

4. As succession progresses, the bare land turns out to be productive Due to the fact that the (1)
- A. environment becomes less stable
 - B. abiotic conditions remain unchanged
 - C. species diversity and richness falls
 - D. ✓ **amount and depth of the soil increases**

Answer: D

During succession, pioneer organisms such as lichens and mosses break down rock, and their dead remains add organic matter. Over time the soil becomes deeper and richer, so larger plants can grow and the land becomes more productive.

The other options say the opposite of what really happens: the environment grows more stable, the abiotic conditions keep improving, and species diversity rises rather than falls.

Textbook: Biology Grade 9, Unit 6 Ecology, section 6.1.6 Ecological succession (page 153).

5. What is the economic impact of AIDS? (1)
- A. Enhance of life expectancy and GDP
 - B. Increase the resources of public expenditure
 - C. ✓ **Seriously affects the taxable population**
 - D. Encourage savings for medical treatment

Answer: C

AIDS mostly strikes adults of working age. When these people fall sick or die, the country loses workers who produce goods, earn income and pay tax, so the taxable population shrinks and the economy weakens.

The other options claim benefits: AIDS does not raise life expectancy, does not add public resources, and forces families to spend savings on treatment rather than encouraging saving.

Textbook: Biology Grade 12, Unit 2 Microorganisms, section 2.5 Viruses (page 84).

6. A geographical area with specific climate, soil type, plants and animals with similar adaptation is (1)
- A. habitat
 - B. ecosystem
 - C. niche
 - D. ✓ **biome**

Answer: D

A biome is a very large geographic region defined by its climate and soil, with plants and animals that share similar adaptations. Examples are desert, taiga and tropical rainforest.

A habitat is only the place where one organism lives, a niche is the role an organism plays, and an ecosystem is a community of organisms together with its non living surroundings, which can be as small as a pond.

Textbook: Biology Grade 9, Unit 6 Ecology, section 6.1.5 Biomes.

7. As energy from the sun, enters the ecosystem in the form of light, one of the following happens to it. It (1)
- A. goes on increasing along the trophic level from primary producers to decomposers
 - B. remains much of the time the same but increases as it reaches decomposers
 - C. ✓ **goes on decreasing along the trophic level from primary producers to decomposers**
 - D. depends on the type of trophic level and changes at each trophic level irregularly

Answer: C

Energy enters the ecosystem as sunlight and is fixed by producers. At every step along the food chain most of the energy is lost as heat and through respiration and waste, so only about ten percent passes to the next trophic level.

Because of these losses, the energy available keeps decreasing from producers up to the decomposers. It never increases along the chain, which rules out the other options.

Textbook: Biology Grade 10, Unit 6 Ecological Interactions, section 6.1 Trophic Levels.

8. Suppose a self fertilizing organism has AaBb genotype, how many different types of gametes would it produce if there is no linkage? (1)
- A. 16
B. 8
C. 12
D. ✓ 4

Answer: D

With no linkage, the two gene pairs assort independently. The Aa pair gives two kinds of allele (A or a) and the Bb pair gives two kinds (B or b), so the gametes are $2 \times 2 = 4$ types: AB, Ab, aB and ab.

The number 16 is tempting because a dihybrid Punnett square has 16 boxes, but those are offspring combinations, not gamete types.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.5.3 Dihybrid Cross (page 142).

9. What is the chemical composition of bacterial cell wall? (1)
- A. starch
B. capsule
C. Cellulose
D. ✓ **Peptidoglycan**

Answer: D

The bacterial cell wall is made of peptidoglycan, a mesh of sugar chains cross linked by short amino acid bridges. This wall gives the cell its shape and protects it from bursting.

Cellulose is the wall material of plant cells, starch is a storage carbohydrate, and the capsule is an extra slimy layer outside the wall in some bacteria, not the wall chemical itself.

Textbook: Biology Grade 12, Unit 2 Microorganisms, section 2.1.1 Structure of Bacterial Cell (page 47).

