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Presents:

Commonly Repeated Questions

F/M 2021 – M/J 2025

TEAM BIOCARDIA

Chapter 21: Human Influences on Ecosystems

Eutrophication (4 repeats / 3-6 marks) VIP

Question: Explain how fertilisers washing into a lake can lead to the death of fish.

Key Marking Points:

- Fertilisers (**nitrates/phosphates**) leach into water.
- Causes **algal bloom** (rapid growth of algae).
- Surface algae **block sunlight** from submerged plants, no photosynthesis --> die.
- **Decomposers** (bacteria) multiply and break down the dead organic matter.
- Decomposers use up **dissolved oxygen** for **aerobic respiration**.
- Lack of oxygen in the water causes fish and other aquatic animals to die.

Pro Tip: 💡 *Focus on the sequence. Crucially, state that **decomposers** use oxygen for **respiration** when breaking down dead plants. This is the key link often missed.*

Deforestation (3 repeats / 3-4 marks) VIP

Question: Describe the negative environmental consequences of large-scale deforestation.

Key Marking Points:

- **Loss of habitat** which reduces **biodiversity** and can lead to **species extinction**.
- **Soil erosion** as tree roots no longer bind the soil – Landslides & mudslides.
- Increased atmospheric **CO_2** due to **less photosynthesis** and **burning of forests**.
- Contributes to the **enhanced greenhouse effect** and climate change.
- Disruption of the **water cycle** due to reduced transpiration.

Pro Tip: 🌍 *To get all the marks, name at least three distinct effects. The most common are: 1. Habitat loss/extinction, 2. Soil erosion, and 3. Increased CO_2/climate change.*

Causes of Climate Change (1 repeat / 4 marks)

Question: Describe how human actions are causing climate change.

Key Marking Points:

- Increased **CO_2** from **burning fossil fuels** and **deforestation**.
- Increased **methane** from **cattle farming** and **landfill sites**.
- These **greenhouse gases** accumulate in the atmosphere.
- They **trap heat** (infrared radiation), causing the **enhanced greenhouse effect** and a rise in global temperatures.

Pro Tip: 🔥 *Name the two main greenhouse gases (CO_2 and methane) and link each to a specific human activity. Then, explain how they cause warming by trapping heat.*

Plastic Pollution (1 repeat / 4 marks)

Question: Outline the dangers of non-biodegradable plastic waste to marine animals.

Key Marking Points:

- **Getting trapped** in large plastics (e.g., nets), causing injury, **suffocation** or drowning.
- **Ingestion** of plastics, which can **block the digestive system.**
- Plastics can be **toxic** or accumulate toxins (**bioaccumulation**).
- Destruction of habitats as **killing coral reefs** and disruption of food chains.

Pro Tip: 🐢 *Structure your answer around the two main dangers: **entanglement** (getting trapped) and **ingestion** (eating). Giving specific examples for each strengthens your answer.*

Energy Efficiency in Food Chains (1 repeat / 4 marks)

Question: Explain why it is more energy efficient for humans to eat crop plants than to eat livestock that have been fed on crop plants.

Key Marking Points:

- Energy is lost at each **trophic level** (approx. 90% is lost).
- As there's uneaten food, undigested food, energy lost through as heat by **respiration** and **movement**
- Eating plants makes humans **primary consumers** (2nd trophic level).
- Eating livestock makes humans **secondary consumers** (3rd trophic level), receiving far less of the original energy.

Pro Tip: ⚡ *The crucial concept is **energy loss between trophic levels**. State that about 90% is lost and give a reason why (respiration is the main one). Then, link this to humans eating at a lower trophic level.*

Chapter 18: Variation and Selection

Natural Selection & Evolution (4 repeats / 3-5 marks) VIP

Question: Explain how natural selection leads to the evolution of a species.

Key Marking Points:

- **Variation** is caused by genetic **mutations**.
- There's **competition** for **food and water** due to large population.
- **So there's a selection pressure** from the environment which favors individuals with **advantageous alleles** → survive more → **reproduce more** → **pass on these advantageous alleles** to their offspring.
- The frequency of these alleles **increases** in the population over many generations.

