

Signature of Invigilators

Roll No.

--	--	--	--	--

(In figures as in Admit Card)

## CHEMICAL SCIENCE

### Paper II

Roll No. ....

(In words)

**D/03/3**

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  Wrong Method  or

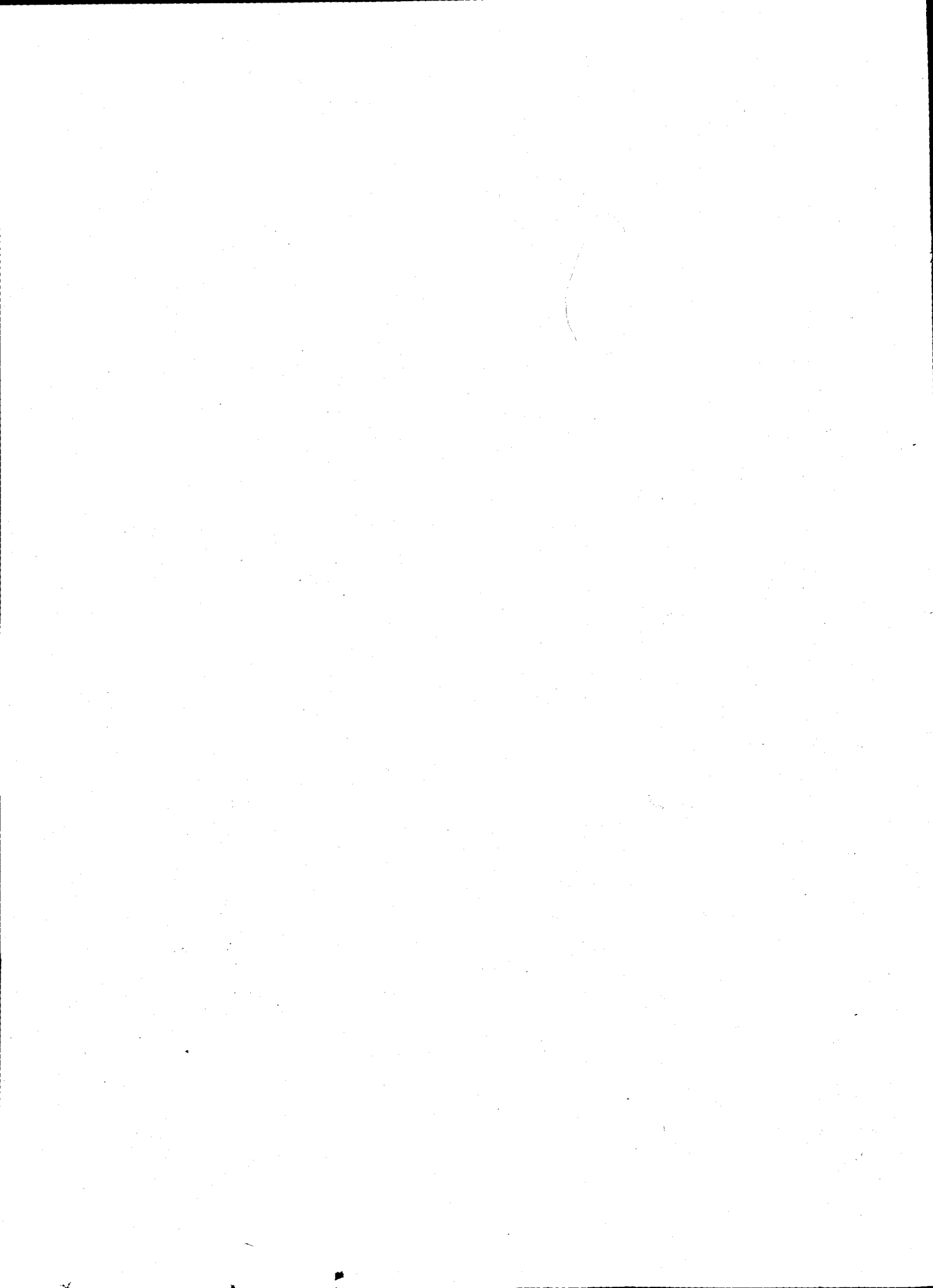
4. Your responses to the items for this paper are to be indicated on the ICR Answer Sheet under paper II only
5. Read instructions given inside carefully.
6. One sheet is attached at the end of the booklet for rough work.
7. You should return the ~~test~~ booklet to the invigilator at the end of paper 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) 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) અને (D) વડે દર્શાવવામાં આવ્યા છે. પ્રશ્નનો ઉત્તર કેપીટલ સંજ્ઞા વડે આપવાનો રહેશે. ઉત્તરની સંજ્ઞા આપેલ પાનામાં બરાબર સમાઈ જાય તે રીતે લખવાની રહેશે.

