SUBJECT CODE	SUBJECT
A-02-18	CHEMICAL SCIENCES

HALL TICKET NUMBER	PAPER
	II

OMR SHEET NUMBER	NUMBER OF QUESTIONS
	100

DURATION	MAXIMUM MARKS	NUMBER OF PAGES
2 HOURS	200	24

QUESTION BOOKLET NUMBER

This is to certify that, the entries made in the above portion are correctly written and verified.

Candidates Signature **Name and Signature of Invigilator**

Instructions for the Candidates

1. Write your Hall Ticket Number in the space provided on the top of this page.
2. This paper consists of hundred multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested **to open the booklet and compulsorily examine it as below** :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
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4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Answer Sheet given to you**. If you mark at any place other than in the circle or half circle or semi circle in the Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. **The candidate must handover the OMR Answer Sheet to the invigilators at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. The candidate is allowed to take away the carbon copy of OMR Sheet and used Question paper booklet at the end of the examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

అభ్యర్థికి సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్‌టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము నందు (100) బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది మొదటి ఐదు నిమిషములలో **ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా పరిచూసుకోండి.**
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్ పేజి అంచున ఉన్న కాగితపు సీలును చించండి. కాగితపు సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) **కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్న పత్రములోని పేజీల సంఖ్యను మరియు ప్రశ్నల సంఖ్యను సరిచూసుకోండి. పేజీల సంఖ్యకు సంబంధించి గానీ లేదా సూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా తేడాలుండుట వంటి దోషపూరితమైన ప్రశ్న పత్రాన్ని పెంటనే మొదటి ఐదు నిమిషాల్లో పరీక్షా పర్యవేక్షకునికి తిరిగి ఇచ్చివేసి దానికి బదులుగా సరిగ్గా ఉన్న ప్రశ్నపత్రాన్ని తీసుకోండి. తదనంతరం ప్రశ్నపత్రము మార్చబడదు అదనపు సమయం ఇవ్వబడదు.**
   (iii) పై విధంగా సరిచూసుకొన్న తర్వాత ప్రశ్నాపత్రం సంఖ్యను OMR పత్రము పై అదేవిధంగా OMR పత్రము సంఖ్యను ఈ ప్రశ్నాపత్రము పై నిర్దిష్ట స్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతి ప్రశ్నకు సరైన జవాబును ఎన్నుకొని OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన జవాబు సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి
   ఉదాహరణ : (A) (B) ● (D)
   (C) సరైన ప్రతిస్పందన అయితే.
5. ప్రశ్నలకు జవాబును ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రం పై వేరొక చోట గుర్తించిన లేక సగ వృత్తం లేదా అసంపూర్ణ వృత్తాన్ని నింపిన మీ జవాబు మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీ స్థలములో చేయాలి.
8. OMRపత్రము పై నిర్ణీత స్థలంలో సూచించబడిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గానీ చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. **పరీక్ష పూర్తయిన తర్వాత OMR పత్రాన్ని తప్పనిసరిగా పరీక్ష పర్యవేక్షకుడికి ఇవ్వాలి.** వాటిని పరీక్ష గది బయటకు తీసుకువెళ్ళకూడదు. పరీక్ష పూర్తయిన తరువాత అభ్యర్థులు ప్రశ్న పత్రాన్ని OMR పత్రం యొక్క కార్బన్ కాపీని తీసుకువెళ్ళవచ్చు
10. **నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.**
11. **లాగరిథమ్ టేబుల్స్, క్యాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్ష గదిలో ఉపయోగించడం నిషేధం.**
12. **తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.**

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CHEMICAL SCIENCES
Paper – II

1. Central atom with sp^3, sp^3d^2 and sp^3d hybridization respectively

(A) $BeCl_2$ and NH_3, I_5^- and ReF_7, XeF_3^+ and ClF_4^+

(B) SiO_2 and $BeCl_2$, $[XeOF_5]^-$ and $[FeCl_6]^{-2}$, XeF_3^+ and SF_4

(C) NH_3 and SeF_3^+, $[FeCl_6]^{-2}$ and $[BrOF_4]^-$, SF_4 and $XeOF_4$

(D) $SOCl_2$ and SeF_3^+, $[BrOF_4]^-$ and $[XeOF_5]^-$, IF_5 and SF_4

2. The bond length and bond order values of CO and CO^+ are

(A) 1.128 A° and 3.0 (CO); 1.015 A° and 3.5 (CO^+)

(B) 1.115 A° and 3.5 (CO); 1.128 A° and 3.0 (CO^+)

(C) 1.128 A° and 3.0 (CO); 1.115 A° and 3.5 (CO^+)

(D) 1.015 A° and 3.5 (CO); 1.128 A° and 3.0 (CO^+)

3. Which of the following statement is correct ?

(A) Best electrophiles have LUMO and best nucleophiles have HOMO

(B) Best electrophiles have vacant d-orbitals and best nucleophiles have filled d-orbitals

