CHEMICAL SCIENCES

PAPER - II

Signature of Invigilators

1. .....

2. .....

Roll No. ☐☐☐☐☐☐
(In figures as in Admit Card)

JY–06/03

Roll No. .....

.....
(in words)

Name of the Areas/Section (if any).....

Time Allowed :75 Minutes] **[Maximum Marks : 100**

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **fifty (50)** multiple choice type questions. **All questions** are compulsory.
3. Each item has upto four alternative responses marked (A), (B), (C) and (D). The answer should be a capital letter for the selected option. The answer letter should entirely be contained within the corresponding square.

   Correct method [A] Wrong method [A] OR [A]

4. Your responses to the items for this paper are to be indicated on the ICR Answer Sheet under Paper II only.
5. Read instructions given inside carefully.
6. Extra sheet is attached at the end of the booklet for rough work.
7. You should return the test booklet to the invigilator at the end of paper and should not carry any paper with you outside the examination hall.

પરીક્ષાર્થીઓ માટે સૂચનાઓ :

૧. આ પાનાની ટોચમાં દર્શાવેલી જગ્યામાં તમારો રોલ નંબર લખો.

૨. આ પ્રશ્નપત્રમાં કુલ **પચાસ (૫૦)** બહુવૈકલ્પિક ઉત્તરો ધરાવતા પ્રશ્નો આપેલા છે. **બધા જ** પ્રશ્નો ફરજિયાત છે.

૩. પ્રત્યેક પ્રશ્ન વધુમાં વધુ ચાર બહુવૈકલ્પિક ઉત્તરો ધરાવે છે. જે (A), (B), (C) and (D). વડે દર્શાવવામાં આવ્યા છે. પ્રશ્નનો ઉત્તર કેપીટલ સંજ્ઞા વડે આપવાનો રહેશે. ઉત્તરની સંજ્ઞા આપેલ ખાનામાં બરાબર સમાઈ જાય તે રીતે લખવાની રહેશે.

   ખરી રીત : [A] ખોટી રીત : [A] , [A]

૪. આ પ્રશ્નપત્રના જવાબ આપેલ ICR Answer Sheet ના Paper II વિભાગની નીચે આપેલ ખાનાઓમાં આપવાના રહેશે.

૫. અંદર આપેલ સૂચનાઓ કાળજીપૂર્વક વાંચો.

૬. આ બુકલેટની પાછળ આપેલું પાનું રફ કામ માટે છે.

૭. પરીક્ષા સમય પૂરો થઈ ગયા પછી આ બુકલેટ જે તે નિરીક્ષકને સોંપી દેવી. કોઈપણ કાગળ પરીક્ષા ખંડની બહાર લઈ જવો નહી.

CHEMICAL SCIENCES
Paper - II

NOTE: This paper contains FIFTY (50) multiple-choice / Assertion & Reasoning/ Matching questions, each questions carrying two (02) marks. Attempt ALL the questions.

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1. A blank titrimetric experiment is carried out to minimise the error. One of the following is not used in the blank
   (A) sample (B) titrant
   (C) indicator (D) solvent

2. If a series of similar measurements are made and one or more values stand out as being different from the other, the test which will be used for the rejection of the value is :
   (A) 'F' test (B) chi square test
   (C) 'Q' test (D) 't' test

3. Replicate samples of a silver alloy are analysed and found to contain 95.67, 95.61, 95.71 and 95.60% Ag. The standard deviation is calculated to be
   (A) 0.052 % (B) 0.0052 %
   (C) 0.026 % (D) 0.032 %

4. Which technique has the lowest detection limit ?
   (A) Gravimetric (B) Conductometric
   (C) Visible spectrophotometric (D) Atomic absorption spectrophotometric

5. The proton magnetic resonance is studied in
   (A) readiofrequency region (B) microwave region
   (C) infrared region (D) visible region

6. The ionization energy of hydrogen atom is 13.6 eV. The kinetic energy of the electron in hydrogen atom is
   (A) 13.6 eV (B) 31.6 eV
   (C) 6.8 eV (D) 21.7 eV

7. Superacids are useful as
   (A) insecticides (B) solvents
   (C) catalysts (D) neutralizing agents

8 A molecule belonging to the point group C_{4v} is
   (A) $XeOF_4$ (B) CCl_4
   (C) CHBrFCl (D) CH_2FCl

9. The number of possible values for the magnetic quantum number (m) for a f-electron is
   (A) 5 (B) 3
   (C) 7 (D) 1

10. The wavelength of the second line in the visible series of the hydrogen spectrum is
   (A) 4.7 nm (B) 4683 nm
   (C) 46.83 nm (D) 486 nm

