SUBJECT CODE	SUBJECT	PAPER
A-02-03	CHEMICAL SCIENCES	III

HALL TICKET NUMBER								

OMR SHEET NUMBER					

QUESTION BOOKLET NUMBER

DURATION	MAXIMUM MARKS	NUMBER OF PAGES	NUMBER OF QUESTIONS
2 HOUR 30 MINUTES	150	24	75

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

Candidate's 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 seventy five 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.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
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 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.**

అభ్యర్థులకు సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్ టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము డెబ్బైఐదు బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో <u>ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా **సరిచూసుకోండి.**</u>
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్‌పేజి అంచున ఉన్న కాగితపు సీలును చించండి. స్టిక్కర్ సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) **కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్నపత్రములోని 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 వెంటనే 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 నిర్దిష్టస్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయ ప్రతిస్పందనలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతిప్రశ్నకు సరైన ప్రతిస్పందనను ఎన్నుకొని కింద తెలిపిన విధంగా OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన ప్రతిస్పందనను సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి.

   ఉదాహరణ : (A) (B) ● (D)

   (C) సరైన ప్రతిస్పందన అయితే
5. ప్రశ్నలకు ప్రతిస్పందనలను ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రంపై వేరొక చోట గుర్తిస్తే మీ ప్రతిస్పందన మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీస్థలములో చేయాలి.
8. OMR పత్రము పై నిర్ణీత స్థలంలో సూచించవలసిన 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 మీ OMR పత్రాన్ని తప్పనిసరిగా పరీక్ష పర్యవేక్షకుడికి ఇవ్వాలి.** వాటిని పరీక్ష గది బయటకు తీసుకువెళ్లకూడదు. పరీక్ష పూర్తయిన తరువాత అభ్యర్థులు ప్రశ్న పత్రాన్ని, OMR పత్రం యొక్క కార్బన్ కాపీని తీసుకువెళ్లవచ్చు.
10. **నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.**
11. **లాగరిథమ్ టేబుల్స్, క్యాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్షగదిలో ఉపయోగించడం నిషేధం.**
12. **తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.**

