

PUNJAB PUBLIC SERVICE COMMISSION

Competitive Examination (September-2017) for Recruitment of Lecturer Chemistry
in the Department of Technical Education & Industrial Training, Govt. of Punjab

READ INSTRUCTIONS BEFORE FILLING ANY DETAILS OR ATTEMPTING TO ANSWER THE QUESTIONS.

Candidate's Name _____

Father's Name _____

Date of Birth
DD MM YYYY

Category Code*

(*as given in the admit card)

OMR Response Sheet No. _____



Roll No. _____

Booklet No.

004216

Candidate's Signature (Please sign in the box)

INSTRUCTIONS

- The candidate shall NOT open this booklet till the time told to do so by the Invigilation Staff. However, in the meantime, the candidate can read these instructions carefully and subsequently fill the appropriate columns given above in CAPITAL letters. The candidate may also fill the relevant columns (other than the columns related to marking responses to the questions) of the Optical Mark Reader(OMR) response sheet, supplied separately.
- Use only blue or black ball point pen to fill the relevant columns on this page. Use of fountain pen may leave smudges which may make the information given by the candidate here illegible.
- The candidate shall be liable for any adverse effect if the information given above is wrong or illegible.
- The candidate must fill all the columns given above on this page and sign at the appropriate place.
- Each candidate is required to attempt 100 questions in 120 minutes, except for orthopaedically/visually impaired candidates, who would be given 40 minutes extra, by marking correct responses on the OMR sheet which would be supplied separately to the candidates.
- The candidate must write the following on the OMRs sheet:
(a) Serial number of OMR sheet supplied to him/her for marking the responses to the questions.
(b) Serial number of the question booklet
Failure to do so may lead to cancellation of candidature or any other action which the Commission may deem fit.
- The candidate should darken the appropriate response to the question by completely darkening the appropriate circle/oval according to his/her choice of response i.e. a, b, c or d in the manner shown in the example below.

- Partly darkening the circle/oval on the OMR response sheet or using other symbols such as tick mark or dots would not result in evaluation of the response as the OMR scanner can only interpret the answers by reading the darkened responses in the manner explained in preceding paragraph. Darkening more than one circle/oval as response to a question shall also be considered as wrong answer.
- The candidates shall be responsible to ensure that the responses are marked in correct manner and any adverse impact due to wrong marking of responses would be the responsibility of the respective candidate. The following are some of the examples of wrong marking of responses on the OMR response sheet.

- The candidates, when allowed to open the question paper booklet, are advised to check the booklet to confirm that the booklet has complete number of pages, the pages printed correctly and there are no blank pages. In case there is any such error in the question paper booklet then the candidate should immediately bring this fact to the notice of the invigilation Staff and obtain a booklet of the same series as this one.
- The serial number of the new booklet should be entered in the relevant column of the OMR. The candidate should request the Invigilation Staff to authenticate the change in serial number of question booklet by obtaining the initials of the Staff on the corrected serial number of the question booklet.
- The question paper booklet has 22 pages.
- Each question shall carry three marks.
- There are four options for each question and the candidate has to mark the most appropriate answer on the OMR response sheet using blue or black ball point pen.
- There is no negative marking for wrong answers or questions not attempted by the candidate.

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1. Who among the following is credited for the political integration of India?
 - (a) Sardar Vallabh Bhai Patel
 - (b) Dr Zakir Hussain
 - (c) Mahatama Gandhi
 - (d) Lala Lajpat Rai
2. Who among the following was associated with Ghadar party?
 - (a) Bhagat Singh
 - (b) Chander Shekhar Azad
 - (c) Kartar Singh Sarabha
 - (d) Kalpana Dutt
3. Who among the following is known as 'Nightingale of India'?
 - (a) Kalpana Dutt
 - (b) Sarojini Naidu
 - (c) Gulab Kaur
 - (d) Bhikaji Cama
4. Who among the following is Governor of the RBI?
 - (a) Raghuram Rajan
 - (b) Urjit Patel
 - (c) N.S. Vishwanathan
 - (d) Arvind Subramaniam
5. Find the correct match :-

A. Michael Temer	i) China
B. Vladimir Putin	ii) Brazil
C. Jacob Zuma	iii) Russia
D. Xi Jinping	iv) South Africa

 - (a) A (ii) B(iii) C (iv) D (i)
 - (b) A (iii) B (ii) C (iv) D (i)
 - (c) A (ii) B (iv) C (i) D (iii)
 - (d) A (iii) B (ii) C (i) D (iv)
6. Luddi is a _____
 - (a) Male Ornament
 - (b) Female Ornament
 - (c) Folk Song
 - (d) Folk Dance