11. The molecular geometry of IF_7 is a
   (A) trigonal bipyramid (B) square pyramid
   (C) pentagonal bipyramid (D) distorted octahedron

12. In the manufacture of iron form haematite, limestone is added as
   (A) flux (B) slag
   (C) gangue (D) reducing agent

13. Kaolin is
   (A) silicate of K (B) oxide of K
   (C) silicate of Al (D) carbonate of Mg

14. Which of the following is paramagnetic ?
   (A) $[Co(NH_3)_6]^{3+}$ (B) $[Zn(NH_3)_4]^{2+}$
   (C) $[PdCl_4]^{2-}$ (D) $[Cr(NH_3)_6]^{3+}$

15. The enhanced stability of complexes containing chelate rings is due to favourable change in

(A) enthalpy
(B) entropy
(C) free energy
(D) symmetry

16. CO coordinates most strongly with metals of zero oxidation state primarily due to

(A) the necessity of following EAN rule
(B) the increased opportunity for bonding
(C) the trans effect
(D) the polarity of CO molecule.

17. How many alpha particles are emitted in the following nuclear transformation?

$$^{215}_{84}Po \longrightarrow {}^{211}_{82}Pb$$

(A) 4
(B) 2
(C) 0
(D) 1

18. IUPAC name of sodium nitroprusside, Na_2 [Fe $(CN)_5$ NO] is

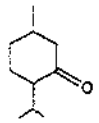
(A) sodium pentacyanonitrosyl ferrate (0)
(B) sodium pentacyanonitrosyl ferrate (II)
(C) sodium pentacyanonitrosyl ferrate (I)
(D) sodium pentacyanonitrosyl ferrate (III)

19. Which of the following is obtained by the process of electrolysis ?

(A) aluminium
(B) copper
(C) zinc
(D) iron

20. The coordination number of the central atom in the anion of the salt, Na $[UO_2 (OCOCH_3)_3]$ is

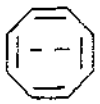
(A) 6
(B) 4
(C) 8
(D) 5

21.  The correct IUPAC nomenclature for this molecule is

(A) 2–Isopropyl–5–methyl cyclohexanone
(B) 3–methyl–6–isopropyl cyclohexanone
(C) 1–methyl–4–isopropyl–5–cyclohexanone
(D) 1–isopropyl–4–methyl–2–cyclohexanone

22. Which of the following is not aromatic ?

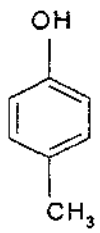

(A)

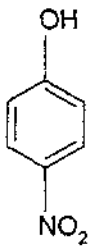

(B)

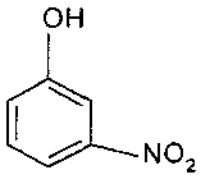

(C)

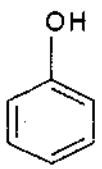

(D)

23. Arrange the following in the decreasing order of their acidity


a

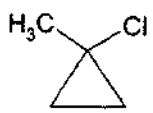

b

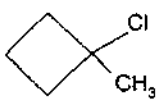

c

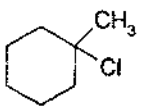

d

(A) b > c > a > d
(B) c > b > a > d
(C) b > c > d > a
(D) a > d > b > c

24. Arrange the following compounds in the order of their decreasing rates of solvolysis

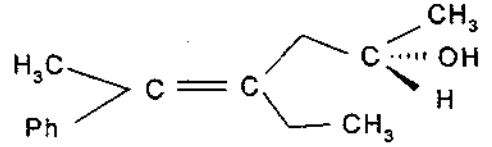

a


b


c

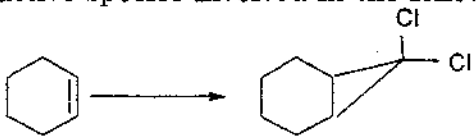
(A) a > b > c
(B) c > b > a
(C) c > a > b
(D) b > c > a

25. The correct configurations for the following molecule are



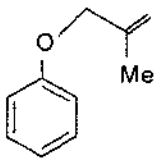
(A) 4Z, 2R
(B) 4E, 2R
(C) 4E, 2S
(D) 4Z, 2S