Pro Tip: 🐾 *Use the key steps: **Variation** (from mutation), **Competition, Survival & Reproduction** of the best adapted. Crucially, mention that this increases the **frequency of advantageous alleles** over generations.*

Development of Antibiotic Resistance (3 repeats / 3-5 marks) VIP

Question: Explain how a population of bacteria can become resistant to an antibiotic.

Key Marking Points:

- **Variation** exists in the bacterial population due to random **mutation**.
- Some bacteria are naturally resistant.
- The antibiotic acts as a **selection pressure**, killing non-resistant bacteria.
- Resistant bacteria **survive and reproduce**, passing on the **resistance gene**.
- The frequency of the resistance allele increases in the population.

Pro Tip: 💊 *This is a perfect example of natural selection. Always use the key phrases: **variation (from mutation)**, **selection pressure** (the antibiotic), **survival**, and **reproduction** (passing on the resistance gene).*

Artificial Selection (2 repeats / 3 marks) VIP

Question: Describe how artificial selection (selective breeding) is used to improve crop plants or livestock.

Key Marking Points:

- **Humans select** individuals with **desired characteristics**.
- These individuals are **bred together**.
- The **best offspring** that show the desired characteristics are **selected** and **bred again**.
- This process is **repeated over many generations**.

Pro Tip: 👩‍🌾 *The key difference from natural selection is the selecting agent. Make it clear that **humans** are doing the selecting for their own benefit (e.g., higher yield), and that the process is repeated over **many generations**.*

Chapter 16: Reproduction

Hormonal Control of the Menstrual Cycle (5 repeats / 3-6 marks) VIP*

Question: Describe the roles of FSH, LH, oestrogen, and progesterone in the menstrual cycle.

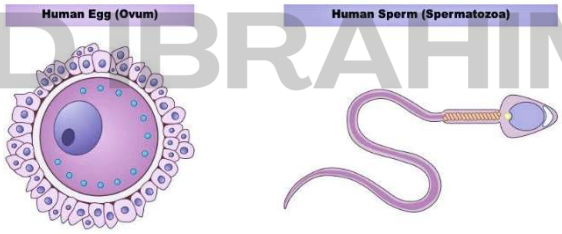
Key Marking Points:

- **FSH:** Stimulate the growth and development of **follicle**; stimulates **oestrogen** production.
- **Oestrogen:** Stimulate growth and repair of **uterus lining**; inhibits **FSH secretion**; stimulates **LH** surge.
- **LH:** Surge triggers **ovulation & rupture of follicle**.
- **Progesterone: Maintains** the uterus lining; inhibits **FSH & LH**.

Pro Tip: 🗓️ *Remember the sequence and what each hormone triggers. Know where each is produced (pituitary gland (FSH & LH) or ovary/corpus luteum (oestrogen & progesterone)). A simple trigger list is: FSH -> Oestrogen -> LH -> Progesterone.*

Gamete Adaptations & Fertilisation (4 repeats / 2-6 marks) VIP*

Question: Describe the adaptive features of sperm and egg cells, and outline the process of fertilisation.



Key Marking Points:

- **Sperm: Acrosome** (enzymes to break down jelly coat); **haploid nucleus**; many **mitochondria** (energy); **Flagellum (tail)** (swimming).
- **Egg: Cytoplasm** (energy store); **jelly coat** (prevents entry of more than one sperm); **haploid nucleus**.
- **Fertilisation:** Fusion of **male and female haploid nuclei** to form a **diploid zygote**.

Pro Tip: 🎯 *For adaptations, always link structure to function. For example: "Mitochondria..." (structure) "...to provide energy for swimming" (function). Simply listing the parts is not enough.*

Artificial Insemination (2 repeats / 3-4 marks)

Question: Outline the process of artificial insemination (AI) in selective breeding.

