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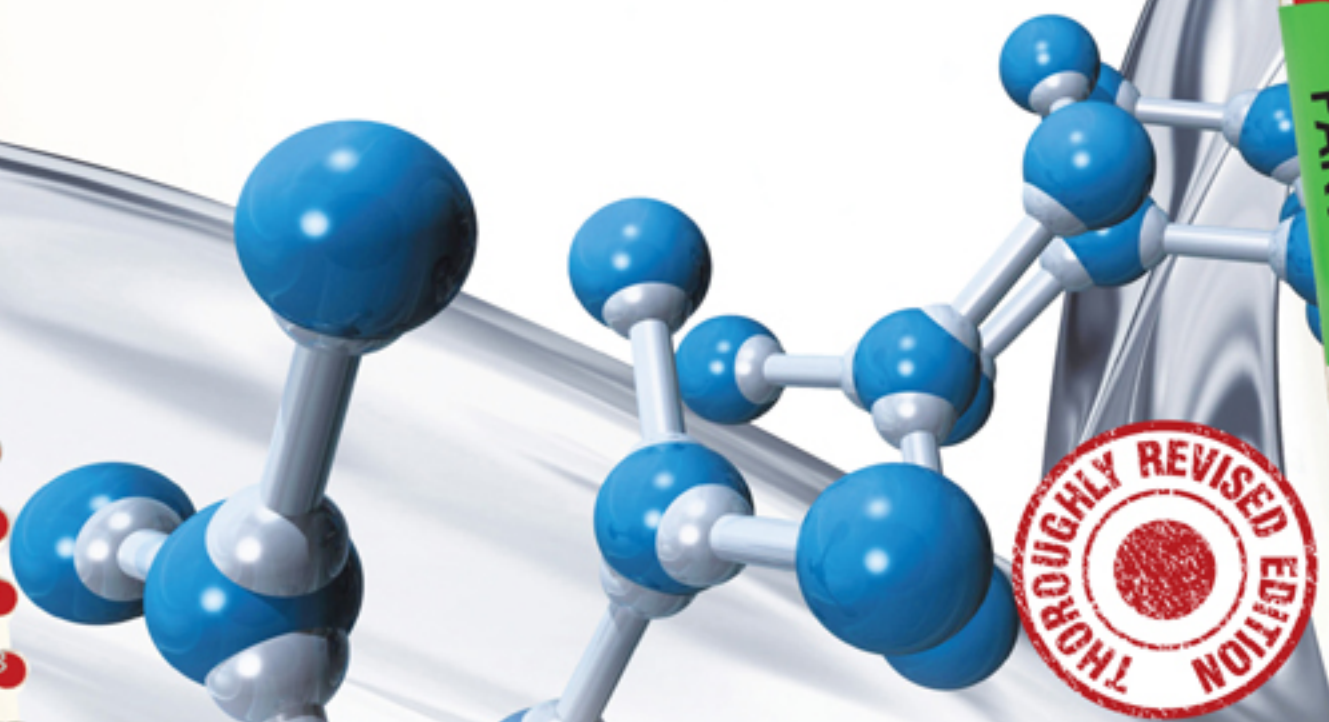
Dr. S.P. Jauhar

CLASS-XI

PART-I



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 (Ist Year PUC), Chhattisgarh, Jharkhand, Punjab, Haryana, Himachal, Kerala, Mizoram, Meghalaya, Nagaland, Assam, Manipur and other States following CBSE curriculum.

MODERN'S abc+ OF

CHEMISTRY

INDIA'S FIRST SMART BOOK

For Class XI

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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REVISED & UPDATED EDITION 2016–2017

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PREFACE

Preface & Acknowledgement

I feel pleasure in presenting the revised edition of our book "Modern's abc + of Chemistry" for Class XI students. The book has been prepared strictly according to the new syllabus proposed by C.B.S.E. New Delhi and Education Board of other Indian States and N.C.E.R.T. Text Book.