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7. Which of the following cities have the largest Grain Market?
- (a) Khanna
 - (b) Morinda
 - (c) Amritsar
 - (d) Sunam
8. In which of the following districts, the National Martyrs Memorial, Hussainiwala located?
- (a) Fazilka
 - (b) Ferozepur
 - (c) Tarantarn
 - (d) Amritsar
9. Which of the following rivers form Sunderban delta?
- (a) Kaveri
 - (b) Ganga
 - (c) Krishna
 - (d) Godavari
10. The Ashoka Chakra in Indian national flag consists of how many spokes?
- (a) 22
 - (b) 24
 - (c) 25
 - (d) 30
11. Rohingya is/are _____
- (a) Border state of Myanmar
 - (b) People normally from Rakhine state, Myanmar
 - (c) Folk dance of Myanmar
 - (d) Local name of a sacred tree of Myanmar
12. The working principle of a washing machine is:
- (a) Reverse Osmosis
 - (b) Diffusion
 - (c) Centrifugation
 - (d) Dialysis

13. When light passes from one medium to another, which of the following properties change?

1. Wavelength
2. Velocity
3. Frequency

Select the correct answer using the codes given below:

- (a) 1 only
- (b) 2 only
- (c) 1 and 3 only
- (d) 1 and 2 only

14. Who is credited with the discovery of Electron?

- (a) E. Gold Stein
- (b) J. J. Thompson
- (c) James Chadwick
- (d) Rutherford

Directions (Qs. 15 - 17) : Each questions consist of two words which have a certain relationship to each other followed by four pairs of related words. Select the pair which has the same relationship.

15. LIGHT : BLIND

- (a) Speech : dumb
- (b) Language : deaf
- (c) Tongue : sound
- (d) Voice : vibrato

16. AFTER : BEFORE

- (a) First : Second
- (b) Present : Past
- (c) Contemporary : Historic
- (d) Successor : Predecessor

17. POETRY : RHYME

- (a) Chain : Table
- (b) Clothes : Paper
- (c) Newspaper : Reading
- (d) Mystery : Suspense

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Directions (Qs. 18 to 20): Read the following information to answer these questions.

Five friends namely Kiran, Geeta, Honey, Ramesh and Jagan have very good characteristics and are being considered for various awards. Geeta, Kiran and Honey are sincere. Kiran, Ramesh and Jagan are very brave. Ramesh, Honey and Jagan are very truthful. Kiran, Geeta and Jagan are courteous.

18. Which of the following person is neither brave nor courteous?
(a) Kiran
(b) Geeta
(c) Honey
(d) Ramesh
19. Which of the following person is neither truthful nor brave but is courteous?
(a) Honey
(b) Ramesh
(c) Kiran
(d) Geeta
20. Which combination of friends is not 'Brave' but 'Sincere'?
(a) Geeta and Kiran
(b) Jagan and Honey
(c) Honey and Ramesh
(d) Geeta and Honey
21. The metal extracted from the ore bauxite is
(a) Aluminium
(b) Gold
(c) Iron
(d) Tungsten
22. What is the Indian Councils Act 1909 popularly known as?
(a) Chelmsford Act
(b) Morley-Minto Reforms Act
(c) Government of India Act
(d) Charter Act
23. Which of the following is true for 'Sound'?
(a) Sound cannot travel through vacuum
(b) Sound cannot travel through gas
(c) Sound cannot travel through liquids
(d) Sound cannot travel through solids

24. The pancreas secretes

- (a) Bile
- (b) Peurine
- (c) Insulin
- (d) None of the above

25. Who was the first Chairman of Rajya Sabha?

- (a) S. Radhakrishnan
- (b) Zakir Hussain
- (c) Vallabh Bhai Patel
- (d) None of the above

26. LPG consists of mainly

- (a) methane, ethane and hexane
- (b) ethane, hexane and nonane
- (c) methane, hexane and nonane
- (d) methane, butane and propane

27. Deficit financing means that the government borrows money from the

- (a) RBI
- (b) local bodies
- (c) big businessmen
- (d) IMF

28. Preamble enshrines the ideals of liberty, equality and fraternity. These ideals are inspired by the

- (a) Russian Revolution
- (b) Irish Revolution
- (c) French Revolution
- (d) US Constitution

29. Match the following:

- | | |
|-------------------|----------------|
| A) K.K. Venugopal | i) Law |
| B) Ravi Shastri | ii) Cricket |
| C) Raghuram Rajan | iii) Economist |
| D) Bipin Rawat | iv) Army |

- (a) A (i) B(ii) C (iii) D (iv)
- (b) A (iii) B (ii) C (iv) D (i)
- (c) A (ii) B (iv) C (i) D (iii)
- (d) A (iii) B (ii) C (i) D (iv)

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30. Who has been recently appointed as Defence Minister of India?

