Test Paper : **II**

Test Subject : **CHEMICAL SCIENCES**

Test Subject Code : **A-02-02**

Test Booklet Serial No. : _____

OMR Sheet No. : _____

Hall Ticket No. | | | | | | | | | |

(Figures as per admission card)

Name & Signature of Invigilator

Name : _____ Signature : _____

Paper : II

Subject : CHEMICAL SCIENCES

Time : 1 Hour 15 Minutes Maximum Marks : 100

Number of Pages in this Booklet : 16 Number of Questions in this Booklet : **50**

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 fifty 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 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. You have to return the test question booklet and OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
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 యాభై బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో **ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా సరిచూసుకోండి.**
   (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 నూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా లేడాలుండుట 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 ప్రశ్నపత్రం 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 ప్రశ్నపత్రాన్ని మరియు OMR పత్రాన్ని తప్పనిసరిగా పరీక్షపర్యవేక్షకుడికి ఇవ్వాలి. వాటిని పరీక్ష గది బయటకు తీసుకువెళ్లకూడదు.
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.**

CHEMICAL SCIENCES

Paper – II

1. The correct increasing order of second ionization energy of elements X, Y, Z with respective atomic numbers 19, 20, 38 is

(A) X, Y, Z

(B) X, Z, Y

(C) Z, Y, X

(D) Z, X, Y

2. Nicotine molecule is composed of

I. Pyridine

II. Furan

III. Pyrrolidine

IV. Pyrimidine

The correct statement is

(A) I and II

(B) I and III

(C) II and IV

(D) I and IV

3. Condensation of water vapour is accompanied by

(A) a decrease in entropy

(B) an increase in entropy

(C) no change in entropy

(D) either increase or decrease in entropy

4. The characteristic feature of an electroactive ion among the following in normal voltammetry is

(A) Residual current

(B) Diffusion current

(C) Summit potential

(D) Half-wave potential

5. The reaction

$$3\,NH_4I + BiN \xrightarrow{NH_3(l)} BiI_3 + 4\,NH_3$$

belongs to which type ?

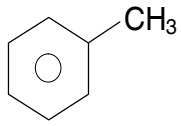
(A) Complex formation

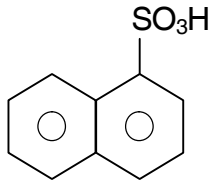
(B) Redox

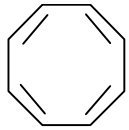
(C) Solvolysis

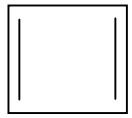
(D) Acid-base

6. Non-aromatic species among the following

I) 

II) 

III) 

IV) 

The correct combination is

(A) I and IV

(B) III and IV

(C) II and III

(D) I and III

7. The number average ($\overline{M}_n$) and weight average ($\overline{M}_w$) molar masses of monodisperse and polydisperse polymers are as follows

(A) $\overline{M}_n = \overline{M}_w$ and $\overline{M}_n = \overline{M}_w$

(B) $\overline{M}_n = \overline{M}_w$ and $\overline{M}_w > \overline{M}_n$

(C) $\overline{M}_n > \overline{M}_w$ and $\overline{M}_w > \overline{M}_n$

(D) $\overline{M}_w > \overline{M}_n$ and $\overline{M}_n = \overline{M}_w$

8. The distance dependence of potential energy in ion-ion type interaction is

(A) $1/r^2$

(B) $1/r^3$

(C) $1/r$

(D) $1/r^6$

9. The most stable among the following is

(A) LiF

(B) LiI

(C) HgF_2

(D) BeI_2

10. The ions with paramagnetic character among the following are

I. Na^+

II. Fe^{3+}

III. VO^{2+}

IV. Sc^{3+}

(A) I, II

(B) II, III

(C) III, IV

(D) II, IV

11. Retinol is

(A) enzyme

(B) hormone

(C) vitamin

(D) provitamin

12. Toluene in proton decoupled ^{13}C NMR spectrum gives

(A) 5 signals

(B) 4 signals

(C) 3 signals

(D) 6 signals

13. The Miller indices of a cubic crystal plane which intercepts the x, y and z axes at $\frac{1}{2}a$, $\frac{2}{3}b$ and $\propto c$ are