Salient Features of the Book

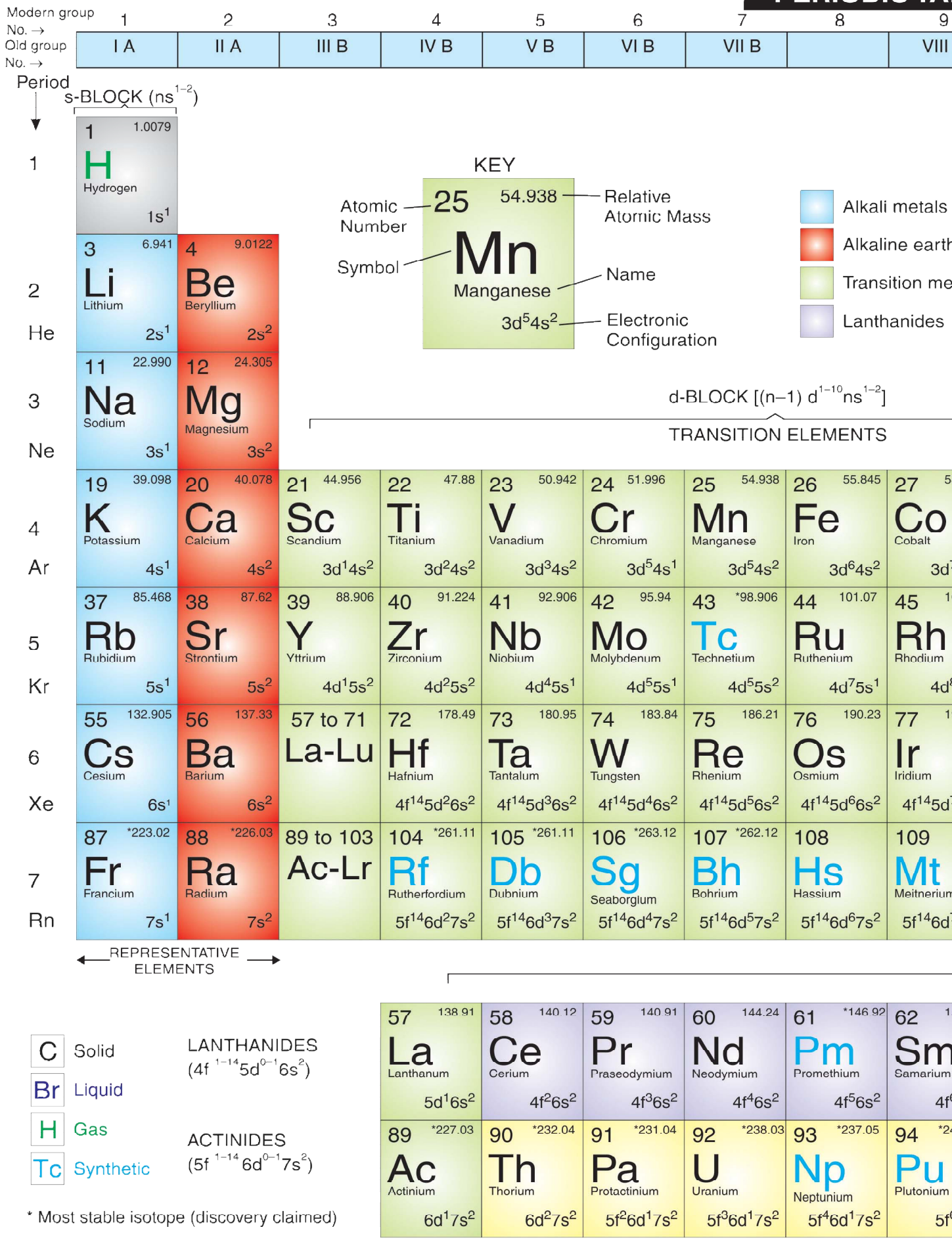
- Text matter has been planned giving emphasis on fundamental concepts in a simple, clear and systematic method.
- The text has been presented in an interesting style with a large number of Illustrative examples and Numerical problems.
- Additional information about the topic is given in Key Note, Key Facts, Facts File, Learning Plus, In focus to provide stimulus to find more about the subject.
- All the N.C.E.R.T. Text Book exercieses are covered with hints and ensures in different Section of the chapter.
- 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.
- Tough & Tricky PROBLEMS with solutions are added to accelerate the potential of the students for SOLVING NUMERICAL PROBLEMS.
- All the numerical problems of Practice Problems are completely solved in solution file at the end of each chapter.
- Large number of Numerical Problems from I.I.T., Roorkee, M.L.N.R. and other Competitive Examinations have been given in Competition File.
- 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 and MCQs based on given comprehension/passage according to latest IIT pattern are also given.
- Objective Questions in the form of assertion-reason type are also given.
- In NCERT file, All the textbook exercises and exemplar problems are fully solved.
- 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.
- A number of Higher Order Thinking Skills (HOTS) and Brain Twisting Questions with answers are included at the end of each chapter.
- The summary of key facts of each chapter is given at the end under the heading Chapter Summary.
- 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.
- Value based questions covering all the chapters are given at the end of the book.