DO NOT WRITE HERE

CHEMICAL SCIENCES

Paper – III

1. Which among the following are wide spread sources of acid rain ?

(A) Nitrogen oxides

(B) Carbon dioxide

(C) Water vapour

(D) Carbon monoxide

2. An antidepressant with selective serotonin reuptake inhibition is

(A) Fluoxetin

(B) Imipramine

(C) Tranylcypromine

(D) Iproniazid

3. Nano particles of CdS undergo aggregation leading to change in absorption

(A) Redshift

(B) Blueshift

(C) No change

(D) Redshift and blueshift

4. Photochemical reactions carried out in zeolitic layer falls under the category of

(A) Silicon – Aluminium catalysis

(B) Sodium – Silicon driven chemistry

(C) Supramolecular photochemistry

(D) Supramolecular catalysis

5. Identify the correct energy order of orbitals in N_2

(A) $\pi 2P_y, \pi 2P_z < \sigma 2P_x$

(B) $\pi 2P_y, \pi 2P_z > \sigma 2P_x$

(C) $\pi 2P_y, \pi 2P_z >> \sigma 2P_x$

(D) $\pi 2P_y, \pi 2P_z = \sigma 2P_x$

6. Consequent to the positron emission from a nuclide, the N/P ratio

(A) decreases

(B) increases

(C) does not change

(D) changes abruptly

7. The Hamiltonian for the internal motion of a hydrogen like atom is given by

(A) $\frac{-\hbar^2}{2\mu}\nabla^2 - \frac{Ze^2}{4\pi\in_0 r}$

(B) $\frac{-\hbar^2}{2\mu}\nabla^2 + \frac{Ze^2}{4\pi\in_0 r}$

(C) $\frac{-\hbar^2}{2\mu}\nabla^2$

(D) $\frac{-\hbar^2}{2\mu}\nabla^2 + \frac{1}{2}kx^2$

8. The correct statements among the following are :

1) Angular momenta of 1s, 2s and 3s orbitals are same

2) Energies of 1s, 2s and 3s orbitals are same

3) Angular momenta of 1s, 2s and 3s orbitals are different

4) Energies of 1s, 2s and 3s orbitals are different

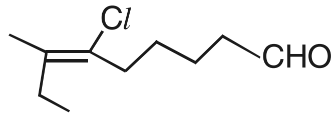
(A) 1, 2

(B) 2, 3

(C) 3, 4

(D) 1, 4

9. The correct name of the following compound is



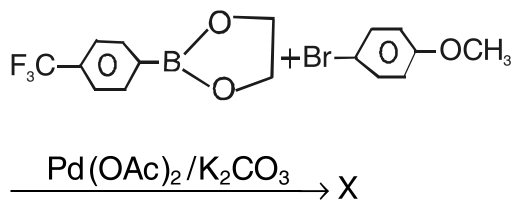
(A) 6-Chloro-7-methylnonanol

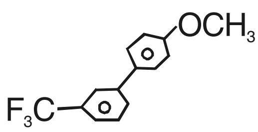
(B) 6-Chloro-7-methylnonenal

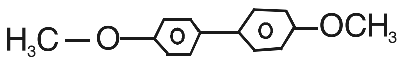
(C) 6-Chloro-7-methylnonenol

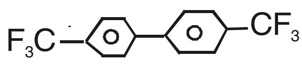
(D) 6-Chloro-7-methylnonanal

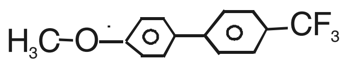
10. The major product in the following reaction is



(A) 

(B) 

(C) 

(D) 

11. Which of the following has the highest Pauling's electronegativity value ?

(A) Be

(B) Mg

(C) Ca

(D) Ba

12. The perturbation Hamiltonian $H^{(1)}$, for the first order correction to the ground-state energy for a particle in a box with a variation in the potential $v = -\in \sin(\pi x/L)$ is given by

(A) $-\in \sin(\pi x/L)$

(B) $\in^2 \sin^2(\pi x/L)$

(C) $\in^3 \sin^3(\pi x/L)$

(D) $\in^3$

13. A particle of mass 'm' is confined between two walls of a box at x = 0 and x = 2L. The potential energy is zero inside this one dimensional box but rises abruptly to infinity at the walls. The energy of this particle (E) is given by

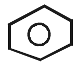
(A) $\dfrac{n^2h^2}{8\,mL^2}$, n = 1, 2. . .

(B) $\dfrac{n^2h^2}{32\,mL^2}$, n = 1, 2. . .

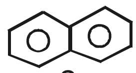
(C) $\dfrac{n^2h^2}{16\,mL^2}$, n = 1, 2. . .

(D) $\dfrac{n^2h^2}{18\,mL^2}$, n = 0, 1, 2 . . .

14. The HOMO-LUMO gap in the following four compounds from 1 to 4.



1



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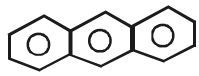

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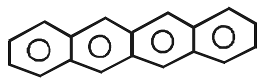


4

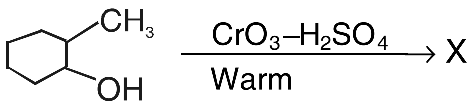
(A) Increases

(B) Increase and then decrease

(C) Decrease and then increase

(D) Decreases

15. The major product in the following reaction is



(A) $CH_3CO(CH_2)_4CH_3$

(B) $CH_3(CH_2)_5CO_2H$

(C) $CH_3CO(CH_2)_4CO_2H$

(D) $CH_3CHOH(CH_2)_4CO_2H$

16. **Assertion (A)** : The bond angle in NF_3 is less than that in NH_3.

Reason (R) : The high electronegativity of F pulls the bonding electrons in NF_3 further away from N and a greater distortion is caused.

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

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

(C) A is true but R is false

(D) A is false but R is true

17. Which of the following is associated with zero field splitting and Kramer's degeneracy ?

(A) $[Cu(H_2O)_6]^{2+}$

(B) $[Ni(H_2O)_6]^{2+}$

(C) $[Mn(H_2O)_6]^{2+}$

(D) $[V(H_2O)_6]^{3+}$

18. The energies E_+ of bonding and $E\_$ of antibonding orbitals of a homonuclear diatomic molecule are given by the secular determinant

$$\begin{vmatrix} \alpha - E & \beta - ES \\ \beta - ES & \alpha - E \end{vmatrix}$$

