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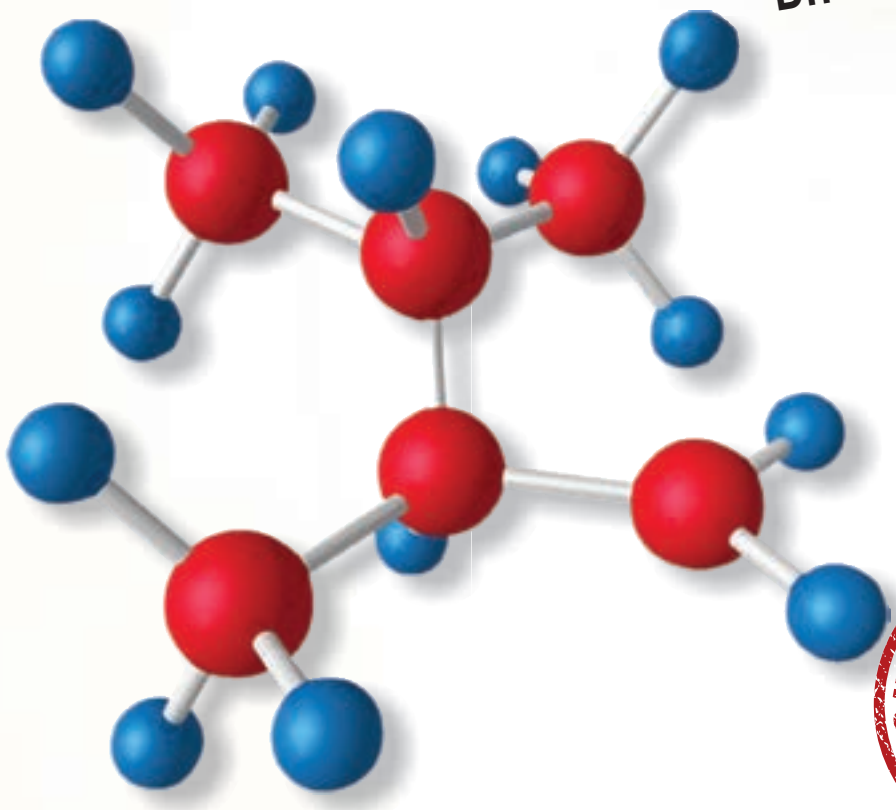
CLASS-XII

PART-I

Dr. S.P. Jauhar



THOROUGHLY REVISED EDITION

STRICTLY ACCORDING TO THE NEW SYLLABUS

INDIA'S FIRST SMART BOOK

According to new syllabus prescribed by Central Board of Secondary Education (CBSE), New Delhi and State Boards of Uttarakhand, Karnataka (IInd Year PUC), Chhattisgarh, Jharkhand, Punjab, Haryana, Himachal, Kerala, Mizoram, Meghalaya, Nagaland, Assam, Manipur and other States following CBSE & ISC curriculum.

MODERN'S abc+ OF

CHEMISTRY

INDIA'S FIRST SMART BOOK

For Class XII

PART-I

Strictly in accordance with the Latest Guidelines and Syllabus Including Value Based Questions issued by N.C.E.R.T. / C.B.S.E.

By

Dr. S.P. JAUHAR

Formerly Professor of Chemistry
Department of Chemistry
Panjab University, **Chandigarh**

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THOROUGHLY REVISED & UPDATED EDITION 2017–2018

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We are committed to serve students with best of our knowledge and resources. We have taken utmost care and paid much attention while editing and printing this book but we would beg to state that Authors and Publishers should not be held responsible for unintentional mistakes that might have crept in. However, errors brought to our notice shall be gratefully acknowledged and attended to.

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Preface & Acknowledgement

I feel pleasure in presenting the revised edition of the book "Modern's abc + of Chemistry" for Class XII students. The book has been prepared strictly according to the new syllabus proposed by C.B.S.E. New Delhi and Education Boards of Indian States.