I am extremely thankful to many teachers and students who have been sending their valuable suggestions and comments for the improvement of the book. I am greatly indebted to them. I wish to acknowledge my sincere thanks to Dr. (Mrs.) Sheenu Jauhar for her untiring efforts and valuable contribution in critical revision of the book and updating Objective Questions. I also feel pleasure to express my thanks to Mr. Arun Kamboj (G.S.S. School, Tohana), Dr. G. J. P. Singh (Chemistry Deptt., P.U., Chandigarh), Dr. O.P. Sood (Govt. College, Chandigarh), Dr. Sajeev Soni (S.D. College, Chandigarh), Dr. A.N. Sharma (Govt. College, Hamirpur), Ms. Parveen (Faridkot), Dr. Neelam Vohra (M.L.N. College, Yamuna Nagar), Dr. R.L. Singla (S.A. Jain College, Ambala), Dr. C.M. Gupta (Govt. College, Muktsar), Mr. R.C. Saini (Govt. S.S. School, Sec. 35, Chandigarh), Mrs. Anju Goel, Govt. S. S. School Sec. 38, Chandigarh and Prof. R.C. Bhanot (Govt. College, Patiala), Dr. Paramjit Singh and Prof. A.S. Chahal (S.G.G.S. College, Chandigarh), Dr. A.S. Chahal (Mohali), Dr. G.S. Arora (Govt. College, Mohali), Mrs. T. Sondhi, (Sacred Heart High School, Chandigarh), Mrs. Sunita Saroha (D.A.V. S.S. School, Sec. 15, Chandigarh, Mrs. Amita Sharma (Saraswati Institute, Chandigarh), Mrs. Seema (Seema Chemistry classes), Mr. Sudhanshu Jaitley (Chandigarh), Mr. Deepak Mishra (H.O.D. Shri Gauri Shankar Inter College, Ferozabad), Mr. Praveen Kumar (S.V.M. Senior Sec. School, Kosi Kalan, Mathura) Mr. Vikas Chander (Saint Mary S.S. School Gurdaspur) and Shri Rakesh Jassotia, (Sr. Lecturer, Govt. G.H.S.S. Nagari PAROLE, Kathua). I am also highly thankful to Mr. Gaurav Chakraborty and Dr. Raghubir Singh (Chandigarh), Mr. Vinod Kumar Jangra G.S.S.S. Ganaur (Sonepat) and Vaibhav Yavlekar, (Ujjain) for thoroughly checking of the book and providing valuable suggestions. 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, Mr. Ravinder Pathania and L.B. Mishra who have taken great pains in bringing up the book.

I hope that the present book will be warmly received by the students and the teachers. Suggestions for the further improvement of the book will be gratefully acknowledged.