- (a) Smriti Irani
- (b) Uma Bharati
- (c) Sushma Swaraj
- (d) Nirmala Sitharaman

31. The order of increasing Bronsted acidity for boron hydride is

- (a) $B_{10}H_{14} < B_5H_9 < B_6H_{10}$
- (b) $B_6H_{10} < B_{10}H_{14} < B_5H_9$
- (c) $B_5H_9 < B_6H_{10} < B_{10}H_{14}$
- (d) $B_{10}H_{14} < B_6H_{10} < B_5H_9$

32. The colorless species is

- (a) VCl_3
- (b) $VOSO_4$
- (c) Na_3VO_4
- (d) $[V(H_2O)_6]SO_4 \cdot H_2O$

33. Extra pure N_2 can be obtained by heating

- (a) NH_3 with CuO
- (b) NH_4NO_3
- (c) $(NH_4)_2Cr_2O_7$
- (d) $Ba(N_3)_2$

34. Which is the most stable oxidation state in lanthanides?

- (a) +2
- (b) +3
- (c) +4
- (d) +5

35. Number of lone pairs in XeF_2 molecule is

- (a) 2
- (b) 1
- (c) 3
- (d) 0

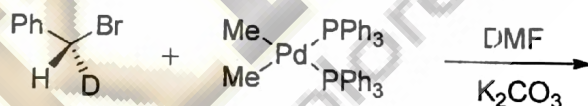
36. Which do not decolorize $KMnO_4$ aqueous solution?

- (a) $C_2O_4^{2-}$
- (b) HSO_3^-
- (c) CO_3^{2-}
- (d) SO_3^{2-}

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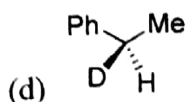
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37. The correct order of magnetic moment (spin only values in B.M.) among is
- $[\text{Fe}(\text{CN})_6]^{4-} > [\text{CoCl}_4]^{2-} > [\text{MnCl}_4]^{2-}$
 - $[\text{MnCl}_4]^{2-} > [\text{Fe}(\text{CN})_6]^{4-} > [\text{CoCl}_4]^{2-}$
 - $[\text{Fe}(\text{CN})_6]^{4-} > [\text{MnCl}_4]^{2-} > [\text{CoCl}_4]^{2-}$
 - $[\text{MnCl}_4]^{2-} > [\text{CoCl}_4]^{2-} > [\text{Fe}(\text{CN})_6]^{4-}$
38. Ligand field stabilization energy (LFSE) and magnetic moment value for an octahedral d^7 ion in high spin state is
- $4\Delta_o/5$ and 3.8 BM
 - $4\Delta_o/5$ and 1.7 BM
 - $3\Delta_o/5$ and 5.9 BM
 - $6\Delta_o/5$ and 4.8 BM
39. Mossbauer spectrum of a metal complex gives information about
- Oxidation state and spin state of metal
 - Type of ligands coordinated to metal
 - Geometry of metal
 - All above
40. According to Hard and Soft acid base principle, a hard acid is
- Has low charge density
 - Shows preference of soft bases
 - It is not polarizable
 - None of the above
41. Consider the following reaction

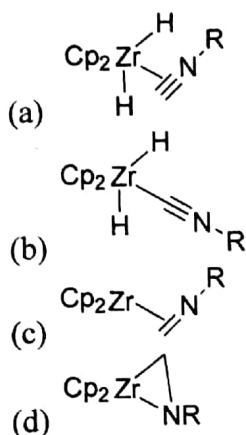


What is the correct product?

- $$\begin{array}{c} \text{H} \quad \text{D} \\ | \quad | \\ \text{Me} - \text{C} - \text{Ph} \\ | \quad | \\ \text{Me} \quad \text{Br} \end{array}$$
- $$\begin{array}{c} \text{D} \quad \text{H} \\ | \quad | \\ \text{Me} - \text{C} - \text{Ph} \\ | \quad | \\ \text{Me} \quad \text{Br} \end{array}$$
- $$\begin{array}{c} \text{Ph} \quad \text{Me} \\ | \quad | \\ \text{C} \\ | \\ \text{H} \quad \text{D} \end{array}$$



42. What is the correct product in the following reaction?

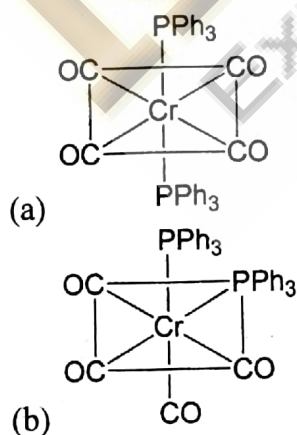


43. Magnetic moment of the following complexes follow the order

Cp_2V (i), Cp_2Ni (ii), Cp_2Co^+ (iii), Cp_2Fe^+ (iv)