Salient Features of the Book

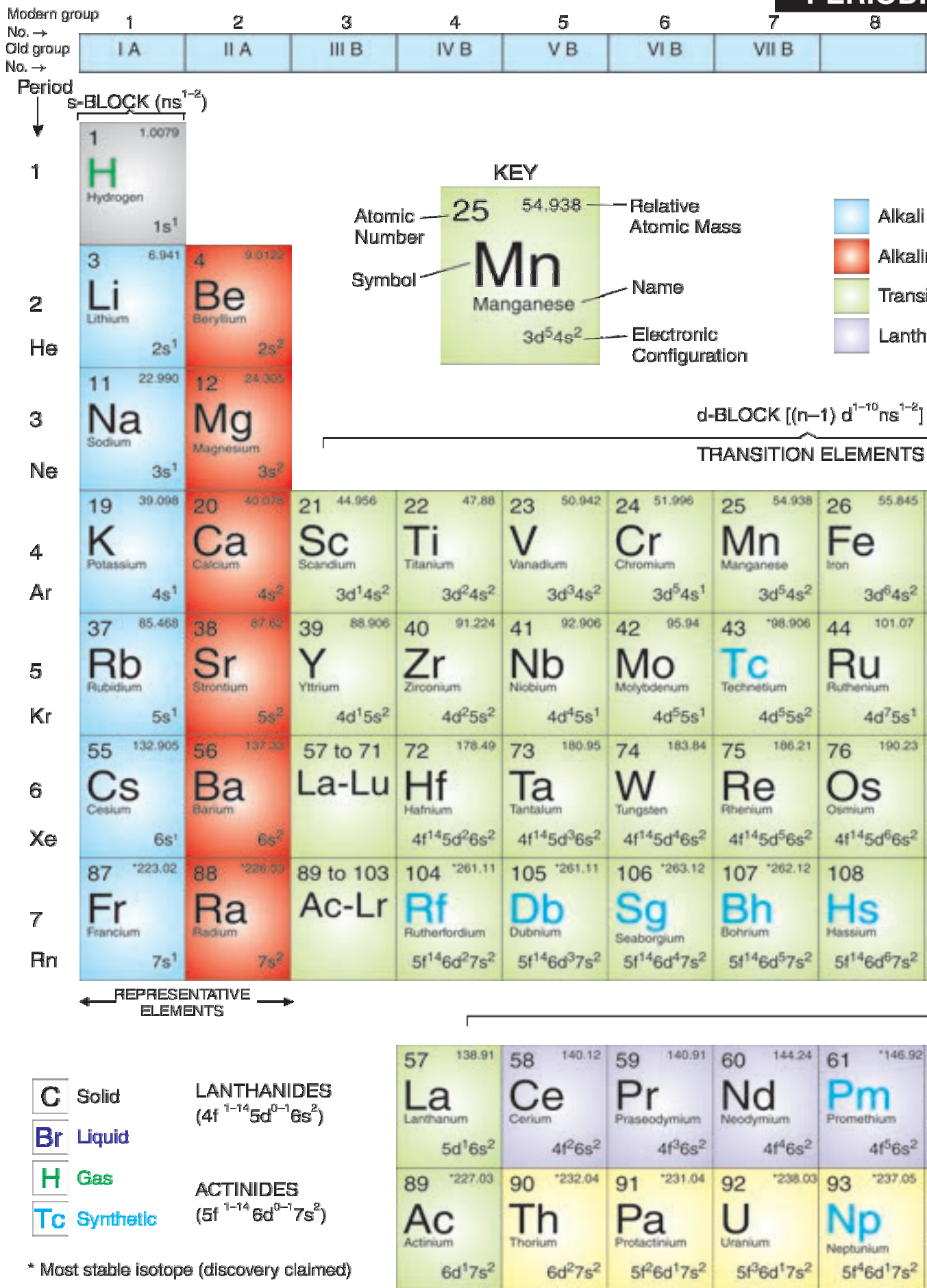
- Text matter has been planned giving emphasis on fundamental concepts in a simple, clear and systematic method. The text has been presented in an interesting style with a large number of illustrative examples and numerical problems. The text also has special features : Key Point, Watch Out, Learning Plus, In Focus, Competition Plus and Additional Useful Informations.
- A number of problems and short answer questions have been given under the heading Practice Problems promoting problem solving skills in students.
- A large number of Conceptual Questions (Solved) are given in each chapter.
- Thought provoking questions under the heading R U Curious.... are given in all chapters.
- In NCERT File all the Intext Questions, Textbook Exercises and Exemplar Problems are solved.
- UNIT PRACTICE TESTS with Hints & Solutions are given at the end of each chapter to help the students to check their performance after covering the chapter. A Mock Test with solutions according to CBSE pattern is given at the end of the book.
- At the end of each chapter, Quick Revision through Objective Questions "Quick Memory Test" have been added to check the retention power of the students.
- Tough & Tricky PROBLEMS with solutions are added to accelerate the potential of the students for SOLVING NUMERICAL PROBLEMS.
- A number of Higher Order Thinking Skills (HOTS) and Brain Twisting Questions with answers are included at the end of each chapter.
- A variety of Multiple Choice Questions from different competitive examinations have been added to make the book useful for the preparation of competitive examinations in Competition File.
- MCQs with more than one correct answers, Comprehension/Passages followed by (MCQs), Assertion and Reason Type Questions, Matrix Match Type Questions and Integer Type questions in the light of new pattern of JEE-Advanced are also given.
- The book provides complete coverage of previous years' Board examinations of different States and All India Secondary Board.
- **Value Based Questions with Answers are given in each chapter.**