The solutions of this equations are

(A) $E_{\pm} = \dfrac{\alpha \mp \beta}{S}$

(B) $E_{\pm} = \dfrac{\alpha \mp \beta}{1 - S}$

(C) $E_{\pm} = \dfrac{\alpha\beta}{1 \pm S}$

(D) $E_{\pm} = \dfrac{\alpha \pm \beta}{1 \pm S}$

19. Match the following

List – I	List – II
I. Orbital angular momentum quantum number	1. M_l
II. Magnetic quantum number	2. l
III. Spin quantum number	3. j
IV. Total angular momentum quantum number	4. S

	1	**2**	**3**	**4**
(A)	I	II	III	IV
(B)	I	III	II	IV
(C)	II	I	IV	III
(D)	III	IV	I	II

20. Which of the following is isolobal with $Mn(CO)_5$?

(A) CH

(B) CH_2

(C) CH_3

(D) CH_4

21. The quadrupole nucleus among the following is :

(A) ^{1}H

(B) ^{12}C

(C) ^{31}P

(D) ^{35}Cl

22. Which one of the following spin wavefunctions (ψ_{spin}) is antisymmetric ?

(A) $\psi_{spin} = [\alpha(1)\beta(2) - \beta(1)\alpha(2)]$

(B) $\psi_{spin} = \beta(1)\beta(2)$

(C) $\psi_{spin} = \alpha(1)\alpha(2)$

(D) $\psi_{spin} = [\alpha(1)\beta(2) + \beta(1)\alpha(2)]$

23. According to HMO theory, the possible energy levels for ethylene in terms of coulombic (α) and exchange (β) integrals are

(A) $(\alpha+\beta)$ and $(2\alpha + \beta)$

(B) $(\alpha+\beta)$ and $(\alpha - 2\beta)$

(C) $(\alpha+2\beta)$ and $(\alpha - 2\beta)$

(D) $(\alpha+\beta)$ and $(\alpha - \beta)$

24. Atenolol is used in the treatment of

(A) Hypertension

(B) Hyperlipidemia

(C) Depression

(D) Schizophrenia

25. Fluconazole is

(A) Antibacterial

(B) Antifungal

(C) Antimalarial

(D) Anticancer

26. Match the following :

Catalyst	**Reaction**
I. Wilkinson's	1. Polymerization of alkenes
II. Ziegler Natta	2. Hydrogenation
III. $CO_2(CO)_8$	3. Conversion of CH_3OH to CH_3COOH
IV. $[Rh(CO)_2I_2]^-$	4. Hydroformylation
	5. Conversion of methanol to gasoline

	I	**II**	**III**	**IV**
(A)	1	2	3	4
(B)	3	2	4	1
(C)	2	3	1	4
(D)	2	1	4	3

27. The number of peaks shown by spin free $FeCl_3$ in its Mossbauer spectrum is

(A) 1

(B) 2

(C) 3

(D) 4

28. **Assertion (A)** : Benzene belongs to D_{6h} point group.

Reason (R) : It has 6 C_2s $\perp$ C_6 and a horizontal plane perpendicular to C_6.

(A) Both A and R are correct but R is not correct explanation of A

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

(C) A is correct and R is not correct

(D) A is not correct and R is correct

29. The rotational spectrum of a diatomic molecule gave several lines. Some of these lines are located at 2021, 2024, 2027, 2030, 2033 cm^{-1}. The rotational constant, B (in cm^{-1}) is

(A) 2027

(B) 3

(C) 1.5

(D) 9

30. Thiamine has the following heterocyclic systems in the structure

(A) Pyridine, pyrrole

(B) Pyridine, thiophene

(C) Pyrimidine, thiazole

(D) Pyrimidine, pyridine

31. Conversion of arylamines to fluoroarenes using HBF_4, HNO_2 is known as

(A) Scholl reaction

(B) Schiemann reaction

(C) Simmons-Smith reaction

(D) Weiss reaction

32. Which of the following combinations forms most stable compounds ?

(A) Ag^+, F^-

(B) Ag^+, NH_3

(C) Pt^{2+}, CN^-

(D) Pt^{2+}, CH_3COO^-

33. In polarography, if 'm' is the mass of mercury drop and 't' is the drop time, the diffusion current is proportional to