(C) Best electrophiles have LUMO and best nucleophiles have LUMO and HOMO

(D) Best electrophiles have LUMO and HOMO and best nucleophiles have HOMO

4. Choose the correct order of the melting points for the following compounds.

(A) LiCl < NaCl < KCl < RbCl < CsCl

(B) LiCl > NaCl < KCl > RbCl > CsCl

(C) LiCl > NaCl > KCl > RbCl > CsCl

(D) LiCl < NaCl > KCl > RbCl > CsCl

5. The statements regarding hydrides of VI group are

i. The order of volatility
$H_2O < H_2Te < H_2Se < H_2S$

ii. The order of boiling point
$H_2O > H_2Te > H_2Se > H_2S$

iii. The order of bond angles
$H_2O > H_2S > H_2Se > H_2Te$

The correct combination is

(A) Only i

(B) ii and iii

(C) i and iii

(D) i, ii and iii

6. Naturally occurring U contains three isotopes, they are

(A) U^{237} (99.3%), U^{235} (0.70%) and U^{239} (traces)

(B) U^{238} (99.3%), U^{235} (0.70%) and U^{234} (traces)

(C) U^{238} (0.70%), U^{235} (99.3%) and U^{234} (traces)

(D) U^{238} (99.3%), U^{235} (traces) and U^{234} (0.70%)

7. Match the following and choose the correct answer

i. UF_6	a. At. No. 101
ii. Am^{241}	b. α-particles
iii. Pu	c. At. No. 105
iv. Un-nil-unium (Unu)	d. Octahedral
	e. Nuclear fuel

(A) i – e, ii – d, iii – a, iv – c

(B) i – b, ii – d, iii – c, iv – a

(C) i – d, ii – b, iii – e, iv – a

(D) i – b, ii – e, iii – d, iv – a

8. Tanabe-sugano diagram is constructed by taking

(A) E/B v/s Δ_0/B

(B) Molar absorbance v/s $\upsilon (cm^{-1})$

(C) E v/s Δ_0

(D) log ε v/s λ/nm

9. The ^{19}F NMR spectrum of WF_6L shows

(A) one line only

(B) two lines with 1 : 1

(C) three lines with 4 : 1 : 1

(D) three lines with 3 : 2 : 1

10. What is the number of vibrational degrees of freedom in $C_6H_5 - CH_2OH$?

(A) 25

(B) 27

(C) 42

(D) 58

11. In Mossbauer spectroscopy, spin-paired Fe(III) and spin-free Fe (III) complexes exhibit

(A) spherical and axial symmetry with 1, 1 signals

(B) Axial and spherical symmetry with 2, 1 signals

(C) Spherical and axial symmetry with 1, 2 signals

(D) Axial and spherical symmetry with 1, 2 signals

12. Which of the following is isolobal with CH_2^- ion ?

(A) CH^+, Co-Cp, $Ir(CO)_3$ and CH_3

(B) CH_2^+, $[Ir(CO)_3]$, $[Cr(CO)_2Cp]$ and P

(C) [Co(CO)Cp], S, CH and $[Cr(CO)_2Cp]$

(D) $Mn(CO)_5$, $Fe(CO)_5^+$, $[Cp–Fe(CO)_2]$ and CH_3

13. Match the following

Column I	Column II
i. $[Ni(acac)_2(PPh_3)_2]$	a. Branched alcohols
ii. $[H\ Co(CO)_4]$	b. Straight chain alcohols
iii. $[Rh(H)(CO)(PPh_3)_2]$	c. Cyclo-oligomerizations
iv. $[Rh(CO)_2I_2]$	d. Acetic acid synthesis

(A) i – c, ii – a, iii – b, iv – d

(B) i – d, ii – b, iii – c, iv – a

(C) i – a, ii – b, iii – c, iv – d

(D) i – b, ii – c, iii – d, iv – a

14. Identify the process against their reactions

i. Insertion	a. $[RhCl(PPh_3)_3] + H_2$
ii. Oxidative addition	b. $[L_4Rh(H)(R)] \rightarrow RhL_4 + R – H$
iii. Isomerization	c. $[L_3Rh(CO)(R)] \rightarrow [L_3Rh – COR]$
iv. Reductive elimination	d. $R – CH_2 – CH = CH_2 \rightarrow R – CH = CH – CH_3$

