Code No.	R – 2108
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## Entrance Examination for Admission to the P.G. Courses in the **Teaching Departments**, 2023 CSS **CHEMISTRY/CHEMISTRY WITH SPECIALIZATION IN (RENEWABLE ENERGY/FUNCTIONAL MATERIALS) General Instructions** 1. The Question Paper is having 100 Objective Questions, each carrying one mark. 2. The answers are to be $(\checkmark)$ 'tick marked' **only** in the "**Response Sheet**" provided. 3. Negative marking : 0.25 marks will be deducted for each wrong answer . Time : 2 Hours Max. Marks: 100 To be filled in by the Candidate Register in Figures Number in words

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

- 1. Which one of the following has the smallest radius?
  - a) Na<sup>+</sup>
  - b) Li<sup>+</sup>
  - c) Be<sup>2+</sup>
  - d) Mg<sup>2+</sup>

DONOTWRITEHERE

# 2. When KCI gas is passed through a saturated solution of common salt, pure NaCI is precipitated because

\_\_\_\_\_

- a) The impurities disolve in HCI
- b) HCI is highly soluble in water
- c) Ionic product, [Na<sup>+</sup>] [Cl<sup>-</sup>] exceeds the solubility product of NaCI
- d) The solubility product is lowered by Cl<sup>-</sup> ions from aqueous HCI

3.	Which of the following products is obtained on heating, $B_2H_6$ with $NH_3$ in the ratio (4.2) at high an term products 2					
	(1:4	2) at higher temperatures?				
	a)	$B_3N_3H_3$	b)	$B_2H_62NH_3$		
	c)	Boron nitride	d)	B <sub>3</sub> N <sub>3</sub> H <sub>6</sub>		
4.	Wh	nich of the following has pyramidal	shape	e?		
	a)	BCl <sub>2</sub>	b)	PF <sub>3</sub>		
	c)	SO <sub>2</sub>	d)	CO <sub>3</sub> <sup>2-</sup>		
5.	A n	nolecule with highest bond energy	is			
	a)	Fluorine	b)	Chlorine		
	c)	Bromine	d)	lodine		
6.	In t	he dichromate ion Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>				
	a)	4 Cr-O bonds are equivalent	b)	6 Cr-O bonds are equivalent		
	c)	All Cr-O bonds are equivalent	d)	All Cr-O bonds are non – equivalent		
7.	Wh	nich complex has square planar str	ucture	e?		
	a)	Ni(Co) <sub>4</sub>	b)	[Ni(CN) <sub>4</sub> ] <sub>2-</sub>		
	c)	$[\operatorname{NiCl}_4]^{2-}$	d)	$[Cu(NH_3)_4]^{2+}$		
8.	The	e trace metal present in insulin is				
	a)	Iron	b)	Cobalt		
	c)	Zinc	d)	Manganese		
9.	CF	SE $(\Delta_0)$ for high spin d <sup>5</sup> octahedra	l corr	nplex is		
	a)	1.8	b)	0		
	c)	2.0	d)	3.0		

10. Which among the following is NOT an iron containing enzyme?

- a) Urease b) Catalase
- c) Cytochrome P-450 d) Peroxidise

11. Which of the noble gas was observed in solar spectrum?

- a) He b) Ar
- c) Ne d) Rn
- 12. Which of the following is not possible?
  - a) XeF<sub>2</sub> b) XeF<sub>4</sub>
  - c)  $XeF_3$  d)  $XeF_6$
- 13. The forces acting between noble gases are
  - a) Vander Waal's force b) Ion-dipole force
  - c) London dispersion force d) Magnetic force
- 14. Which of the following phosphorous sulphides is used in the manufacture of "strike anywhere" matches?
  - a)  $P_2S_3$  b)  $P_2S_5$ c)  $P_4S_3$  d) None of the above
- 15. The end product of natural radioactive series is
  - a) bismuth b) polonium
  - c) any isotope of lead d) thorium
- 16. T-shaped inter halogen compound is
  - a) CIF<sub>5</sub> b) ICI
  - c)  $CIF_3$  d)  $IF_5$