10. In this biology section, a biology student applied a Gram stain two groups of bacteria named X and Y. At the end, he observed that the bacteria X stained purple while bacteria Y stained pink, which of the following could be the correct conclusion of his experiment? Bacteria (1)
- A. X and Y are both Gram negative
B. Y are Gram positive and X are Gram negative
C. ✓ **X are Gram positive and Y are Gram negative**
D. Y and X are both Gram positive

Answer: C

Gram positive bacteria have a thick peptidoglycan wall that holds the crystal violet dye, so they appear purple. Gram negative bacteria have a thin wall covered by an outer membrane; the violet dye washes out and the pink counterstain (safranin) shows instead.

Since X stained purple, X is Gram positive, and since Y stained pink, Y is Gram negative.

Textbook: Biology Grade 12, Unit 2 Microorganisms, section 2.1.1 Structure of Bacterial Cell (page 47).

11. As compared to infectious diseases, functional diseases (1)
- A. can spread through the bite of insects
B. are passed from person to person through reservoirs
C. are Caused by pathogenic microorganisms
D. ✓ **can result from malfunction of organs**

Answer: D

Functional diseases develop when an organ or system of the body stops working properly. Diabetes and heart disease are examples. No pathogen is involved, so they cannot spread from person to person.

Options A, B and C all describe infectious diseases, which are caused by pathogenic microorganisms and can be transmitted, for example through insect bites.

Textbook: Biology Grade 9, Unit 5 Human health, nutrition and diseases, section 5.8 Types of diseases.

12. Which of the following products does NOT need the role of bacteria?

(1)

- A.** ✓ Enzymes **B.** Insulin
C. Ethanol **D.** Vaccine

Answer: A

Human insulin is made by bacteria that carry the human insulin gene, several vaccines are prepared from bacteria or their weakened toxins, and bacteria also take part in industrial ethanol fermentations. So options B, C and D all depend on bacteria.

Enzymes are different: every living cell makes its own enzymes, and commercial enzymes are also obtained from fungi, plants and animals, so bacteria are not required for them.

Textbook: Biology Grade 12, Unit 2 Microorganisms, section 2.8 Uses of microorganisms (page 97).

13. Bacteria are used in the production of vinegar to

(1)

- A. dilute ethanoic acid in to vinegar
B. produce alcohol in beer
C. supply oxygen for the fermenter
D. ✓ **oxidise alcohol to ethanoic acid**

Answer: D

Vinegar is dilute ethanoic (acetic) acid. Acetic acid bacteria such as *Acetobacter* use oxygen to oxidise the alcohol in a fermented liquid into ethanoic acid, and this is exactly the job the bacteria do in vinegar making.

Producing the alcohol itself is the work of yeast, not bacteria, and the bacteria do not supply oxygen or simply dilute the acid.

Textbook: Biology Grade 12, Unit 2 Microorganisms, section 2.8 Uses of microorganisms (page 97).

14. Among the parts of the cell, which organelles are bounded with Double membrane?

(1)

- D. ✓ Nucleus, mitochondria and chloroplast**

Answer: D

Three organelles are surrounded by two membranes: the nucleus, with its double layered nuclear envelope, and the mitochondrion and chloroplast, each with an outer and an inner membrane.

Ribosomes have no membrane at all, while lysosomes, vacuoles, the endoplasmic reticulum and the Golgi body are bounded by a single membrane, so the other options fail.

Textbook: Biology Grade 9, Unit 3 Cells (page 44).

15. Why are cells that secrete hormones and enzymes rich in rough endoplasmic reticulum? Because they produce more:

(1)

- A. Carbohydrates
B. Lipids
C. ✓ **Proteins**
D. ATP

Answer: C

Hormones such as insulin and all enzymes are proteins. The rough endoplasmic reticulum is covered with ribosomes that build proteins and then packages them for export, so a cell that secretes hormones or enzymes needs plenty of rough ER.

Lipids are made by the smooth ER, ATP comes from mitochondria, and carbohydrates are handled mainly by the Golgi body.

Textbook: Biology Grade 9, Unit 3 Cells (page 44).