બરી રીત :  ખોટી રીત :  ,

૪. આ પ્રશ્નપત્રના જવાબ આપેલ ICR Answer Sheetના Paper II વિભાગની નીચે આપેલ પાનાઓમાં આપવાના રહેશે.
૫. અંદર આપેલ સૂચનાઓ કાળજીપૂર્વક વાંચો.
૬. આ બુકલેટની પાછળ આપેલું પાનું રફ કામ માટે છે.
૭. પરીક્ષાસમય પૂરો થઈ ગયા પછી આ બુકલેટ જે તે નિરીક્ષકને સોંપી દેવી. કોઈ પણ કાગળ પરીક્ષાખંડની બહાર લઈ જવો નહીં.



**CHEMICAL SCIENCE**  
**PAPER II**

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

1. In the spectrophotometric analysis of iron (III) with thiocyanate as chromogenic ligand, the variation in the absorbance measured due to voltage fluctuation is termed as :  
(A) Determinant error                      (B) Indeterminant error  
(C) Personal error                          (D) Huge error
2. The standard deviation in any chemical analysis represents the measure of :  
(A) Accuracy                                  (B) Precision  
(C) Range                                      (D) Median
3. In the volumetric analysis of oxalic acid against potassium permanganate the corresponding titre values were 10.1 ml, 10.2 ml, 10.3 ml, 10.4 ml and 10.5 ml. The most accurate value of 10.3 is represented by :  
(A) Mean value                              (B) Median value  
(C) Mean and median value              (D) Variant value
4. The amount of aluminium in bauxite mineral by replicate analysis is (%) :  
42, 40, 41, 38.

Therefore the calculated value of  $Q$  for the suspected value of 38 is :

- (A) 0.25                                      (B) 0.50  
(C) 0.75                                      (D) 1.00

5. The degree of freedom in the calculation of the standard deviation for a given sample analysis is represented as :
- (A)  $N + 1$  (B)  $N - 1$   
(C)  $N - 2$  (D)  $N$
6. Which of the following orbitals has finite electron density at nucleus ?
- (A)  $s$  orbitals (B)  $p$  orbitals  
(C)  $d$  orbitals (D)  $f$  orbitals
7. The value of L-S coupling for the ground state of carbon is :
- (A) 2 (B) 1  
(C) 0 (D)  $1/2$
8. The ionic radii are :
- (A) proportional to effective nuclear charge  
(B) proportional to square root of effective nuclear charge  
(C) inversely proportional to effective nuclear charge  
(D) inversely proportional to square of effective nuclear charge
9. Electronegativity is greater for the carbon atom of :
- (A) acetylene (B) ethylene  
(C) ethane (D) methane
10. Which of the  $d$  orbitals involved in  $dsp^2$  hybridization ?
- (A)  $d_{z^2}$  (B)  $d_{x^2 - y^2}$   
(C)  $d_{xy}$  (D)  $d_{xz}$
11. The H-C-H bond angles in ethylene are :
- (A) greater than  $120^\circ$  (B) smaller than  $120^\circ$   
(C) equal to  $120^\circ$  (D) equal to  $90^\circ$

12. The electronic configuration of  $O_2$  molecule is :
- (A)  $(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\pi)^4 (\sigma_{2p})^1 (\pi^*)^3$
- (B)  $(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2p})^2 (\pi)^4 (\pi^*)^2$
- (C)  $(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2p})^2 (\pi)^2 (\pi^*)^4$
- (D)  $(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2p})^2 (\sigma_{2p}^*)^2 (\pi)^4$
13. In molecules such as  $BrF_3$ ,  $XeF_2$ , the lone pairs occupy equatorial positions because the central atom along equatorial positions has :
- (A) Smaller  $s$  character                      (B) Greater  $s$  character
- (C) Only  $p$  and  $d$  characters              (D) Only  $p$  character
14. The point group of  $XeF_4$  is :
- (A)  $C_{3v}$     (B)  $D_{3h}$
- (C)  $D_{4h}$     (D)  $T_d$
15. The lattice energy is a measure of the :
- (A) strength of an ionic bond              (B) strength of a metallic bond
- (C) strength of a covalent bond              (D) number of ions in a crystal
16. Compared with ionic compounds, molecular compounds :
- (A) have higher boiling points              (B) are brittle
- (C) have lower melting points              (D) are harder
17. For which of the molecules, the bond angles are longer ?
- (A)  $NH_3$     (B)  $PH_3$
- (C)  $AsH_3$     (D)  $SbH_3$
18. The roasting procedure converts :
- (A) metal oxides to metal chlorides
- (B) metal sulfides to metal oxides
- (C) metal sulfides to metal hydroxide
- (D) metal carbonates to metal sulfites

