

# CONTENTS

<b>Preface</b> .....	<b>(vii)</b>
<b>Abbreviations</b> .....	<b>(xxi)</b>
<b>Above the Author</b> .....	<b>(xxv)</b>
<b>Syllabus</b> .....	<b>(xxvii)</b>

## Chapter 1| Environment

1.1	Man and Environment .....	3
1.2	Environments in Nature.....	4
1.3	Racial Development Theories .....	5
1.4	World Environmental Day (WED).....	6
	1.4.1 Environmental Main Issues .....	7
1.5	Environmental Protection Act.....	7
1.6	Ecosystems .....	8
1.7	Autotrophs and Heterotrophs .....	9
1.8	Components of an Ecosystem .....	10
1.9	Ecology.....	10
	1.9.1 Types of Ecosystems .....	12
1.10	Types of Climax.....	12
1.11	Food Chain.....	13
1.12	Trophic Levels .....	14
1.13	Food Webs .....	14
1.14	Ecological Pyramids .....	15
	<b>Questions</b> .....	<b>17</b>

## Chapter 2| Biological Environment of Sea

2.1	Marine Environment .....	19
2.2	Marine Biosphere .....	20
2.3	Marine Environment Classifications .....	20

**(xii) Contents**

---

2.4	Sea Life .....	23
2.5	Populations of the Sea .....	23
2.6	Animal Populations of the Sea .....	24
2.7	B – Vertebrates .....	26
2.8	Phytoplankton in Relation to Marine Environment .....	27
2.9	Factors of Phytoplankton Reproduction .....	28
2.10	Marine Organisms .....	30
2.11	The Nitrogen Cycle.....	32
2.12	Ecological Groups of Marine Animals .....	34
2.13	Organic Production in the Sea .....	34
2.14	Plant Nutrient Consumption as an Index of Organic Production.....	35
2.15	Oxygen Production and Consumption as an Index of Organic Production.....	35
2.16	Zooplankton Production .....	36
2.17	Marine Biosphere Atmosphere Interaction.....	36
	<b>Questions .....</b>	<b>37</b>

**Chapter 3| Natural Resources**

3.1	Natural Resources-(A) Land Resources .....	39
	3.1.1 Soil .....	40
3.2	Minerals.....	44
3.3	Soil Survey and Mapping .....	46
3.4	Soil Testing (Practical) .....	49
3.5	Land Utilization.....	50
3.6	Agriculture .....	52
3.7	Definition of Terms used in Land Utilization Statistics .....	52
3.8	Soil Erosion .....	54
3.9	Soil Fertility.....	55
3.10	Natural Resources – (B) Water Resources.....	57
	3.10.1 Hydrology .....	58
3.11	World’s Water.....	60
3.12	Surface Water Resources Estimates for India .....	65
3.13	Groundwater Resources .....	67
3.14	Utilization of Water Resources.....	67
3.15	Cryosphere or Ice Sphere .....	68
3.16	Water Uses.....	69
	<b>Questions .....</b>	<b>70</b>

## Chapter 4| Environmental Degradation and Protection

4.1	Disaster Management .....	72
	4.1.1 Mitigation .....	74
	4.1.2 Climate Disasters .....	76
4.2	The National Environment Appellate Authority Act 1997 .....	77
4.3	World Environmental Day 5th June.....	78
4.4	Environmental Issues .....	78
4.5	Environmental Degradation.....	79
	4.5.1 Air Pollution Control Boards .....	80
4.6	Environmental Hazards .....	81
	4.6.1 Types of Hazards/Disasters	
	Natural or Man-made .....	82
	4.6.2 The Chemical Weapons and Weapons of	
	Mass Destruction.....	83
	4.6.3 Prohibition of Chemical Weapons .....	83
	4.6.4 Prohibition Relating to Weapons of	
	Mass Destruction.....	84
	4.6.5 IPCC (Inter Governmental Panel on	
	Climate Change) .....	85
4.7	Industrial Chemical Wastes and Toxic Chemicals .....	86
	4.7.1 Some Toxic Chemicals.....	86
	4.7.2 National Authority .....	88
	<b>Questions .....</b>	<b>89</b>

## Chapter 5| The Atmosphere

5.1	Composition of the Atmosphere.....	91
5.2	Atmospheric Heat Process.....	92
5.3	The Vertical Structure of the	
	Atmosphere based on Temperature .....	93
5.4	The Sun.....	97
	<b>Questions .....</b>	<b>101</b>

## Chapter 6| The Oceans

6.1	Composition of Sea Water .....	103
6.2	The Exchange of Earth Materials between	
	Sea and Atmosphere.....	104
6.3	The Cryosphere.....	106
	6.3.1 Sea Icing .....	107
6.4	Some Physical Properties of Sea Water .....	107