(A) $(m)^{1/3} (t)^{1/6}$

(B) $(m)^{2/3} (t)^{1/3}$

(C) $(m)^{2/3} (t)^{1/6}$

(D) $(m)^{3/2} (t)^{1/6}$

34. The correct nuclear magnetic resonance condition is

(A) $hg = \nu\beta H$

(B) $h\beta = \nu gH$

(C) $h\nu g = \beta H$

(D) $h\nu = g\beta H$

35. The entropy change (ΔS) in $Jg^{-1}\ K^{-1}$ for

$$\underset{1\ atm;\ 100°C,}{H_2O(l)} \rightleftharpoons \underset{1\ atm;\ 100°C}{H_2O(g)}; \quad \Delta H = 2270\ Jg^{-1}$$

is

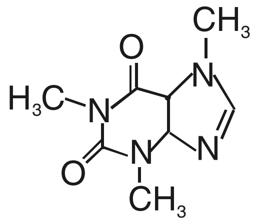
(A) $\frac{2270}{373}$

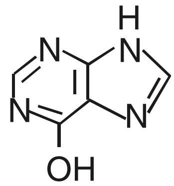
(B) $\frac{373}{2270}$

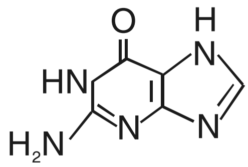
(C) 2270 x 373

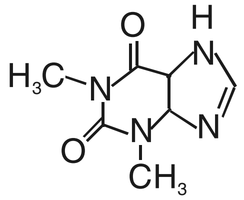
(D) $(2270\ x\ 373)^{1/2}$

36. Match the following :

I. Guanine — 1. 

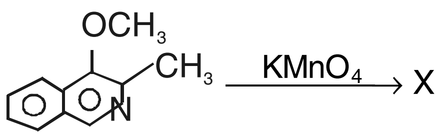
II. Theophylline — 2. 

III. Hypoxanthine — 3. 

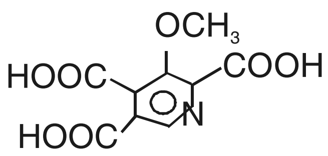
IV. Caffeine — 4. 

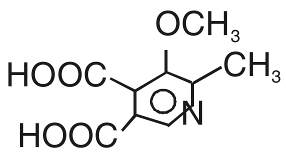
	I	II	III	IV
(A)	4	2	3	1
(B)	3	4	2	1
(C)	1	3	2	4
(D)	2	4	1	3

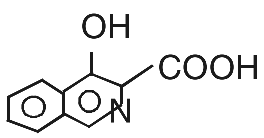
37. Identify X in the following reaction

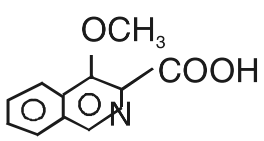


X is

(A) 

(B) 

(C) 

(D) 

38. The organic reagent used for the spectrophotometric determination of iron (II) is

(A) Dithizone

(B) Nitroso-R-salt

(C) Solochrome black

(D) 1,10-phenanthroline

39. **Assertion (A)** : $W(C_5H_5)_2(CO)_2$ is a stable organometallic compound.

Reason (R) : Organometallic compound which obeys 18 electron rule is generally stable.

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

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

(C) A is true but R is false

(D) A is false but R is true

40. Using the fundamental equation $dA = -SdT - Pdv$ the Maxwell relation is

(A) $\left(\frac{\partial A}{\partial P}\right)_T = \left(\frac{\partial V}{\partial S}\right)_V$

(B) $\left(\frac{\partial S}{\partial V}\right)_P = \left(\frac{\partial P}{\partial T}\right)_V$

(C) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_T$

(D) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$

41. The partition function (Q) is related to Gibbs free energy as

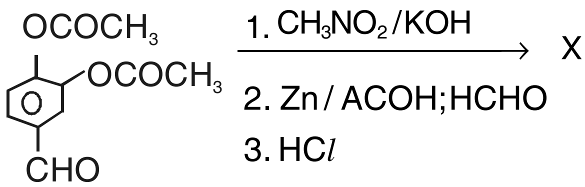
(A) $-RT\left[\ln\frac{Q}{N_A}\right]$

(B) $-RT\left[\ln\frac{Q}{N_A}+1-\left(\frac{\partial \ln Q}{\partial \ln V}\right)_T\right]$