(A) 1 2 $\propto$

(B) 4 3 0

(C) 2 3 0

(D) 2 3 $\propto$

14. The increase in the molar conductance of KNO_3 with increase in the dilution of its aqueous solution is due to the

(A) increase in the speed of the solvent molecules

(B) increase in the transport numbers of K^+ and NO_3^- ions

(C) increase in the velocities of K^+ and NO_3^- ions

(D) increase in the number of K^+ and NO_3^- ions

15. Gas liquid chromatography is used for the separation of compounds that have/are

I. Low vapour pressure

II. High vapour pressure

III. Stable at high temperatures

IV. Unstable at high temperatures

(A) I, III

(B) II, III

(C) I, IV

(D) II, IV

16. **Assertion** (**A**) : HF is the strongest acid in water among HF, HCl, HBr and HI

Reason (R) : HF has the largest electronegativity difference among all

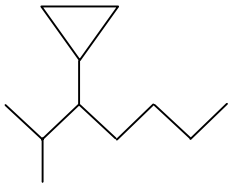
(A) Both A and R are true and R is the correct explanation of A

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

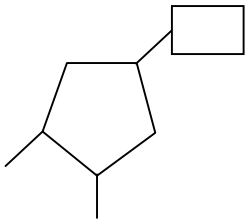
(C) A is true, but R is false

(D) A is false, but R is true

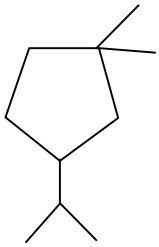
17. Match the following :

I. 

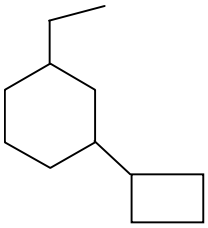
1. 1,1-Dimethyl-3-isopropyl cyclopentane

II. 

2. 1-Cyclobutyl-3-ethylcyclo-hexane

III. 

3. 1,1,2,3-Tetramethyl-cyclobutane

IV. 

4. 3-cyclopropyl-2-methyl-heptane

5. 1-cyclobutyl-3,4-dimethyl cyclopentane

	I	II	III	IV
(A)	1	3	2	4
(B)	4	1	2	3
(C)	5	2	3	4
(D)	4	5	1	2

18. D-Erythrose on oxidation gives

(A) (+) – tartaric acid

(B) (±) – tartaric acid

(C) meso-tartaric acid

(D) (–) – tartaric acid

19. _____ radiation is used to record the ESR spectrum of a radical.

(A) Ultraviolet

(B) Infrared

(C) Microwave

(D) Radio frequency

20. The difference in molar heat capacities $(C_p - C_v)$ of any gas is equal to

(A) $P\left(\frac{\partial E}{\partial V}\right)_P$

(B) $V\left(\frac{\partial E}{\partial P}\right)_V$

(C) $P\left(\frac{\partial V}{\partial T}\right)_P$

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

21. **Assertion** (**A**) : A liquid can be used as the stationary phase in a chromatography technique.

Reason (**R**) : A liquid has the property of moving.

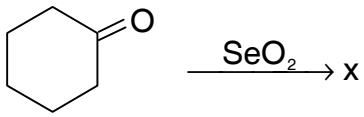
(A) Both A and R are true and R is the correct explanation of A

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

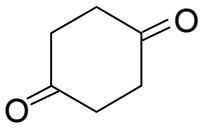
(C) A is true, but R is false

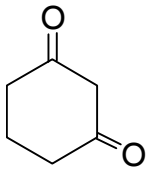
(D) A is false, but R is true

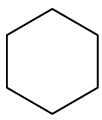
22. In the reaction

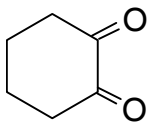


X is

(A) 

(B) 

(C) 

(D) 

23. Which of the following molecules do not have IR active vibrations ?

(A) H_2

(B) NO

(C) N_2O

(D) CH_4

24. **Assertion** (**A**): A quarter Faraday of electricity passed through an aqueous solution of $AlCl_3$ solution produces $\frac{1}{12} \times$ At.wt. of Al.