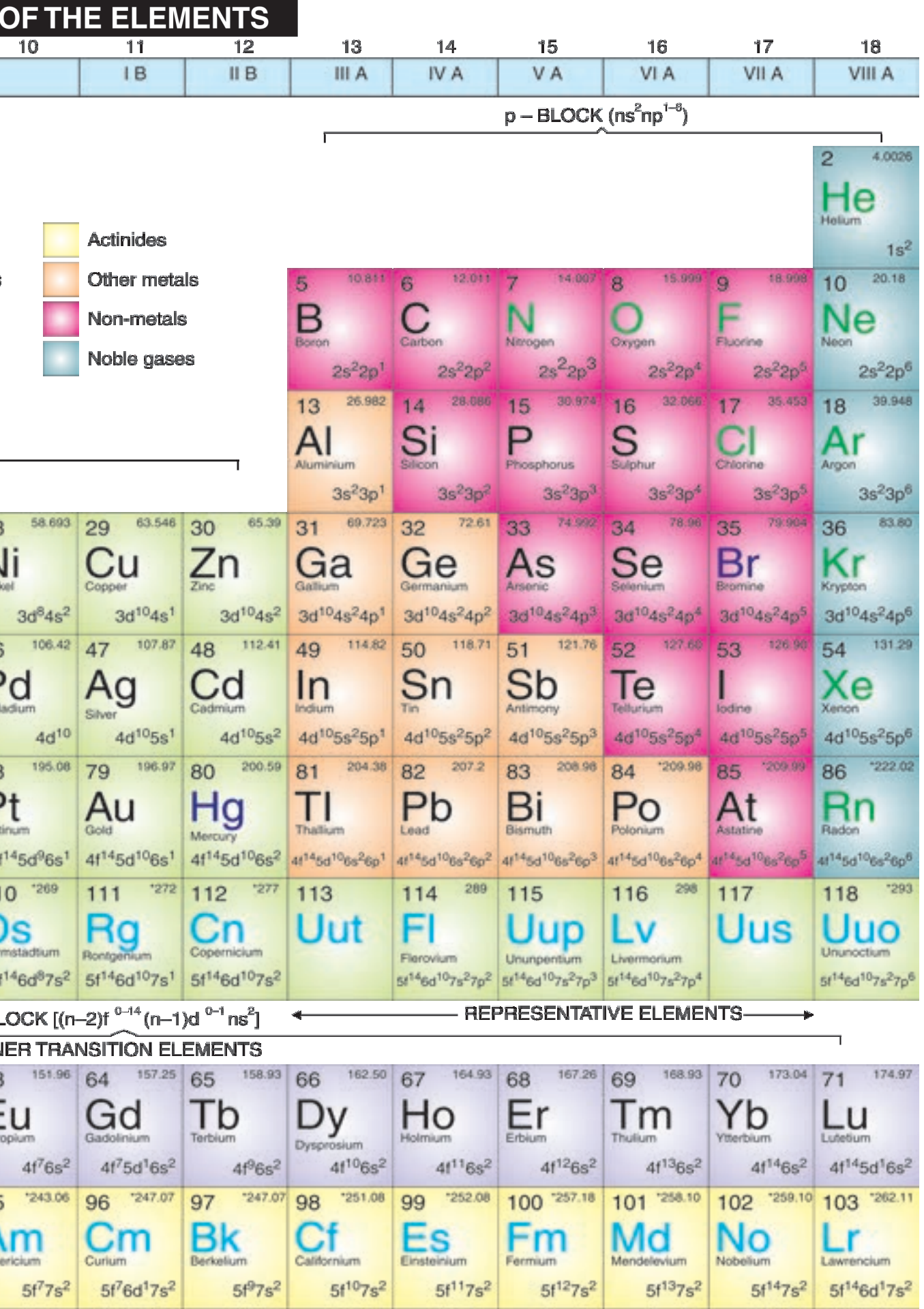
I am extremely thankful to Mrs. Sheenu Jauhar for her sincere efforts and unmatched contribution in crictical and thorough revision of the whole book and revising Objective Questions. I am also thankful to many teachers and students who have been sending their valuable suggestions and comments for the improvement of the book. We are greatly indebted to them. I wish to acknowledge my sincere thanks to Mr. Arun Kamboj (G.S.S. School, Tohana), Dr. G.J.P. Singh (Chemistry Deptt., P.U., Chandigarh), Dr. Sajeev Soni (S.D. College, Chandigarh), Dr. A.N. Sharma (Govt. College, Hamirpur), Ms. Parveen (Faridkot), Mrs. Anju Goel (Govt. S.S. School, Sec 16, Chandigarh), Mr. Deepak Mishra, H.O.D. (Shri Gauri Shankar Inter College, Firozabad), Mr. Praveen Kumar (S.V.M. Senior Sec. School, Kosi Kalan, Mathura), Mr. Vikas Chander (Saint Mary S.S. School, Gurdaspur), Mr. Rakesh Jassotia (Sr. Lecturer, Govt. H.S.S. Nagari, Parole, Kathua), Mrs. Amita Sharma (Saraswati Institute, Chandigarh), Dr. G.S. Arora, Mr. Sudhanshu Jaitley, Gaurav Chakraborty (Chandigarh), and Vaibhav Yavlekar, (Ujjain). I am thankful to Mr. Vinod Jangra (G.S.S.S., Akbarpur Baroto, Sonepat) for his valuable suggestions/corrections. Finally, I am happy to express my sincerest thanks and indebtness to our dynamic and versatile publisher and his efficient staff for making the project successful. I am also thankful to Mr. Manik Juneja, National Head — Content Operations, Mr. S.K. Sikka, Mr. B.S. Rawat, Ravinder Pathania and L.B. Mishra who have taken great pains in bringing up the book.

I would also like to gratefully appreciate the tremendous efforts of Mr. Manu Jauhar for excellent thoughtful editing of the book.