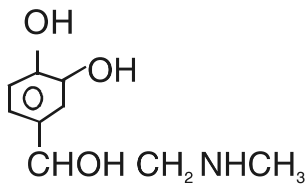
(C) $-RT\left[\ln\frac{Q}{N_A}-1+\left(\frac{\partial \ln Q}{\partial \ln V}\right)_T\right]$

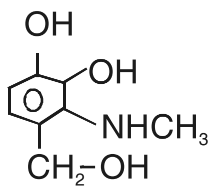
(D) $RT\left[\ln\frac{Q}{N_A}+1-\left(\frac{\partial \ln Q}{\partial \ln V}\right)_T\right]$

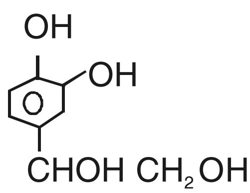
42. Predict X in the following reaction

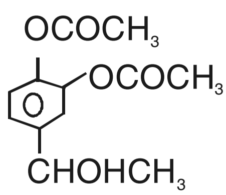


X is

(A)


(B)


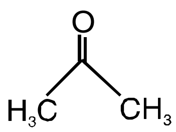
(C)


(D)


43. Arrange the following in an increasing order of pKa values

(i) H_3C-NO_2

(ii) $H_3C-\overset{\overset{\displaystyle O}{\|}}{C}-NEt_2$

(iii) 

(A) (i) > (ii) > (iii)

(B) (ii) > (iii) > (i)

(C) (iii) > (i) > (ii)

(D) (ii) > (i) > (iii)

44. The standard oxidation potentials of Cu/Cu^{2+} and Ag/Ag^{+} electrodes are – 0.337 V and – 0.799 V respectively. The standard free energy change for the process

$Cu + 2Ag^{+} \longrightarrow Cu^{2+} + 2Ag$ in J is

(A) – (965 x 184.8)

(B) – (965 x 92.4)

(C) + (965 x 184.8)

(D) + (965 x 92.4)

45. The standard electrode potentials of the half cells Zn/Zn^{+2} and Fe/Fe^{+2} are 0.76 V and 0.44 V respectively. The standard EMF of the spontaneous cell set with these electrodes is

(A) – 3.2 V

(B) – 0.32 V

(C) 3.2 V

(D) 0.32 V

46. The metal atoms present in nitrogenase enzyme are

(A) Cu and Zn

(B) Mn and Fe

(C) Mo and W

(D) Fe and Mo

47. A very low quantum yield of a photochemical reaction indicates that

1) The reaction is not a chain reaction

2) The reaction is a chain reaction but the reactants are regenerated

3) The excited molecules formed in the primary process are deactivated by a radiative process

4) The excited molecules do not emit fluorescence radiation

The correct statements are

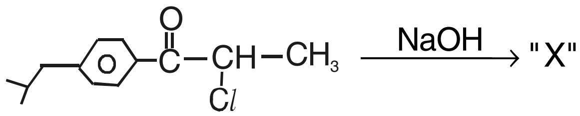
(A) 1 and 4

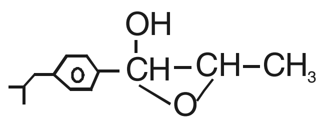
(B) 2 and 4

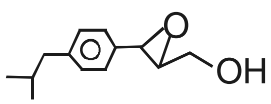
(C) 1, 2 and 3

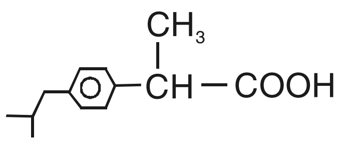
(D) 1, 2 and 4

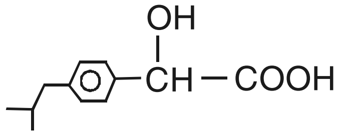
48. Identify the product "X" of the following chemical transformation



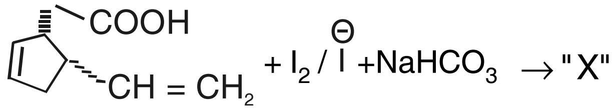
(A) 

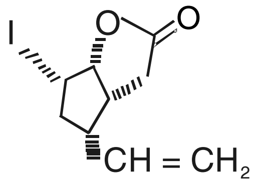
(B) 