Reason (**R**) : One Faraday of electricity passed through a solution of an ion produces one equivalent weight of that ion.

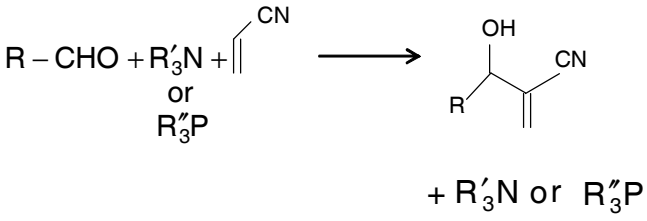
(A) Both A and R are true and R is the correct explanation of A

(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

25. Name the reaction :



(A) Baylis-Hillman Reaction

(B) Baylis Reaction

(C) Morita-Baylis-Hillman Reaction

(D) Hillman Reaction

26. The value of the Planck's constant is

(A) 6.626×10^{-34} JS

(B) 6.626×10^{-27} JS

(C) 1.380×10^{-23} JK^{-1}

(D) 9.109×10^{-31} Kg

27. **Assertion** (**A**) :$SOCl_2$ in liquid SO_2 is an acid

Reason (**R**) : Liquid SO_2 autoionises to give SO^{2+} and SO_3^{2-}

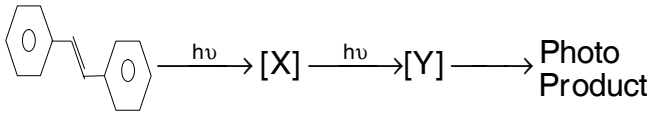
(A) Both A and R are true and R is the correct explanation of A

(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

28. Identify the photo product :



(A) Phenanthrene

(B) Naphthalene

(C) Anthracene

(D) Phenylnaphthalene

29. If an arbitrary wave function is used to calculate the energy of a quantum mechanical system the calculated energy is never less than the true energy of the system. This statement is

(A) Heisenberg uncertainty principle

(B) Perturbation theory

(C) Law of conservation of energy

(D) Variation principle

30. $Mn_2P_2O_7(s) \xrightarrow{\Delta} Mn_2P_2O_7(l)$ is characterized by

I. No weight loss in TGA

II. Weight loss in TGA

III. Exothermic peak in DTA

IV. Endothermic peak in DTA

(A) I, III

(B) II, III

(C) I, IV

(D) II, IV

31. Match the following :

I. Furyl acrylic acid from furfural	1. Skraup synthesis
II. 8-quinolinol from 0-amino phenol	2. Perkin reaction
III. Indole-3-carboxaldehyde	3. Bischler-Napieralski reaction
IV. 1-Methyl Iso-quinoline from β-phenyl ethyl amine	4. Reimer-Tieman reaction
	5. Grignard reaction

	I	II	III	IV
(A)	1	3	5	2
(B)	4	2	1	5
(C)	2	1	4	3
(D)	2	3	1	4

32. A hypothetical molecule has a configuration $1\sigma_g^2\ 1\sigma_u^2\ 2\sigma_g^2\ 1\pi_u^4 1\pi_g^4\ 2\sigma_u^2$ What is its bond order ?

(A) 1

(B) 2

(C) 0

(D) 1.5

33. The selection rules for the appearance of Q branch in the rotational-vibrational spectrum of a diatomic molecule are

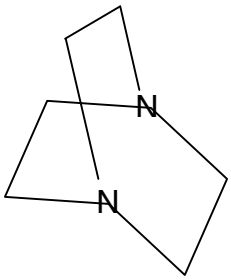
(A) $\Delta v = +1, \Delta J = 0$

(B) $\Delta v = +1, \Delta J = +1$

(C) $\Delta v = -1, \Delta J = -1$

(D) $\Delta v = -1, \Delta J = 0$

34. Identify the symmetry element present in



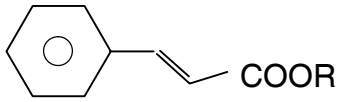
(A) C_{3V}

(B) D_{3H}

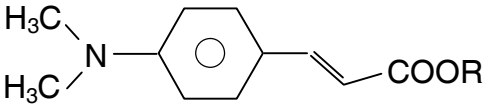
(C) C_{2V}

(D) C_{3H}

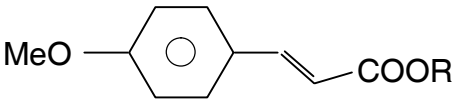
35. Arrange the given molecules with the increasing absorption maxima



