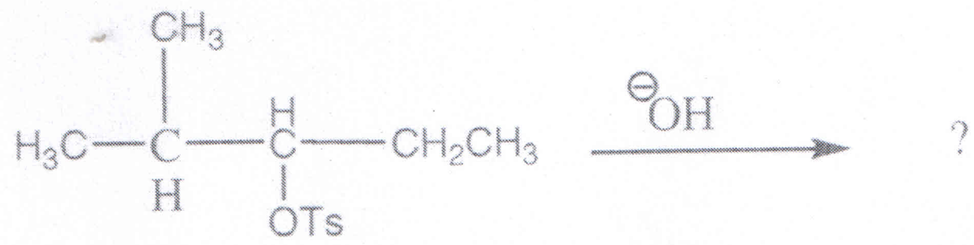
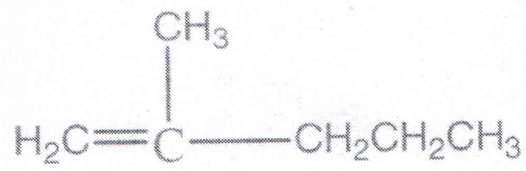
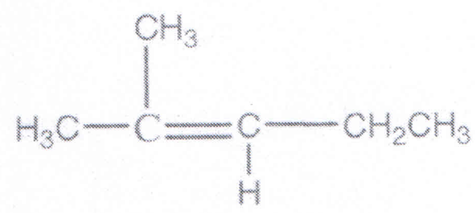
(78) Predict the major product of following E2 elimination reaction,



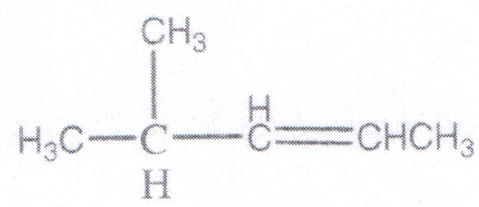
[A]



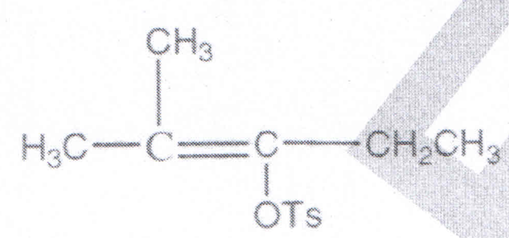
[B]



[C]



[D]



(79) What is the correct order of leaving group ability of following groups?

$-OCOCH_3$	$-OCH_3$	$-OSO_2CH_3$	$-OSO_2CF_3$
I	II	III	IV

[A] IV > III > I > II

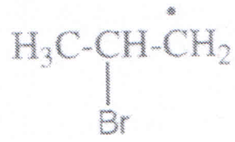
[B] III > II > I > IV

[C] II > III > I > IV

[D] I > II > III > IV

(80) The reaction of propene with HBr in the presence of ROOR (peroxide) proceeds through which of the following intermediates?

[A]



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[B] $H_3C\text{-}\dot{C}H\text{-}CH_3$

[C] $H_3C\text{-}CH_2\text{-}\dot{C}H_2$

[D] $H_3C\text{-}\dot{C}H\text{-}\underset{\underset{Br}{|}}{C}H_2$

(81) Which of the following is a polymer?

[A] ATP

[B] Glucose

[C] Glycerol.

[D] Cellulose.

(82) One strand of DNA has the following sequence of nucleotide 3' ATTCGCTAT 5' so the other strand of DNA has the sequence

[A] 5' TAAGCGATA 3'

[B] 3' TAAGCGATA 5'

[C] 5' GACGCGATA 3'

[D] 3' GACGCGATA 5'

(83) With reference to enzymes, which one of the following statements is true?:

[A] Coenzyme = Apoenzyme + Holoenzyme

[B] Holoenzyme = Apoenzyme + Coenzyme

[C] Holoenzyme= Apoenzyme – Coenzyme

[D] Apoenzyme = Holoenzyme + Coenzyme

(84) The "Repeating Unit" of glycogen is

[A] galactose

[B] mannose.

[C] glucose

[D] Ribose

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(85) The glycosidic linkage which β- amylase cleaves is

[A] α 1→ 4 glycosidic bond

[B] β 1 → 4 glycosidic bond

[C] β 1 → 6 glycosidic bond

[D] α 1 → 6 glycosidic bond

(86) Thiamine is a

[A] purine

[B] pyrimidine

[C] vitamin

[D] amino acid

(87) Which of the following is a diamino dicarboxylic acids?

[A] cystine

[B] lysine.

[C] arginine

[D] glutamine.

(88) Anticodon is a group of three :

[A] monosaccharides

[B] nucleosides

[C] nucleotides

[D] amino acid.

(89) Feedback inhibition of enzymes is due to:

[A] enzyme

[B] coenzyme

[C] end-product.

[D] substrate

(90) Which of the following is not a conjugated protein?

[A] phosphoprotein

[B] lipoprotein

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[C] peptone

[D] glycoprotein

(91) Which of the following is an essential fatty acid in humans?

[A] palmitic acid

[B] stearic acid

[C] linoleic acid

[D] myristic acid

(92) Gene is expressed as

[A] vitamin

[B] protein

[C] carbohydrate

[D] fatty acid

(93) Blood clotting disorders is due to the deficiency of vitamin

[A] B_6

[B] B_{12}

[C] A

[D] K

(94) The metal ion present in chloroplast pigment

[A] Iron

[B] Molybdenum

[C] Zinc

[D] Magnesium.

(95) RNA differs from DNA due to

[A] Uracil

[B] thymine

[C] adenine

[D] cytosine

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(96) The role of adapter for amino acids during protein biosynthesis is played by

[A] messenger RNA

[B] ribosomal RNA

[C] transfer RNA

[D] DNA

(97) Proteins are synthesized on

[A] Lysosomes

[B] Chloroplasts

[C] Mesosomes

[D] Ribosomes

(98) Blood glucose level is maintained by

[A] inulin

[B] insulin

[C] thyroxine

[D] vasopressin

(99) Membrane bound cell organelles are not present in

[A] Bacterial cell

[B] Plant cell

[C] Human cell

[D] Fungal cell

(100) The enzyme that acts on fats is

[A] lipase

[B] protease

[C] glycosidase

[D] nuclease

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