- 3hrs is
  - a) 11.5% 12.5% b)
  - c) 13.5% d) 14.5%
- 18. Which metal oxide will react both with acid and base?
  - a) BeO b) BaO
  - c) CaO d) MgO
- 19. The splitting of the spectral lines under the influence of an electric field is called
  - Raman effect Zeeman effect a) b)
  - Stark effect Photoelectric effect c) d)
- 20. Transition metals are often paramagnetic owing to
  - Their high melting point and boiling point a)
  - The presence of vacant orbitals b)
  - The presence of one or more unpaired electrons in the system c)
  - d) Their being less electropositive than the elements of group I A and II A

## 21. In gel

- Liquid is dispersed in solid Gas is dispersed in solid a) b)
- c) Liquid is dispersed in liquid d) Solid is dispersed in solid

## 22. The catalyst used in the Haber process for the manufacture of ammonia is

- Pt b) Pd a)
- c) Ni d) Fe

## 23. Haemoglobin is a/an

- a) Iron (II) complex b)
- c) Magnesium (II) complex d)
- Cobalt (III) Complex
- Chromium (III) complex

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- 24. Which of the following orbitals has zero probability of finding the electron in yz plane?
  - a) p<sub>x</sub> b) p<sub>y</sub>
  - c)  $p_z$  d)  $d_{yz}$
- 25. According to VSEPR, the arrangement of lone pairs of an atom containing a total of four such pair is
  - a) Linear b) Tetrahedron
  - c) Square planar d) Octahedron
- 26. Cupellation is a process used for the refining of
  - a) Silverb) Leadc) Copperd) Iron
- 27. The chemical processes in the production of steel from haematite ore involve
  - a) Reduction
  - b) Oxidation
  - c) Reduction followed by oxidation
  - d) Oxidation followed by reduction
- 28. The ratio of the energy of a photon of 200nm wavelength to that of 400nm radiation is
  - a) ¼ b) 4
  - c) <sup>1</sup>⁄<sub>2</sub> d) 2
- 29. The number of nearest neighbours around each particles in a face centered cubic lattice is
  - a) 4 b) 6 c) 8 d) 12
- 30. Solution of pure buckminsterfullerene has a colour ofa) Greenb) Purple

a)	Oreen	<b>D</b> )	i uipie
c)	Pink	d)	Yellow

- 31. Which one of the following is an example for top-down approach?
  - a) Ball milling technique b) Sol-gel process
  - c) Both (a) and (b) d) None of the above
- 32. What property of metallic nanoparticles causes them to have an optical resonance?
  - a) Quantum confinement
  - b) Surface Plasmons
  - c) Stokes shifts
  - d) High cross sectional density correlation
- 33. The triple point of water is at
  - a) 273.16K b) 273.16 K and 760 Torr
  - c) 273.16 K and 4.58 Torr d) 760 Torr
- 34. Only one absorption band is observed invisible region of spectrum of
  - a)  $[Ni(H_2O)_6]^{2+}$  b)  $Ti[(H_2O)_6]^{3+}$ c)  $[Fe(CN)_6]^{4-}$  d)  $VO_4^{3-}$
- 35. Which is the electrolyte used in Li-ion battery?
  - a) Lead dioxide b) Lithium-based gel
  - c) Sulfur dioxide d) Cobalt
- 36. Which of the following is also known as invert detergents?
  - a) Anionic detergents
  - b) Cationic detergents
  - c) Non-ionic detergents
  - d) All detergents comes in the category of invert detergents
- 37. Which of the following is NOT an example of a natural biodegradable polymer?
  - a) Collagen b) Polyvinyl alcohol
  - c) Lignin d) Natural rubber