Dr. S.P. Jauhar

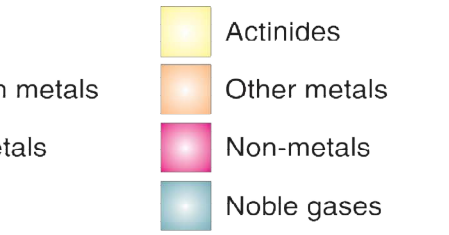
PERIODIC TA


Modern group No. →
Old group No. →
Period
1 2 3 4 5 6 7 8 9
I A II A III B IV B V B VI B VII B VIII
s-BLOCK (ns1–2)
KEY
Atomic Number
25
54.938
Relative Atomic Mass
Mn
Symbol
Manganese
Name
3d54s2
Electronic Configuration
Alkali metals
Alkaline earth
Transition me
Lanthanides
d-BLOCK [(n–1) d1–10ns1–2]
TRANSITION ELEMENTS
1 1.0079 H Hydrogen 1s1
3 6.941 Li Lithium 2s1
4 9.0122 Be Beryllium 2s2
11 22.990 Na Sodium 3s1
12 24.305 Mg Magnesium 3s2
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
27 5 Co Cobalt 3d
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
45 1 Rh Rhodium 4d
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
77 1 Ir Iridium 4f145d
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
109 Mt Meitnerium 5f146d
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
62 1 Sm Samarium 4f
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
94 *24 Pu Plutonium 5f
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)

BLE OF THE ELEMENTS

10	11	12	13	14	15	16	17	18
B	I B	II B	III A	IV A	V A	VI A	VII A	VIII A

p – BLOCK (ns^2np^{1-6})



			5 10.811 **B** Boron $2s^22p^1$	6 12.011 **C** Carbon $2s^22p^2$	7 14.007 **N** Nitrogen $2s^22p^3$	8 15.999 **O** Oxygen $2s^22p^4$	9 18.998 **F** Fluorine $2s^22p^5$	10 20.18 **Ne** Neon $2s^22p^6$
			13 26.982 **Al** Aluminium $3s^23p^1$	14 28.086 **Si** Silicon $3s^23p^2$	15 30.974 **P** Phosphorus $3s^23p^3$	16 32.066 **S** Sulphur $3s^23p^4$	17 35.453 **Cl** Chlorine $3s^23p^5$	18 39.948 **Ar** Argon $3s^23p^6$
8.933 ... $4s^2$	28 58.693 **Ni** Nickel $3d^84s^2$	29 63.546 **Cu** Copper $3d^{10}4s^1$	30 65.39 **Zn** Zinc $3d^{10}4s^2$	31 69.723 **Ga** Gallium $3d^{10}4s^24p^1$	32 72.61 **Ge** Germanium $3d^{10}4s^24p^2$	33 74.992 **As** Arsenic $3d^{10}4s^24p^3$	34 78.96 **Se** Selenium $3d^{10}4s^24p^4$	35 79.904 **Br** Bromine $3d^{10}4s^24p^5$	36 83.80 **Kr** Krypton $3d^{10}4s^24p^6$
02.91 ... $5s^1$	46 106.42 **Pd** Palladium $4d^{10}$	47 107.87 **Ag** Silver $4d^{10}5s^1$	48 112.41 **Cd** Cadmium $4d^{10}5s^2$	49 114.82 **In** Indium $4d^{10}5s^25p^1$	50 118.71 **Sn** Tin $4d^{10}5s^25p^2$	51 121.76 **Sb** Antimony $4d^{10}5s^25p^3$	52 127.60 **Te** Tellurium $4d^{10}5s^25p^4$	53 126.90 **I** Iodine $4d^{10}5s^25p^5$	54 131.29 **Xe** Xenon $4d^{10}5s^25p^6$
92.22 ... $6s^2$	78 195.08 **Pt** Platinum $4f^{14}5d^96s^1$	79 196.97 **Au** Gold $4f^{14}5d^{10}6s^1$	80 200.59 **Hg** Mercury $4f^{14}5d^{10}6s^2$	81 204.38 **Tl** Thallium $4f^{14}5d^{10}6s^26p^1$	82 207.2 **Pb** Lead $4f^{14}5d^{10}6s^26p^2$	83 208.98 **Bi** Bismuth $4f^{14}5d^{10}6s^26p^3$	84 *209.98 **Po** Polonium $4f^{14}5d^{10}6s^26p^4$	85 *209.99 **At** Astatine $4f^{14}5d^{10}6s^26p^5$	86 *222.02 **Rn** Radon $4f^{14}5d^{10}6s^26p^6$
... $7s^2$	110 *269 **Ds** Darmstadtium $5f^{14}6d^87s^2$	111 *272 **Rg** Rontgenium $5f^{14}6d^{10}7s^1$	112 *277 **Cn** Copernicium $5f^{14}6d^{10}7s^2$	113 **Uut**	114 289 **Fl** Flerovium $5f^{14}6d^{10}7s^27p^2$	115 **Uup** Ununpentium $5f^{14}6d^{10}7s^27p^3$	116 298 **Lv** Livermorium $5f^{14}6d^{10}7s^27p^4$	117 **Uus**	118 *293 **Uuo** Ununoctium $5f^{14}6d^{10}7s^27p^6$