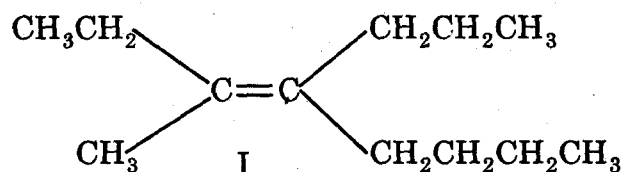
19. Complex  $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$  contains number of unpaired electron(s) :

- (A) one (B) four  
(C) zero (D) two

20. The Zinc (II) compounds are generally :

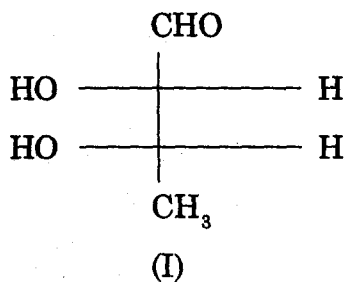
- (A) green (B) yellow  
(C) red (D) white

21. The correct IUPAC name of the compound I is :

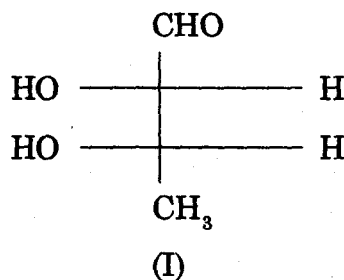
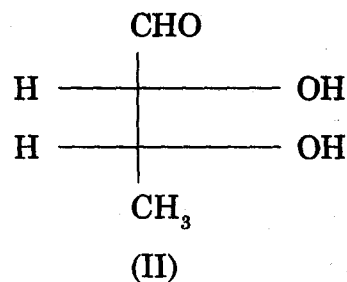


- (A) Z-3-methyl-4-propyl-3-octene (B) Z-3-methyl-4-butyl-3-heptene  
(C) E-3-methyl-4-propyl-3-octene (D) E-5-propyl-6-methyl-5-octene

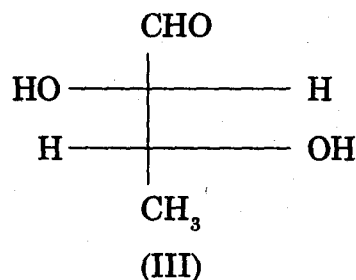
22. Which is the *correct* statement for the following pair of compounds ?



and

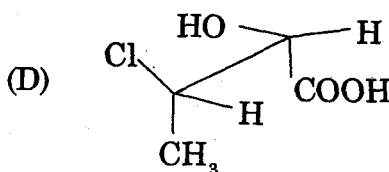
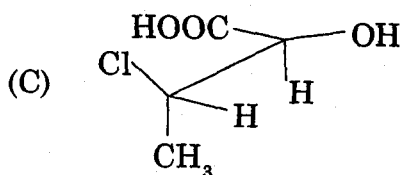
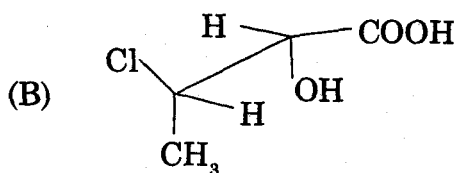
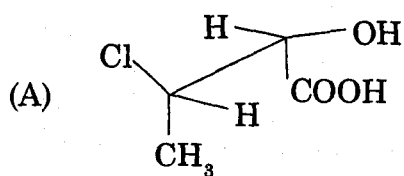
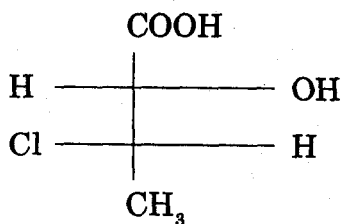


and

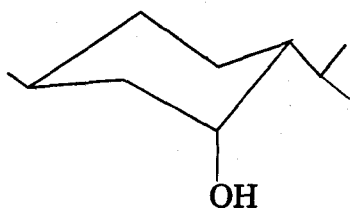


- (A) Both pairs are enantiomeric  
(B) Both pairs are diastereomeric  
(C) Pair I and II are enantiomeric and pair I and III are diastereomeric  
(D) Pair I and II are diastereomeric and pair I and III are enantiomeric