38. The most stable carbocate	on Is
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- a)  $CH_3 S CH_2^+$  b)  $CH_3 C^+H CH_3$
- c)  $F C^{+}H_{2}$  d)  $CI_{3} C^{+}$

#### 39. The compound 2,3 dichloro butane has

- a) Four stereo isomers
- b) Two pairs of enantiomers
- c) One pair of enantiomers
- d) One pair of enantiomers and two meso compounds

#### 40. Inductive effect is a polarisation of a

- a) sigma bond b) pi bond
- c) co-ordinate bond d) conjugated system
- 41. Which of the following compound has the highest boiling point?
  - a) n-hexaneb) n-pentanec) 2,2-dimethyl propaned) 2-methyl butance

#### 42. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is

a)  $3^{\circ} > 2^{\circ} > 1^{\circ}$ b)  $3^{\circ} < 2^{\circ} < 1^{\circ}$ c)  $3^{\circ} > 2^{\circ} < 1^{\circ}$ d)  $3^{\circ} < 2^{\circ} > 1^{\circ}$ 

#### 43. The epimer of glucose is

- a) Fructose b) Galactose
- c) Ribose
- 44.  $\alpha$  Helix is refers to
  - a) primary structure of protein b) secondary
    - c) tertiary structure of protein
- b) secondary structure of protein

Deoxyribose

d) quarternary structure of protein

d)

- 45. The formula  $C_3H_0N$  may represent
  - 1° and 2° amines b)  $2^{\circ}$  and  $3^{\circ}$  amines a)
  - $1^{\circ}$ ,  $2^{\circ}$  and  $3^{\circ}$  amines 1<sup>°</sup> amine only c) d)
- 46. Carbon and hydrogen are estimated by
  - Leibig's method a) b)
  - Kjeldhal's method c) d)
- 47. A compound is chiral even if
  - mirror plane is present a)
  - centre of inversion exists b)
  - a rotation axis exists c)
  - d) an improper roatation axis is present
- 48. Alkyl halides can be converted into Grignard reagents by
  - a) Boiling them with Mg ribbon in alcoholic solution
  - Warming them with magnesium powder in dry ether b)
  - Refluxing them with MgCl<sub>2</sub> solution c)
  - d) Warming them with MgCl<sub>2</sub>

## 49. During debromination of meso-dibromobutane, the major compound formed is

- a) n-butane 1-butene b) trans 2-butene cis-2-butene c) d)
- 50. What happens in photosystem II (pigment system)
  - CO<sub>2</sub> fixation photolysis of H<sub>2</sub>O a) b)
  - CO<sub>2</sub> reduction all of these c) d)
- 51. is produced by the polymerization of a diacid with a diol.
  - Polyethylene Polyester a) b)
  - Poly-methane Poly-ethane c) d)
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- Dumas method
- Carius method

- 52. Among the following phenols, the most acidic is
  - a) p-aminophenol b) p-nitrophenol
  - c) o-chlorophenol d) m-nitrophenol
- 53. Ziegler catalyst is
  - a) Chromium oxide supported over silica
  - b) Triethyl aluminium and titanium tetrachloride dispersed in an inert solvent
  - c) Alumina
  - d) Platinum/paladium
- 54. An electrophilic reagent must have
  - a) a vacant orbital
  - b) an orbital containing one electron
  - c) an orbital containing two electrons
  - d) all completely filled atomic orbitals
- 55. Which of the following belongs to +I group
  - a) –OH b) –OCH<sub>3</sub>
  - c) –COOH d) –CH<sub>3</sub>
- 56. Chlorination of benzene proceeds via
  - a) nucleophilic substitution mechanism
  - b) electrophilic substitution mechanism
  - c) elimination-addition mechanism
  - d) addition-elimination mechanism
- 57. The two enantiomers differ in
  - a) their boiling and melting points
  - b) their chemical properties towards achiral reagents
  - c) their optical activities
  - d) their solubilities in a solvent

