🌿 CLASS 12 BIOLOGY – ECOLOGY SUPER STUDY GUIDE

(Organisms & Populations | Ecosystem | Biodiversity & Conservation | Environmental Issues)

⭐ PART 1 — THEORY IN SIMPLE WORDS (Kid-Friendly + Visual Style)

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1. ORGANISMS AND POPULATIONS

🌱 A. Levels of Organization

Imagine ecology as a zooming camera:

- **Organism → Population → Community → Ecosystem → Biome → Biosphere**

Zoom Level	Meaning	Memory Trick
Organism	Single living being	"One-ganism"
Population	Group of same species	"Pop = Same People"
Community	Different species living together	"Comm = Combination"
Ecosystem	Community + environment	"Eco = Home + Rules"

🌦️ B. Abiotic Factors

Environmental factors affecting organisms.

1. Temperature

Affects metabolism.

- Cold places → Animals have more **body fat** (insulation).
- Hot places → **Long limbs, big ears** for heat loss (Desert fox).

2. Water

Aquatic organisms are adapted to **salinity**.

3. Light

Affects photosynthesis, flowering.

4. Soil

Texture, nutrients, pH.

🧬 C. Adaptations

Think of adaptations as "superpowers" organisms develop.

Habitat	Adaptation Example	Visual Image
Desert	Cactus spines	"Leaf → Sword to stop water loss"
Polar	Thick fur	"Wearing a furry coat"
Aquatic	Streamlined body	"Fish torpedo"

🧩 D. Population Interactions

🌞 + + Both Benefit → Mutualism

Examples:

- Lichen (algae + fungus)
- Bees & flowers

🌿 + 0 One benefits, other unaffected → Commensalism

- Egret + Cattle

🦁 Predation

Predator eats prey → keeps population balance.

🦠 Parasitism

Parasite lives on host.

Memory Trick:
"MiCoPP" → Mutual, Commensal, Parasitic, Predation

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2. ECOSYSTEM

🌎 A. Structure

1. Biotic Components

- **Producers** – Plants, algae
- **Consumers** – Herbivores, carnivores
- **Decomposers** – Bacteria, fungi

2. Abiotic Components

Light, temp, soil, water.

🍃 B. Food Chain

Linear sequence of "who eats whom".

Types:

- Grazing food chain (grass → deer → lion)
- Detritus food chain (dead leaves → earthworm → bird)

🌀 C. Food Web

Interconnected food chains.

"Food webs are nature's safety nets."

🔋 D. Energy Flow

Always unidirectional.
Sun → Producer → Consumer → Decomposer

10% Law:
Only **10%** energy transferred to next level.

🌿 E. Ecological Pyramids

- **Pyramid of Number**
- **Pyramid of Biomass**
- **Pyramid of Energy** (always upright)

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3. BIODIVERSITY & CONSERVATION

🌈 A. Levels of Biodiversity

1. **Genetic** – variations within species
2. **Species** – number of species
3. **Ecosystem** – variety of ecosystems

🌟 Memory Trick: "G-S-E" → Good Students Excel

💡 B. Importance of Biodiversity

- Ecosystem stability
- Pollination
- Cultural value
- Medicinal resources

🚨 C. Threats to Biodiversity

- Habitat loss
- Poaching
- Invasive species
- Pollution
- Climate change

Mnemonic: "HIPPCO"
Habitat loss
Invasive species
Population growth
Pollution
Climate change
Overexploitation

🛡️ D. Conservation

1. In-situ (inside natural habitat)

- National parks
- Wildlife sanctuaries
- Biosphere reserves

2. Ex-situ (outside)

- Zoo
- Seed banks
- Botanical gardens

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4. ENVIRONMENTAL ISSUES

🌫️ Air Pollution

- SO_2, CO_2, NO_x
- Smog
- Respiratory diseases

💧 Water Pollution

- Eutrophication
- Heavy metals
- Sewage

🌎 Ozone Depletion

- Caused by **CFCs**
- Leads to UV radiation increase

🌡️ Global Warming

- Greenhouse gases
- Melting glaciers
- Sea-level rise

Memory Trick: "GOOG" → Global warming, Ozone depletion, Overexploitation, Gases

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⭐ PART 2 — KEY CONCEPTS, FORMULAS & MNEMONICS

🌟 Important Formulas

Concept	Formula
Population density	D = N / S (Number / Area)
Growth rate	r = (Births – Deaths) / N
Logistic growth	dN/dt = rN (K – N / K)

⭐ PART 3 — SOLVED NUMERICALS (Step-by-Step)

🧮 1. Population Density

Q: If 500 deer live in a forest of 50 km^2, find population density.

Solution:
D = N / S
D = 500 / 50
D = **10 deer/km^2**

🧮 2. Growth Rate

Q: For 200 rabbits: Births = 40, Deaths = 10. Find r.

r = (B – D) / N
= (40 – 10) / 200
= 30 / 200
= **0.15**

⭐ PART 4 — EXAM-STYLE QUESTIONS (PYQ-Like)

Very Short Answer

1. Define carrying capacity.
2. What is niche?
3. Name one invasive species in India.

Short Answer

1. Explain parasitism with examples.
2. Differentiate between primary and secondary succession.
3. Describe impacts of deforestation.

Long Answer

1. Describe energy flow in an ecosystem with a neat diagram.
2. Explain biodiversity hotspots.
3. Describe population interactions.

⭐ PART 5 — QUICK REVISION NOTES

🌟 One-Page Visual Summary

Topic	Key Points
Population Interactions	Mutualism, Commensalism, Competition, Predation, Parasitism
Pyramids	Energy always upright
Conservation	In-situ: NP, WS; Ex-situ: zoo, seed bank
Pollution	Air, Water, Soil, Noise
Global Warming	Greenhouse gases increase

Super Mnemonic:
“MECE-PB” → Mutualism, Energy flow, Conservation, Ecology, Pyramids, Biodiversity

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⭐ PART 6 — PREDICTED / LIKELY QUESTIONS

🔥 Highly Repeated Areas

- Logistic vs exponential growth
- 10% law
- Biodiversity hotspots
- Causes of extinction
- Ecological succession
- Food web vs food chain
- Ozone depletion

⭐ PART 7 — EXAM TIPS & COMMON MISTAKES

✔️ Do:

- Draw diagrams (simple + labeled).
- Use flowcharts for definitions.
- Write examples for every concept.

❌ Don't:

- Confuse **in-situ** and **ex-situ**.
- Forget units in numericals.
- Mix up food chain and food web.

⏱️ Time-Saving Strategy

- Attempt **5-mark eco questions first** — they're predictable and scoring.

⭐ PART 8 — VISUAL/KID-FRIENDLY MEMORY BOOSTERS

🧠 1. Niche = "Job + Address"

- Where an organism lives
- What it does

📐 2. Pyramids = "Energy is King → Always Upright"

🌳 3. Biodiversity = "Nature's Library"

- Losing species = burning books!