Key Marking Points:

- **Semen** (sperm) is collected from a selected male.
- The semen is placed into the **uterus/vagina** of a female.
- This is done around the time of **ovulation** to increase the chance of fertilisation.
- Advantages: (**no intercourse needed**, higher **chance of pregnancy**)

Pro Tip: 💉 *This process is used in both farming and human fertility treatment. The key steps are collecting sperm and inserting it into the female's reproductive tract.*

Advantages/Disadvantages of Sexual vs Asexual Reproduction (2 repeats / 4 marks)

Question: Describe the advantages and disadvantages of sexual reproduction.

Key Marking Points:

- **Advantage:** Creates **genetic variation**, allowing populations to **adapt** to changing environments.
- **Disadvantage:** Requires **two parents** (can be slow and uncertain); relies on finding a mate or pollinators.

Pro Tip: ⭐ *The number one concept to remember is **genetic variation** for sexual reproduction, and the **lack of it** for asexual reproduction. Link this directly to adaptation and survival.*

Chapter 5: Enzymes

Effect of Temperature on Enzyme Activity (3 repeats / 4-6 marks)

Question: Describe and explain how changes in temperature affect enzyme activity.

Key Marking Points:

- On increasing temperature, rate of enzyme activity **increases** due to **higher kinetic energy** of molecules and **more frequent successful collisions**, more **enzyme-substrate complex**
- Rate increases up to an **optimum**, then decreases as the enzyme starts to **denature** losing the shape of the **active site**, so it's no longer complementary and the substrate can no longer bind.

Pro Tip: ⚠️ *Never say the enzyme is "killed." The correct term is **denatured**. For full marks, you must explain what denaturation is: the active site changes shape.*

Effect of pH on Enzyme Activity (3 repeats / 4-6 marks)

Question: Describe and explain how changes in pH affect enzyme activity.

Key Marking Points:

- At **optimum pH**, enzymes work **best** as the shape of **active site** is **fully complementary** to substrate, more **enzyme-substrate complex**.
- On changing pH, rate of enzyme activity **decreases** as the enzyme starts to **denature** losing the shape of the **active site**, so it's no longer complementary and the substrate can no longer bind.

Pro Tip: ⚠️ *Never say the enzyme is "killed." The correct term is **denatured**. For full marks, you must explain what denaturation is: the active site changes shape.*

Enzyme Specificity (Lock and Key) (3 repeats / 2-3 marks) VIP*

Question: Using the lock and key model, explain why an enzyme can only break down its specific substrate.

Key Marking Points:

- An enzyme's **active site** has a specific 3D shape which is **complementary** to only one specific **substrate**.
- Substrate **binds** to the enzyme's active site like **lock in key.**
- This allows the formation of an **enzyme-substrate complex**.

Pro Tip: 🔑 *Use the keyword **"complementary"** to describe the fit. Do not say the active site and substrate have the "**same shape**".*

Chapter 10: Diseases & Immunity

Mechanism of Vaccination (2 repeats / 4-5 marks)

Question: Explain how vaccination provides long-term protection from a transmissible disease.

Key Marking Points:

- A vaccine contains a dead **pathogen** or its **antigens**.
- **Lymphocytes** recognize antigens and is stimulated to produce **antibodies**.
- **Antibodies bind** to **antigens** marking them for phagocytosis
- This produces **memory cells**.
- On re-infection, memory cells enable a **faster and stronger** secondary antibody response.
- This provides long-term, **active immunity**.

Pro Tip: 🛡️ *The most important part of the explanation for long-term immunity is the role of **memory cells**. Forgetting to mention them means you cannot get full marks.*

How Antibodies Work (2 repeats / 3 marks)

Question: Explain how antibodies protect the body against pathogens.

Key Marking Points:

- Antibodies have a **specific** shape, **complementary** to an antigen.
- They **bind** to antigens on the pathogen.
- This **marks the pathogen** for destruction by **phagocytes**
- or causes them to **clump together** (agglutination)
- or **neutralize toxins**
- or **directly kill** the pathogen

Pro Tip: ✨ *Focus on specificity. State that the antibody shape is **complementary** to the antigen shape, allowing them to bind. Then, state the consequence: marking the pathogen for destruction.*

Blood Clotting (2 repeats / 3 marks)

Question: Describe the process of **blood clotting** and how it **prevents infection**.