58.	58. The colour of $_{62}$ Sm <sup>3+</sup> is yellow. The expected colour of $_{66}$ Dy <sup>3</sup>				
	a)	Colourless	b)	Yellow	
	c)	Red	d)	Blue	
59.	The	e Cannizzaro reaction is NOT giver	ר by		
	a)	trimethylacetaldehyde	b)	benzaldehyde	
	c)	acetaldehyde	d)	formaldehyde	
60.	In t	he Friedel-Crafts acylation, the ele	ctrop	hile is	
	a)	$C_6H_5^+$	b)	$AICI_3^-$	
	c)	$CH_{3}CO^{+}$	d)	$C_6H_5CH_2^+$	
61.	Wil	liamson's synthesis involves			
	a)	S <sub>N</sub> 1 mechanism	b)	nucleophilic addition	
	c)	S <sub>N</sub> 2 mechanism	d)	S <sub>E</sub> mechanism	
62.	Oxa	alic acid when reduced with zinc a	nd H <sub>2</sub>	SO₄ gives	
	a)	glyoxalic acid	b)	glyoxal	
	c)	glycolic acid	d)	glycol	
63.	Cro	ess aldol condensation occurs betw	/een		
	a)	Two same aldehydes			
	b)	Two same ketones			
	c)	Two different aldehydes and keto	ones		
	d)	None of the above			
64.	Nig	ht blindness may be caused by the	e deff	ciency of Vitamin	
	a)	A	b)	В	

c) D d) C

65. An azo dye is formed by interaction of an aromatic diazonium chloride with A phenol a) b) An aliphatic primary amine Nitrous acid c) Benzene d) 66. Acetic acid is manufactured by the fermentation of which of the following reaction? Ethanol Methanol a) b) Ethanal Methanal c) d) 67. Which class of compounds shows H-bonding even more than in alcohols? a) Phenols b) Carboxylic acids c) Ethers d) Aldehydes 68. Which of the following reagents is used in Oppenauer oxidation? b) OsO<sub>4</sub> a) SeO<sub>2</sub> c) Ozone d) Aluminium isopropoxide 69. Which base is present in RNA but not in DNA? Cytosine b) Guanine a) Thymine c) d) Uracil 70. If latent heat of vaporisation is L at boiling point T (K) then entropy of vaporisation is LT b)  $LT^{-1}$ a)  $TL^{-1}$ None of these c) d) 71. At lower temperatures, all gases except  $H_2$  and He show a) Negative deviation b) Positive deviation Positive and negative deviation d) None of the above c) 72. Photochemical smog is caused by a) CO  $CO_3$ b) c)  $O_3$ d) NO<sub>2</sub>

- 73. In Bragg equation, *n* represents
  - a) number of electrons
  - c) principal quantum number
- 74. A 6% solution of urea is isotonic with
  - a) 1 M solution of glucose b) 0.05 M solution of glucose
  - c) 6% solution of glucose d) 25% solution of glucose
- 75. Azeotropic mixture are
  - a) Constant temperature boiling mixture
  - b) Those which boils at different temperature
  - c) Mixture of two solids
  - d) None of the above
- 76. The vant's Hoff factor for 0.1 M Ba  $(NO_3)_2$  solution is 2.74. The degree of dissociation is
  - a) 91.3% b) 87% c) 100% d) 74%

77. On passing 0.1F of electricity through aluminium metal deposited at cathode is (AI = 27)

a)	0.3g			b)	0.6g
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- c) 0.9g d) 1.2g
- 78. Which of the following bonds will show an absorption band at the greatest wave number?
  - a) C=C b) O-H
  - c) C-H d)  $C \equiv C$
- 79. A solution shows absorbance A = 1.0. The % radiation absorbed by the sample is
  - a) 10 b) 50
  - c) 90 d) 100

- b) number of atoms
- d) order of diffraction

80.	<ol> <li>Which is the radiation employed in NMR spectroscopy</li> </ol>				
	a)	Radio frequency	b)	Microwave	
	c)	X ray	d)	Gamma ray	
81.	The	EPR spectrum of phenyl radical (0	$C_6H_5$ )	shows	
	a)	6 lines	b)	18 lines	
	c)	24 lines	d)	36 lines	
82.	The to 4	amount of heat required to raise t 0°C will be	he te	mperature of 100gm water from 20°C	
	a)	100 calorie	b)	2000 calorie	
	c)	4000 calorie	d)	Zero	
83.	The	temperature which is same in <sup>0</sup> C a	nd <sup>0</sup> F	- is	
	a)	40	b)	-40	
	c)	20	d)	-20	
84.	dW	= (– dU) is true for the process			
	a)	isothermal	b)	isobaric	
	c)	adiabatic	d)	isochoric	
85.	The	molecule that has an S6 symmetry	y eler	nent is	
85.	The a)	molecule that has an S6 symmetry $B_2H_6$	y eler b)	nent is CH₄	
85.	The a) c)	molecule that has an S6 symmetry $B_2H_6$ PH <sub>5</sub>	y eler b) d)	nent is CH₄ SF <sub>6</sub>	
85. 86.	The a) c) An e	molecule that has an S6 symmetry B <sub>2</sub> H <sub>6</sub> PH <sub>5</sub> example of an intensive property is	y eler b) d)	nent is CH₄ SF <sub>6</sub>	
85. 86.	The a) c) An e a)	molecule that has an S6 symmetry $B_2H_6$ $PH_5$ example of an intensive property is Volume	y eler b) d) b)	nent is CH₄ SF <sub>6</sub> Mass	
85. 86.	The a) c) An e a) c)	molecule that has an S6 symmetry $B_2H_6$ $PH_5$ example of an intensive property is Volume Pressure	y eler b) d) b) d)	nent is CH <sub>4</sub> SF <sub>6</sub> Mass Entropy	
85. 86. 87.	The a) c) An e a) c) Whi	molecule that has an S6 symmetry $B_2H_6$ $PH_5$ example of an intensive property is Volume Pressure ch one is NOT ungerade orbital?	y eler b) d) b) d)	nent is CH <sub>4</sub> SF <sub>6</sub> Mass Entropy	
85. 86. 87.	The a) c) An e a) c) Whi a)	molecule that has an S6 symmetry $B_2H_6$ PH <sub>5</sub> example of an intensive property is Volume Pressure ch one is NOT ungerade orbital? $\sigma * 1s$	y eler b) d) b) d)	nent is CH₄ SF <sub>6</sub> Mass Entropy σ*2s	

88. The highest occupied molecular orbital of HF is

- a) Bonding b) Antibonding
- c) Ionic d) Non bonding

89. Lyophilic sols are stabler than lyophobic sols because the particles in lyophils are

- a) Smaller b) Larger
- c) Lighter d) Solvated
- 90. In the determination of gold number of a lyophil, the electrolyte employed to coagulate the sol is 1ml of
  - a) 10% NaCl b) 5% NaCl c) 10% KCl d) 5% KCl
- 91. The half life of a first order reaction varies with temperature according to
  - a) In  $t_{_{1/2}} \propto 1/T$  b) In  $t_{_{1/2}} \propto T$
  - c)  $t_{1/2} \propto 1/T^2$  d)  $t_{1/2} \propto T^2$

92. Phosphorescence re-emit excess radiation within

- a)  $10^{-6}$  to  $10^{-4}$  seconds b)  $10^{-4}$  to 20 seconds
- c) 10 sec to 50 seconds d) 1 minute
- 93. The pick colour of phenolphthalein in alkaline medium is due to
  - a) the acidic form of phenolphthalein
  - b) the anionic form of phenolphthalein
  - c) OH-of the base
  - d) the non conjugated structure of phenolphthalein
- 94. Which of the following spectral series of hydrogen atom lies in the ultra violet region of electromagnetic radiation?
  - a) Lyman b) Balmer
  - c) Paschen d) Brackett