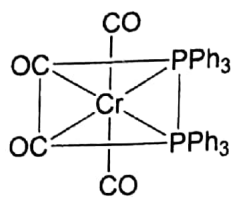
- (a) $\text{iii} < \text{iv} < \text{ii} < \text{i}$
 (b) $\text{iii} < \text{iv} < \text{i} < \text{ii}$
 (c) $\text{iv} < \text{iii} < \text{ii} < \text{i}$
 (d) $\text{iv} < \text{iii} < \text{i} < \text{ii}$

44. The complex $[\text{Cr}(\text{CO})_4(\text{PPh}_3)_4]$ has strong IR absorption at 1889 cm^{-1} the possible structure are



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- (c)
(d) Both (a) and (b)

45. Which pair among the following is iso-structural
- (a) XeF_2 , IF_2^-
 (b) NH_3 , BF_3
 (c) CO_3^{2-} , SO_3^{2-}
 (d) PCl_5 , ICl_5
46. The correct order of increasing bond length of CO , CO_3^{2-} and CO_2 is
- (a) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$
 (b) $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
 (c) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$
 (d) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
47. IF_5 and SbF_5 react together with ratio of 1:1 to form
- (a) $[\text{SbF}_4]^+ [\text{IF}_6]^-$
 (b) $[\text{IF}_4]^+ [\text{SbF}_6]^-$
 (c) $[\text{IF}_3]^+ [\text{SbF}_7]^-$
 (d) $[\text{IF}_6]^+ [\text{SbF}_4]^-$
48. In FCC crystal lattice, edge length is 400pm. The radius of the greatest sphere which can be fitted into the interstitial void without distortion of the lattice is
- (a) 58.54
 (b) 32.56
 (c) 28.27
 (d) 66.68
49. Which of the following molecules cannot produce rotational Raman spectrum?
- (a) H_2
 (b) CO_2
 (c) CH_4
 (d) SF_4

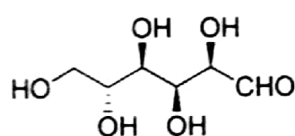
50. In a coordinate compound of general molecular formula, $Ma_2b_2c_2$, where M-metal ion, a,b,c-monodentate ligands. The pair of enantiomers will be

- (a) 0
- (b) 1
- (c) 2
- (d) 6

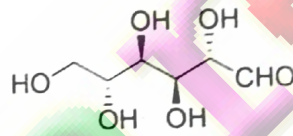
51. $[Pt(NH_3)_2Cl_2]$ coordinate compound exist in three isomers, which isomer is used in medicine as antitumor agent?

- (a) Tetrahedral
- (b) Trans- square-planar
- (c) Cis- square-planar
- (d) All

52. The correct relation between the molecules (A) and (B) are



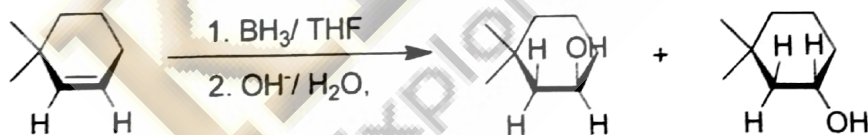
(A)



(B)

- (a) Diastereomer, epimer
- (b) Enantiomer, epimer
- (c) Diastereomer, anomer
- (d) Enantiomer, anomer

53. Predict the faces of the π -bond in the following hydroboration–oxidation reaction of alkene

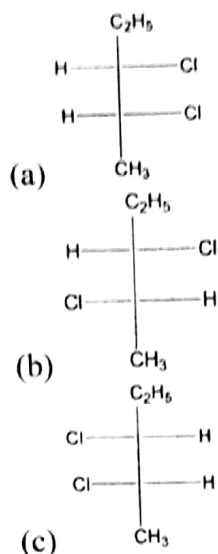


- (a) Enantiotropic
- (b) Diastereotropic
- (c) Stereohetrotropic
- (d) None of these