I hope that the present book will be warmly received by the students and the teachers.

Dr. S.P. Jauhar


Modern group No. →
Old group No. →
Period
1 2 3 4 5 6 7 8
I A II A III B IV B V B VI B VII B
s-BLOCK (ns1–2)
KEY
Atomic Number
25
54.938
Relative Atomic Mass
Mn
Symbol
Manganese
Name
3d54s2
Electronic Configuration
Alkali
Alkali
Transi
Lanth
d-BLOCK [(n–1) d1–10ns1–2]
TRANSITION ELEMENTS
1 1.0079 H Hydrogen 1s1
2 He
3 6.941 Li Lithium 2s1
4 9.0122 Be Beryllium 2s2
3 Ne
11 22.990 Na Sodium 3s1
12 24.305 Mg Magnesium 3s2
4 Ar
19 39.098 K Potassium 4s1
20 40.078 Ca Calcium 4s2
21 44.956 Sc Scandium 3d14s2
22 47.88 Ti Titanium 3d24s2
23 50.942 V Vanadium 3d34s2
24 51.996 Cr Chromium 3d54s1
25 54.938 Mn Manganese 3d54s2
26 55.845 Fe Iron 3d64s2
5 Kr
37 85.468 Rb Rubidium 5s1
38 87.62 Sr Strontium 5s2
39 88.906 Y Yttrium 4d15s2
40 91.224 Zr Zirconium 4d25s2
41 92.906 Nb Niobium 4d45s1
42 95.94 Mo Molybdenum 4d55s1
43 *98.906 Tc Technetium 4d55s2
44 101.07 Ru Ruthenium 4d75s1
6 Xe
55 132.905 Cs Cesium 6s1
56 137.33 Ba Barium 6s2
57 to 71 La-Lu
72 178.49 Hf Hafnium 4f145d26s2
73 180.95 Ta Tantalum 4f145d36s2
74 183.84 W Tungsten 4f145d46s2
75 186.21 Re Rhenium 4f145d56s2
76 190.23 Os Osmium 4f145d66s2
7 Rn
87 *223.02 Fr Francium 7s1
88 *226.03 Ra Radium 7s2
89 to 103 Ac-Lr
104 *261.11 Rf Rutherfordium 5f146d27s2
105 *261.11 Db Dubnium 5f146d37s2
106 *263.12 Sg Seaborgium 5f146d47s2
107 *262.12 Bh Bohrium 5f146d57s2
108 Hs Hassium 5f146d67s2
REPRESENTATIVE ELEMENTS
57 138.91 La Lanthanum 5d16s2
58 140.12 Ce Cerium 4f26s2
59 140.91 Pr Praseodymium 4f36s2
60 144.24 Nd Neodymium 4f46s2
61 *146.92 Pm Promethium 4f56s2
89 *227.03 Ac Actinium 6d17s2
90 *232.04 Th Thorium 6d27s2
91 *231.04 Pa Protactinium 5f26d17s2
92 *238.03 U Uranium 5f36d17s2
93 *237.05 Np Neptunium 5f46d17s2
C Solid
Br Liquid
H Gas
Tc Synthetic
LANTHANIDES (4f 1–14 5d0–1 6s2)
ACTINIDES (5f 1–14 6d0–1 7s2)
* Most stable isotope (discovery claimed)


