

Code No. **J – 2270**

**Entrance Examination for Admission to the P.G. Courses in the  
Teaching Departments, 2020  
CSS**

**CHEMISTRY**

**General Instructions**

1. The Question Paper is having two Parts — Part 'A' Objective type (60%) & Part 'B' Descriptive type (40%).
2. Objective type questions which carry 1 mark each are to be (✓) 'tick marked' in the response sheets against the appropriate answers provided.
3. 8 questions are to be answered out of 12 questions carrying 5 marks each in Part 'B'.
4. **Negative marking** : 0.25 marks will be deducted for each wrong answer in Part 'A'.

**Time : 2 Hours**

**Max. Marks : 100**

To be filled in by the Candidate

Register Number	in Figures								
	in words								

PART – A  
(Objective Type)

Choose appropriate answer from the options in the questions. **One mark each.**

**(60 × 1 = 60 marks)**

1. In the Schrodinger equation for a system, the symbol H stands for
  - a) Schrodinger constant
  - b) Hamiltonian operator
  - c) Energy
  - d) Eigen value

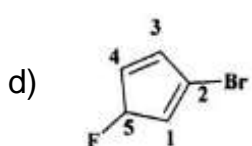
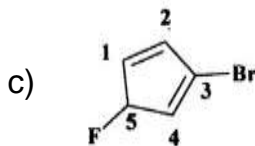
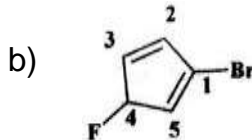
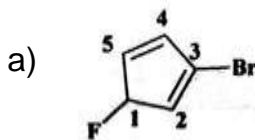
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2. The available atomic orbitals with the lowest energy levels are occupied before those with higher energy levels is called
- a) Aufbau principle
  - b) Hund's rule
  - c) Pauli's principle
  - d) Heisenberg's principle
3. Which particle among the following will have the smallest de Broglie wavelength, measuring that they have the same velocity
- a) a positron
  - b) a photon
  - c) an alpha particle
  - d) a neutron

4. Which of the following is used as indelible ink?
- a) aq. Cobalt nitrate solution b) aq. Silver nitrate solution c) aq. Ferric nitrate solution d) aq. Copper nitrate solution
5. Among the followings, which is both paramagnetic and coloured?
- a)  $K_3 [Cu(CN)_4 ]$  b)  $(NH_4)_2 TiCl_6$   
 c)  $K_2CrO_4$  d)  $VOCl_2$
6. In which of the following reaction  $H_2O_2$  is acting as a reducing agent?
- a)  $H_2O_2 + SO_2 \rightarrow H_2SO_4$  b)  $\overset{H}{O} \overset{2}{2} + 2KI \rightarrow 2KOH + I_2$   
 c)  $4H_2O_2 + PbS \rightarrow PbSO_4 + H_2O$  d)  $\overset{H}{O} \overset{2}{2} + Ag_2 \rightarrow 2 Ag + H_2O + O_2$
7. Bleaching action of  $CaOCl_2$  is due to
- a) nascent oxygen b) hydrogen chloride  
 c) chlorine d) hydrogen oxychloride
8. The total number of possible isomers for the complex compound  $[Cu(NH_2)_4][PtCl_4]$  is
- a) six b) five  
 c) four d) three
9. Pyrometallurgy involves
- a) roasting and calcination  
 b) calcination and smelting  
 c) roasting and smelting  
 d) roasting, calcination and smelting

