PAPER – II

CHEMICAL SCIENCES

Note : Attempt all the questions. Each question carries *two* (2)marks.

1. The atomic number of Cr and Cu is 24, 29 and its electronic configuration is

1) $3d^5\ 4s^1$ and $3d^{10}4s^1$

2) $3d^4\ 4s^2$ and $3d^{10}4s^1$

3) $3d^5\ 4s^1$ and $3d^9 4s^2$

4) $3d^4\ 4s^2$ and $3d^9 4s^2$

2. The difference in the electronegativity scale between the two atom is 1.9, the nature of the bond is

1) 75% ionic

2) 50% ionic

3) 25% ionic

4) 100% ionic

3. NaOH and HOCl both contains –OH groups but the former is base while the later is acid in their aquous solution, because

1) Na-O bond is more polar than O-H bond in NaOH

2) –O-H bond is more polar than Na-O bond in NaOH

3) H-O bond in HOCl is less polar

4) –O-Cl bond in HOCl is more polar

4. The oil of Vitriol is

1) $FeSO_4 \cdot 7H_2O$

2) $CuSO_4 \cdot 5H_2O$

3) H_2SO_4

4) $ZnSO_4 \cdot 5H_2O$

5. Gas which bleaches the colour of the flowers and vegetables by reduction is

1) SO_2

2) Cl_2

3) H_2S

4) Br_2

6. A greenish yellow gas reacts with an alkali metal hydroxide to form a halite, which can be used in fireworks and safety matches. The gas and halite respectively are

1) Cl_2 , $KClO_3$

2) Br_2 , $KBrO_3$

3) I_2 , $NaIO_3$

4) Cl_2 , $NaClO_3$

7. The element which has only +3 oxidation state is

1) Gd

2) Eu

3) Tb

4) Tm

8. The hybridisation of Copper in $[CU(NH_3)_4]SO_4$ is

1) Sp^3d^2

2) Sp^3

3) Sp^2

4) dSp^2

9. The hexadentate ligand is

1) acetyl acetonate

2) 8-hydroxy quinolate

3) ethylene diamine tetraacetate

4) ethylenediamine

10. The separation of lanthanides in ion exchange method is based on

1) Size of hydrated ions

2) Size of unhydrated ions

3) Basicity of hydroxides

4) Solubility of their nitrates

11. Which of the following is not considered as an organometallic compound?

1) Ferrocene

2) Cis-platin

3) Zeisel's salt

4) Grignard reagent

12. The equilibrium constants for the formation of $Ni(en)_3^{2+}$ is 10^{10} fold greater than the equilibrium constant for the formation of $Ni(NH_3)_6^{2+}$. The primary explanation for the large difference is

1) John teller effect

2) Chelate effect

3) Crystal field effect

4) Ammonalysis effect

13. Gel permeation chromatography can be used to separate

1) Lanthanides

2) Alkaline earths

3) Alkali metals

4) Low molecular weight peptide

14. The size of the hole in the centre of the porphyrin ring system is ideal for accommodating

1) 1^{st} transition series

2) 2^{nd} transition series

3) 3^{rd} transition series

4) Alkaline earth metal

15. If by mistake some radioactive substance gets into human body, then from the point of view of radiation damage, the most harmful will be one that emits

1) Gamma rays

2) Neutrons

3) β – rays

4) α – rays

16. For an Eigen function α^{ikx} of linear momentum operator $\hat{P}x$, the Eigen value is

1) ik

2) i

3) $i\hbar$

4) $k\hbar$

17. ———————— is Laplacian operator.

1) $\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}$

2) $i\frac{\partial}{\partial x}+j\frac{\partial}{\partial y}+k\frac{\partial}{\partial z}$

3) $\hat{A}\psi=a\psi$

4) $\hat{A}\widehat{A^n}$ - $\widehat{A^n}\hat{A}$

18. Equivalent symmetry operation for combined symmetry operation $\sigma_{xz}\,\sigma_{yz}$ is

1) $C_{2(z)}$

2) σ_{xy}

3) E

4) I

19. Eclipsed form of ruthenacene is

1) D_{5h}

2) C_{5v}

3) D_{2h}

4) S_5

20. Which of the following does not contain C_3 axis?

1) $POCl_3$

2) NH_4^+

3) H_3O^+

4) ClF_3

21. The temperature (T) dependence of the equilibrium constant (K) of a chemical reaction is correctly described by the following statement

1) For an endothermic reaction the slope of $\ln k$ vs $1/T$ plot is positive

2) For an endothermic reaction $k \alpha T$

3) For an endothermic reaction $k = T$

4) If ΔH is independent of temperature, the change in k with T is smaller at lower temperature

22. Consider a simple hypothetical reaction $A \dashrightarrow L$. The concentration of the product L goes on increasing with time. Hence the rate of the reaction (r) can also be expressed in term of increasing in concentration of product, L as well. Thus r is

1) $\frac{-dt}{dc1}$

2) $\frac{d[L]}{dt}$

3) $\frac{dt}{dc1}$

4) $\frac{-d[L]}{dt}$

23. Standard solution of KNO_3 is used to make salt bridge because

1) Velocity of K^+ is greater than of NO_3^-

2) Velocity of NO_3^- is greater than of K^+

3) Velocity of both K^+ and NO_3^- are nearly same

4) KNO_3 is highly soluble in water

24. In an electrolytic cell, the flow of electron is from

1) cathode to anode solution

2) cathode to anode through external supply

3) cathode to anode through internal supply

4) anode to cathode through internal supply

25. The reduction potentials of Cu^{2+}/Cu and Ag^+/Ag electrodes are 0.34 V and 0.80 V respectively. For what concentration of Ag^+ ions will the EMF of the cell at 25°C is zero. Given that the concentration of Cu^{2+} is 0.01 M

1) 1.65×10^{-9} M

2) 11.45×10^{-9} M

3) 2.34×10^{-7} M

4) 4.22×10^{-7} M

26. Which of the following statement is not true for lyophilic sols?

1) It is stable

2) It can be prepared in high concentration

3) Its colloidal particles are highly solvated

4) Its colloidal particles are less solvated

27. Fixed parts of a colloidal sol of AgI are respectively $[AgI]Ag^{+}$ and $[AgI]I^{-}$ in presence of

1) KI and $AgNO_3$

2) AgI and $AgNO_3$

3) AgI and KI

4) $AgNO_3$ and KI

28. For an ideal gas system the ratio of MPV : AV : Rms is

1) 1 : 1.12 : 1.22

2) 1 : 1.414 : 1.732

3) 1 : 2 : 3

4) 1 : 0.82 : 0.62

29. Find the value of the magnetic field necessary for protons to absorb at frequency of 200.00MHz

1) Bz = 4.6973T

2) Bz = 2.2131T

3) Bz = 8.1242T

4) Bz = 6.1234T

30. The correct equation representing Maxwell-Boltzmann distribution law is

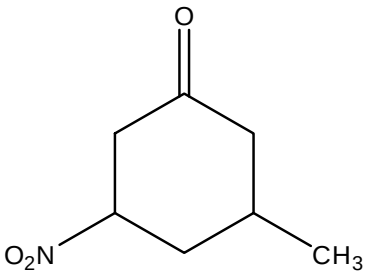
1) $n_i = g_i e^{-(\alpha+\beta\varepsilon_i)}$

2) $\frac{n_i}{n} = g_i e^{-(\alpha-\beta\varepsilon_i)}$

3) $n_i = \frac{g_i}{[e^{(\alpha+\beta\varepsilon_i)} - 1]}$

4) $n_i = \frac{g_i}{[1 - e^{(\alpha+\beta\varepsilon_i)}]}$

31. The IUPAC name of the following compound is



1) 3-methyl-5-nitrocyclohexanone

2) 5-methyl-3-nitrocyclohexanone

3) 3-methyl-5-nitro-1-oxocyclohexane

4) 5-methyl-3-nitro-1-oxocyclohexane

32. The priority order of groups for consideration in Cahn Ingold Prelog rule is

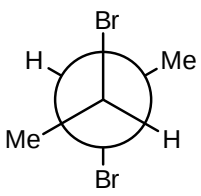
1) benzyl > allyl > isopropyl > ethyl

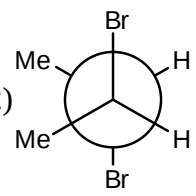
2) benzyl > isopropyl > ethyl > allyl

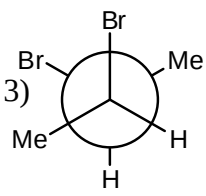
3) benzyl > ethyl > allyl > isopropyl

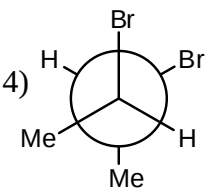
4) isopropyl > benzyl > allyl > ethyl

33. The Newmann projection of *meso*-2,3-dibromobutane is

1) 

2) 

3) 

4) 