Key Marking Points:

- **Platelets** trigger the conversion of soluble **fibrinogen** into insoluble **fibrin**.
- Fibrin forms a **mesh** that traps blood cells, forming a clot.
- The clot dries to form a scab, which acts as a **barrier** to pathogens.

Pro Tip: 🩸 *Remember the key conversion: soluble **Fibrinogen** -> insoluble **Fibrin**. The fibrin then forms the mesh.*

Chapter 9: Transport in Animals

Heart Structure & Function (3 repeats / 2-6 marks)

Question: Explain the difference in the thickness of the walls of the left and right ventricles.

Key Marking Points:

- The heart is composed of 2 atria and 2 ventricles
- The right ventricle pumps **deoxygenated** blood into **lungs**
- The left ventricle pumps **oxygenated** blood to **all body organs** except lungs
- The **left ventricle** has a **thicker**, more muscular wall than the right ventricle.
- It needs to generate **higher pressure** to pump blood all around the **body**.
- The **right ventricle** has a thinner wall as it only pumps blood at lower pressure to the **lungs**.

Pro Tip: ❤️ *Always link structure to function. Thicker wall = more muscle = higher pressure = pumps further. Clearly state where each ventricle pumps blood to (body vs. lungs).*

Double vs Single Circulation (2 repeats / 3 marks) VIP*

Question: Explain the advantages of a double circulatory system in mammals compared to a single circulatory system in fish.

Key Marking Points:

- Blood passes through the heart **twice** per **single circuit**, one is **pulmonary circulation** and the other is **systemic circulation** keeping oxygenated and deoxygenated blood separate.
- This allows blood to be pumped to the body at a **higher pressure**.
- This enables a **faster delivery of oxygen** to tissues.
- This supports a **higher metabolic rate**, **large mammal size** and maintenance of body temperature.

Pro Tip: 🫀 *The key advantage is **high pressure**. Explain why this is good: it leads to more efficient oxygen delivery, which supports a higher metabolic rate.*

Chapter 11: Gas Exchange in Humans

Structures of the Airways (3 repeats / 2-5 marks)

Question: Describe the roles of cartilage, goblet cells, and ciliated cells in the human gas exchange system.

Key Marking Points:

- **Cartilage:** C-shaped rings in the **trachea** and **bronchi** provide support and **prevent the airways from collapsing**.
- **Goblet Cells:** Secrete **mucus** to **trap** dust and pathogens.
- **Ciliated Cells:** Cilia **beats upwards** to move **the mucus** up and out of the airways towards the throat to be swallowed.

Pro Tip: 🖌️ *Remember the partnership: Goblet cells make the sticky trap (mucus), and ciliated cells beat upwards clearing the trap away. Mentioning both roles is key.*

Chapter 14: Coordination and Response

The Reflex Arc (2 repeats / 5 marks)

Question: Describe the pathway of a nerve impulse through a simple reflex arc, from stimulus to response.

Key Marking Points:

- **Stimulus** -> **Receptor** -> **Sensory neurone** -> **Relay neurone** (in CNS) -> **Motor neurone** -> **Effector** -> **Response**.
- Impulses cross **synapses** between neurones.

Pro Tip: 🧠 *This is a sequence question. The correct order is essential: Receptor -> Sensory -> Relay -> Motor -> Effector. Mentioning the **synapses** will secure top marks.*

Rods and Cones in the Eye (2 repeats / 3-4 marks)

Question: Describe the functions of the rods and cones in the retina.

Key Marking Points:

- **Rods:** Sensitive to **low light intensity** (dim light/night vision); provide **monochromatic** (black and white) vision.
- **Cones:** Sensitive to **high light intensity** (bright light); provide **colour vision**.

Pro Tip: 👀 *A simple way to remember: **C**ones for **C**olour and high clarity. Rods are for the rest (dim light, black and white).*

Plant Tropisms & Auxin (2 repeats / 3-5 marks)

Question: Explain how auxin causes phototropism (growth towards light) in a plant shoot.