**(xiv) Contents**

---

6.5	Energy Exchange Processes between Sea and Atmosphere Interface .....	108
6.6	Ocean Currents .....	109
6.7	Motion of the Sea and the Effect of Wind on Ocean Currents.....	110
6.8	Ocean Currents caused by Density Differences .....	111
6.9	Some Ocean Currents.....	113
6.10	Indian Ocean Currents .....	114
6.11	Some Definitions and Explanation of Terms.....	114
6.12	Geophysical Properties of Oceans and Earth.....	115
6.13	Major Oceans .....	117
6.14	Sea Floor Features.....	118
	6.14.1 Basin.....	119
	<b>Questions .....</b>	<b>120</b>

**Chapter 7| Soils**

7.1	Soil Erosion Types .....	121
	7.1.1 Mechanism of Erosion.....	122
	7.1.2 Factors Influencing Erosion.....	123
7.2	Soil and Water Conservation Measures.....	123
	7.2.1 Soil and Water Conservation on Agricultural Land .....	124
7.3	Erosion Control-Mechanical Measures .....	125
	7.3.1 Soil Types.....	126
	7.3.2 Desert and Desertification .....	127
7.4	Interior Structure of the Earth.....	130
7.5	Plate Tectonics.....	132
7.6	Seismicity of India .....	144
	<b>Questions .....</b>	<b>151</b>

**Chapter 8| Environmental Pollution**

8.1	Air Pollution .....	154
8.2	pH Value.....	159
8.3	Pollutions Standard Index .....	160
	8.3.1 Hazards of Nuclear Fall-out .....	167
	8.3.2 Nuclear Energy and Radiation Hazards.....	170
8.4	Carbon and its Compounds .....	171

8.5	Sulphur (S) .....	173
8.6	Atmospheric Nitrogen and its Compounds .....	173
8.7	Ozone (O <sub>3</sub> ) .....	175
8.8	Elementary Ways of Pollution Control.....	177
8.9	Acid Rain .....	178
8.10	BAPMoN.....	179
8.11	SMOG .....	181
8.12	Toxic Air Pollutants.....	182
8.13	Dispersal of Air Pollutants .....	183
8.14	Methods of Estimation of Particulate Matter in Air .....	186
8.15	Global Warming Effects.....	188
8.16	Solid Wastes .....	198
8.17	Fire Services (Prevention, Control and Forecasting).....	199
	<b>Questions .....</b>	<b>200</b>

## **Chapter 9| Water and its Pollutions**

9.1	The Water Pollution Act 1974 .....	207
9.2	Global and India Water uses .....	209
9.3	Functions of Central/State Water Pollution Control Boards .....	210
9.4	Prohibition on use of Stream or Well for Disposal of Polluting Substances/Matter.....	211
9.5	Emergency Measures in Case of Pollutions of Stream or Well.....	211
9.6	Rivers in India.....	212
9.7	Hydrological Cycle.....	212
9.8	Water Resources.....	214
9.9	Hardness of Water .....	217
9.10	Drinking Water.....	220
	<b>Questions .....</b>	<b>224</b>

## **Chapter 10| Forests**

10.1	Definition .....	225
10.2	Forests in India.....	226
10.3	Forest Policy.....	226
10.4	Forests and Man .....	227

**(xvi) Contents**

---

10.5	Indian Forest Organization.....	227
	10.5.1 Main Forest Products .....	228
10.6	ICFRE (Indian Council of Forestry Research and Education)	
	HQ Dehradun .....	228
10.7	Forest Fires .....	229
10.8	Forest .....	229
10.9	Coral Reefs .....	232
10.10	The Indian Forest Act 1927 .....	232
10.11	Reserved Forest.....	233
	10.11.1 Acts Prohibited in Reserve Forest Area .....	233
	10.11.2 Forest Conservation Act 1980.....	233
10.12	Forest Products .....	234
10.13	Danger due to Deforestation .....	237
	<b>Questions .....</b>	<b>238</b>

**Chapter 11| The Biodiversity**

11.1	The Bio-Diversity Act 2002.....	240
11.2	The National Green Tribunal Act 2010.....	241
11.3	Biodiversity .....	241
11.4	Coastal and Marine Biodiversity.....	242
11.5	Wild Life.....	244
	11.5.1 The Variety of Fauna in India .....	245
	11.5.2 Human Population Growth .....	246
	11.5.3 The Present Environmental Issues .....	248
	11.5.4 Biological Diversity Under Stress .....	249
	11.5.5 Variety of Fauna in India .....	251
	11.5.6 Coastal and Marine Bio-diversity .....	256
	11.5.7 The Wild Life (Protection) Act, 1972 .....	258
	11.5.8 The National Board for Wild Life .....	259
	11.5.9 State Boards for Wild Life .....	259
11.6	Biogeographic Zones in India.....	260
11.7	The Public Liability Insurance Act, 1991 .....	261
11.8	Sustainable Development .....	262
	<b>Questions .....</b>	<b>268</b>