16. What is the role of cholesterol in the cell membrane?

(1)

- A. ✓ **maintain the membrane fluidity**
- B. anchor integral proteins with the membrane
- C. serve as signals to other membrane of cells
- D. make the membrane selectively permeable

Answer: A

Cholesterol molecules sit between the phospholipids of the membrane and act as a fluidity buffer. In warm conditions they hold the phospholipids together so the membrane does not become too loose, and in cold conditions they stop the phospholipids from packing too tightly.

In this way cholesterol keeps the fluidity of the membrane steady. Anchoring proteins, cell signalling and selective transport are jobs of membrane proteins, not of cholesterol.

17. If potato cells are immersed in a hypertonic solution, they will

(1)

- A. gain water and haemolysed
- B. ✓ **lose water and plasmolysed**
- C. gain water and become larger
- D. lose water and become turgid

Answer: B

A hypertonic solution is more concentrated than the cell contents, so water moves out of the potato cells by osmosis. The cytoplasm shrinks and the membrane pulls away from the cell wall, a state called plasmolysis.

Cells gain water and become turgid only in a hypotonic solution, and haemolysis is the bursting of red blood cells, which have no wall, in a hypotonic solution.

Textbook: Biology Grade 9, Unit 3 Cells, section 3.7 The cell and its environment.

18. Which molecule of the plasma membrane contains carbohydrate Chains and allows identification of the cell by the immune system?

(1)

- A. Peripheral proteins
- B. Integral proteins
- C. ✓ **Glyco proteins**
- D. Channel proteins

Answer: C

Glycoproteins are membrane proteins with short carbohydrate chains attached on the outer surface of the cell. These chains work as identity tags: the immune system reads them to tell the body's own cells from foreign cells.

Channel, integral and peripheral proteins transport substances or support the membrane, but they do not carry the carbohydrate name tags described in the question.

19. Red - green colour blindness is due to X-linked gene and determined By the recessive alleles. Which one of the following is true about this Condition?

(1)

- A. Expressed in both sexes equally if the parents are carriers
- B. Female inherit one sex's allele from each parent and become Affected
- C. ✓ **It affects males due alleles inherited from the father**
- D. It is much more common in females

Answer: C

The gene for red green colour blindness sits on the X chromosome. A male has only one X, which he always receives from his mother, so a single recessive allele is enough to make him colour blind. This is why the condition is far more common in males, ruling out option D.

A female needs two copies of the allele, one from each parent, to be affected, so the two sexes are not affected equally. Note that the printed option C should say the allele comes from the mother, since a boy's X chromosome never comes from his father.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.7.3 Sex-linked inheritance in humans (page 153).

20. Which one of the following statements is true about chromosome? It is

(1)

- A. ✓ **made up of DNA which is tightly coiled many times around histones**
- B. clearly visible in the nucleus when the cell is not dividing
- C. divided in two equal sections by the centromere
- D. Loosely organized throughout the nucleus when the cell is dividing

Answer: A

A chromosome is one long DNA molecule wound tightly many times around proteins called histones. This packing lets about two metres of DNA fit inside a tiny nucleus.

Chromosomes become visible only when the cell is dividing; between divisions the material is spread out as loose chromatin, so options B and D are reversed. The centromere joins the two chromatids but does not usually divide the chromosome into two equal sections.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.1 The genetic materials (page 114).

21. 24.Consider the following disordered events of transcription

(1)

- I. RNA polymerase crosses a stop sequence in the gene
- II. RNA polymerase reads the antisense DNA strand and builds mRNA
- III.mRNA molecule detaches from DNA and the DNA rejoin
- IV.RNA polymerase binds to the promoter which signals the DNA To unwind

Which one is the correct sequence of events during transcription?

- A. I → IV → III
- B. IV → I → II → III
- C. ✓ **IV → II → I → III**
- D. I → IV → III → II

Answer: C

Transcription starts when RNA polymerase binds to the promoter and the DNA unwinds (IV). The enzyme then moves along the template (antisense) strand and builds the mRNA (II). When it reaches the stop sequence at the end of the gene (I), transcription ends, and finally the mRNA detaches while the DNA strands rejoin (III).