(A) i – d, ii – b, iii – a, iv – c

(B) i – c, ii – a, iii – d, iv – b

(C) i – c, ii – b, iii – d, iv – a

(D) i – d, ii – b, iii – c, iv – a

15. The geometrical isomers of the type $[Pt\ A_2X_2]$ are distinguished by

(A) Ring test

(B) Chromyl chloride test

(C) Silver nitrate test

(D) Kurnakov test

16. Choose the correct order of d-orbital splitting in a trigonal bipyramidal geometry

(A) $d_{z^2} > d_{x^2-y^2}, d_{xy} > d_{xz}, d_{yz}$

(B) $d_{z^2} > d_{xz}, d_{yz} > d_{x^2-y^2}, d_{xy}$

(C) $d_{xz}, d_{yz} > d_{x^2-y^2}, d_{xy} > d_{z^2}$

(D) $d_{x^2-y^2}, d_{xy} > d_{z^2} > d_{xz}, d_{yz}$

17. In bacterial rubredoxin, the number of iron atoms, sulphur bridges and cysteine ligands are

(A) 4, 4, 4

(B) 2, 2, 4

(C) 2, 2, 2

(D) 1, 0 ,4

18. Itai Itai disease is due to

(A) Hg poison

(B) H_3CHg poison

(C) Pb poison

(D) Cd poison

19. Which of the following correctly places the ligands in their order with respect to Δ_0 values

(A) $F^- < Cl^- < N_3^- < O^{-2}$

(B) $S^{-2} < OH^- < CN^- < PPh_3$

(C) $I^- < H_2O < en < py$

(D) $I^- < H_2O < py < en$

20. A drunken person was asked to blow a glass tube packed with acidified potassium dichromate. The change in colour of the material from orange to green confirmed the drinking of Alcohol. It is due to

I. The oxidation of alcohol with reduction of dichromate to chromium (III)

II. Complex formation of alcohol and dichromate.

III. Change in the coordination number of chromium.

Which of the following statements given above is/are correct ?

(A) I only

(B) II only

(C) III only

(D) II and III

21. In reverse phase chromatography, the stationary phase is made

(A) Hydrophobic non-polar

(B) Hydrophilic polar

(C) Either non-polar or polar

(D) Polar head and non-polar tail

22. Which reaction is an example of chain reaction ?

(A) $^{235}_{92}U \rightarrow {}^{4}_{2}He + {}^{231}_{90}Th$

(B) $^{75}_{34}Se \rightarrow {}^{75}_{35}Br + e^{-1}$

(C) $^{123}_{53}I \rightarrow {}^{123}_{53}I$ + energy

(D) $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{142}_{56}Ba + {}^{91}_{36}Kr + 3\,{}^{1}_{0}n$

23. Given the character table of the point group C_{3V}

	E	**$2C_3$**	**$3\sigma_v$**	
A_1	1	1	1	z
A_2	1	1	– 1	
E	2	– 1	0	(x, y)

Consider the reducible representation, Γ

	E	**$2C_3$**	**$3\sigma_v$**	
Γ	6	3	0	

Its irreducible components are

(A) $E + 2A_1 + 2A_2$

(B) $2E + A_1 + A_2$

(C) $3A_1 + 3A_2$

(D) $E^2 + 2A_1$

24. Find the symmetry point groups for Ethane in eclipsed and staggered conformations.

(A) C_{3v}, D_{3h}

(B) D_{3h} , C_{3h}

(C) D_{3h}, D_{3d}

(D) D_{3h}, D_3

25. In gas liquid chromatography, when films are used in the interior of capillary column, then what is the Eddy diffusion ?

(A) Greater than 1

(B) Less than 1

(C) Zero

(D) Less than zero

26. The main buffer system of the human blood is

(A) $NH_2\,CONH_2 – NH_2\,CONH^+$

(B) $H_2\,CO_3 – HCO_3^-$

(C) $CH_3COOH – CH_3COO^-$

(D) $H_2CO_3 – CO_3^{2-}$

27. Retention volume can be obtained by finding the products of which of the following parameters ?

(A) Dead time and total porosity

(B) Retention time and volumetric flow rate

(C) Adjusted retention time and volumetric flow rate

(D) Retention time and total porosity

28. Which of the following oxides finally dissolve in water to cause acid rains ?

(A) NO, NO_2

(B) NO_2, SO_2

(C) NO_2, SO_3

(D) N_2O_5, SO_3

29. Which statement is correct ?

a. All tetrahedral complexes are high spin, $p > \Delta t$.

b. Square planar complexes are usually low spin and $\Delta sp > p$.

c. All tetrahedral and square planar complexes are usually high spin and $p > \Delta t$ and Δsp.

d. All octahedral complexes are high spin and $p < \Delta_0$

(A) a and b are correct

(B) b and c are correct

(C) a and c are correct

(D) b and d are correct

30. Graphene is a

(A) Wide band-gap semiconductor

(B) Gapless-band semiconductor

(C) Not a semiconductor but behaves like graphite

(D) A narrow band-gap semiconductor

31. Potential of air pollution increases when the ventillation coefficient is

(A) $> 11{,}000\ m^2/s$

(B) $\simeq 3{,}500\ m^2/s$

(C) $< 6{,}000\ m^2/s$

(D) $\simeq 7{,}600\ m^2/s$

32. Match the objects in Part A with their size in part B

Part A	Part B
i. Nanoshell	a. 100 nm
ii. Hydrogen atom	b. 2000 nm
iii. E.coli bacteria	c. 90 nm
iv. Transistor	d. 0.1 nm

(A) i – a, ii – c, iii – d, iv – b

(B) i – a, ii – d, iii – b, iv – c

(C) i – b, ii – a, iii – c, iv – d

(D) i – c, ii – d, iii – b, iv – a

33. Which of the following method is used to make both nano-particles and nano-powders ?

(A) Chemical vapourization method

(B) Sol-gel method

(C) Ball-mill method

(D) Plasma arching

34. According to Huckel Molecular Orbital Theory (HMO) the possible energy in terms of Coulombic (α) and exchange (β) integrals are

(A) $(\alpha + \beta)$, α, $(2\alpha + \beta)$, $(2\alpha - \beta)$

(B) $(\alpha + 2\beta)$, 2α, $(\alpha - 2\beta)$, $(2\alpha + \beta)$

(C) $(\alpha + 2\beta)$, α, α, $(\alpha - 2\beta)$

(D) α, α, $(\alpha + \beta)$, $(\alpha + 2\beta)$

35. The ESR spectrum of Triphenyl methyl radical consists of

(A) 25 lines

(B) 75 lines

(C) 196 lines

(D) 27 lines

36. Which of the following are intrinsic properties ?

1. Specific rotation
2. Boiling point
3. Chemical potential
4. Pressure

(A) 1, 2

(B) 2, 3, 4

(C) 3, 4

(D) 1, 2, 3, 4

37. "For centrosymmetric molecules, any vibration which is IR active is Raman active vice-versa" represents

(A) Frank – condon principle

(B) Stark effect

(C) Mutual exclusion principle

(D) Doppler effect

38. **Assertion (A)** : If $(dE_{Cell}/dT)\ p > 0$ for a cell reaction, then ΔS is + ve.

Reason (R) : $\Delta S = nFT\ (dE/dT)$.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true and R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

39. Only one signal is present in the PMR or NMR spectra of

(A) C_3H_4, C_3H_6

(B) C_4H_6, C_5H_{12}

(C) C_3H_8, C_2H_6O

(D) C_4H_6, C_3H_{18}

40. Rotational Raman Spectrum is not possible for

(A) CCl_4

(B) CO

(C) HCl

(D) N_2

41. Which is true among the following about collids ?

1. Smaller the gold number greater the protective power.
2. Lesser the valency of the coagulating ion, the greater the coagulation power.
3. Charge on the colloidal solution is due to preferential adsorption of either positive or negative ion which is common and present in excess.
4. Emulsion is dispersion of one liquid into another which are completely miscible.

(A) 1, 2

(B) 1, 3

(C) 2, 4

(D) 3, 4

42. At what angles for the first order diffraction, spacing between two planes respectively are λ and $\frac{\lambda}{2}$?

(A) 0° , 90°

(B) 30° , 90°

(C) 90° , 0°

(D) 90° , 30°

43. The X-rays of wavelength equal to 0.134 nm give a first order diffraction from the surface of a crystal when the value of θ is 10.5°. Then the distance between the adjacent planes in the crystal is (sin 10.5° = 0.1822)

(A) 367 nm

(B) 3.67 nm

(C) 0.0367 nm

(D) 0.367 nm

44. Number average molecular mass of polymers can be determined by following method

(A) light scattering

(B) osmometry

(C) viscometry

(D) sedimentation method

45. Standard deviation is

(A) $(\text{variance})^2$

(B) $(\text{variance})^{1/2}$

(C) $(\text{variance})^{1/3}$

(D) $\left(\frac{\text{variance}}{2}\right)$

46. The number of significant figures in 0.00320 is

(A) Five

(B) Six

(C) Four

(D) Three

47. ΔG° and ΔH° for a reaction at 300 K is – 72.8 kJ mol^{-1} and – 42.8 kJ mol^{-1} respectively. ΔG° for the same reaction at 320 K is

(A) – 30.0 kJ mol^{-1}

(B) + 30.0 kJ mol^{-1}

(C) 11.8 kJ mol^{-1}

(D) – 74.8 kJ mol^{-1}

48. For a reaction A $\rightarrow$ B, E_a = 20 kJ/mol and ΔH = 10 kJ/mol. Energy of activation of B $\rightarrow$ A is

(A) 25 kJ mol^{-1}

(B) 10 kJ mol^{-1}

(C) 5 kJ mol^{-1}

(D) – 25 kJ mol^{-1}

49. A transition for which first derivative of the chemical potential with respect to temperature is continuous, but the second derivative of the chemical potential with respect to temperature is discontinuous is classified as

(A) First order phase transition

(B) Second order phase transition

(C) Zero order transition

(D) Third order transition

50. In a ground canonical ensemble all the systems have constant

1. Volume
2. Chemical Potential
3. Energy
4. Temperature

(A) 2, 3

(B) 3, 4

(C) 2, 4

(D) 1, 2

51. The average position of a particle in one dimensional box of length L is

(A) L

(B) L /2

(C) 2L

(D) 12L

52. For a two component system the reduced phase rule equation is

(A) F = 4 – P

(B) F = 3 – P

(C) F = 2 – P

(D) F = 1 – P

53. Identify the correct energy order of equivalent ionic conductance of the following

(A) $Li^+ < Na^+ < K^+ < Rb^+$

(B) $Li^+ > Na^+ < K^+ < Rb^+$

(C) $Li^+ > Na^+ > K^+ > Rb^+$

(D) $Li^+ > Na^+ < K^+ > Rb^+$

54. The point group symmetry of the free nitrate ion and BF_3 molecule are

(A) C_{3v}, C_{3h}

(B) D_{3h}, D_{3h}

(C) C_{2v}, D_{2h}

(D) D_{2h}, D_{3h}

55. Average distance for 2s orbital of He^+ is

(A) 1A°

(B) 2A°

(C) 3A°

(D) 4A°

56. The radial function 'R' depends on

1. n
2. l
3. m
4. s

(A) 1, 2

(B) 1, 4

(C) 2, 3

(D) 3, 4

57. For distinguishable independent molecules, the relationship between canonical partition function (Q) and molecular partition function (q) is

(A) Q = q/N

(B) Q = qN

(C) Q = q

(D) Q = q/N!

58. Which of the following transition require the least energy ?

(A) $n \rightarrow \pi^*$

(B) $\pi \rightarrow \pi^*$

(C) $\sigma \rightarrow \sigma^*$

(D) $n \rightarrow \sigma^*$

59. Given $Ag^+/Ag = + 0.80V$

$Co^{2+}/Co = - 0.28V$

$Cu^{2+}/Cu = + 0.34V$

$Zn^{2+}/Zn = - 0.70V$

The most reactive metal which displaces other metals from their salts in solution is

(A) Ag

(B) Cu

(C) Co

(D) Zn

60. Collision theory of reaction rates satisfactorily explains

(A) First order reactions

(B) Any order reaction

(C) Unimolecular reactions

(D) Bimolecular reactions

61. The entropy of all perfect crystalline substances is zero at T = 0°C represents

(A) First law of thermodynamics

(B) Zeroth law of thermodynamics

(C) Second law of thermodynamics

(D) Third law of thermodynamics

62. Which of the following are, path functions ?

1. Internal energy
2. Enthalpy
3. Work
4. Heat

(A) 1, 2

(B) 2, 3

(C) 3, 4

(D) 1, 4

63. According to Lindemann mechanism of unimolecular reaction the observed order at high concentration is

(A) 1

(B) 0.5

(C) 1.5

(D) 2.0

64. What is the indicator electrode used in the potentiometric titration of $AgNO_3$ Vs KCl ?

(A) Hydrogen electrode

(B) Platinum electrode

(C) Silver electrode

(D) Calomel electrode

65. Chain transfer reagent in the formation of polymer is

(A) CBr_4

(B) $CHCl_3$

(C) CH_4

(D) CF_4

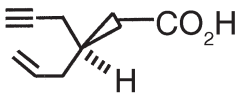
66. Match List – I with List – II and select the correct option from the codes given below :

List – I	**List – II**
a. D_{3h}	i. PCl_3
b. C_{2h}	ii. Cis 1,2 dichloro ethylene
c. C_{3v}	iii. BF_3
d. C_{2v}	iv. Trans-N_2F_2

Codes :

	a	**b**	**c**	**d**
(A)	i	ii	iii	iv
(B)	i	iii	ii	iv
(C)	ii	i	iv	iii
(D)	iii	iv	i	ii

67. The IUPAC name of the following compound is



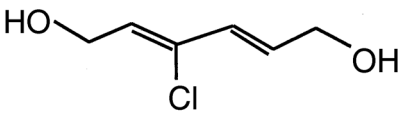
(A) (R) – 3 – (prop – 2 – enyl) hex – 5 – ynoic acid

(B) (R) – 3 – (prop – 2 – enyl) hex – 5 – enoic acid

(C) (S) – 3 – (prop – 2 – ynyl) hex – 5 – enoic acid

(D) (S) – 3 – (prop – 2 – enyl) hex – 5 – ynoic acid

68. The IUPAC nomenclature of the following compound is



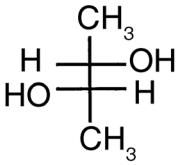
(A) (2E, 4E) – 3 – chlorohexa – 2,4 – diene – 1,6 – diol

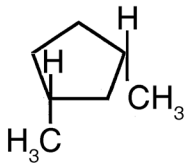
(B) (2Z, 4E) – 3 – chlorohexa – 2,4 – diene – 1,6 – diol

(C) (2Z, 4Z) – 3 – chlorohexa – 2,4 – diene – 1,6 – diol

(D) (2E, 4Z) – 3 – chlorohexa – 2,4 – diene – 1,6 – diol

69. Identify the following :

I. 

II. 

(A) I Meso; II Enantiomer

(B) I and II are Enantiomers

(C) I Enantiomer; II Meso

(D) I and II are Meso compounds

70. The Gauche conformation of n-butane possess

(A) Plane of symmetry and is achiral

(B) C_2 – axis of symmetry and is chiral

(C) C_2 – axis of symmetry and is achiral

(D) Plane of symmetry and is chiral

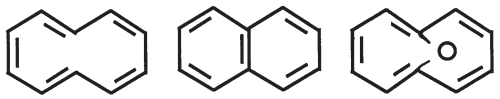
71. Amongst the following non-benzenoid aromatic compounds which is π rich ?

I II III

(A) I (B) III

(C) II (D) I and III

72. Among the following the aromatic compounds are



I II III

(A) I, II and III

(B) I and III

(C) I and II

(D) II and III

73. Among the following compounds, the formyl anion equivalent is

(A) 1, 4 – Dithiane

(B) Acetylene

(C) Ethyl Chloroformate

(D) Acetone

74. Addition of BH_3 to carbon-carbon double bond is

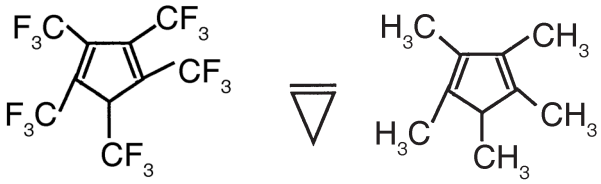
(A) Markovnikov syn addition

(B) Antimarkovnikov syn addition

(C) Markovnikov anti addition

(D) Antimarkovnikov anti addition

75. The correct order of acidity of the compounds given below is



1 2 3

(A) 2 > 3 > 1

(B) 3 > 1 > 2

(C) 1 > 3 > 2

(D) 1 > 2 > 3

76. Match the following.

a. Beckmann Rearrangement	i. Oxetane
b. Paterno Buchi Reaction	ii. Olefin
c. Wittig reaction	iii. Enamine
d. Stork reaction	iv. Caprolactum

(A) a – iv; b – i; c – iii; d – ii

(B) a – ii; b – iii; c – iv; d – i

(C) a – iv; b – i; c – ii; d – iii

(D) a – ii; b – iii; c – i; d – iv

77. Hell-Volhard-Zelinsky reaction is conducted in the presence of

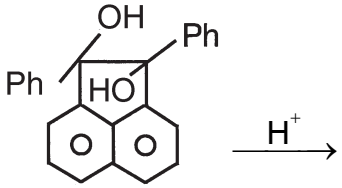
(A) Magnesium

(B) Phosphorus

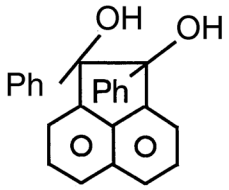
(C) Zinc

(D) Iron

78. Identify the correct statements regarding 'X' and 'Y' reactions.



X



Y

a. is form is more reactive

b. trans form is more reactive

c. anti group migration favors as such is form is more reactive

d. syn group migration favors as such trans form is more reactive

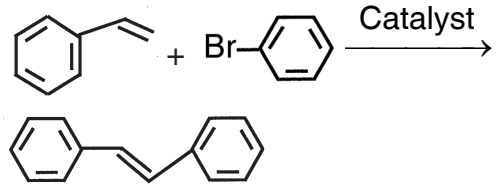
(A) a, d

(B) b, c

(C) 'a' is correct but 'd' is not the correct explanation

(D) 'b' is correct but 'c' is not the correct explanation

79. Identify the catalyst in the following reaction.



(A) Na in C_2H_5OH

(B) Pd $(OAc)_2$

(C) Zn in AcOH

(D) n-BuLi

80. Predict the stereochemistry of the product in the following reaction

$R - CH = CH - R \xrightarrow{OsO_4}$ product.

(A) Syn Diol

(B) Anti Diol

(C) Both (A) and (B)

(D) Epoxide

81. In the below sequence 'X' can be

$C_6H_5 - CH = CH - CHO \xrightarrow{X}$

$C_6H_5 - CH = CH - CH_2OH$

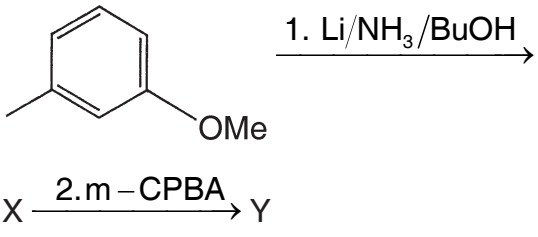
(A) H_2 | Ni

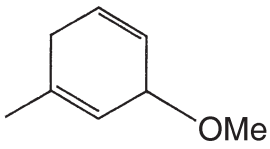
(B) Sn | HCl

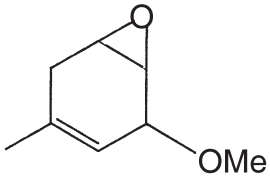
(C) $NaBH_4$

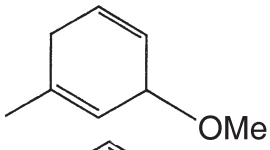
(D) $K_2Cr_2O_7$ | H^+

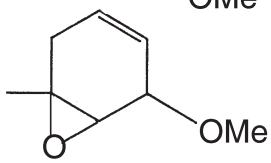
82. Identify the intermediate (X) and target molecule (Y) in the following reaction.