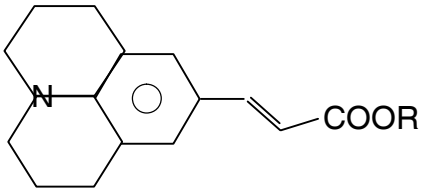
1



2



3



4

(A) 1 ; 3 ; 2 ; 4

(B) 2 ; 3 ; 1 ; 4

(C) 4 ; 3 ; 2 ; 1

(D) 3 ; 4 ; 1 ; 2

36. The crystal field stabilization energy values of $[Fe(CN)_6]^{3-}$ and $[CoF_6]^{3-}$ considering pairing energy (PE) are respectively

I. $-2.0\,\Delta_o + 2PE$

II. $-0.4\,\Delta_o$

III. 0 (zero)

IV. $-2.4\,\Delta_o + 2PE$

(A) I, II (B) II, III

(C) III, IV (D) II, IV

37. **Assertion** (**A**) :The pH of pure water at 80°C is less than 7.0.

Reason (**R**) : The ionic product of water increases with increase in temperature.

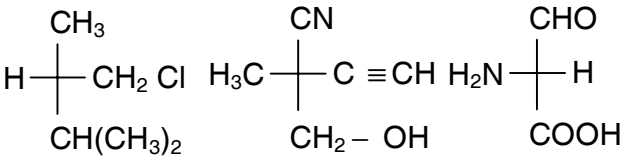
(A) A is false and R is true

(B) A is true and R is false

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

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

38. Identify the following as "R" or "S"



(A) R ; R ; S ;

(B) S ; S ; S ;

(C) S ; R ; R ;

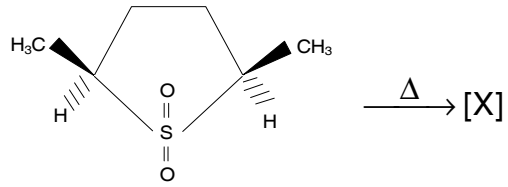
(D) S ; R ; S ;

39. Match the following :

List – I (Phenomenon)	**List – II (Related technique)**
I. Koopman's rule	1. Raman spectroscopy
II. Polarizability	2. Photoelectron spectroscopy
III. Spin-spin coupling	3. Mossbauer spectroscopy
IV. Dipole moment	4. NMR spectroscopy
	5) Infrared spectroscopy

	I	II	III	IV
(A)	2	5	4	1
(B)	2	1	4	5
(C)	3	1	4	5
(D)	3	5	4	1

40. In the following reaction



the major product [X] is

(A) E, E – 2, 4-hexadiene

(B) Z, E – 2, 4-hexadiene

(C) Z, Z – 2, 4-hexadiene

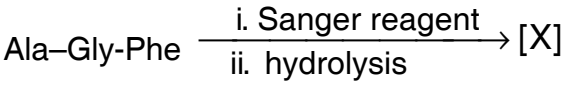
(D) E, Z – 2, 4-hexadiene

41. Match the following :

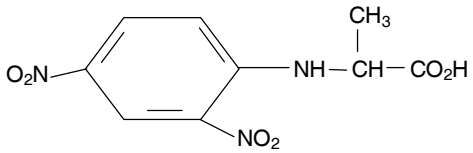
	List – I (Process)		**List – II (Catalyst used)**
I.	Hydroformylation	1.	$Rh(Ph_3P)_3Cl$
II.	Monsanto acetic acid process	2.	$Co_2(CO)_8$
III.	Hydrogenation	3.	$[Rh(CO)_2I_2]^-$
IV.	Wacker process	4.	ZSM – 5
		5.	$[PdCl_4]^{2-}$