So the correct order is IV, then II, then I, then III. Order B fails because the polymerase would reach the stop sequence before it had copied any of the gene.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.4 Protein synthesis (page 133).

22. Which of the following bases are the triplets of codes in the mRNA That cease translation and the ribosome folds the polypeptide into its Final structure?

(1)

- A. ✓ **UAA, UAG and UGA**
- B. TAA, TAG and TGA
- C. ATT, ATCandACT
- D. CCC, UUA and GUU

Answer: A

UAA, UAG and UGA are the three stop codons. They code for no amino acid, so when the ribosome reaches one of them translation ends and the finished polypeptide is released to fold.

Any triplet containing T cannot be an mRNA codon, because RNA uses uracil (U) in place of thymine (T). That removes options B and C, and the triplets in D all code for amino acids.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.4 Protein synthesis (page 133).

23. By which level of precipitation, temperature and type of plants is the Taiga biome characterized, respectively (1)
- A. Almost none, cold and succulents B. ✓ **Adequate, cool year round and conifers**
- C. Humid, days warm, and ferns D. Dry, cold and lichens

Answer: B

The taiga, also called the boreal or coniferous forest, receives adequate precipitation of roughly 40 to 100 cm a year, much of it as snow. It stays cool or cold through the year, and its typical plants are evergreen conifers such as pines and spruces.

Option A, with almost no rain and succulent plants, describes a desert, and lichens with very dry cold conditions point to the tundra instead.

Textbook: Biology Grade 9, Unit 6 Ecology, section 6.1.5 Biomes (page 152).

24. In which biome are epiphytes common? (1)
- A. Tundra forest B. ✓ **Tropical rainforest**
- C. Temperature forest D. Thorn forest

Answer: B

Epiphytes are plants that grow on the trunks and branches of other plants instead of in the soil. In a tropical rainforest the tree canopy is so dense that little light reaches the ground, so growing high on a tree is the best way to reach sunlight, and the warm humid air lets epiphytes absorb the water they need without roots in soil.

Tundra and thorn forests are too dry or too cold to support them in large numbers.

Textbook: Biology Grade 9, Unit 6 Ecology, section 6.1.5 Biomes.

25. What makes Ethiopia rich in biodiversity which deserves a global attention? (1)
- A. Uniformity of high lands and low lands B. Similar terrestrial and aquatic biomes
- C. ✓ **Variation in topography and vegetation** D. Narrow range in altitude and climate

Answer: C

Ethiopia stretches from high mountains above 4,000 metres to the Danakil Depression below sea level. This wide variation in topography creates many different climates and vegetation zones, and each zone offers habitats for different species, including many found nowhere else in the world.

The other options describe uniformity or a narrow range of conditions, which would support fewer species, not more.

26. Why maintaining habitats is the key and fundamental aspect to conserve biodiversity? Because (1)
- A. preserving habitats leads to decreased species richness and abundance
- B. replacing natural habitats by artificial ones increases food security
- C. disturbance of habitats makes the population well adapted
- D. ✓ **destruction of habitats is the leading cause of extinction**

Answer: D

Every species depends on its habitat for food, shelter and breeding sites. Destroying habitats, for example by deforestation, is the leading cause of species extinction worldwide, so protecting a habitat protects all the species that live in it at once.

Options A, B and C are false claims: preserving habitats increases species richness, replacing natural habitats destroys wild species, and disturbance harms populations rather than adapting them.

Textbook: Biology Grade 11, Unit 6 Population and natural resources, section 6.5.6 Loss of Biodiversity (page 274).

27. Among the following statements, which one is correct about mutations? Mutations (1)
- A. are changes in genetic composition of population
 - B. that occur in sex cells are completely harmless
 - C. ✓ **are accidents that occur spontaneously and randomly during DNA Replication**
 - D. that occur in somatic cells can pass on to the next generation

Answer: C

A mutation is a change in the DNA of an individual. Many mutations arise spontaneously and at random as copying mistakes during DNA replication, which is what option C says.

Option A describes a change in the genetic make up of a whole population, which is evolution rather than mutation. