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Part III — CHEMISTRY

(New Syllabus)

(English Version)

Time Allowed: 3 Hours |

[Maximum Marks: 150

Note: i) Answer all the questions from Part - I.

- ii) Answer any fifteen questions from Part- II.
- iii) Answer any seven questions from **Part III** covering all Sections and choosing at least *two* questions from each Section.
- iv) Question No. 70 is compulsory. Answer any three from the remaining questions in Part IV.
- v) Draw diagrams and write equations wherever necessary.

PART - I

Note: Answer all the questions.

 $30\times1=30$

Choose and write the correct answer:

]	. The transition e	lement with	i the l	lowest	atomic num	ıber i	ls

a) scandium

b) titanium

c) zinc

d) lanthanum.

2. The elements in which extra electron enter (n-2) f orbital are

a) s-block elements

b) p-block elements

c) d-block elements

d) *f*-block elements.

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3.	The isotope used as a power source in long mission space probes is					
	a)	U-235	b)	Pu-235		
	c)	Pu-238	d)	U-238.		
4.	The	type of isomerism found in the co	mplex	es		
		Pt (NH ₃) ₄ CuCl ₄ and	Cu	(NH ₃) ₄] [PtCl ₄] is		
	a)	ionisation isomerism	b)	co-ordination isomerism		
	c)	linkage isomerism	d)	ligand isomerism.		
5.		r 24 hours 0.125 g of the initial q . The half-life period is	uantit	y of 1 g of a radioactive isotope is left		
	a)	24 hours	b)	12 hours		
	c)	8 hours	d)	16 hours.		
6.		a reaction $E_a = 0$ and $k = 4.2$ K will be	× 10 5	5 sec ⁻¹ at 300 K, the value of k at		
	a)	$4.2 \times 10^{5} \text{ sec}^{-1}$	b)	$8.4 \times 10^{5} \text{ sec}^{-1}$		
	c)	$8.4 \times 10^{-5} \text{ sec}^{-1}$	d)	$4.2 \times 10^{-5} \text{ sec}^{-1}$.		
7.	The	iron catalyst used in the Haber's	proces	ss is poisoned by		
	a)	Pt	b)	H ₂		
	c)	H ₂ S	d)	As ₂ O ₃ .		
8.	Cur	d is a colloidal solution of				
	a)	liquid in liquid	b)	liquid in solid		
	c)	solid in liquid	d)	solid in solid.		
9.	An e	emulsion is a colloidal solution of				
	a)	two solids	b }	two gases		
	c)	two liquids	d)	solid and liquid.		
10. When one coulomb of electricity is passed through an electrolytic semants deposited on the electrode is equal to						
	a)	equivalent weight	b)	molecular weight		
	c)	electrochemical equivalent	d)	one gram.		
В]					

11.	The	isomerism exhibited by CH $_3$ – CF	i ₂ – N	and and			
	$CH_3 - CH_2 - O - N = O$ is						
	a)	position	b)	chain			
	c)	functional	d)	tautomerism.			
12.		ch of the following nitro-compoung alkali?	nds b	ehave as an acid in the presence of			
	a)	Primary	b)	Secondary			
	c)	Tertiary	d)	both (a) and (b).			
13.	Con	version of benzene diazonium chlo	ride to	chlorobenzene is called			
	a)	Sandmeyer's reaction	b)	Stephan's reaction			
	c)	Gomberg reaction	d)	Schotten-Baumann reaction.			
14.	Prot	eins are					
	a)	polypeptides	b)	polyacids			
	c)	polyphenols	d)	polyesters.			
15.	5. Mixture of equal molecules of D(+) glucose and D(-) fructose is called as						
	a)	Fruit sugar	p)	Invert sugar			
	c)	Cane sugar	d)	Non-sugar.			
16.	. Dual character of an electron was explained by						
	a)	Bohr	b)	Heisenberg			
	c)	de Broglie	d)	Pauli.			
17.	The	momentum of a particle which ha	s de E	Broglie wavelength of 1 Å			
	$(h = 6.626 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}) \text{ is}$						
	a)	6.6×10^{-23} kg ms ⁻¹	b)	6.6×10^{-24} kg ms ⁻¹			
	c)	6.6×10^{-34} kg ms ⁻¹	d)	6.6×10^{34} kg ms ⁻¹ .			
18.	The	order of ionisation energy is					
	a)	s	b)	s > p > d > f			
	c)	s > d > p > f	d)	s < d < p < f.			
19.	The	general electronic configuration of	carbo	on family is			
	a)	ns² np²	b)	ns ² np ³			
	c)	ns ² np ¹	d)	ns ² np ⁴ .			
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20. Which of the following compounds will not give positive Chromyl Chloride Test?

b)

 C_6H_5Cl

 $CuCl_2$

a)

	c)	ZnCl ₂	d)	HgCl ₂ .				
21.	In a	simple cubic cell, each point on	a cori	ner is shared by				
	a)	one unit cell	b)	two unit cells				
	c)	eight unit cells	d)	four unit cells.				
22 .	The	change of entropy for the process	8 H ₂ ($O(liq) \rightarrow H_2O(vap)$ involving				
$\Delta H_{\rm vap} = 40850 \ {\rm J \ mol^{-1}} \ {\rm at} \ 373 \ {\rm K \ is}$								
	മ)	120 J mol ⁻¹ K ⁻¹	b)	$9.1 \times 10^{-3} \text{ J mol}^{-1} \text{ K}^{-1}$				
	c)	109·52 J mol ⁻¹ K ⁻¹	d)	$9.1 \times 10^{-4} \text{ J mol}^{-1} \text{ K}^{-1}$.				
23.	Wh	ch of the following does not result	in an	increase in the entropy?				
	a)	Rusting of iron						
	b)	Crystallisation of sucrose from so	lutior	1				
	c)	Vaporisation of camphor						
	d)	Conversion of ice to water.						
24.	For	the homogenous gas reaction at 6	00 K					
	$4 \text{ NH}_3(g) + 5 O_2(g) \iff 4 \text{ NO}(g) + 6 \text{ H}_2 O(g)$							
	the equilibrium constant K_c has the unit							
	a)	mol dm ⁻³	b)	$(mol dm^{-3})^{-1}$				
	c)	$\left(\text{ mol dm}^{-3} \right)^{10}$	d)	$(mol dm^{-3})^9$.				
25.	. $2 H_2 O(g) + 2 Cl_2(g) \rightleftharpoons 4 HCl(g) + 5 O_2(g)$, the value of K_p and K_c							
•		related as						
		$K_p = K_c$		$K_p > K_c$				
	c)	$K_p < K_c$	d)	$K_p = K_c = 0.$				
26 .	Oxio	dation of glycerol with bismuth nit	rate g	ives				
	a)	meso-oxalic acid	b)	glyceric acid				
	c)	tartronic acid	d)	both (b) and (c).				
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27 .	7. According to Lewis concept of acids and bases, ethers are				
	a)	neutral		b)	acidic
	°)	basic		d)	amphoteric.
2 8.	The	compound mixed w	ith ethanol to s	erve a	as substitute for petrol is
	a)	methoxy methane		b)	ethoxy ethane
	c)	methanol		d)	ethanal.
2 9.	Aldo	l is			
	a)	2-hydroxy butanol		b)	3-hydroxy butanol
	c)	3-hydroxy butanal		d)	2-hydroxy butanal.
30.	СН	3 CH (OH) COOH	H ₂ O ₂ / Fe ²	+ —→ ²	X. The X is
	a)	CH ₃ CO COOH	·.	b)	CH 3 CH 2 COOH
	c)	СН ₃ СНОН СНО		d)	CH ₂ (COOH) ₂ .

PART - II

Note: Answer any fifteen questions.

 $15 \times 3 = 45$

- 31. State Heisenberg's Uncertainty principle.
- 32. Why is electron affinity of fluorine less than that of chlorine?
- 33. What are cyclic silicates? Give an example.
- 34. H₃ PO₄ is triprotic. Prove.
- 35. Explain why Mn²⁺ is more stable than Mn³⁺.
- 36. A substance is found to have a magnetic moment of 3.9 BM. How many unpaired electrons does it contain?
- 37. Explain the principle behind the 'Hydrogen bomb'.
- 38. What are superconductors? Give any one of its applications.
- 39. What is entropy? What is its unit?
- 40. The equilibrium constant K_c for $A(g) \rightleftharpoons B(g)$ is 2.5×10^{-2} . The rate constant of the forward reaction is $0.05~{\rm sec^{-1}}$. Calculate the rate constant of the reverse reaction.

- 41. Give any three examples for opposing reactions.
- 42. The half-life period of a first order reaction is 20 mins. Calculate the rate constant.
- 43. What is electrophoresis?
- 44. State Faraday's first and second laws of electrolysis.
- 45. Mesotartaric acid is an optically inactive compound with asymmetric carbon atoms. Justify your answer.
- 46. How can the consumption of alcohol by a person be detected?
- 47. How will you convert phenol to phenolphthalein?
- 48. Give the IUPAC names for the following:
 - Crotonaldehyde
 - ii) Methyl n-propyl ketone
 - iii) Phenyl acetaldehyde.
- 49. What is trans-esterification?
- 50. How will you convert acetamide to methyl amine? Give equation.
- 51. How is Dacron prepared? Give any one of its uses.

PART - III

Note: Answer any seven questions choosing at least two questions from each Section. $7 \times 5 = 35$

SECTION - A

- 52. Explain the formation of oxygen molecule by molecular orbital theory.
- 53. How is zinc extracted from its chief ore?
- 54. Compare the points of similarities and differences between lanthanides and actinides (any five points).
- 55. Explain the postulates of Werner's theory.

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SECTION - B

- 56. Write the various statements of second law of thermodynamics.
- 57. Derive the relation $K_p = K_c (RT)^{\Delta n(g)}$ for a general chemical equilibrium reaction.
- 58. State the characteristics of order of a reaction.
- 59. Calculate the e.m.f. of the cell having the cell reaction

2 Ag +
$$Zn \rightleftharpoons 2$$
 Ag + Zn^{2} + E_{cell}^{0} = 1.56 at 25°C

when concentration of $Zn^{2+} = 0.1$ M and $Ag^{+} = 10$ M in the solution.

SECTION - C

- 60. How do ethers react with HI? Give the significance of the reaction.
- 61. Explain the mechanism of Cannizzaro reaction.
- 62. How is lactic acid manufactured in large scale? How can it be converted into cyclic diester?
- 63. Explain briefly the characteristics of rocket propellants.

PART - IV

Note: Question No. **70** is compulsory and answer any three from the remaining questions. $4 \times 10 = 40$

- 64. a) Explain Pauling's method to determine ionic radii.
 - b) How is fluorine isolated from their fluorides by Dennis method?
- 65. a) Mention the type of hybridisation, magnetic property and geometry of the following complexes using VB theory.
 - t) [FeF₆]⁴⁻
 ti) [Fe(CN)₆]⁴⁻
 - b) How are radioactive isotopes useful in medicine?

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5

B

66.	a)	Explain Schottky and Frenkel defects.				
	b)	Write briefly about the adsorption theory of catalysis.				
67.	a)	Explain Ostwald's dilution law.	5			
	b)	Write the IUPAC convention of representation of a cell.	5			
68.	a)	Distinguish enantiomers from diastereomers. Give an example each.	5			
	b)	Give the mechanism of esterification.	5			
69.	a)	Distinguish between primary, secondary and tertiary amines.	5			
	b)	Discuss the structure of fructose in detail.	5			
70.	a)	An organic compound (A) of molecular formula C_7H_6O is not reduced by	οу			
,		Fehling's solution but will undergo Cannizzaro reaction. Compound (A) reacts with Aniline to give compound (B). Compound (A) also reacts with Cl ₂ in the presence of catalyst to give compound (C). Identify (A), (B) and (C) and (C) are compound (C).	th C)			
		and explain the reactions.	5			
	b)	An element (A) belongs to group number 11 and period number 4. (A) is reddish brown metal. (A) reacts with HCl in the presence of air and give compound (B) . (A) also reacts with conc. HNO $_3$ to give compound (C) with the liberation of NO $_2$. Identify (A) , (B) and (C) . Explain the reactions.	es ?)			
		OR				
	c)	An organic compound (A) of molecular formula C $_3$ H $_8$ O gives turbidi within 5 – 10 min on reaction with anhydrous ZnCl $_2$ / HCl. Compound (A)				
		on treatment with sodium hypochlorite gives a carbonyl compound (B) which	:h			
		on further chlorination gives compound (C) of molecular formu C ₃ H ₃ OCl ₃ . Identify (A), (B) and (C). Explain the reactions.	la 5			

What is the pH of a solution containing 0.5 M propionic acid and 0.5 M sodium propionate? The K_a of propionic acid is 1.34×10^{-5} .

d)