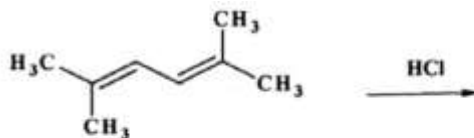
10. The maximum covalency is generated equal to
- the number of unpaired  $s$  electrons
  - the actual number of  $s$  and  $p$  electrons in the valence shell
  - the number of unpaired  $p$  electrons
  - the number of unpaired  $s$  and  $p$  electrons
11. Among the followings, which is the best for measuring nanostructure?
- STM
  - SEM
  - TEM
  - AFM
12. The reagent(s) for group VI of inorganic cation analysis is (are)
- aqueous solution disodium hydrogen phosphate
  - acidic solution disodium hydrogen phosphate
  - acidic solution sodium hydrogen phosphate and hydrogen sulphide
  - basic solution disodium hydrogen phosphate
13. The lattice energy of a crystalline ionic compound is calculated using
- Alfred-Rochow scale
  - Pauling's scale
  - Born-Lande equation
  - Mulliken scale
14. Hydrogen bomb is an example of nuclear
- fission
  - fusion
  - transformation
  - transmutation
15. The metal found in myoglobin is
- Iron
  - Cobalt
  - Nickel
  - Copper
16. The precipitation that occurs as a layer upon the already formed precipitate is termed as
- post-precipitation
  - co-precipitation
  - layer-precipitation
  - agglutination

17. The indicator for complexometric titration is
- a)  $I_2$  b) EDTA  
c)  $KMnO_4$  d)  $K_2Cr_2O_7$
18. The cathode in the Coolidge tube is made of
- a) Copper b) Barium  
c) Platinum d) Tungsten
19. \_\_\_\_\_ is an allotrope of carbon whose molecule consists of carbon atoms connected by single and double bonds so as to form a closed/partially closed mesh, with fused rings of five to seven atoms.
- a) Fullerene b) Graphite  
c) Diamond d) Graphene
20. Glass transition temperature of a polymer can be measured using
- a) TGA b) XRD  
c) DSC d) SEM
21. Which of the following numbering is correct?



22. An alkene on treatment with  $NaIO_4$ ,  $KMnO_4$  and  $Na_2O_2$  gives 2 moles of acetone. The alkene is
- a) 2, 3-dimethyl but-2-ene b) 2-methyl but-2-ene  
c) 3-methyl but-1-ene d) 3, 3-dimethyl but-1-ene

23. What is the product of the following reaction?



- a) b)
- c) d)

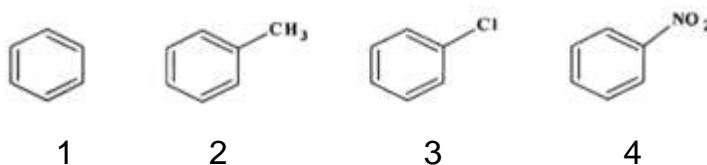
24. Ethanol when treated with  $I_2$  and NaOH gives

- a)  $CH_3CH_2I$  b)  $CH_2 = CH_2$   
 c)  $CH_3 - O - CH_3$  d)  $CHI_3$

25. The enol form of acetone after treatment with  $D_2O$  gives

- a)  $CH_3 - C(OD) = CH_2$  b)  $CH_2D - C(OH) = CH_2$   
 c)  $CD_3 - CO - CD_3$  d)  $CD_3 - C(OD) = CD_2$

26. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds :



- a)  $2 > 1 > 3 > 4$  b)  $2 > 3 > 1 > 4$   
 c)  $4 > 3 > 2 > 1$  d)  $1 > 2 > 3 > 4$

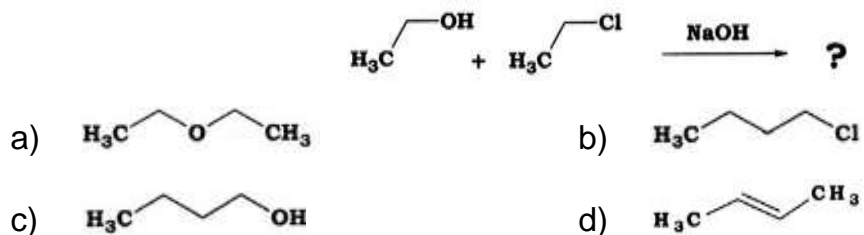
27. The reaction  $\text{CH}_3\text{Br} + \text{OH}^- \rightarrow \text{CH}_3\text{OH} + \text{Br}^-$  is