54. The no. of stereoisomer possible for 2,3-pentanediol is

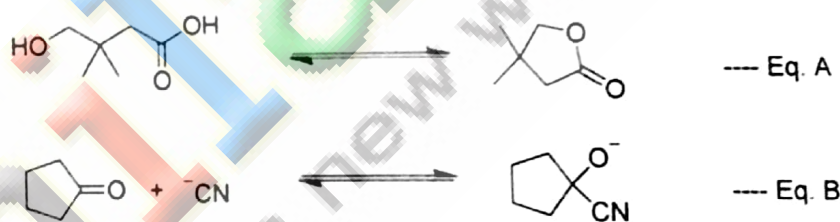
- (a) 2
- (b) 3
- (c) 4
- (d) 5

55. Which of the following compound exhibit optical activity



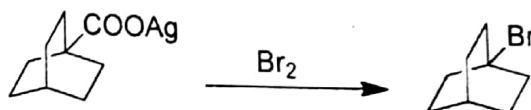
(d) All of these

56. Correct statement on the effect of addition of aq. HCl on the equilibrium is



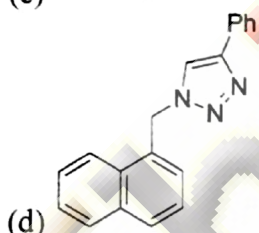
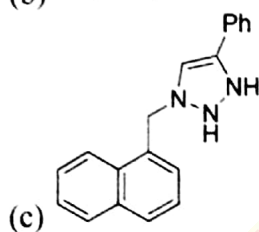
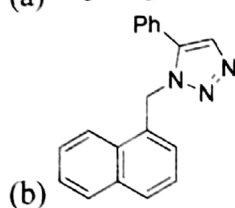
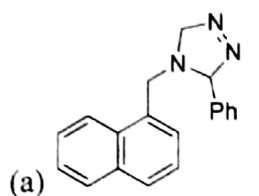
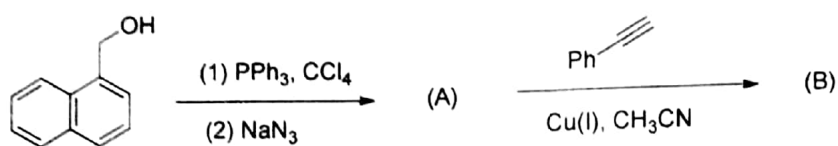
- (a) Equilibrium will shift towards right in case of both A and B
 (b) Equilibrium will shift towards left in case of both A and B
 (c) Equilibrium will shift towards right in A and left in case of B
 (d) Equilibrium will shift towards right in B and left in case of A

57. In the following reaction, predict the most likely reaction mechanism is

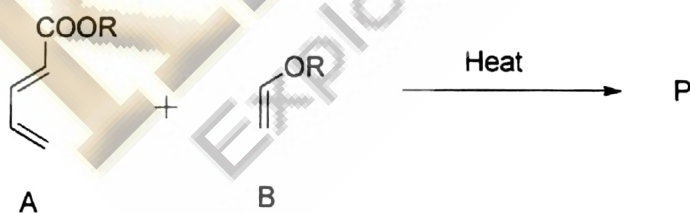


- (a) Free radical intermediate
 (b) Carbanion intermediate
 (c) Carbocation intermediate
 (d) Carbene intermediate

58. In the following reaction, the major product B is



59. Correct statement for the following reaction is



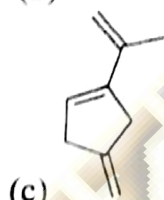
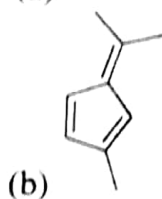
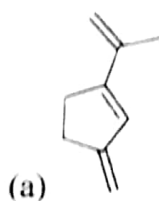
- (a) HOMO of A and LUMO of B will react
- (b) HOMO of B and LUMO of A will react
- (c) Both are possible
- (d) None of the above

60. In the following concerted reaction, the product is formed by



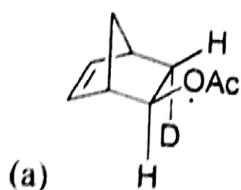
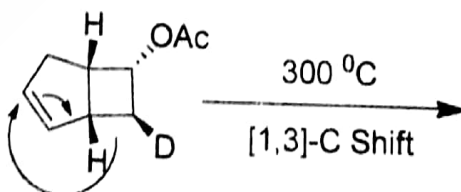
- (a) 6π -disrotatory electrocycelisation
- (b) 4π -disrotatory electrocycelisation
- (c) 6π -conrotatory electrocycelisation
- (d) 4π -conrotatory electrocycelisation

61. Which of the following compound has more number of acidic hydrogen atoms



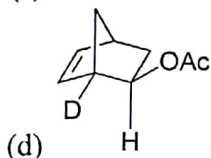
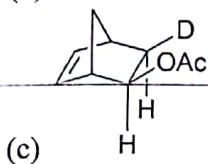
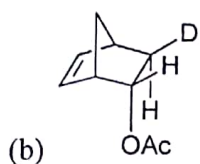
- (d) None of these

62. A concerted [1,3]-sigmatropic rearrangement took place in the reaction shown below. The structure of the resulting product is



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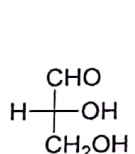


63. Arrange these amino acids in order of their increasing isoelectric point

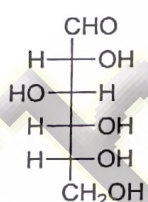
Lysine (Lys), Cystine (Cys), Aspartine (Asp), Alanine(Ala)

- (a) Lys < Cys < Asp < Ala
(b) Ala < Asp < Cys < Lys
(c) Asp < Ala < Cys < Lys
(d) Cys < Ala < Asp < Lys

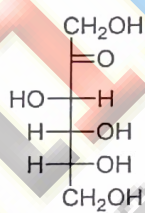
64. Optical rotation of compounds along with their structures is given below. Which of them have D-configuration?