OF THE ELEMENTS
10
11
12
13
14
15
16
17
18
I B
II B
III A
IV A
V A
VI A
VII A
VIII A
p – BLOCK (ns2np1–6)
Actinides
Other metals
Non-metals
Noble gases
2 4.0026 He Helium 1s2
5 10.811 B Boron 2s22p1
6 12.011 C Carbon 2s22p2
7 14.007 N Nitrogen 2s22p3
8 15.999 O Oxygen 2s22p4
9 18.998 F Fluorine 2s22p5
10 20.18 Ne Neon 2s22p6
13 26.982 Al Aluminium 3s23p1
14 28.086 Si Silicon 3s23p2
15 30.974 P Phosphorus 3s23p3
16 32.066 S Sulphur 3s23p4
17 35.453 Cl Chlorine 3s23p5
18 39.948 Ar Argon 3s23p6
58.693 Ni 3d84s2
29 63.546 Cu Copper 3d104s1
30 65.39 Zn Zinc 3d104s2
31 69.723 Ga Gallium 3d104s24p1
32 72.61 Ge Germanium 3d104s24p2
33 74.992 As Arsenic 3d104s24p3
34 78.96 Se Selenium 3d104s24p4
35 79.904 Br Bromine 3d104s24p5
36 83.80 Kr Krypton 3d104s24p6
106.42 Pd 4d10
47 107.87 Ag Silver 4d105s1
48 112.41 Cd Cadmium 4d105s2
49 114.82 In Indium 4d105s25p1
50 118.71 Sn Tin 4d105s25p2
51 121.76 Sb Antimony 4d105s25p3
52 127.60 Te Tellurium 4d105s25p4
53 126.90 I Iodine 4d105s25p5
54 131.29 Xe Xenon 4d105s25p6
195.08 Pt 4f145d96s1
79 196.97 Au Gold 4f145d106s1
80 200.59 Hg Mercury 4f145d106s2
81 204.38 Tl Thallium 4f145d106s26p1
82 207.2 Pb Lead 4f145d106s26p2
83 208.98 Bi Bismuth 4f145d106s26p3
84 *209.98 Po Polonium 4f145d106s26p4
85 *209.99 At Astatine 4f145d106s26p5
86 *222.02 Rn Radon 4f145d106s26p6
*269 Ds 4f146d87s2
111 *272 Rg Roentgenium 5f146d107s1
112 *277 Cn Copernicium 5f146d107s2
113 Uut
114 289 Fl Flerovium 5f146d107s27p2
115 Uup Ununpentium 5f146d107s27p3
116 298 Lv Livermorium 5f146d107s27p4
117 Uus
118 *293 Uuo Ununoctium 5f146d107s27p6
LOCK [(n–2)f 0–14 (n–1)d 0–1 ns2]
REPRESENTATIVE ELEMENTS
NER TRANSITION ELEMENTS
151.96 Eu 4f76s2
64 157.25 Gd Gadolinium 4f75d16s2
65 158.93 Tb Terbium 4f96s2
66 162.50 Dy Dysprosium 4f106s2
67 164.93 Ho Holmium 4f116s2
68 167.26 Er Erbium 4f126s2
69 168.93 Tm Thulium 4f136s2
70 173.04 Yb Ytterbium 4f146s2
71 174.97 Lu Lutetium 4f145d16s2
*243.06 Am 5f77s2
96 *247.07 Cm Curium 5f76d17s2
97 *247.07 Bk Berkelium 5f97s2
98 *251.08 Cf Californium 5f107s2
99 *252.08 Es Einsteinium 5f117s2
100 *257.18 Fm Fermium 5f127s2
101 *258.10 Md Mendelevium 5f137s2
102 *259.10 No Nobelium 5f147s2
103 *262.11 Lr Lawrencium 5f146d17s2

Atomic Masses (C^{12} = 12.00) and Electronic Configurations of Elements				
Element	**Symbol**	**Atomic Number**	**Atomic Mass**	**Electronic Configuration**
Actinium	Ac	89	227	$[Rn]^{86}\ 6d^1\ 7s^2$
Aluminium	Al	13	26.9	$[Ne]^{10}\ 3s^2\ 3p^1$
Americium	Am	95	243	$[Rn]^{86}\ 5f^7\ 7s^2$
Antimony	Sb	51	121.75	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^3$
Argon	Ar	18	39.94	$[Ne]^{10}\ 3s^2\ 3p^6$
Arsenic	As	33	74.92	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^3$
Astatine	At	85	210	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6p^5$
Barium	Ba	56	137.3	$[Xe]^{54}\ 6s^2$
Berkelium	Bk	97	247	$[Rn]^{86}\ 5f^9\ 7s^2$
Beryllium	Be	4	9.01	$[He]^2\ 2s^2$
Bismuth	Bi	83	208.98	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6p^3$
Boron	B	5	10.81	$[He]^{54}\ 2s^2\ 2p^1$
Bromine	Br	35	79.90	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^5$
Cadmium	Cd	48	112.40	$[Kr]^{36}\ 4d^{10}\ 5s^2$
Calcium	Ca	20	40.02	$[Ar]^{18}\ 4s^2$
Californium	Cf	98	251	$[Rn]^{86}\ 5f^{10}\ 7s^2$
Carbon	C	6	12	$[He]^2\ 2s^2\ 2p^2$
Cerium	Ce	58	140.12	$[Xe]^{54}\ 4f^1\ 5d^1\ 6s^2$
Cesium	Cs	55	132.90	$[Xe]^{54}\ 6s^1$
Chlorine	Cl	17	35.45	$[Ne]^{10}\ 3s^2\ 3p^5$
Chromium	Cr	24	51.99	$[Ar]^{18}\ 3d^5\ 4s^1$
Cobalt	Co	27	58.93	$[Ar]^{18}\ 3d^7\ 4s^2$
Copper	Cu	29	63.54	$[Ar]^{18}\ 3d^{10}\ 4s^1$
Curium	Cm	96	245	$[Rn]^{86}\ 5f^7\ 6d^1\ 7s^2$
Dysprosium	Dy	66	162.50	$[Xe]^{54}\ 4f^{10}\ 6s^2$
Einsteinium	Es	99	254	$[Rn]^{86}\ 5f^{11}\ 7s^2$
Erbium	Er	68	167.26	$[Xe]^{54}\ f^{12}\ 6s^2$
Europium	Eu	63	151.96	$[Xe]^{54}\ 4f^7\ 6s^2$
Fermium	Fm	100	257	$[Rn]^{86}\ 5f^{12}\ 7s^2$
Flerovium	Fl	114	289	$[Rn]5f^{14}6d^{10}7s^27p^2$
Fluorine	F	9	18.99	$[He]^2\ 2s^2\ 2p^5$
Francium	Fr	87	223	$[Rn]^{86}\ 7s^1$
Gadolinium	Gd	64	157.25	$[Xe]^{54}\ 4f^7\ 5d^1\ 6s^2$
Gallium	Ga	31	69.72	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^1$
Germanium	Ge	32	72.59	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^2$
Gold	Au	79	196.99	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^1$
Hafnium	Hf	72	178.48	$[Xe]^{54}\ 4f^{14}\ 5d^2\ 6s^2$
Hanium	Ha	105	260	$[Rn]^{86}\ 5f^{14}\ 6d^3\ 7s^2$
Helium	He	2	4	$1s^2$
Holmium	Ho	67	164.93	$[Xe]^{54}\ 4f^{11}\ 6s^2$
Hydrogen	H	1	1	$1s^1$
Indium	In	49	114.82	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^1$
Iodine	I	53	126.90	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^5$
Iridium	Ir	77	192.2	$[Xe]^{54}\ 4f^{14}\ 5d^7\ 6s^2$
Iron	Fe	26	55.84	$[Ar]^{18}\ 3d^6\ 4s^2$
Krypton	Kr	36	83.80	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^6$
Lanthanum	La	57	138.91	$[Xe]^{54}\ 5d^1\ 6s^2$
Lawrencium	Lr	103	257	$[Rn]^{86}\ 5f^{14}\ 6d^1\ 7s^2$
Lead	Pb	82	207.19	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6p^2$
Lithium	Li	3	6.93	$[He]^2\ 1s^1$
Livermorium	Lv	116	293	$[Rn]5f^{14}6d^{10}7s^27p^4$
Lutetium	Lu	71	174.97	$[Xe]^{54}\ 4f^{14}\ 5d^1\ 6s^2$
Magnesium	Mg	12	24.31	$[Ne]^{10}\ 3s^2$
Manganese	Mn	25	54.93	$[Ar]^{18}\ 3d^5\ 4s^2$

