Signature of Invigilators

1. .....

2. .....

Roll No. | | | | | |

(In figures as in Admit Card)

CHEMICAL SCIENCES

Paper II

Roll No. .....

.....

(In words)

J—0302

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 A question 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. One 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 માટેની સૂચનાઓ :

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

૨. આ પ્રશ્નપત્રમાં કુલ **પચાસ (50)** બહુવિકલ્પીય ઉત્તરો ધરાવતા પ્રશ્નો આપેલા છે. **સભી** પ્રશ્ન અનિવાર્ય છે.

૩. પ્રત્યેક પ્રશ્ન વધુમાં વધુ ચાર બહુવૈકલ્પિક ઉત્તરો ધરાવે છે. જે (A), (B), (C) અને (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 બુક્લેટની પાછળ આપેલું પાનું રફ કામ માટે છે.

૭. પરીક્ષા સમય પૂરો થઈ ગયા પછી આ બુક્લેટ જે તે નીરીક્ષકને સોંપી દેવી. કોઈપણ પેપર પરીક્ષા રૂમની બહાર લઈ જવું નહી.

SEAL

CHEMICAL SCIENCES

PAPER II

Note :— This paper contains *fifty* **(50)** multiple-choice questions, carrying **two (2)** marks each. Attempt *all* the questions.

1. Electromagnetic radiations are deflected in :
   (A) Electric field only
   (B) Magnetic field only
   (C) Neither electric field nor magnetic field
   (D) Both in electric and magnetic field

2. Third law of thermodynamics leads to the concept of :
   (A) Temperature (B) Free energy
   (C) Entropy (D) None of these

3. A spontaneous reaction is impossible if :
   (A) both ΔH and ΔS are negative
   (B) both ΔH and ΔS are positive
   (C) ΔH is negative and ΔS is positive
   (D) ΔH is positive and ΔS is negative

4. Stronger the oxidising agent, the greater is :
   (A) reduction potential (B) Oxidation potential
   (C) Chemical potential (D) Ionic behaviour

5. Enthalpy of combustion of a substance is :
   (A) always positive (B) always negative
   (C) always zero (D) may be positive or negative

6. In a mixture of liquids if one component shows positive deviation from Raoult's law, the other component shows :
   (A) negative deviation
   (B) positive deviation
   (C) positive or negative deviation
   (D) no deviation

7. At 90°C, pH of water is :

(A) 7 (B) greater than 7

(C) less than 7 (D) always zero

8. In 10 minutes concentration of a reactant decreases from 0.1 M to 0.05 M. In the next 10 minutes it decreases to 0.025 M. Then the order of reaction is :

(A) zero

(B) one

(C) two

(D) cannot be ascertained from the given data

9. Change of configuration of a molecule gives rise to :

(A) rotational spectrum (B) vibrational spectrum

(C) electronic spectrum (D) ESR spectrum

10. Artificial radioactivity was discovered by :

(A) Rutherford (B) Marie Curie

(C) Irene Curie (D) Becquerel

11. In the case of the equilibrium

$$PCl_5 \rightleftharpoons PCl_3 + Cl_2$$

(A) $K_P = K_C$ (B) $K_P = K_C(RT)^{-1}$

(C) $K_P = K_C(RT)^{-2}$ (D) $K_P = K_C(RT)$

12. The value of equilibrium constant for the reaction :

$$H_2 + I_2 \rightleftharpoons 2HI$$

is 50 at 450°C. The volume of the container is doubled at the same temperature, the equilibrium constant now will be :

(A) 50 (B) 25

(C) 100 (D) 50^2

13. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and 1 M Z^- at 25°C. If the reduction potential is in the order Z > Y > X :

(A) Y will oxidize X and not Z (B) Y will oxidize Z and not X

(C) Y will oxidize both X and Z (D) Y will reduce both X and Z

14. An aqueous solution of HCl of pH = 4.0 on diluting 10,000 times with water will change the pH to approximately :

(A) 5.0 (B) 7.0

(C) 8.0 (D) 6.0

15. Which of the statements about a catalyst is not *true* ?

(A) A catalyst decreases the activation energy of the reaction

(B) A catalyst alters the position of equilibrium of a reaction

(C) A catalyst increases the rate of the forward reaction without taking part in the reaction