f-BLOCK [$(n-2)f^{0-14}(n-1)d^{0-1}ns^2$]

REPRESENTATIVE ELEMENTS

INNER TRANSITION ELEMENTS

50.36 ... $6s^2$	63 151.96 **Eu** Europium $4f^76s^2$	64 157.25 **Gd** Gadolinium $4f^75d^16s^2$	65 158.93 **Tb** Terbium $4f^96s^2$	66 162.50 **Dy** Dysprosium $4f^{10}6s^2$	67 164.93 **Ho** Holmium $4f^{11}6s^2$	68 167.26 **Er** Erbium $4f^{12}6s^2$	69 168.93 **Tm** Thulium $4f^{13}6s^2$	70 173.04 **Yb** Ytterbium $4f^{14}6s^2$	71 174.97 **Lu** Lutetium $4f^{14}5d^16s^2$
44.06 ... $7s^2$	95 *243.06 **Am** Americium $5f^77s^2$	96 *247.07 **Cm** Curium $5f^76d^17s^2$	97 *247.07 **Bk** Berkelium $5f^97s^2$	98 *251.08 **Cf** Californium $5f^{10}7s^2$	99 *252.08 **Es** Einsteinium $5f^{11}7s^2$	100 *257.18 **Fm** Fermium $5f^{12}7s^2$	101 *258.10 **Md** Mendelevium $5f^{13}7s^2$	102 *259.10 **No** Nobelium $5f^{14}7s^2$	103 *262.11 **Lr** Lawrencium $5f^{14}6d^17s^2$

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	$[Rn]^{86}\ 5f^{12}\ 7s^2$
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	$[He]^2\ 1s^1$
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	$[Kr]^{36}\ 4d^2\ 5s^2$

Award of Excellence

Modern's abc+ of Chemistry (XI & XII) was awarded

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R U CURIOUS....

Thought provoking questions during understanding of the text with answers to satisfy your curiosity.

IN THIS UNIT

Main contents are given in the beginning to make the book Target Oriented. For Boards Examinations & Competitive Examinations, students can easily search the relevent material without wasting time

SOLVED EXAMPLES & PRACTICE PROBLEMS

A very large number of solved numerical problems of different levels of difficulty and practice problems promoting problem solving skills in students.

TOUGH & TRICKY PROBLEMS

To accelerate the potential of students for solving numerical problems.

COMPETITION PLUS

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.

CHAPTER SUMMARY

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

VALUE BASED QUESTIONS

With Answers are given in each unit.

IN ADDITION : EACH UNIT HAS

- AISB Qs. and State Boards' Qs. highlighted in Revision Exercises
- Quick Memory Test
- HOTS & Brain Twisting Questions.
- AIPMT, JEE (main), JEE (advance) given separately.
- Unit Practice Test with Hints & Solutions.