- a)  $\text{S}_{\text{N}}1$
- b)  $\text{S}_{\text{N}}2$
- c)  $\text{S}_{\text{E}}1$
- d)  $\text{S}_{\text{E}}2$

28. Toluene reacts with chlorine in the presence of sunlight to give

- a) para chlorotoluene
- b) benzoyl chloride
- c) ortho chlorotoluene
- d) benzyl chloride

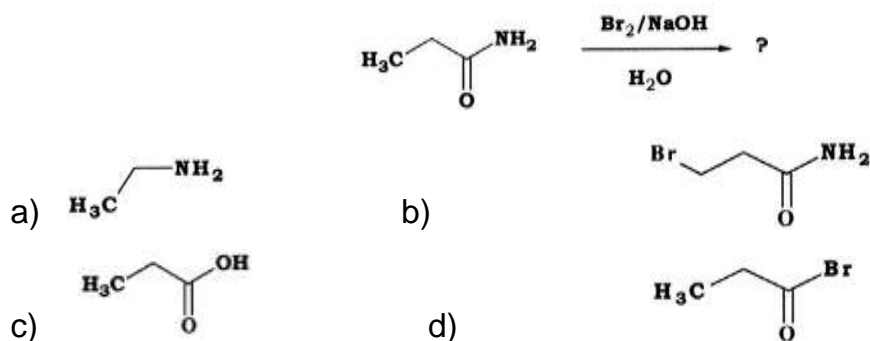
29. Choose the product of the following reaction



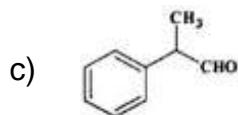
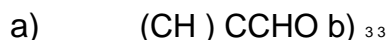
30. Ethylbenzene on oxidation with potassium permanganate gives

- a) benzaldehyde
- b) benzoic acid
- c) phenyl acetic acid
- d) acetic acid and benzene

31. Choose the product of the reaction :



32. Which of the followings give Aldol condensation reaction?

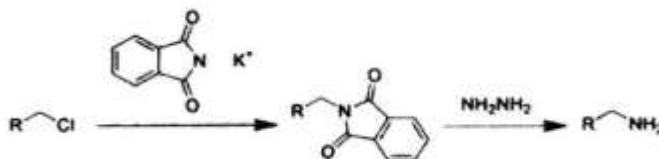


d)

33. Carboxylic acids on treatment with bromine and a catalytic amount of phosphorus leads to the selective  $\alpha$ -bromination is known as

- a) Cope reaction b) Perkin reaction c) Schmidt reaction d) HVZ reaction

34. The following reaction is known as



a) Hofmann reaction

b) Gabriel synthesis

c) Perkin reaction

d) Schmidt reaction

35. The mixture of Rochelle salt and copper sulphate is called

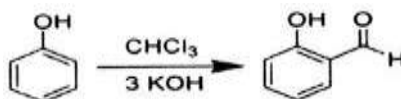
a) Fehling's solution

b) Caro's reagent

c) Tollan's reagent

d) Nessler's reagent

36. The following reaction is known as



a) Oppenheimer oxidation

b) Cannizzaro reaction

c) HVZ reaction

d) Reimer Tiemann reaction

37. Conversion of an acid chloride to an aldehyde by the hydrogenolysis using Palladium and Barium sulphate catalysts is known as

a) MPV reduction b) Wolf-Kishner reduction

c) Rosenmund reduction d) Birch reduction



38. The chemical name of Vitamin C is
- a) cobalamin                                      b) ascorbic acid  
c) calcitriol                                      d) linoleic acid
39. Furan reacts with ammonia in presence of alumina at 400°C to give
- a) pyrrole    b) 3-aminofuran  
c) pyridine    d) 2-aminofuran
40. In H-NMR the OH peak of phenol and ethanol appears at \_\_\_\_\_ and \_\_\_\_\_ ppm respectively.
- a) 5.5 and 4.5                                      b) 8.5 and 7.5  
c) 8.5 and 4.5                                      d) 4.5 and 2.5
41. A gas is liquefied
- a) above critical temperature and below critical pressure  
b) below critical temperature and above critical pressure  
c) below critical temperature and critical pressure  
d) above critical temperature and critical pressure
42. CsBr has *bcc* structure with edge length of 4.30 Å . The shortest interionic distance in between  $\text{Cs}^+$  and  $\text{Br}^-$  in Å is
- a) 3.72    c) 7.44                                      b) 37.2    d) 74.4
43. Heat of a reaction does not depend on
- a) temperature of the reaction  
b) physical states of the reactants and products  
c) whether the reaction is carried out at constant pressure or volume  
d) the path by which final product is obtained