23. Which of the following sawhorse projections corresponds to the Fischer projection of the given molecule :



24. The relationship of various groups in neomenthol is :



- (A) Me and iPr trans; Me and OH cis; OH and iPr cis  
 (B) Me and iPr trans; Me and OH trans; OH and iPr cis  
 (C) Me and iPr trans; Me and OH trans; OH and iPr trans  
 (D) Me and iPr cis; Me and OH cis; OH and iPr cis

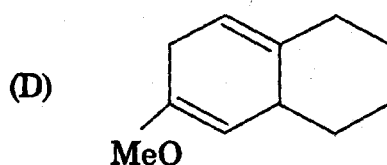
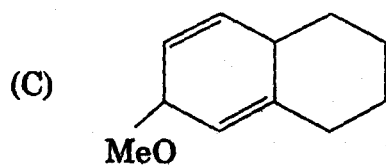
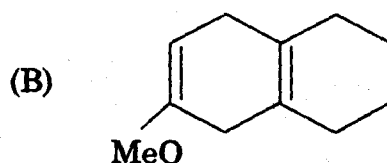
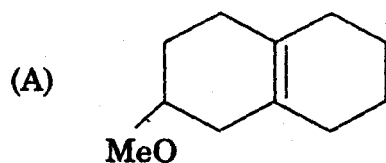
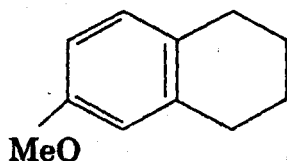
25. Which spectroscopic technique can clearly differentiate between cis and trans cinnamic acid ?

- (A) IR (B) Mass  
(C) UV (D) NMR

26. Amongst the  $(\text{CH}_3)_3\text{C}^\oplus$ ,  $\text{PhCH}_2^\oplus$  and  $:\text{CCl}_2$  intermediates the neutral, highly reactive and electrophilic species is :

- (A)  $(\text{CH}_3)_3\text{C}^\oplus$  (B)  $\text{PhCH}_2^\oplus$  and  $(\text{CH}_3)_3\text{C}^\oplus$   
(C) only  $:\text{CCl}_2$  (D)  $\text{PhCH}_2^\oplus$  and  $:\text{CCl}_2$

27. The Birch reduction of compound shown below gives :



28. Acetoacetic ester can be prepared by :

- (A) Aldol condensation (B) Claisen condensation  
(C) Stobbe condensation (D) Claisen rearrangement



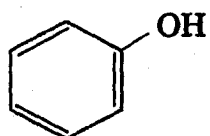
29. The molecular ions in the mass spectrum of bromobenzene will be seen at  $m/z$  :

- (A) 156 and 158 (B) 156 and 158 in 1 : 1 ratio  
(C) 156 (D) 158

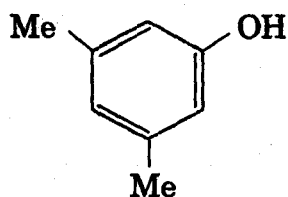
30. Which of the following is *not* a reducing agent ?

- (A) Lithium aluminium hydride (B) Sodium hydride  
(C) Zinc borohydride (D) Diborane

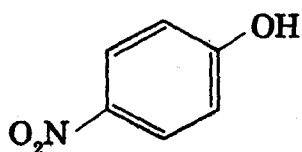
31. The  $pK_a$  value of the following phenols decreases in the order :