ABOVE ALL : A NEW FEATURE

Nytra: a first augmented reality app for K-12 Education in India.
To help the students to visualize the concepts more easily and enhance understanding – a digital revolution: Watch chemistry come alive.

A NOTE TO THE STUDENTS

The present book has been prepared to provide a single book for students preparing for different Boards' Examinations and Competitive Examinations for Entrance to Medical, Engineering and other Professional Colleges. Each chapter is divided into two parts. The first part of each chapter provides complete discussion of all the basic principles, definitions, terms and mathematical relations. The aim of the book is to make the basic concepts strong with Practice Problems and Conceptual Questions.

The second part of each chapter under the heading Competition File is planned with a target of Competitive Examinations. This provides additional useful information (not covered in the chapter). This also includes Objective Questions in the form of multiple choice type, comprehension type, matching type, matrix-match type, integer answer type and assertion reason type. Hints & Answers to almost all MCQs have been given.

PLEASE SEE THE SPECIAL FEATURES OF THE BOOK IN THE MARGINS WHICH MAKE IT NUMBER 1.

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The Study of the book will induce confidence among the students to face the challenges in the examination and achieve their target.

SYLLABUS

CHEMISTRY–XI

Time : 3 Hours | **Total Periods (Theory 160 + Practical 60)** | **Total Marks : 70**

Unit No.	Title	No. of Periods	Marks
Unit I	Some Basic Concepts of Chemistry	12	11
Unit II	Structure of Atom	14	
Unit III	Classification of Elements and Periodicity in Properties	08	04
Unit IV	Chemical Bonding and Molecular Structure	14	21
Unit V	States of Matter : Gases and Liquids	12	
Unit VI	Thermodynamics	16	
Unit VII	Equilibrium	14	
Unit VIII	Redox Reactions	06	16
Unit IX	Hydrogen	08	
Unit X	*s*-Block Elements	10	
Unit XI	Some *p*-Block Elements	14	
Unit XII	Organic Chemistry : Some Basic Principles and Techniques	14	18
Unit XIII	Hydrocarbons	12	
Unit XIV	Environmental Chemistry	06	
	Total	**160**	**70**

Unit I : Some Basic Concepts of Chemistry (Periods 12)

General Introduction : Importance and scope of chemistry.

Nature of matter, laws of chemical combination, Dalton's atomic theory : concept of elements, atoms and molecules.

Atomic and molecular masses. Mole concept and molar mass; percentage composition, empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II : Structure of Atom (Periods 14)

Discovery of electron, Proton and Neutron; atomic number, isotopes and isobars. Thomson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of *s*, *p*, and *d* orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit III : Classification of Elements and Periodicity in Properties (Periods 08)

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.

Unit IV : Chemical Bonding and Molecular Structure (Periods 14)

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization involving *s*, *p* and *d* orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only). Hydrogen bond.

Unit V : States of Matter : Gases and Liquids (Periods 12)

Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charle's law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation. Deviation from ideal behaviour, liquefaction of gases, critical temperature. Kinetic energy and molecular speeds (elementary idea).

Liquid State – Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

Unit VI : Chemical Thermodynamics (Periods 16)

Concepts of systems and types of Systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics – internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH, Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition ionization, solution and dilution.

Second law of thermodynamics (brief introduction).

Introduction of entropy as a state function. Gibb's energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Third law of thermodynamics (brief introduction).

Unit VII: Equilibrium (Periods 14)

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle; ionic equilibrium – ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH. Henderson equation, hydrolysis of salts (elementary idea), buffer solutions, solubility product, common ion effect (with illustrative examples).

Unit VIII : Redox Reactions (Periods 06)

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

Unit IX : Hydrogen (Periods 08)

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides – ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, reactions, structure and use; hydrogen as a fuel.

Unit X : *s*-Block Elements (Alkali and Alkaline Earth Metals) (Periods 10)

Group 1 and Group 2 elements :

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.

Preparation and Properties of Some Important Compounds

Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium.

Calcium Oxide and Calcium Carbonate and their industrial uses, biological importance of Magnesium and Calcium.