(+) rotation
i



(+) rotation
ii



(-) rotation
iii

- (a) i, ii, iii
(b) ii, iii
(c) i, ii
(d) iii

65. Aldehydes and ketones both reacts with

- (a) Fehling solution
(b) Grignard reagent
(c) Tollen's reagent
(d) Schiff's reagent

66. Deficiency of vitamin D leads to disease

- (a) Rickets
- (b) Beri-Beri
- (c) Scurvy
- (d) Night-blindness

67. An Organic compound shows following special data:

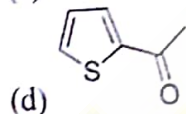
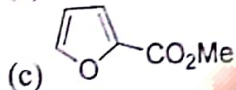
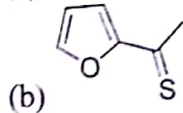
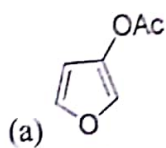
IR (cm^{-1}): 1680

^1H NMR (CDCl_3): 7.66(m, 1H), 7.60(m, 1H), 7.10(m, 1H), 2.50(s, 3H)

^{13}C NMR (CDCl_3): 190, 144, 134, 132, 128, 28.

m/z (EI): 126 (M^+ , 100%), 128 ($\text{M}^+ + 2$, 4.9%)

The structure of the compound is

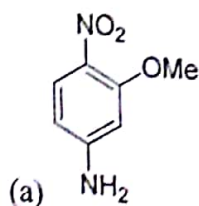


68. In the mass spectrum of 1,2-dichloroethane, approximate ratio of peaks at m/z values 98, 100, 102 will be

- (a) 3:1:1
- (b) 9: 6:1
- (c) 1:1:2
- (d) 1:2:1

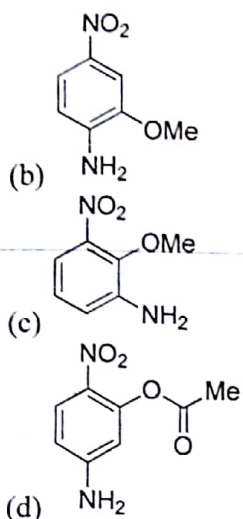
69. The structure of the compound that matches the ^1H NMR data given below is

^1H NMR($\text{DMSO}-d_6$): δ 7.75 (dd, $J = 8.8, 2.4$ Hz, 1H), 7.58 (d, $J = 2.4$ Hz, 1H), 6.70 (d, $J = 8.8$ Hz, 1H), 6.50 (broad s, 2H), 3.80 (s, 3H)

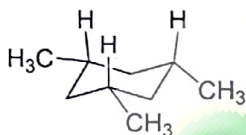


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70. The pattern of ^1H NMR for the given compound



- (a) A_2X_2
 (b) AMX
 (c) AX_3
 (d) A_4
71. If the reduced mass of a diatomic molecule is doubled without changing its force constant, the vibrational frequency of the molecule will be
- (a) $\sqrt{2}$ times the original frequency
 (b) $\frac{1}{\sqrt{2}}$ times the original frequency
 (c) twice the original frequency
 (d) unchanged
72. The ^1H NMR frequency at 1.0 T is 42.4 MHz. If the gyromagnetic ratios of ^1H and ^{13}C are 27×10^7 and $6.75 \times 10^7 \text{ T}^{-1} \text{ s}^{-1}$, respectively, what will be the ^{13}C frequency at 1.0 T?
- (a) 10.6 MHz
 (b) 169.6 MHz
 (c) 42.6 MHz
 (d) 21.3 MHz

73. The vibrational frequency of a homonuclear diatomic molecule is ν . The temperature at which the population of the first excited state will be half that of the ground state is given by

- (a) $h\nu \cdot \ln 2 / k_B$
- (b) $h\nu / (\ln 2 \cdot k_B)$
- (c) $\ln 2 / (h\nu \cdot k_B)$
- (d) $h\nu \cdot \log 2 / k_B$

74. The electric-dipole allowed transition among the following is

- (a) $^3S \rightarrow ^3D$
- (b) $^3S \rightarrow ^3P$
- (c) $^3S \rightarrow ^1D$
- (d) $^3S \rightarrow ^1F$

75. 25 ml of 0.01 AgNO_3 solution is mixed with 25 ml of 0.0005 M aqueous NaCl solution. Determine ionic product if the precipitate of AgCl will be formed. (Given $K_{sp}(\text{AgCl}) = 1.7 \times 10^{-10} \text{M}^2$)

- (a) $1.225 \times 10^{-5} \text{M}^2$
- (b) $2.145 \times 10^{-6} \text{M}^2$
- (c) $1.425 \times 10^{-6} \text{M}^2$
- (d) $1.125 \times 10^{-6} \text{M}^2$