34. Which of the following cabanions is more stable?

1) ethyl

2) phenyl

3) cyclopropyl

4) neopentyl

35. Choose the wrong statement :

1) Peterson reaction is known as sila Wittig reaction

2) In Peterson reaction, the stereochemistry of the product formed can be reversed when the catalyst is changed from acid to base

3) The Peterson olefination goes *via* four membered cyclic transition state

4) The Peterson olefination involves a free radical intermediate

36. Triacetoxyperiodinane is used as the oxidant in

1) Des Martin oxidation

2) Swern oxidation

3) Baeyer Villiger reaction

4) dienone phenol rearrangement

37. (S) sec-butyl tosylate on acetate treatment gives

1) (S)sec-butyl acetate

2) n-butyl acetate

3) t-butyl acetate

4) (R)sec-butyl acetate

38. Which of the following statements is wrong?

1) All the pericyclic reactions are concerted

2) All the pericyclic reactions are not stereospecific

3) The pericyclic reactions do not involve intermediates

4) The pericyclic reactions go via cyclic transition state

39. In acidic medium, oxepin can be easily rearranged to

1) phenol

2) 2,5-dimethylfuran

3) 2,5-dihydroxylfuran

4) 4-hydroxypyran

40. Choose the correct statement :

1) In 5α-cholestan-3β-ol the hydroxyl group and the angular methyl group are cis to each other, but in 5β-cholestan-3β-ol, they are trans to each other

2) In 5α-cholestan-3β-ol the hydroxyl group and the angular methyl group are trans to each other, but in 5β-cholestan-3β-ol, they are cis to each other

3) In both 5α-cholestan-3β-ol and 5β-cholestan-3β-ol, the hydroxyl group and the angular methyl group are cis to each other

4) In both 5α-cholestan-3β-ol and 5β-cholestan-3β-ol, the hydroxyl group and the angular methyl group are trans to each other

41. A compound on ozonolysis yields only acetone and no other carbonyl compounds. The compound is

1) 1-butene

2) 2,3-dimethyl-2-butene

3) 1,3-butadiene

4) cyclohexene

42. The ^{1}H NMR spectral data of a compound are given : 1.3,t, 6H; 4.29, q, 4H; 7.4 to 7.9, m, 4H. The molecular mass is 222. The compound is

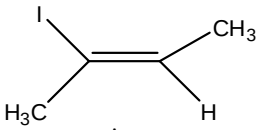
1) diethylphthalate

2) diethyl tere-phthalate

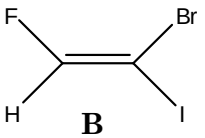
3) dimethyl phthalate

4) dimethyl tere-phthalate

43. Which of the following statements is true?



A



B

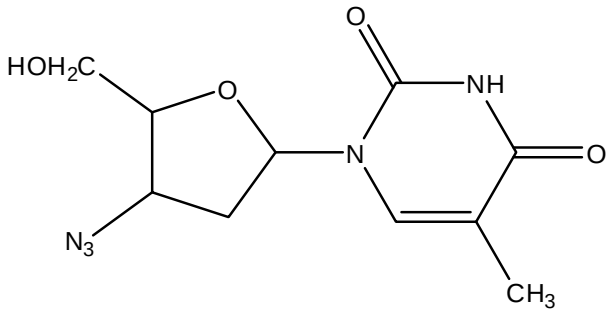
1) A has E configuration and B has Z configuration

2) A has Z configuration and B has E configuration

3) Both A and B have Z configuration

4) Both A and B have E configuration

44. The following compound is used in the treatment of AIDS. How many stereoisomers are possible for this compound?



1) 4

2) 6

3) 8

4) 27

45. The main function of an enzyme is

1) to transport energy

2) to shift the equilibrium

3) to maintain the Ph

4) to catalyse a biological reaction

46. The diameter of bucky ball is about

1) 1A°

2) 100A°

3) 1 nm

4) 10 nm

47. In medicine $MgSO_4 \cdot 7H_2O$ is used as

1) purgative

2) antiseptic

3) analgesic

4) Antipyretics

48. Choose the supramolecule from the given below compounds

1) Glucose

2) DNA

3) Caffine

4) Glycine

49. Eutrophication is process which involves

1) Depletion of ozone layer

2) Increase in the concentration of O_3 in water

3) Decrease in the concentration of dissolved oxygen in water by algae

4) Decrease in the level of SO_2 in air

50. Green Chemistry synthesis could also involves which of the following

1) High temperature

2) Dicholoromethane

3) Fossil fuels

4) Microwave

ROUGH WORK

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