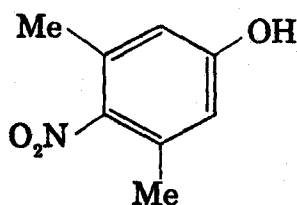
I



II



III



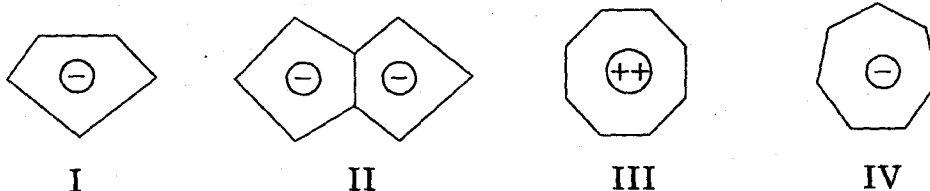
IV

- (A) I > II > IV > III (B) III > IV > I > II  
(C) II > I > IV > III (D) II > IV > I > III

32. The Baeyer's angle strain is expected to be maximum in :

- (A) Cyclododecane (B) Cyclohexane  
(C) Cyclopentane (D) Cyclooctane

33. Which of the following species is *not* aromatic in nature ?

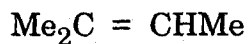


- (A) I (B) II  
(C) IV (D) III

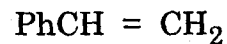
34. Arrange the following olefins (I to IV) in the increasing order of reactivity towards  $\text{CCl}_3\text{Br}$  in the presence of peroxides :



I



II



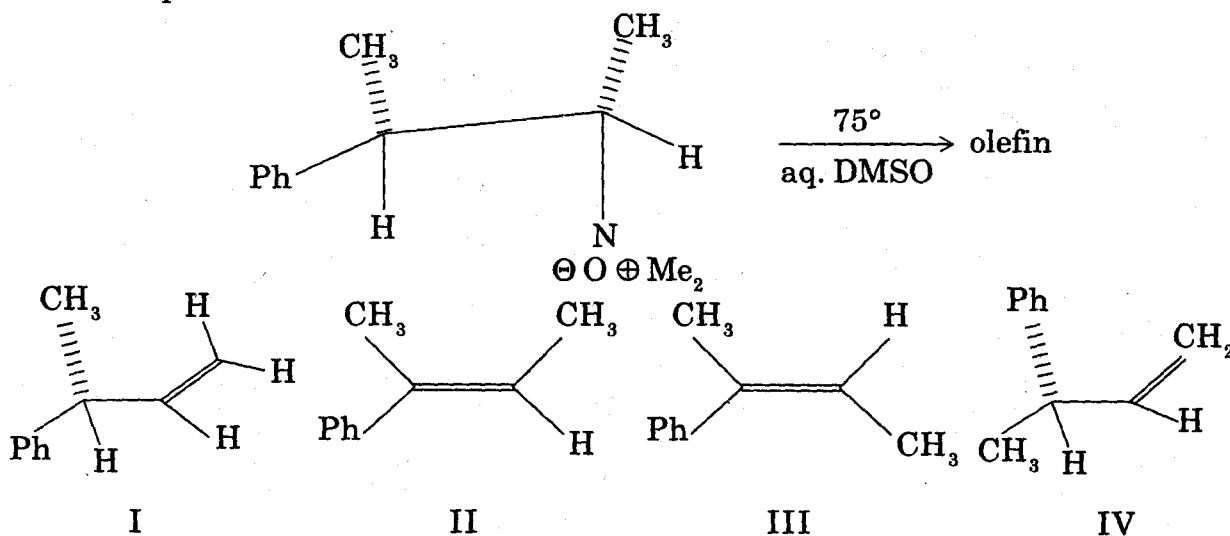
III



IV

- (A) I < II < III < IV (B) IV < II < III < I  
(C) II < III < IV < I (D) II < III < I < IV

35. Which of the following olefins will be obtained on the pyrolysis of the compound shown below ?



- (A) II (B) I  
(C) III (D) IV

36. The pH of  $10^{-6}$  N NaOH aqueous solution will be :
- (A) 6.0 (B) 6.9  
(C) 7.1 (D) 8.0
37. Which one of the following represents both a Lowry-Bronsted acid and a base ?
- (A)  $\text{PO}_4^{3-}$  (B)  $\text{H}_2\text{PO}_4^-$   
(C)  $\text{H}_3\text{PO}_4$  (D)  $\text{H}_2\text{PO}_3$
38. Which of the following is an aprotic solvent ?
- (A) Liquid  $\text{NH}_3$  (B) Liquid HF  
(C) Water (D)  $\text{CHCl}_3$
39. Which one of the following will *not* function as a buffer solution ?
- (A)  $\text{NaCl} + \text{NaOH}$   
(B)  $\text{CH}_3\text{COONH}_4 + \text{NaOH}$   
(C)  $\text{Na}_2\text{B}_4\text{O}_7 + \text{H}_3\text{BO}_3$   
(D)  $\text{NaH}_2\text{PO}_4 + \text{Na}_2\text{HPO}_4$
40. In which of the following compounds the oxidation number of oxygen is not - 2 ?
- (A)  $\text{KMnO}_4$  (B)  $\text{H}_2\text{SO}_4$   
(C)  $\text{H}_2\text{O}$  (D)  $\text{F}_2\text{O}$