44. The relationship between enthalpy change and internal energy change for a system is given by

a)  $\Delta H = \Delta E + P\Delta V$

b)  $\Delta H = \Delta E - P\Delta V$

c)  $\Delta H = \Delta E + PV$

d)  $\Delta H = \Delta E + RT$

45. Choose the correct relation

a)  $K_C = K_X (P_T)^{\Delta n}$

b)  $K_P = K_C (P_T)^{\Delta n}$

c)  $K_P = K_X (P_T)^{\Delta n}$

d)  $K_P = K_X (R_T)^{\Delta n}$

46. The temperature dependence of rate constant ( $k$ ) of a chemical reaction is written in terms of Arrhenius equation  $k = A \cdot e^{-E/RT}$ . Activation energy ( $E$ ) of the reaction

can be calculated by plotting

a)  $k$  vs  $1/T$

b)  $\log k$  vs  $1/T$

c)  $\log k$  vs  $1/\log T$

d)  $k$  vs  $T$

47. Tyndall effect

a) absorption of light

b) presence of electrically charged particles

c) reflection of light

d) scattering of light

48. The pH of saturated solution of  $Zn(OH)_2$  is 9.2 at  $25^\circ C$ . The value of solubility product of  $Zn(OH)_2$  at this temperature is

a)  $1.8 \times 10^{-7}$

b)  $1.8 \times 10^{-14}$

c)  $.8 \times 10^{-10}$

d)  $1.8 \times 10^{-5}$

49. For the reaction system  $2 \text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$ , volume is suddenly reduced to half its value by increasing the pressure on it. If the reaction is of first order with respect to  $\text{O}_2$  and second order with respect to  $\text{NO}_2$ , the rate of reaction will
- diminish to one-fourth of its initial value
  - diminish to one-eighth of its initial value
  - increase to eight times of its initial value
  - increase to four times of its initial value
50. The transition without emission of radiation of a molecule from a stable excited state to an unstable excited state that leads to dissociation is termed as
- Pre-dissociation
  - Post-dissociation
  - Fluorescence
  - Phosphorescence
51. The \_\_\_\_\_ Bravais lattices are grouped into \_\_\_\_\_ lattice systems.
- fourteen, seven
  - sixteen, eight
  - fifteen, seven
  - twelve, six
52. The \_\_\_\_\_ says that as absolute zero is approached, the entropy change  $\Delta S$  for a chemical or physical transformation approaches the value of zero.
- Gibbs theorem
  - Nernst heat theorem
  - The zeroth law
  - Carnot theorem
53. Equivalent amounts of aqueous solutions of a weak acid and a weak base have a dissociation constant  $5 \times 10^{-7}$  each. The percentage hydrolysis of salt is
- 8.3
  - 33.2
  - 66.4
  - 16.6
54. If the half-cell reaction  $A + e^- \rightarrow A^-$  has a large negative reduction potential, it follows that
- $A$  is readily oxidized
  - $A$  is readily reduced
  - $A^-$  is readily oxidized
  - $A^-$  is readily reduced