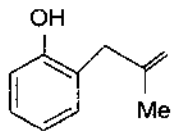
26. The reactive species involved in the following conversion is

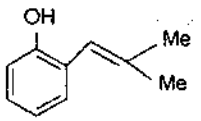


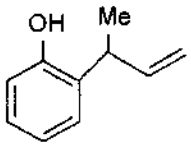
(A) $\ominus CCl_2$
(B) $\oplus CCl_2$
(C) $:CCl_2$
(D) $^{+}CCl3$

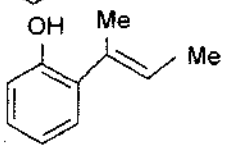
27. The Claisen rearrangement of compound Y would give Y =



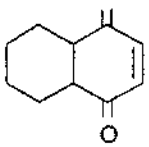
(A) 

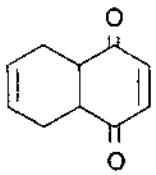
(B) 

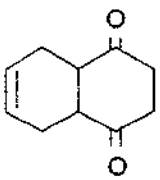
(C) 

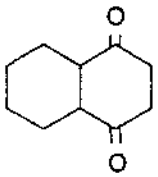
(D) 

28. The Diels-Alder reaction between one mole each of buta–1,3–diene and benzoquinone would give

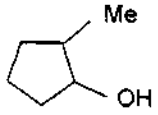
(A) 

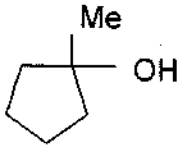
(B) 

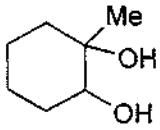
(C) 

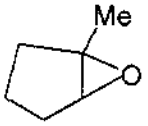
(D) 

29. The reaction of 1-Methylcyclopentene with Hg $(OAc)_2$ – H_2O followed by reduction with $NaBH_4$ would give

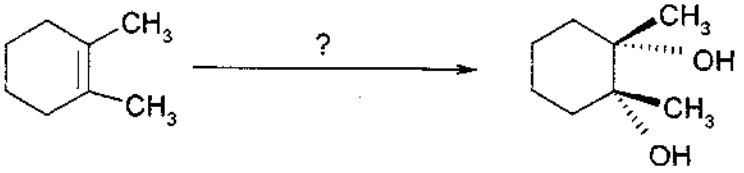
(A) 

(B) 

(C) 

(D) 

30. The reagent required for the following conversion is



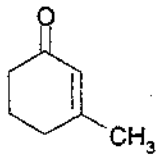
(A) H_2O_2, H^+

(B) $F_3C-C(=O)-O-O-H$

(C) OsO_4, $Na_2S_2O_3$

(D) H_2O_2, NaOH

31. The compound X can be prepared by aldol condensation of which of the following starting materials

X = 

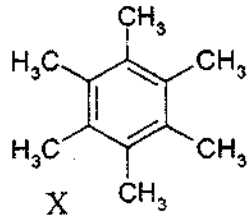
(A) $CH_3-C(=O)-(CH_2)_4-C(=O)-CH_3$

(B) $CH_3-C(=O)-(CH_2)_5-C(=O)-CH_3$

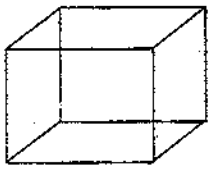
(C) $CH_3\,CH_2-C(=O)-(CH_2)_3-C(=O)-CH_3$

(D) $CH_3-C(=O)-(CH_2)_5-CHO$

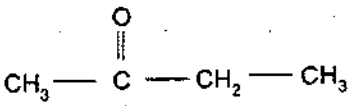
32. How many different ^{1}H-NMR signals will be observed for these compounds (ignore splitting)



X



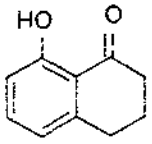
Y



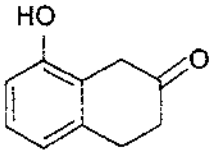
Z

	X	Y	Z
(A)	1	1	3
(B)	1	4	3
(C)	2	4	2
(D)	1	2	3

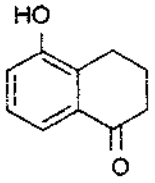
33. The IR spectrum of a compound with molecular formula $C_{10}H_{10}O_2$ shows peaks near 1685 cm^{-1} and 3350 cm^{-1}. The position of the peak at 3350 cm^{-1} did not change when the spectrum was recorded under dilute conditions, The compound is



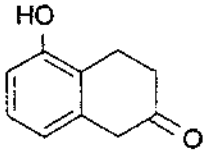
(A)



(B)

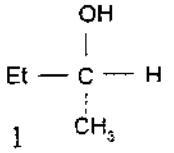


(C)

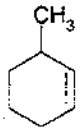


(D)

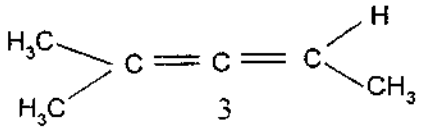
34. Which of the following compounds are optically active ?