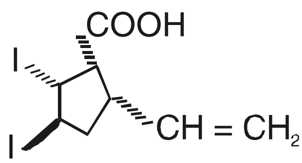
(C) 

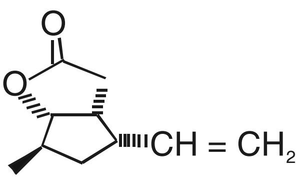
(D) 

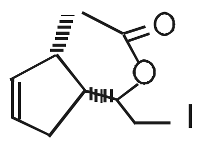
49. Predict the product "X" of the reaction



(A) 

(B) 

(C) 

(D) 

50. The energy of the activated complex of a bimolecular reaction is equal to the

(A) Activation energy of the reaction

(B) Sum of the energy of the reactants and the activation energy of the reaction

(C) Difference in the energies of the reactants and products

(D) Sum of the energy of the reactants and the heat of reaction

51. The efficiency of Al^{3+} ion in coagulating a negatively charged sol is

(A) Equal to that of Na^+ ion

(B) Three times that of Na^+ ion

(C) Six times that of Na^+ ion

(D) Nine times that of Na^+ ion

52. The correct combination of geometry of complex and order of energy of 'd' orbitals is

(A) Square pyramidal $\rightarrow d_{xz}, d_{yz} < d_{xy} < d_{z^2} < d_{x^2-y^2}$

(B) Square planar $\rightarrow d_{z^2} < d_{x^2-y^2} < d_{xz}, d_{yz} < d_{xy}$

(C) Octahedral $\rightarrow d_{x^2-y^2}, d_{z^2} < d_{xy}, d_{xz}, d_{yz}$

(D) Tetrahedral $\rightarrow d_{xy}, d_{yz}, d_{xz} < d_{x^2-y^2}, d_{z^2}$

53. Which of the following proteins contains both iron and copper ?

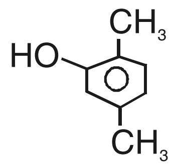
(A) Haemoglobin

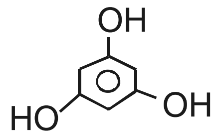
(B) Cytochrome c

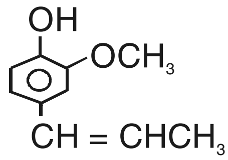
(C) Cytochrome c oxidase

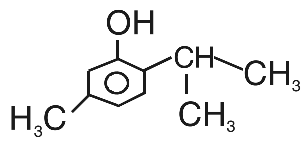
(D) Carbonic anhydrase

54. Match the following:

I.  — 1. Phloroglucinol

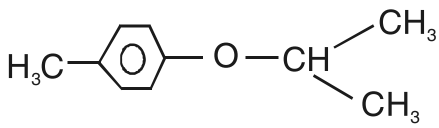
II.  — 2. P.Xylenol

III.  — 3. Thymol

IV.  — 4. Isoeugenol

	I	II	III	IV
(A)	1	3	2	4
(B)	2	1	4	3
(C)	3	4	2	1
(D)	1	4	3	2

55. Predict the number of doublets present in the H-nmr spectrum of given compound



(A) One

(B) Two

(C) Three

(D) Four

56. The diffraction pattern of a lattice gave lines corresponding to (111), (200), (220), (311) and (222) Miller planes. The lattice belongs to

(A) body centred cubic

(B) monoclinic

(C) triclinic

(D) face centred cubic

57. The d_{200} of a cubic lattice is 4.1 Å units. What is the unit cell parameter (a) in Å units ?

(A) 4.1

(B) 8.2

(C) 2.05

(D) $4.1 \times \sqrt{2}$

58. The sulphur containing drug used in the treatment of Wilson's disease is

(A) Pencillamine

(B) Streptomycin

(C) Tetracyclin

(D) Valinomycin

59. The molecular orbital configuration of $[Re_2Cl_8]^{2-}$ is

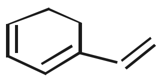
(A) $\sigma^2\ \pi^2\ \pi^{*2}\ \delta^2$