76. The correct pH of 0.01 M aqueous solution of CH_3COONa at 25°C is (where, K_a for $\text{CH}_3\text{COOH} = 1.75 \times 10^{-5}$ and $K_w = 1.008 \times 10^{-14}$)

- (a) 8.83
- (b) 7.58
- (c) 9.12
- (d) 8.38

77. Heat capacity of a species is independent of temperature if it is

- (a) Tetratomic
- (b) Triatomic
- (c) Diatomic
- (d) Monoatomic

78. Match list-I (electrode) with list-II (type) and select the correct answer using the codes given below:

List I	List II
a Calomel	1 Reference
b Glass	2 Redox
c Hydrogen	3 Membrane
d Quinhydrone	4 Gas

Codes:

	a	b	c	d
(a)	1	2	3	4
(b)	1	3	4	2
(c)	2	1	4	3
(d)	3	2	1	4

79. A zinc rod is placed in 0.1 M solution of zinc sulphate at 25 °C. Assuming that the salt is dissociated to the extent of 95% at this dilution, the potential of the electrode is ($E_{Zn^{2+}, Zn}^{\circ} = -0.76V$)

- (a) -0.76V
- (b) -0.79V
- (c) 0.79V
- (d) -0.72

80. A wood piece, obtained from an archaeological source has only 25% as much ^{14}C activity as a fresh piece of wood. The age of wood piece is (^{14}C $t_{1/2} = 5770$ years)

- (a) 11554
- (b) 12635
- (c) 10734
- (d) 13576

81. In a chemical reaction: $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$, xenon gas is added at constant volume. The equilibrium

- (a) will shift towards the reactant
- (b) will shift towards the products
- (c) will not change the amount of reactant and products
- (d) will increase both reactant and products

82. The pressure of nitrogen required for adsorption of $1.0 \text{ cm}^3 \text{ g}^{-1}$ (25°C , 1.013 bar) of gas on graphitized carbon black are 24 Pa at 77.5 K and 290 Pa at 90.1K. The enthalpy of adsorption at this fraction of surface coverage is
- 11.6 KJ mol^{-1}
 - 16.3 KJ mol^{-1}
 - 12.5 KJ mol^{-1}
 - 10.6 KJ mol^{-1}
83. What is the equation for the distance between 110 planes for a crystal with mutually perpendicular axes?
- $d = ab/(a^2 + b^2)^{1/2}$
 - $d = n\lambda / 2\sin\theta$
 - $d = ab/(a^3 + b^3)^{1/3}$
 - $d = b/(a^3 + b^3)^{1/3}$
84. For a primitive cubic crystal with $a = 3 \times 10^{-10} \text{ m}$ and $\lambda = 1.50 \times 10^{-10} \text{ m}$, the smallest diffraction angles θ is of plane
- 110
 - 100
 - 111
 - 222
85. Silver crystallizes in face-centered cubic structure. The 2nd order diffraction angle of a beam of X-ray ($\lambda = 1\text{\AA}$) of (111) plane of the crystal is 30° . Therefore, the cell length of the crystal would be
- $a = 3.284 \text{\AA}$
 - $a = 3.174 \text{\AA}$
 - $a = 3.915 \text{\AA}$
 - $a = 3.464 \text{\AA}$
86. The condensation of acetophenone with formaldehyde and dimethylamine to form 3-dimethylamino-1-phenyl-1-propanone is name reaction called
- Mannich reaction
 - Robinson reaction
 - Perkin reaction
 - Stobbe reaction

87. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic field and electric fields?

- (A) $n=1, l=0, m=0$
- (B) $n=2, l=0, m=0$
- (C) $n=2, l=1, m=1$
- (D) $n=3, l=2, m=1$
- (E) $n=3, l=2, m=0$

- (a) (A) and (B)
- (b) (B) and (D)
- (c) (C) and (D)
- (d) (D) and (E)

88. Heating mixture of Cu_2O and Cu_2S will give

- (a) $\text{Cu} + \text{SO}_2$
- (b) $\text{Cu} + \text{SO}_3$
- (c) $\text{CuO} + \text{CuS}$
- (d) Cu_2SO_3

89. 10^{-6} M NaOH is diluted 100 times. The pH of the diluted bases is

- (a) between 5 and 6
- (b) between 6 and 7
- (c) between 10 and 11
- (d) between 7 and 8

90. Coordination compound has great importance in biological systems. In this context which of the following statements is incorrect?