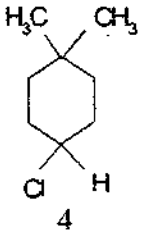
1



2



3



4

(A) → 1, 3, 4
(B) → 1, 2, 3
(C) → 1, 3, 4
(D) → 2, 3, 4

35. Aniline on nitration with con. H_2SO_4 and HNO_3 will give which of the following as major product ?

(A) ortho nitro aniline
(B) para nitro aniline
(C) meta nitro aniline
(D) 2, 4– dinitro aniline

36. The ionization energy of nitrogen is more than that of oxygen because
(A) of the extra stability of the half-filled p-orbital
(B) of the smaller size of nitrogen
(C) nitrogen contains less number of electrons
(D) nitrogen is less electronegative

37. A nuclear reaction is accompanied by a loss of mass equivalent to 0.01864 amu. Energy liberated in the process is
(A) 931 MeV
(B) 186.2 MeV
(C) 17.36 MeV
(D) 460 MeV

38. $NaHCO_3$ molecules have
(A) ionic bonds only
(B) ionic and covalent bonds
(C) ionic, covalent and H-bond
(D) ionic and H-bond

39. An iron nail is placed in an aqucous solution of aluminium sulphate and copper sulphate. The results is
(A) no reaction
(B) formation of Al^o, H_2 and Fe^{2+}
(C) formation of Al^o and H_2
(D) formation of Fe^{2+} and Cu^o

40. The dissociation constant of two weak acids are K_1 and K_2. The relative strengths of these acids is given by
(A) $\frac{K_1}{K_2}$
(B) $\frac{K_1+\sqrt{K_2}}{K_2+\sqrt{K_1}}$
(C) $\left(\frac{K_1}{K_2}\right)^{1/2}$
(D) $\left(\frac{K_1}{K_2}\right)^{3/2}$

41. Which of the following is not an intensive property ?
(A) entropy
(B) temperature
(C) chemical potential
(D) molar volume

42. For the process $2F_{(g)} \rightarrow F_{2_{(g)}}$, the sign of ΔH and ΔS respectively are
(A) +, −
(B) +, +
(C) −, −
(D) −, +

43. When supercooled water suddenly freezes, the free energy of the system
(A) increases
(B) decreases
(C) remains same
(D) becomes zero

44. An endothermic reaction A $\rightarrow$ B, has an activation energy as x kJ.mol^{-1} of A. If energy change in the reaction is y kJ, the activation energy of reverse reaction is

(A) $-x$ (B) $x - y$

(C) $x + y$ (D) $y - x$

45. In a reaction A $\rightarrow$ products, 25% of the original concentration of A is consumed in 10 minutes. How much A will remain unreacted after 30 minutes if the reaction follows first order kinetics ?

(A) 50% (B) 35%

(C) 42% (D) 12.5%

46. 0.1 M solution of glucose and 0.1 M solution of urea are placed on two sides of semipermeable membrane to equal heights. Which of the following is correct?

(A) there will be flow of water from glucose side to urea

(B) there will be flow of water from urea side to glucose

(C) there will be no net flow across the membrane

(D) glucose solution will move into urea solution.

47. Which of the following statements is not true about a catalyst ?

(A) a catalyst increases the rate of a reaction

(B) a catalyst takes part in the reaction

(C) a catalyst changes the position of equilibrium

(D) a catalyst remains unchanged chemically at the end of the reaction

48. Fractional atomic masses of elements are due to

(A) experimental errors (B) presence of impurities

(C) choice of carbon as the standard (D) presence of isotopes of the element

49. Which of the following molecules does not show infra red spectrum ?

(A) CH_4 (B) HCl

(C) CO_2 (D) H_2

50. The frequency region of electromagnetic radiation used for recording ESR spectrum is

(A) Microwave region (B) radiofrequency region

(C) Ultraviolet region (D) Infrared region

ROUGH WORK