Key Marking Points:

- **Auxin** is produced at the **tip of the shoot**.
- Light causes auxin to accumulate on the **shaded side**.
- Higher auxin concentration causes cells on the shaded side to **elongate** more.
- This differential growth causes the shoot to **bend towards the light**.

Pro Tip: 🌱 *The crucial points are: 1. Auxin is made at the tip, 2. Light makes it move to the shaded side, 3. It causes **cell elongation** (not cell division), 4. More elongation on the shaded side causes the bending.*

Chapter 2: Organisation of the Organism

Definition of an Organ (1 repeat / 2 marks)

Question: Explain why a leaf is considered to be an organ.

Key Marking Points:

- It is made of a group of different **tissues** (e.g., xylem, phloem, epidermis).
- These tissues **work together** to perform a specific function (e.g., photosynthesis).

Pro Tip: 💡 *You need both parts of the definition: 1. Group of tissues, 2. Working together for a specific function.*

Stem Cells (1 repeat / 2 marks) VIP*

Question: Describe what is meant by the term stem cell.

Key Marking Points:

- Stem cells are **unspecialised** cells.
- They can divide by mitosis and then **differentiate** (become specialised) for various functions.

Pro Tip: 📝 *The two keywords are "unspecialised" and "differentiate". Use both for the marks.*

Chapter 3: Movement into and out of Cells

Active Transport vs. Diffusion (1 repeat / 3 marks)

Question: Describe how active transport differs from diffusion.

Key Marking Points:

- **Active Transport:** Moves substances **against** a concentration gradient; requires **energy** (from respiration); uses **protein carriers**.
- **Diffusion:** Moves substances **down** a concentration gradient; is a passive process (no energy); does not require carriers.

Pro Tip: ⚡ *For a "describe differences" question, directly contrasting the points is best. Mention: 1. Concentration gradient, 2. Energy, and 3. Protein carriers.*

Chapter 4: Biological Molecules

Structure of DNA (1 repeat / 4 marks)

Question: Describe the structure of a DNA molecule.

Key Marking Points:

- Consists of **two strands** forming a **double helix**.
- Made of four bases: **A, T, C, G**.
- Follows specific base pairing rules: **A pairs with T**, and **C pairs with G**.

Pro Tip: 🧬 *For 4 marks, you need four clear points. Always include: 1. Two strands/double helix, 2. The four bases, 3. The specific base pairing rule (A-T, C-G), and 4. The idea of cross-links or bonds between the bases.*

Chapter 6: Plant Nutrition

Conditions for Germination (1 repeat / 3 marks)

Question: State the conditions that are necessary for seeds to germinate.

Key Marking Points:

- **Water**
- **Oxygen**
- A **suitable temperature** (warmth).

Pro Tip: 🌱 *Do not mention light! For most seeds, light is not required for germination, and mentioning it can lose you a mark. Stick to Water, Oxygen, and Warmth (WOW).*

Chapter 12: Respiration

Oxygen Debt (1 repeat / 4 marks)

Question: Outline how the body removes an oxygen debt.

Key Marking Points:

- An oxygen debt is a build-up of **lactic acid** from anaerobic respiration.
- Heart rate and breathing rate remain high after exercise to supply extra **oxygen**.
- Blood transports the lactic acid to the **liver**.
- In the liver, the lactic acid is broken down by **aerobic respiration**.

Pro Tip: 🏃 *The key location is the **liver**. Don't say the lactic acid is broken down in the muscles. It's transported from the muscles to the liver for breakdown.*

Chapter 13: Excretion in Humans

Formation of Urea (1 repeat / 3 marks)

Question: Describe how urea is formed.

Key Marking Points:

- Urea is formed in the **liver**.
- It is formed from **excess amino acids**.
- The nitrogen-containing part is removed in a process called **deamination**.

Pro Tip: 🧪 *You must name the location (liver), the starting molecule (excess amino acids), and the process (deamination) for full marks.*