Element	Symbol	Atomic Number	Atomic Mass	Electronic Configuration
Mendelevium	Md	101	256	$[Rn]^{86}\ 5f^{13}\ 7s^2$
Mercury	Hg	80	200.50	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2$
Molybdenum	Mo	42	95.94	$[Kr]^{36}\ 4d^5\ 5s^1$
Neodymium	Nd	60	144.24	$[Xe]^{54}\ 4f^4\ 6s^2$
Neon	Ne	10	20.18	$[He]^2\ 2s^2\ 2p^6$
Neptunium	Np	93	237	$[Rn]^{86}\ 5f^4\ 6d^1\ 7s^2$
Nickel	Ni	28	58.71	$[Ar]^{18}\ 3d^8\ 4s^2$
Niobium	Nb	41	92.90	$[Kr]^{36}\ 4d^4\ 5s^1$
Nitrogen	N	7	14	$[He]^2\ 2s^2\ 2p^3$
Nobelium	No	102	254	$[Rn]^{56}\ 5f^{14}\ 7s^2$
Osmium	Os	76	190.2	$[Xe]^{54}\ 4f^{14}\ 5d^6\ 6s^2$
Oxygen	O	8	15.99	$[He]^2\ 2s^2\ 2p^4$
Palladium	Pd	46	106.4	$[Kr]^{36}\ 4d^{10}$
Phosphorus	P	15	30.97	$[Ne]^{10}\ 3s^2\ 3p^3$
Platinum	Pt	78	195.09	$[Xe]^{54}\ 4f^{14}\ 5d^9\ 6s^1$
Plutonium	Pu	94	244	$[Rn]^{86}\ 5f^6\ 7s^2$
Polonium	Po	84	210	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6p^4$
Potassium	K	19	39.102	$[Ar]^{18}\ 4s^1$
Praseodymium	Pr	59	140.907	$[Xe]^{54}\ 4f^3\ 6s^2$
Promethium	Pm	61	145	$[Xe]^{54}\ 4f^5\ 6s^2$
Protactinium	Pa	91	231	$[Rn]^{86}\ 5f^2\ 6d^1\ 7s^2$
Radium	Ra	88	226	$[Rn]^{86}\ 7s^2$
Radon	Rn	86	222	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6p^6$
Rhenium	Re	75	186.2	$[Xe]^{54}\ 4f^{14}\ 5d^5\ 6s^2$
Rhodium	Rh	45	102.90	$[Kr]^{36}\ 4d^8\ 5s^1$
Rubidium	Rb	37	85.47	$[Kr]^{36}\ 5s^1$
Ruthenium	Ru	44	101.07	$[Kr]^{36}\ 4d^7\ 5s^1$
Rutherfordium	Rf	104	257	$[Rn]^{86}\ 5f^{14}\ 6d^2\ 7s^2$
Samarium	Sm	62	150.35	$[Xe]^{54}\ 4f^6\ 6s^2$
Scandium	Sc	21	44.95	$[Ar]^{18}\ 3d^1\ 4s^2$
Selenium	Se	34	78.96	$[Ar]^{18}\ 3d^{10}\ 4s^2\ 4p^4$
Silicon	Si	14	28.08	$[Ne]^{10}\ 3s^2\ 3p^2$
Silver	Ag	47	107.87	$[Kr]^{22}\ 4d^{10}\ 5s^1$
Sodium	Na	11	22.98	$[Ne]^{10}\ 3s^1$
Strontium	Sr	38	87.62	$[Kr]^{36}\ 5s^2$
Sulphur	S	16	32.06	$[Ne]^{10}\ 3s^2\ 3p^4$
Tantalum	Ta	73	180.94	$[Xe]^{54}\ 4f^{14}\ 5d^{\ 3}\ 6s^2$
Technetium	Tc	43	99	$[Kr]^{36}\ 4d^5\ 5s^2$
Tellurium	Te	52	127.60	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^4$
Terbium	Tb	65	158.92	$[Xe]^{54}\ 4f^9\ 6s^2$
Thallium	Tl	81	204.37	$[Xe]^{54}\ 4f^{14}\ 5d^{10}\ 6s^2\ 6\ p^1$
Thorium	Th	90	232.03	$[Rn]^{86}\ 6d^2\ 7s^2$
Thulium	Tm	69	168.93	$[Xe]^{54}\ 4f^{13}\ 6s^2$
Tin	Sn	50	118.69	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^2$
Titanium	Ti	22	47.90	$[Ar]^{18}\ 3d^2\ 4s^2$
Tungsten	W	74	183.85	$[Xe]^{54}\ 4f^{14}\ 5d^4\ 6s^2$
Uranium	U	92	238.02	$[Rn]^{86}\ 5f^2\ 6d^1\ 7s^2$
Vanadium	V	23	50.94	$[Ar]^{18}\ 3d^3\ 4s^2$
Xenon	Xe	54	131.04	$[Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^6$
Ytterbium	Yb	70	173.04	$[Xe]^{54}\ 4f^{14}\ 6s^2$
Yttrium	Y	39	88.90	$[Kr]^{36}\ 4d^1\ 5s^2$
Zinc	Zn	30	63.37	$[Ar]^{18}\ 3d^{10}\ 4s^2$
Zirconium	Zr	40	91.22	$[Kr]^{36}\ 4d^2\ 5s^2$