**Chapter 12| The Climate-Role of Ocean in  
Climate Fluctuations**

12.1	Worlds Land Utilization (1990).....	270
	12.1.1 Climate .....	271

12.2	Climatology.....	274
12.3	Climate of India .....	277
12.4	The Role of Ocean in Climate Fluctuation .....	284
	12.4.1 Role Factors (Importance) of Ocean in Climate Variability .....	286
12.5	Present and Past Radioactivity of the Earth .....	287
12.6	Climatic Controls .....	289
12.7	Components of Climate System.....	291
12.8	Climate System or Earth System .....	293
	12.8.1 Extinction of Dinosaurs on the Earth.....	293
	12.8.2 Climate Change.....	293
	12.8.3 Disaster (Measurement) Management System-Instruments .....	295
	12.8.4 Environ Automatic Weather Station .....	296
12.9	Role Factors (Importance) of Ocean in Climate Variability .....	301
12.10	The Earth-Atmospheric System .....	302
12.11	Climate over Earth History .....	305
	12.11.1 Annual Carbon Fluxes in the Earth Atmosphere System .....	306
12.12	The Evolution of the Earth's Atmosphere .....	306
12.13	Climate during Geological Cretaceous Period of Earthwarm Epoch 135-180 MY Ago .....	309
12.14	Geological Time Scale .....	310
12.15	Milankovitch Cycles.....	313
12.16	Impact of Climate Change on Agriculture .....	315
	12.16.1 Agroclimatology.....	317
	12.16.2 Topoclimatology .....	318
	<b>Questions.....</b>	<b>319</b>

## **Chapter 13| International Geosphere-Biosphere Programme IGBP-1989**

13.1	The Linkages of General Circulation Models (GCM) with Ecosystem Models.....	321
13.2	Global Changes of the Past .....	322
13.3	Law of the Sea .....	324
	13.3.1 The Role of Ocean in Climate Variability .....	325
	<b>Questions.....</b>	<b>325</b>

### Chapter 14| Field Study

14.1	Thermal Comfort .....	327
14.2	Water Purification Technologies (CSIR) Waste Water Treatment using Electrodialysis .....	329
14.3	CSIR-CLRI Technology Zero Waste Water Discharge (ZWD) .....	330
14.4	“Environ” Automatic Weather Station.....	331
14.5	Water and Waste Water Analysis System .....	332

### Chapter 15| Modern Aids of Communication and Detection

15.1	Radio Spectrum.....	347
15.2	Satellite Communication .....	349
15.2.1	Radar.....	353
15.3	Satellite Meteorology.....	354
15.3.1	Satellite Pay Loads, TV Camera .....	357
15.3.2	Remote Sensing.....	358
15.3.3	Geostationary Satellites .....	360
15.3.4	IMDPS (INSAT Meteorological Data Processing System).....	361
15.4	Global Positioning System .....	361
15.4.1	Indian Regional Navigation Satellite System (IRNSS) .....	364
15.4.2	GAGAN (GPS Aided geo Augmented Navigation) ...	365
15.4.3	IRS Applications .....	366
15.4.4	Geostationary Operational Environmental Satellite (GOES).....	366
15.4.5	Satellite Measurements of Ocean Parameters Routinely .....	367
15.4.6	GSAT-17 Communication Satellite .....	368
15.4.7	Cartostat-series .....	368
15.4.8	Satellite Navigation (Sat Nav) .....	369
15.4.9	UN Indirect Satellite Imagery for Disaster Risk Reduction (UNISDR) Model.....	372
15.5	Geophysical Information System (GIS).....	372
15.5.1	Some Applications of GIS .....	373
	<b>Questions</b> .....	<b>375</b>

### Chapter 16| Energy

16.1	Different Forms of Energy .....	378
16.2	Energy Resources.....	388



16.3	Fossil Fuels .....	390
16.4	Petroleum Refining.....	391
	16.4.1 Petroleum Refining Products .....	392
	16.4.2 Petroleum Resources.....	393
16.5	Mineral Wealth of India .....	394
16.6	Metallurgy.....	396
16.7	Metal Extraction Furnaces .....	396
	<b>Questions.....</b>	<b>398</b>
	<b>Appendixes .....</b>	<b>399</b>
	<b>Meaning/Explanation of Some Terms.....</b>	<b>437</b>
	<b>References .....</b>	<b>443</b>
	<b>Index .....</b>	<b>445</b>