41. The E.M.F. for  $\text{Mg (s)} + \text{Cr}^{3+} (\text{aq}) \rightarrow \text{Mg}^{2+} (\text{aq}) + \text{Cr (s)}$  in an electrochemical cell is given by :

$$(A) \quad \Delta E = \Delta E^\circ - \frac{RT}{2F} \ln \frac{[\text{Mg}^{2+}]}{[\text{Cr}^{3+}]}$$

$$(B) \quad \Delta E = \Delta E^\circ - \frac{RT}{2F} \ln \frac{[\text{Mg}^{2+}]^3}{[\text{Cr}^{3+}]^2}$$

$$(C) \quad \Delta E = \Delta E^\circ - \frac{RT}{6F} \ln \frac{[\text{Mg}^{2+}]^3}{[\text{Cr}^{3+}]^2}$$

$$(D) \quad \Delta E = \Delta E^\circ - \frac{RT}{3F} \ln \frac{[\text{Mg}^{2+}]^2}{[\text{Cr}^{3+}]^3}$$

42. The colour change of an acid-base indicator can be explained by :

- (A) Ostwald's dilution theory      (B) Debye-Huckel theory  
(C) Quinonoid theory                (D) Arrhenius theory

43. In the electrolysis of an acidic solution of  $\text{AgNO}_3$  between Pt electrodes, the discharged ion at the anode will be :

- (A)  $\text{NO}_3^-$                                 (B)  $\text{NO}_2^-$   
(C)  $\text{H}_3\text{O}^+$                                 (D)  $\text{OH}^-$

44. For an exothermic reaction, the equilibrium constant :

- (A) increases with increase of temperature  
(B) decreases with increase of temperature  
(C) no change with change in temperature  
(D) increases with increase of pressure

45. Which one of the following expressions represents Gibbs-Helmholtz equation?

(A)  $\Delta S = - \frac{\partial G}{\partial T}$

(B)  $\Delta H = - T^2 \left[ \frac{\partial (\Delta G)}{\partial T} \right]_P$

(C)  $\Delta G = - RT \ln K_C$

(D)  $\Delta H = \frac{1}{T^2} \left[ \frac{\partial (\Delta G)}{\partial T} \right]_P$

46. When a crystal of  $KMnO_4$  is added to water the process is accompanied by:

(A) Decrease of entropy

(B) Evolution of heat

(C) Increase of entropy

(D) Increase of free energy

47. Arrhenius equation can be written as :

(A)  $\frac{d \ln K}{dT} = - \frac{E_a}{RT}$

(B)  $\frac{d \ln K}{dT} = - \frac{E_a}{RT^2}$

(C)  $\frac{d \ln K}{dT} = \frac{E_a}{2.303 RT}$

(D)  $\frac{d \ln K}{dT} = \frac{E_a}{RT^2}$

48. The rate constant for a first order reaction is  $6.93 \times 10^{-4} \text{ min}^{-1}$ . What time will it take to reduce initial concentration of reactant from 1 M to 0.5 M solution ?
- (A)  $10^2$  min    (B)  $10^{-2}$  min  
 (C)  $10^{-3}$  min    (D)  $10^3$  min
49. Which one of the statements about a catalyst is universally *correct* ?
- (A) A catalyst remains unchanged chemically and physically  
 (B) A catalyst is always heterogeneous  
 (C) A catalyst lowers the energy of activation  
 (D) A catalyst increases the rate of forward reaction to a greater extent than that of a backward reaction.
50. Which one of the following is *not* a colligative property ?
- (A) Depression in freezing point  
 (B) Elevation of boiling point  
 (C) Increase in entropy  
 (D) Lowering of vapour pressure

## ROUGH WORK

## ROUGH WORK

ES  
AL