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Advanced level matter to explore more about the topic for competitive examinations with reference at the appropriate place in the text and detail in competition file.

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Provides definitions of new terms, laws, name reactions in organic chemistry, important facts to remember and mathematical relations.

VALUE BASED QUESTIONS

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IN ADDITION : EACH UNIT HAS

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Useful Relations

$\pi = 3.1416$	$\ln X = 2.303 \log X$	$2.303\ RT/F = 0.05916$ V
$e = 2.71828$	$2.303\ RT = 5709$ J mol (at 25°C)	(at 25°C)

Selected Greek letters

α	alpha	ξ	xi
β	beta	ν	nu
γ	gamma	Π, π	pi
Δ, δ	delta	ρ	rho
ε	epsilon	Σ, σ	sigma
η	eta	τ	tau
θ	theta	Φ, ϕ	phi
κ	kapha	χ	chi
Λ, λ	lambda	ψ	psi
μ	mu	Ω, ω	omega

Some Useful Conversion Factors

1 kg	=	1000 gram
1 gram	=	10 decigram
	=	100 centigram
	=	1000 milligram
1 litre	=	1 $dm^3 = 10^3\ cm^3$
1eV	=	1.6022×10^{-19} J
1 cal	=	$4.184\ J = 4.184 \times 10^7$ erg
1 J	=	10^7 erg
1 L. atm	=	24.217 cal = 101.32 J
1 Å	=	10^{-8} cm = 10^{-10} m = 0.1 nm
1 atm	=	760 mm Hg
	=	1.013×10^5 pascals
1 bar	=	10^5 pascals

Prefixes

f	p	n	μ	m	c	d	k	M
femto	pico	nano	micro	milli	centi	deci	kilo	mega

USEFUL PHYSICAL CONSTANTS

Quantity	Symbol	Value
Speed of light	c	$2.9979 \times 10^8\ ms^{-1}$
Atomic mass unit	amu or u	1.6606×10^{-27} kg
Avogadro constant	N_A	$6.022 \times 10^{23}\ mol^{-1}$
Planck constant	h	6.6262×10^{-34} J s
Faraday constant	F	$9.64846 \times 10^4 C\ mol^{-1}$
Boltzmann constant	k	$1.3807 \times 10^{-23}\ JK^{-1}$
Charge-to-mass ratio of electron	e/m	$1.7588 \times 10^{11}\ C\ kg^{-1}$
Electronic charge	e	1.60219×10^{-19} C
Gas constant	R	$8.314\ J\ mol^{-1}\ K^{-1}$
Molar volume (STP)	V_m	$22.414 \times 10^{-3}\ m^3\ mol^{-1}$
		$22.414\ dm^3\ mol^{-1}$
Mass of electron	m_e	9.10953×10^{-31} kg
Mass of proton	m_p	1.67265×10^{-27} kg
Mass of neutron	m_n	1.67495×10^{-27} kg
Rydberg constant	R	$1.096 \times 10^7\ m^{-1}$

SYLLABUS

CHEMISTRY

CLASS XII (THEORY)