55. The standard e.m.f. of the cell  $\text{Cd(s)}|\text{CdCl}_2(\text{aq})||\text{AgCl}(\text{aq})|\text{Ag(s)}$  in which the cell reaction is  $\text{Cd} + 2\text{AgCl(s)} \rightarrow 2\text{Ag(s)} + 2\text{Cl}^-(\text{aq})$  is 0.6915 V at 0°C and 0.6755 V at 25°C is \_\_\_\_\_ kJ
- a) -176.0    b) -334.7  
 c) +123.5    d) -167.6
56. The \_\_\_\_\_ law states that only that light which is absorbed by a system can bring about a photochemical change.
- a) Grotthuss-Draper    b) Einstein's  
 c) Lambert's    d) Stark
57. The graph of a conductometric titration involving a strong acid and a strong base
- a) first increases and then decreases  
 b) first decreases and then increases  
 c) first decreases and then remaining same  
 d) first increases and then remaining same
58. The ratio of the electric current derived from the cation to the total electric current is called
- a) transport number    b) ionic constant  
 c) oxidation number    d) transference number
59. The purple of Cassius is colloidal solution of
- a) silver    b) antimony  
 c) gold    d) copper
60. During the discharge of the lead storage battery, the reaction occurring at anode is represented by
- a)  $\text{Pb}_2 + 2\text{e}^- \rightarrow \text{Pb}$     b)  $\text{Pb} + \text{SO}_4^{2-} \rightarrow \text{PbSO}_4 + 2\text{e}^-$   
 c)  $\text{SO}_4^{2-} + 2\text{H}^+ \rightarrow \text{H}_2\text{SO}_4$     d)  $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$

ANSWER SHEET — PART — A

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E
14	A	B	C	D	E
15	A	B	C	D	E
16	A	B	C	D	E
17	A	B	C	D	E
18	A	B	C	D	E
19	A	B	C	D	E
20	A	B	C	D	E

21	A	B	C	D	E
22	A	B	C	D	E
23	A	B	C	D	E
24	A	B	C	D	E
25	A	B	C	D	E
26	A	B	C	D	E
27	A	B	C	D	E
28	A	B	C	D	E
29	A	B	C	D	E
30	A	B	C	D	E
31	A	B	C	D	E
32	A	B	C	D	E
33	A	B	C	D	E
34	A	B	C	D	E
35	A	B	C	D	E
36	A	B	C	D	E
37	A	B	C	D	E
38	A	B	C	D	E
39	A	B	C	D	E
40	A	B	C	D	E

41	A	B	C	D	E
42	A	B	C	D	E
43	A	B	C	D	E
44	A	B	C	D	E
45	A	B	C	D	E
46	A	B	C	D	E
47	A	B	C	D	E
48	A	B	C	D	E
49	A	B	C	D	E
50	A	B	C	D	E
51	A	B	C	D	E
52	A	B	C	D	E
53	A	B	C	D	E
54	A	B	C	D	E
55	A	B	C	D	E
56	A	B	C	D	E
57	A	B	C	D	E
58	A	B	C	D	E
59	A	B	C	D	E
60	A	B	C	D	E



## CHEMISTRY

### PART – B (Descriptive Type)

Answer **any eight** questions.

**(8 × 5 = 40 Marks)**

1. Discuss the major differences between Valance bond and Molecular Orbital theories.
2. Describe the manufacturing process and uses of glass.
3. Discuss the various factors that affect the stability of a coordination compound.
4. Explain the various methods of synthesis of nanoparticles.
5. Distinguish between E1 and E2 mechanisms.
6. How do you convert an
  - (a) aldose to ketose and
  - (b) a ketose to aldose

Write down the reaction steps.

7. What are the main reagents used for reduction? Give one examples each of the following reductions :
- (a) Rosenmund
  - (b) Clemmenson
  - (c) Wolf-Kishner.
8. Draw the IR and proton NMR spectra of  $\text{CH}_3\text{-CO-O-CH}_2\text{-CH}_3$  . Pick the main IR bands and NMR peaks (with peak splitting).
9. Describe the various types of liquid crystals.
10. (a) What is Stark-Einstein law?
- (b) What is the principle of NMR?
11. (a) What is Michaelis – Menten law?
- (b) What is Debye-Falkenhagen effect?
12. Differentiate between Freundlich and Langmuir isotherms.