(D) A catalyst does not initiate a reaction

16. Melting point of boron is very high due to its :

(A) High density

(B) Strong d-d bonds

(C) High solvation energy

(D) Large three-dimensional structure

17. The symmetry of Phosphorus pentafluoride is :

(A) T_d (B) D_{4h}

(C) D_3 (D) D_{3h}

18. Catenation is most predominant in :

(A) Silicon (B) Phosphorus

(C) Carbon (D) Germanium

19. Which element *does not* occur in a natural elemental state ?

(A) K (B) Au

(C) Ag (D) Ir

20. Which trend is correct for X–X single bond dissociation energy of the diatomic halogens ?

(A) $F_2 > Cl_2 > Br_2 > I_2$ (B) $I_2 > Br_2 > Cl_2 > F_2$

(C) $F_2 < Cl_2 > Br_2 > I_2$ (D) $F_2 > Cl_2 > I_2 > Br_2$

21. A slag containing CaO is :

(A) acidic (B) basic

(C) neutral (D) contains molten metal

22. Which of the following salts is a good reducing agent ?

(A) NaF (B) NH_4Br

(C) Na_3BO_3 (D) $NaBH_4$

23. For oxygen and ozone which of the following statements is *not* true ?

(A) Both are allotropes

(B) Passing electricity through oxygen produces ozone

(C) O_3 contains π bond delocalized over three oxygen atoms while in oxygen no such thing occurs

(D) Oxygen is a stronger oxidizing agent

24. The number of neutrons in $^{235}_{92}U$ is :

(A) 147 (B) 145

(C) 143 (D) 141

25. Which of the following lanthanide forms most stable divalent state ?

(A) Cerium (B) Samarium

(C) Europium (D) Thulium

26. What is the geometrical structure of ClF_3 ?

(A) Trigonal Planar (B) Trigonal Pyramidal

(C) Trigonal Bipyramidal (D) Bent T

27. Which of the following properties account for the conductivity of metals ?

(A) Movement of ions (B) Strong ionic bond

(C) Mobility of valence electrons (D) High melting point

28. Which pair of orbitals have almost similar energy in octahedral crystal field ?

(A) $d_{x^2-y^2}, d_{z^2}$ (B) $d_{x^2-y^2}, d_{xy}$

(C) d_{z^2}, d_{yz} (D) d_{z^2}, d_{xz}

29. The structure of yellow $Ni(CN)_4^{2-}$ is :

(A) tetrahedral

(B) distorted octahedral

(C) square planar

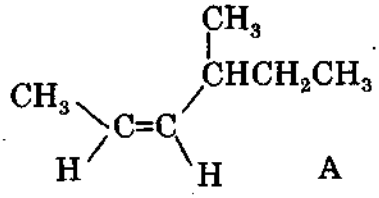
(D) It can have all the three given above

30. Out of the given combination which one has the soft acid-soft base character ?

(A) Hg^{2+}, S^{--} (B) Hg^{2+}, Cl^-

(C) Hg^{2+}, O^{2-} (D) Fe^{3+}, F^-

31. According to IUPAC nomenclature the name of compound A is :

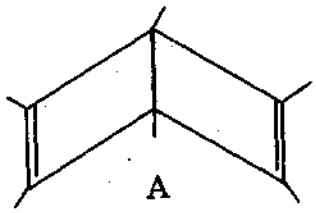


A

(A) Z-4-methyl-hexene-2 (B) Z-heptene-2

(C) E-heptene-2 (D) Z-4-ethyl-pentene-2

32. According to IUPAC nomenclature the correct name of compound A is :



A

(A) Hexamethyl Cyclohexadiene

(B) Hexamethyl bicyclo (2, 2, 0) hexadiene

(C) Hexamethyl bicyclo (2, 2) hexadiene

(D) 1, 2, 3, 4, 5, 6-hexamethyl cyclohexadiene

33. The addition of a singlet carbene to cis-butene-2 will give :

(A) cis-2-methyl-2-butene

(B) trans-1,2-dimethyl cyclopropane

(C) a mixture of cis- and trans-1, 2-dimethyl cyclopropane

(D) cis- 1, 2-dimethyl cyclopropane

34. Hofmann reaction is an example of :

(A) 1,2-intramolecular electrophilic shift

(B) 1,2-intermolecular electrophilic shift

(C) 1,2-intermolecular nucleophilic shift

(D) 1,2-intramolecular nucleophilic shift

35. Which of the following show splitting of the signal in NMR spectrum ?

(A) 1,2-dichloroethane

(B) Isobutylene

(C) 1,2-dibromo-2-methyl propane

(D) Ethanol

36. $R—CH=CH—\underset{\underset{O}{\|}}{C}—R'$ on Meerwein-Pondorf-Verley reduction will produce :