- 95. Which of the following statements is true with respect to the extent of physisorption?
  - a) Increases with increase in temperature
  - b) Decreases with increase in surface area
  - c) Decreases with increase in the strength of Vander Waals forces
  - d) Decreases with increase in temperature
- 96. Water \_\_\_\_\_\_ on melting and has the fusion curve with a \_\_\_\_\_\_ slope.
  - a) contracts, negative b) contracts, positive
  - c) expands, negative d) expands, positive
- 97. Diastase takes part in digestion of which one:
  - a) Proteinb) Starchc) Amino acidsd) Fat
- 98. Which of the following is a diamagnetic material?
  - a) Sodium b) Calcium
  - c) Oxygen (at STP) d) Nitrogen (at STP)

#### 99. Organic functional group vibrations appear in

- a) FIR b) MIR c) NIR d) UV
- 100. According to Faraday's second law, the masses of different substances deposited or liberated by the passage of the same quantity of electricity are proportional to their
  - a) Chemical equivalent weight b) Quantity of electricity
  - c) Electrochemical equivalent d) Volume

## ANSWER SHEET

1	А	В	С	D	Е
2	Α	В	С	D	Е
3	А	В	С	D	Е
4	Α	В	С	D	Е
5	А	В	С	D	Е
6	А	В	С	D	Е
7	Α	В	С	D	Е
8	Α	В	С	D	Е
9	Α	В	С	D	Е
10	Α	В	С	D	Е
11	А	В	С	D	Е
12	А	В	С	D	Е
13	Α	В	С	D	Е
14	Α	В	С	D	Е
15	Α	В	С	D	Е
16	Α	В	С	D	Е
17	Α	В	С	D	Е
18	Α	В	С	D	Е
19	Α	В	С	D	Е
20	Α	В	С	D	Е
21	Α	В	С	D	Е
22	Α	В	С	D	Е
23	Α	В	С	D	Е
24	Α	В	С	D	Е
25	Α	В	С	D	Е

26	А	В	С	D	Е
27	Α	В	С	D	Е
28	Α	В	С	D	Е
29	Α	В	С	D	Е
30	Α	В	С	D	Е
31	А	В	С	D	Е
32	А	В	С	D	Е
33	А	В	С	D	Е
34	А	В	С	D	Е
35	А	В	С	D	Е
36	А	В	С	D	Е
37	А	В	С	D	Е
38	Α	В	С	D	Е
39	Α	В	С	D	Е
40	Α	В	С	D	Е
41	А	В	С	D	Е
42	Α	В	С	D	Е
43	Α	В	С	D	Е
44	Α	В	С	D	Е
45	Α	В	С	D	Е
46	Α	В	С	D	Е
47	Α	В	С	D	Ε
48	Α	В	С	D	Е
49	А	В	С	D	Е
50	Α	В	С	D	Е

51	А	В	С	D	Е
52	А	В	С	D	Ε
53	А	В	С	D	Ε
54	А	В	С	D	Ε
55	Α	В	С	D	Е
56	А	В	С	D	Е
57	Α	В	С	D	Е
58	Α	В	С	D	Е
59	Α	В	С	D	Е
60	Α	В	С	D	Е
61	А	В	С	D	Е
62	Α	В	С	D	Е
63	А	В	С	D	Е
64	А	В	С	D	Е
65	Α	В	С	D	Е
66	А	В	С	D	Е
67	Α	В	С	D	Е
68	Α	В	С	D	Е
69	Α	В	С	D	Е
70	Α	В	С	D	Е
71	Α	В	С	D	Е
72	Α	В	С	D	Е
73	Α	В	С	D	Е
74	Α	В	С	D	Е
75	Α	В	С	D	Е



## **ROUGH WORK**

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