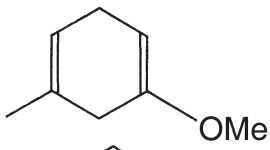


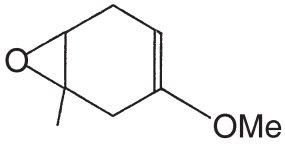
(A) X = 

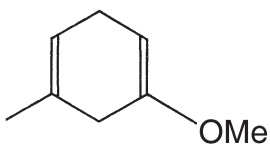
Y = 

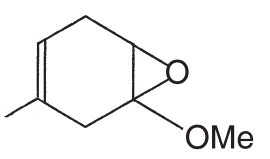
(B) X = 

Y = 

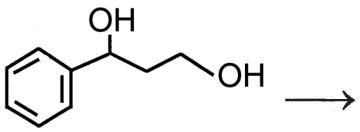
(C) X = 

Y = 

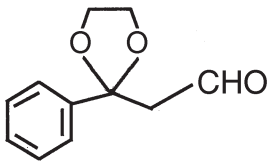
(D) X = 

Y = 

83. For the following three step conversion of 'X' to 'Y', the appropriate sequence of reactions is



X



Y

(A) MnO_2; $(CH_2OH)_2$/P – TSA; PCC

(B) PCC; MnO_2; $(CH_2OH)_2$/P – TSA

(C) Jones reagent; $(CH_2OH)_2$/p – TSA; MnO_2

(D) MnO_2; $(CH_2OH)_2$/p – TSA; Jones reagent

84. Absolute asymmetric synthesis means

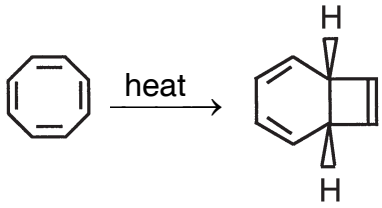
(A) Synthesis of optically active compound from inactive one without using optically active reagent

(B) Synthesis of optically active compound from inactive one using optically active reagent

(C) Synthesis of optically active compound from optically active one using optically active reagent

(D) Synthesis of optically inactive compound from optically active one using optically active reagent

85. The number of π electrons participating and the mode of cyclization in the following reaction are



(A) 4 and CON rotatory

(B) 4 and DIS rotatory

(C) 6 and CON rotatory

(D) 6 and DIS rotatory

86. Predict the stereochemistry of the product in 1, 3 – sigmatropic rearrangement of 'carbon' substituent under thermal conditions.

(A) Inversion of configuration

(B) Retention of configuration

(C) Both (A) and (B)

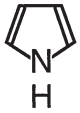
(D) The reaction does not proceed

87. Amongst the following which will undergo Diel's Alder reaction ?

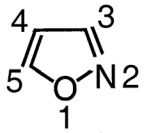
(A)

(B)

(C)

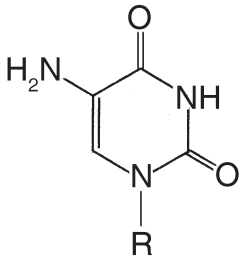
(D) 

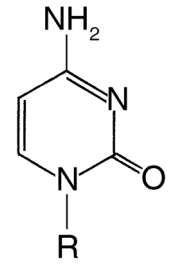
88. What is the preferable site for electrophilic substitution reaction in isoxazole ?

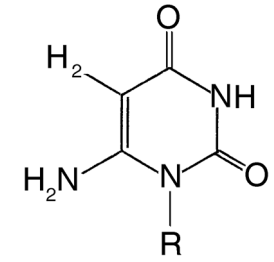


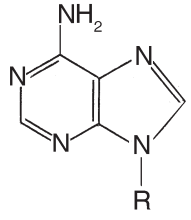
(A) C – 3
(B) C – 4
(C) C – 3 and C – 5
(D) C – 3 and C – 4

89. The major product formed on nitration of uridine followed by reduction with tin and HCl is

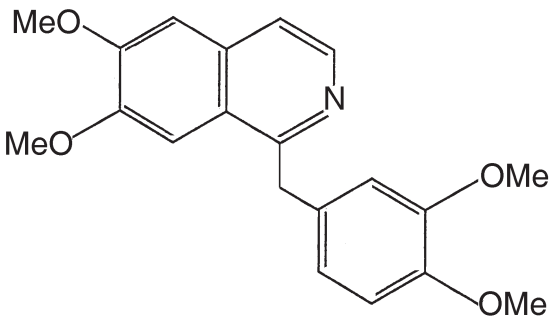
(A) 

(B) 

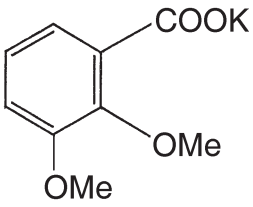
(C) 

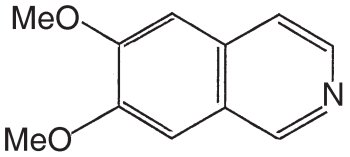
(D) 