(A) $R—CH=CH.\ CH(OH)—R'$

(B) $R—CH_2—CH_2—\underset{\underset{O}{\|}}{C}—R'$

(C) $R—CH_2\ .\ CH_2CH(OH)\ .\ R'$

(D) $R—CH_2\ .\ CH_2\ .\ CH_2R'$

37. Aromatic hydroxy ketones from phenolic esters are obtained by :

(A) Birch reaction (B) Oppeanaur oxidation

(C) Fries rearrangement (D) Wittig reaction

38. $R—COOH \xrightarrow[H_2SO_4]{HN_3^+} R—NH_2$ reaction is an example of :

(A) Schmidt rearrangement (B) Beckmann rearrangement

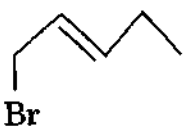
(C) Reformatsky reaction (D) Grignard reaction

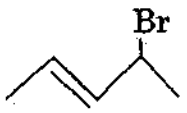
39. A nitrile can be converted into a ketone easily by :

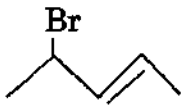
(A) Aldol condensation (B) Clemmensen reduction

(C) Wolff-Kishner reduction (D) Grignard reaction

40. Which of the following could be obtained from a 1,4-addition of HBr to 1,3-pentadiene ?

(A) 

(B) 

(C) 

(D) 

41. The anion of ethylacetoacetate reacts with chloromethyl methyl ether to give :

(A) C-alkylation (B) O-alkylation

(C) Both (A) and (B) (D) None of these

42. IR peaks at 3100 cm^{-1} and 2200 cm^{-1} may most probably indicate the presence of :

(A) A terminal alkene (B) A terminal alkyne

(C) A ketene (D) A nitrile

43. Which of the following statements is true about Diels-Alder reaction ? It is :

(A) non-concerted reaction

(B) stereoselective reaction

(C) concerted, but not stereospecific reaction

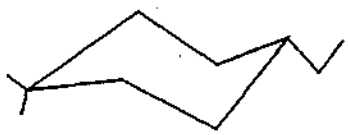
(D) concerted and stereospecific reaction

44. 2-Ethyl-2-hexen-1-al can be obtained by the base catalysed condensation of :

(A) Propanal (B) 2-Butanone

(C) 2-Methyl propanal (D) Butanal

45. According to IUPAC :



(A) 1,1-dimethyl-4-ethyl cyclohexane

(B) 1-ethyl-4,4,-dimethyl cyclohexane

(C) cis-1-ethyl-4,4-dimethyl cyclohexane

(D) trans-1-ethyl -4,4-dimethyl cyclohexane

46. For the replicate analysis of mercury a relative standard deviation of 0.354 was observed. Then the coefficient of variation would be :

(A) 0.354 (B) 3.540

(C) 35.400 (D) 354.000

47. The replicate coulometric analysis (5 times) of iron gave mean value of 19.80 ppm. The standard known value is 20.00 ppm. Then the absolute error would be :

(A) 0.22 (B) –0.22

(C) 0.044 (D) 1.10

48. In a linear least square ($y = a + bx$) analysis, the value of $b = 1$, then the intercept would be :

(A) zero (B) –1

(C) + 1 (D) > 1

49. The population standard deviation σ is represented as :

(A) $\sigma = \dfrac{\sqrt{\sum_{i=1}^{N} (x_i - \bar{x})^2}}{N}$ (B) $\sigma = \dfrac{\sqrt{\sum_{i=1}^{N} (x_i - \bar{x})}}{N}$

(C) $\sigma = \sqrt{\dfrac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N}}$ (D) $\sigma = \sqrt{\dfrac{\sum_{i=1}^{N} (x_i)^2}{N}}$

50. The standard deviation s is represented as :

(A) $s = \sqrt{\dfrac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N - 1}}$ (B) $s = \sqrt{\dfrac{\sum_{i=1}^{N} x_i}{N - 1}}$

(C) $s = \sqrt{\dfrac{\sum_{i=1}^{N} \bar{x}}{N - 1}}$ (D) $s = \dfrac{\sqrt{\sum_{i=1}^{N} (x_i - x)^2}}{N - 1}$

ROUGH WORK

ROUGH WORK