Time : 3 Hours **70 Marks**

UNIT	Title	No. of Periods	Marks
I.	Solid State	10	23
II.	Solutions	10	
III.	Electrochemistry	12	
IV.	Chemical Kinetics	10	
V.	Surface Chemistry	08	
VI.	General Principles and Processes of Isolation of Elements	08	19
VII.	p-Block Elements	12	
VIII.	d- and f-Block Elements	12	
IX.	Coordination Compounds	12	
X.	Haloalkanes and Haloarenes	10	28
XI.	Alcohols, Phenols and Ethers	10	
XII.	Aldehydes, Ketones and Carboxylic Acids	10	
XIII.	Organic Compounds Containing Nitrogen	10	
XIV.	Biomolecules	12	
XV.	Polymers	08	
XVI.	Chemistry in Everyday Life	06	
	Total	**160**	**70**

Unit I : Solid State (Periods 10)

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea). Unit cell in two and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties. Band theory of metals, conductors, semiconductors and insulators, and n-and p-type semiconductors

Unit II : Solutions (Periods 10)

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties – relative lowering of vapour pressure, Raoult's law, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor.

Unit III: Electrochemistry (Periods 12)

Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, relation between Gibb's energy change and emf of a cell, fuel cells, corrosion.

Unit IV : Chemical Kinetics (Periods 10)

Rate of a reaction (average and instantaneous), factors affecting rates of reaction: concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment) Activation energy, Arrhenius equation.

Unit V : Surface Chemistry (Periods 8)

Adsorption – physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis, homogeneous and heterogeneous activity and selectivity, enzyme catalysis, colloidal state distinction between true solutions, colloids and suspensions; lyophillic, lyophobic, multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions – types of emulsions.

Unit VI : General Principles and Processes of Isolation of Elements (Periods 8)

Principles and methods of extraction–concentration, oxidation, reduction : electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

Unit VII : p-Block Elements (Periods 12)

Group 15 elements : General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; Nitrogen – preparation, properties and uses; compounds of nitrogen: preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorus–allotropic forms; compounds of phosphorus: preparation and properties of phosphine ,halides (PCl_3, PCl_5) and oxoacids (elementary idea only).

Group 16 elements : General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, Dioxygen – preparation, properties and uses; classification of oxides; Ozone. Sulphur – allotropic forms; compounds of sulphur: preparation, properties and uses of sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

Group 17 elements : General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens: preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

Group 18 elements : General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

Unit VIII : d and f-Block Elements (Periods 12)

General introduction ,electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids – electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

Actinoids – Electronic configuration, oxidation states and comparison with lanthanoids.

Unit IX : Coordination Compounds (Periods 12)

Coordination compounds – Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; Werner's theory, VBT, CFT, structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit X : Haloalkanes and Haloarenes (Periods 10)

Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

Haloarenes: Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only)

Uses and environmental effects of dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit XI : Alcohols, Phenols and Ethers (Periods 10)

Alcohols : Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, some important compounds – methanol and ethanol.

Phenols : Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.

Ethers : Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit XII : Aldehydes, Ketones, Carboxylic Acids (Periods 10)

Aldehydes and Ketones : Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses.

Carboxylic acids : Nomenclature, acidic nature, methods of preparation, physical and chemical properties, uses.

Unit XIII : Organic Compounds Containing Nitrogen (Periods 10)

Amines : Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides will be mentioned at relevant places in the text.

Diazonium salts : Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit XIV : Biomolecules (Periods 12)

Carbohydrates – Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen) importance of carbohydrates.

Proteins – Elementary idea of □ - amino acids, peptide bond, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins, enzymes, hormones-Elementary idea excluding structure.

Vitamins – Classification and functions.

Nucleic acids: DNA and RNA.

Unit XV : Polymers (Periods 8)

Classification – natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers: natural and synthetic like polythene, nylon, polyesters, bakelite, rubber; Biodegradable and non-biodegradable polymers.

Unit XVI : Chemistry in Everyday Life (Periods 6)

Chemicals in medicines – analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food – preservatives, artificial sweetening agents, elementary idea of anti-oxidants.

Cleansing agents – soaps and detergents, cleansing action.

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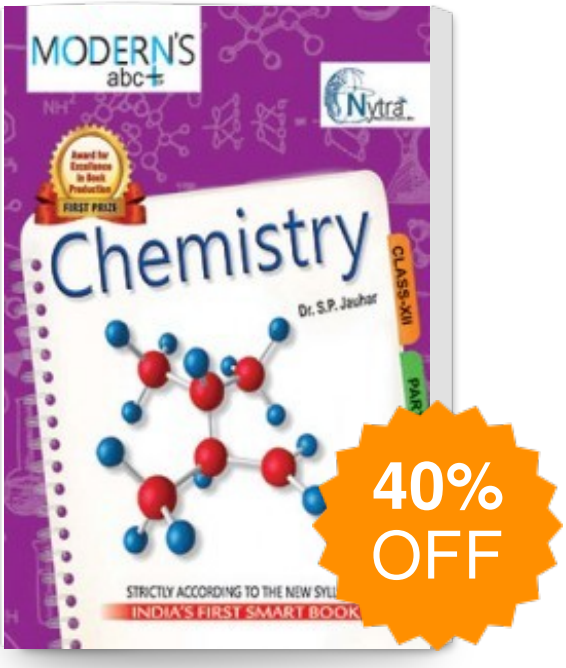

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