Unit XI : Some *p*-Block Elements (Periods 14)

General Introduction to *p*-Block Elements

Group 13 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron : physical and chemical properties, some important compounds : borax, boric acids, boron hydrides. Aluminium : reactions with acids and alkalies, uses.

Group 14 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements. Carbon-catenation, allotropic forms, physical and chemical properties; uses of some important compounds : oxides. Important compounds of silicon and a few uses : silicon tetrachloride, silicones, silicates and zeolites, their uses.

Unit XII : Organic Chemistry – Some Basic Principles and Techniques (Periods 14)

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond : inductive effect, electromeric effect, resonance and hyperconjugation. Homolytic and heterolytic fission of a covalent bond : free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions.

Unit XIII : Hydrocarbons (Periods 12)

Classification of Hydrocarbons

Aliphatic Hydrocarbons

Alkanes – Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes – Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation; chemical reactions : addition of hydrogen, halogen, water, hydrogen halides (Markownikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes – Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions : acidic character of alkynes, addition reaction with - hydrogen, halogens, hydrogen halides and water.

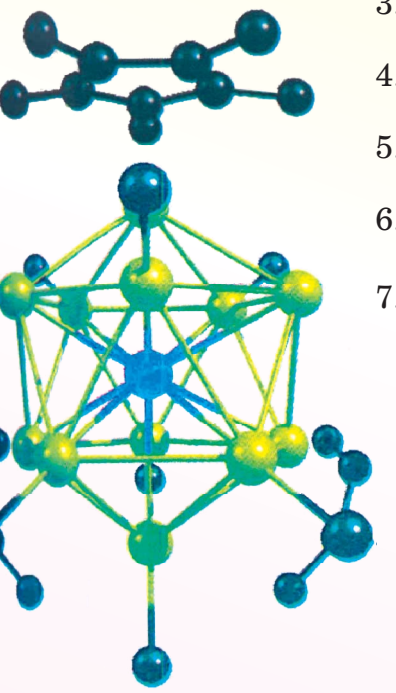
Aromatic hydrocarbons : Introduction, IUPAC nomenclature; benzene : resonance, aromaticity; chemical properties mechanism of electrophilic substitution, nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of a functional group in mono-substituted benzene. Carcinogenicity and toxicity.

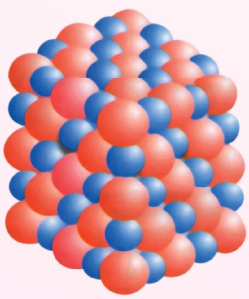
Unit XIV : Environmental Chemistry (Periods 06)

Environmental pollution – air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming – pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategies for control of environmental pollution.

CONTENTS

PART–I





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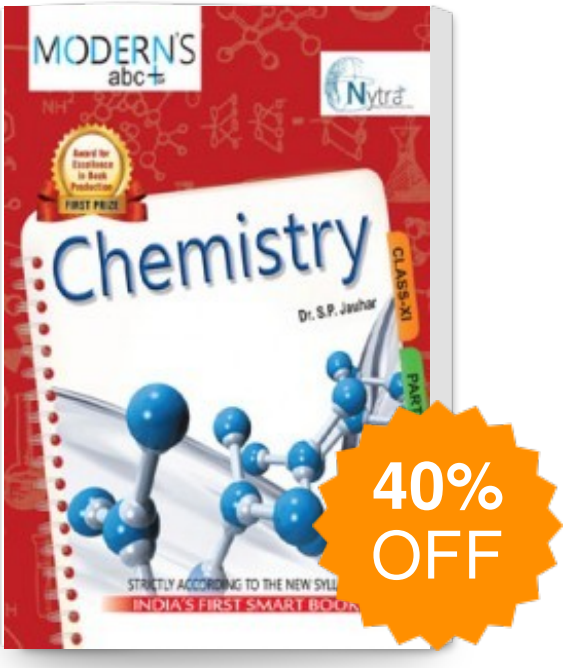

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