(B) $\sigma^2\ \pi^4\ \delta^2$

(C) $\sigma^2\ \pi^2\ \delta^2\ \delta^{*2}$

(D) $\sigma^2\ \pi^4\ \delta^2\ \sigma^{*2}$

60. Use Woodward – Feiser rules and predict absorption maximum for the given compound



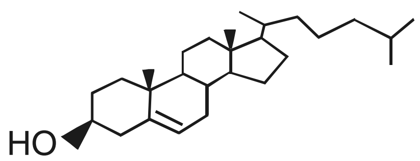
(A) 232 nm

(B) 252 nm

(C) 272 nm

(D) 293 nm

61. How many stereogenic centers are present in cholesterol ?



(A) Six

(B) Seven

(C) Eight

(D) Five

62. According to Lux-Flood definition CaO and SiO_2 are

(A) Both are acids

(B) Both are bases

(C) SiO_2 is acid and CaO is base

(D) CaO is acid and SiO_2 is base

63. Among the halogens from Cl to I, a decreasing trend is observed with respect to

I. Ionization energy

II. Electropositivity

III. Electronegativity

IV. Metallic character

The correct combination is

(A) I, II

(B) I, III

(C) II, III

(D) II, IV

64. A polymer sample contains 100 molecules of molecular weight 1000 and 200 molecules of molecular weight 10000. What is its number average molecular weight ?

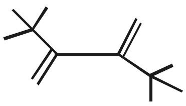
(A) 700

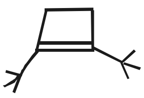
(B) 7000

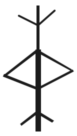
(C) 10000

(D) 11000

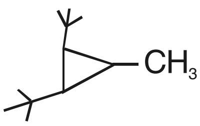
65. Predict the product of the given reaction

 $\xrightarrow{h\nu}$ Major Product

(A) 

(B) 

(C) A and B

(D) 

66. The standard deviation of a given set of data x_i, mean of the data $\bar{x}$ for n items is given by the relation

(A) $\sqrt{\dfrac{\sum(x_i-\bar{x})^2}{n-1}}$

(B) $\dfrac{\sum(x_i-\bar{x})}{n-1}$

(C) $\dfrac{\sum(x_i-\bar{x})^2}{n^2}$

(D) $\sqrt{\dfrac{\sum(x_i-\bar{x})^2}{(n-1)^2}}$

67. According to HSAB Theory

I. Hard species have large HOMO-LUMO gap

II. Hard species have small HOMO-LUMO gap

III. Soft species have large HOMO-LUMO gap

IV. Soft species have small HOMO-LUMO gap

The correct combination is

(A) I, II

(B) II, IV

(C) II, III

(D) I, IV

68. Assertion (A) : $\bar{e}$ transfer in

$$[Co^*(NH_3)_6]^{3+} + [Co(NH_3)_6]^{2+} \rightarrow$$
$$[Co^*(NH_3)_6]^{2+} + [Co(NH_3)_6]^{3+}$$

is slow whereas $\bar{e}$ transfer

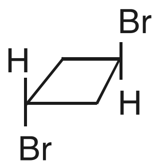
$$\left.\begin{array}{l}[Fe^*(CN)_6]^{3-} + [Fe(CN)_6]^{4-} \rightarrow \\ [Fe^*(CN)_6]^{4-} + [Fe(CN)_6]^{3-}\end{array}\right. \text{ is fast}$$

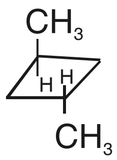
Reason (R) : Cobalt remains low spin in both oxidized and reduced forms (Co^{3+} to Co^{2+} complexes) whereas iron changes from low spin to high spin complex on $\bar{e}$ transfer (Fe^{3+} to Fe^{2+} complex)

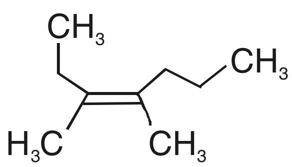
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

69. Identify "cis" compound

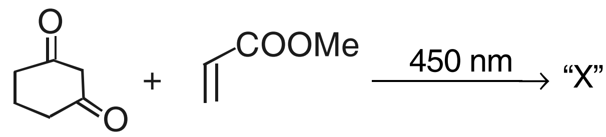
(A) 

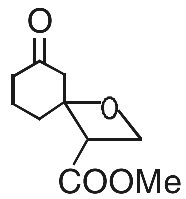
(B) 

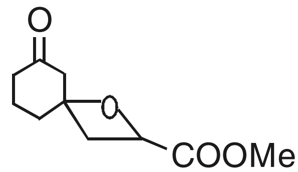
(C) 

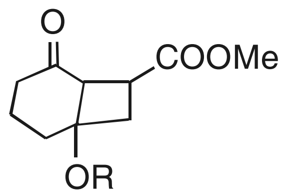
(D) 

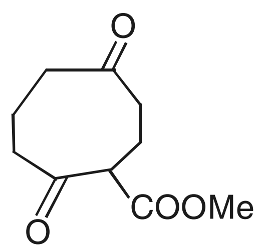
70. Indicate the product "X" formed upon photocycloaddition between cyclohexanedione and methylacrylate



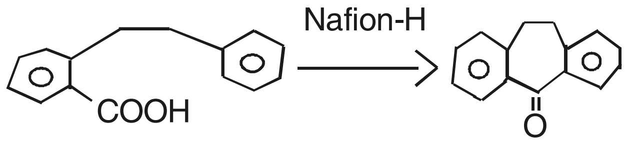
(A) 

(B) 

(C) 

(D) 

71. Identify the name reaction



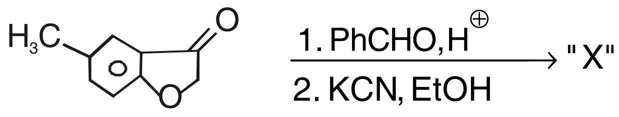
(A) Olah reaction

(B) Price reaction

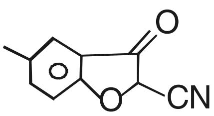
(C) Kulka reaction

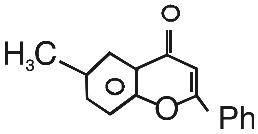
(D) Friedel-Crafts reaction

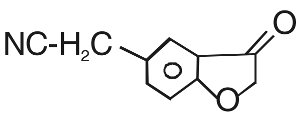
72. Identify X in the following reaction

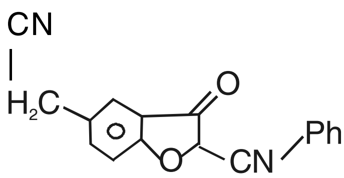


X is

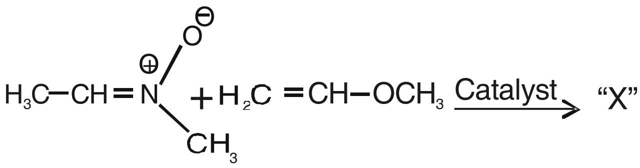
(A) 

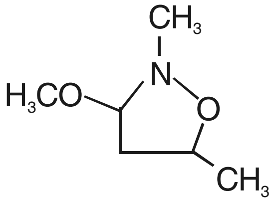
(B) 

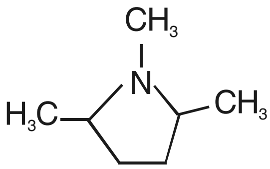
(C) 

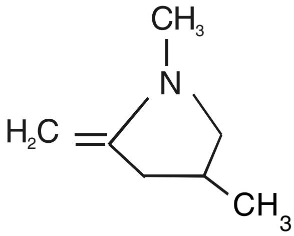
(D) 

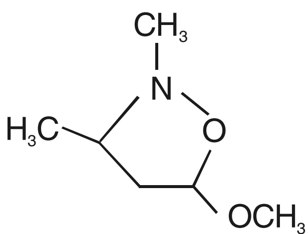
73. The major product in the following reaction is



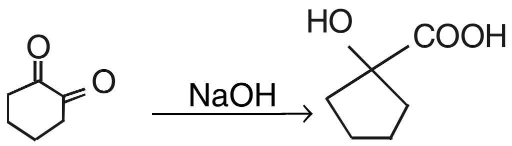
(A) 

(B) 

(C) 

(D) 

74. What is the other name for Benzil-Benzilic acid type rearrangement ?



(A) Leibig

(B) Warren

(C) Houber

(D) Eastham

75. **Assertion (A)** : The radius of Fe^{3+} is less than that of Fe^{2+}.

Reason (R) : Fe^{3+} has a lower effective nuclear charge than Fe^{2+}.

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

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

(C) A is true but R is false

(D) A is false but R is true

Space for Rough Work

Space for Rough Work

Space for Rough Work