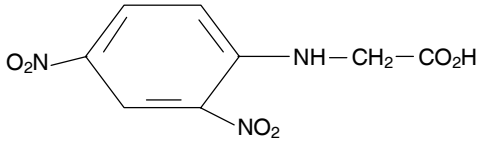
	I	II	III	IV
(A)	2	1	3	5
(B)	2	3	1	5
(C)	3	5	1	4
(D)	4	3	1	5

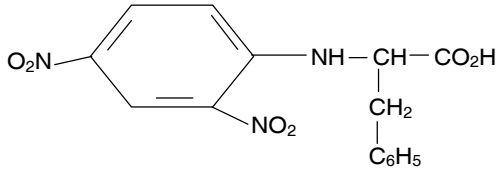
42. In the reaction

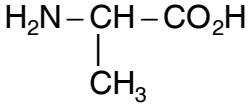


the major product [X] is

(A) 

(B) 

C) 

(D) 

43. Match the following

List – I	List – II
I. Identify operation of doing nothing	1. C_n
II. n-fold rotation	2. E
III. Reflection in a mirror plane	3. i
IV. Inversion through a centre of symmetry	4. σ
	5. S_n

	I	II	III	IV
(A)	1	2	3	4
(B)	2	1	4	3
(C)	1	2	4	5
(D)	5	1	2	4

44. For the following reactions

$$N_2(g) + 3H_2(g) \underset{\rightleftharpoons}{K_{P_1}} 2NH_3(g)$$

$$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \underset{\rightleftharpoons}{K_{P_2}} NH_3(g)$$

the equilibrium constants K_{P_1} and K_{P_2} are related as

(A) $K_{P_1} = 2K_{P_2}$

(B) $K_{P_1} = \frac{1}{2}K_{P_2}$

(C) $K_{P_1} = K^2_{P_2}$

(D) $K_{P_1} = (K_{P_2})^{1/2}$

45. Match the following :

List – I (Ion)	List – II (Number of unpaired electrons)
I. Fe^{2+}	1. 0
II. Cr^{3+}	2. 2
III. Cu^{+}	3. 3
IV. Ni^{2+}	4. 4
	5. 6

	I	II	III	IV
(A)	5	4	2	1
(B)	4	3	2	1
(C)	4	3	1	2
(D)	5	3	1	2

46. Anti inflammatory activity is exhibited by

(A) ibuprofen

(B) chloroequin

(C) isoniazid

(D) metronidazole

47. The conversion of toluene to benzoic acid is faster in presence of

(A) Thermal energy

(B) Sonication

(C) Cooling

(D) MW irradiation

48. Salbutamol is useful in the treatment of

(A) hypertension

(B) amoebiasis

(C) tuberculosis

(D) bronchial asthama

49. Which of the following statements is wrong ?

(A) Nanomaterials show the same properties as those exhibited by bulk materials

(B) Nanomaterials are prepared by either top down or bottom up approaches

(C) Texture of nanomaterials is studied by SEM / TEM

(D) Phase identification of nanomaterials is done by XRD

50. The pollutant responsible for Bhopal disaster in 1984 is

(A) Phosgene

(B) Methylamine

(C) Methyl isocyanate

(D) Carbon monoxide

CHEMICAL SCIENCES PAPER – II				
(SUBJECT CODE-02)				
Q.No	KEY		Q.No	KEY
1	C		26	A
2	B		27	B
3	A		28	A
4	D		29	D
5	D		30	C
6	B		31	C
7	B		32	C
8	C		33	A
9	A		34	B
10	B		35	A
11	C		36	A
12	A		37	C
13	B		38	D
14	C		39	B
15	B		40	A
16	D		41	B
17	D		42	A
18	C		43	B
19	C		44	C
20	C		45	C
21	B		46	A
22	D		47	D
23	A		48	D
24	A		49	A
25	C		50	C