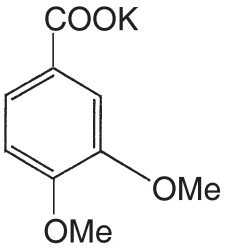
90. Papaverine on oxidation with potassium permanganate gives a ketone, which on fusion with potassium hydroxide gives

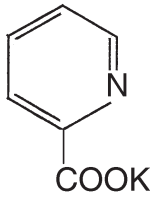


papaverine

(A) 

(B) 

(C) 

(D) 

91. Consider the following reaction sequence starting with α-pinene, identify the correct statement

$$\underset{A}{\alpha\text{-pinene}} \xrightarrow{\text{alk. } KMnO_4} \underset{B}{\text{pinonic acid}}$$

$$\xrightarrow{NaOH / Br_2} \underset{C}{\text{pinic acid}}$$

(A) 'A' has a disubstituted double bond; 'B' and 'C' are dicarboxylic aicds

(B) 'A' has a trisubstituted double bond; 'B' has a ketone and carboxylic acid 'C' is a dicarboxylic acid

(C) 'A' has a trisubstituted double bond; 'B' is a diketone and 'C' is a dicarboxylic acid

(D) 'A' has a disubstituted double bond; 'B' is a diketone and 'C' is a dicarboxylic acid

92. For estrone amongst the following statements which is true ?

a. It has an aromatic ring

b. It has two hydroxyl groups

c. It has one ketone and one hydroxyl group

d. It is a steroidal harmone

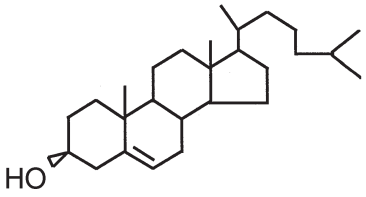
(A) b, c, d

(B) a, b, d

(C) a, c, d

(D) a, b, c

93. How many stereogenic centers are present in cholesterol ?



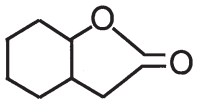
(A) Seven

(B) Six

(C) Eight

(D) Nine

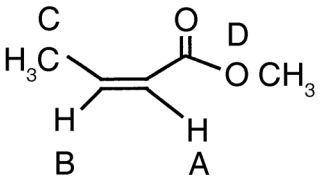
94. In the IR spectrum, carbonyl absorption band for the following compound appears at



(A) 1770 cm^{-1} (B) 1690 cm^{-1}

(C) 1810 cm^{-1} (D) 1660 cm^{-1}

95. Predict the appropriate ^1H NMR chemical shifts for the protons A – D for the following compound.



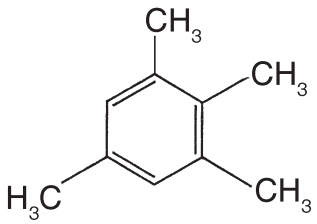
(A) A 5.7; B 6.8; C 3.9; D 2.1 ppm

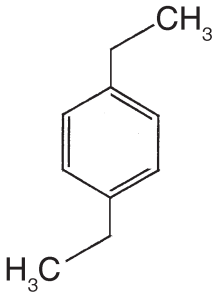
(B) A 6.8; B 5.7; C 2.1; D 3.9 ppm

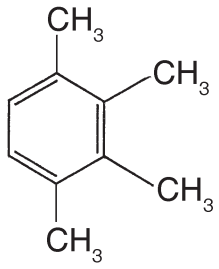
(C) A 6.8; B 5.7; C 3.9; D 2.1 ppm

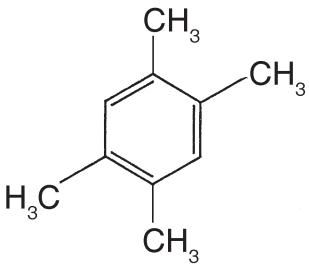
(D) A 5.7; B 6.8; C 2.1; D 3.9 ppm

96. An organic compound having the molecular formula $C_{10}H_{14}$ exhibited two singlets in ^{1}H NMR spectrum and three signals in ^{13}C NMR spectrum. The compound is

(A) 

(B) 

(C) 

(D) 

97. Match the following drugs with their medicinal activity.

a. 5-fluorouracil	i. Anticancer
b. Amoxicillin	ii. Anti-inflammatory
	iii. Antibacterial
	iv. Cholesterol lowering

(A) a – iii, b – iv (B) a – i, b – iii

(C) a – ii, b – iii (D) a – i, b – ii

98. The heterocyclic compounds present in the drug omeprazole are

(A) Benzimidazole and pyridine

(B) Benzopyrazole and imidazole

(C) Benzoxazole and furan

(D) Benzisoxazole and pyridine

99. A non-haem iron containing protein is

(A) Hemorythrin

(B) Myoglobin

(C) Hemocyanin

(D) Hemoglobin

100. Which one of the following is not a green solvent ?

(A) Ionic liquid

(B) H_2O

(C) MeOH

(D) EtOH

Space for Rough Work

Space for Rough Work

Space for Rough Work