- (a) Chlorophylls are green pigments in plants and contains calcium
- (b) Carboxypeptidase-A is an enzyme and contains zinc
- (c) Cyanocobalamin is B_{12} and contains cobalt
- (d) Haemoglobin is the red pigment of blood and contains iron

91. Match the following

Compound		^{13}C NMR Chemical Shift (δ ppm)		
(A)	Acetic acid	(i)	95	
(B)	Acetonitrile	(ii)	115	
(C)	Acetone	(iii)	175	
(D)	Carbon tetrachloride	(iv)	205	
(a)	(A)-(iii)	(B)-(ii)	(C)-(iv)	(D)-(i)
(b)	(A)-(iii)	(B)-(iv)	(C)-(i)	(D)-(ii)
(c)	(A)-(i)	(B)-(ii)	(C)-(iv)	(D)-(iii)
(d)	(A)-(iii)	(B)-(i)	(C)-(ii)	(D)-(iv)

92. Among Al_2O_3 , SiO_2 , P_2O_3 and SO_2 the correct order of acid strength is

- (a) $\text{SO}_2 < \text{P}_2\text{O}_3 < \text{SiO}_2 < \text{Al}_2\text{O}_3$
- (b) $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{P}_2\text{O}_3 < \text{SO}_2$
- (c) $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{SO}_2 < \text{P}_2\text{O}_3$
- (d) $\text{SiO}_2 < \text{SO}_2 < \text{Al}_2\text{O}_3 < \text{P}_2\text{O}_3$

93. In 1L saturated solution of AgCl [$K_{\text{sp}}(\text{AgCl}) = 1.6 \times 10^{-10}$], 0.1 mol of CuCl [$K_{\text{sp}}(\text{CuCl}) = 1.0 \times 10^{-6}$] is added. The resultant concentration of Ag^+ in the solution is 1.6×10^{-x} . The value of "x" is.

- (a) 7
- (b) 9
- (c) 13
- (d) 15

94. A solution containing one mole per litre each of $\text{Cu}(\text{NO}_3)_2$, AgNO_3 , $\text{Hg}_2(\text{NO}_3)_2$ and $\text{Mg}(\text{NO}_3)_2$ is electrolyzed using inert electrodes. Standard electrode potentials in volts (reduction potentials) are:

- (i) $\text{Ag}^+ | \text{Ag} = 0.80$
- (ii) $\text{Hg}_2^{2+} | \text{Hg} = 0.79$
- (iii) $\text{Cu}^{2+} | \text{Cu} = 0.34$
- (iv) $\text{Mg}^{2+} | \text{Mg} = -2.37$

With increasing voltage, the sequence of deposition of metals on the cathode will be:

- (a) $\text{Ag}, \text{Hg}, \text{Cu}, \text{Mg}$
- (b) $\text{Mg}, \text{Cu}, \text{Hg}, \text{Ag}$
- (c) $\text{Ag}, \text{Hg}, \text{Cu}$
- (d) $\text{Cu}, \text{Hg}, \text{Ag}$

95. The correct order of magnetic moments (spin only values in B.M.) among is

- (a) $[\text{MnCl}_4]^{2-} > [\text{CoCl}_4]^{2-} > [\text{Fe}(\text{CN})_6]^{4-}$
- (b) $[\text{Fe}(\text{CN})_6]^{4-} > [\text{CoCl}_4]^{2-} > [\text{MnCl}_4]^{2-}$
- (c) $[\text{Fe}(\text{CN})_6]^{4-} > [\text{MnCl}_4]^{2-} > [\text{CoCl}_4]^{2-}$
- (d) $[\text{MnCl}_4]^{2-} > [\text{Fe}(\text{CN})_6]^{4-} > [\text{CoCl}_4]^{2-}$

(Atomic numbers: $\text{Mn} = 25$; $\text{Fe} = 26$; $\text{Co} = 27$)

96. In a first order reaction the $a/(a-x)$ was found to be 8 after 10 min. The rate constant is

- (a) $(2.303 \times 3 \log 2)/10$
- (b) $(2.303 \times 2 \log 3)/10$
- (c) $10 \times 2.303 \times 2 \log 3$
- (d) $10 \times 2.303 \times 3 \log 2$

97. Which of the following set represents all aromatic amino acids?

- (a) Tryptophan, Histidine, Asparagines
- (b) Tyrosine, Tryptophan, Histidine
- (c) Tyrosine, Tryptophan, Proline
- (d) Phenylalanine, Tyrosine, Lysine

98. The condensation of methyl vinyl ketone with cyclic ketones to provide Bicyclic cyclohexeneones is known as

- (a) Mannich reaction
- (b) Claisen condensation
- (c) Robinson annulation
- (d) Dieckmann condensation

99. In Infrared spectroscopy which frequency range is known as finger print region?

- (a) 400-1400 cm^{-1}
- (b) 1400-900 cm^{-1}
- (c) 900-600 cm^{-1}
- (d) 600-250 cm^{-1}

100. "Phosphorescence" is represented as:

- (a) $T_1 \longrightarrow S_0 + h\nu$
- (b) $T_1 \longrightarrow S_0 + \Delta$
- (c) $S_1 \longrightarrow S_0 + h\nu$
- (d) $S_1 \longrightarrow T_1 + \Delta$
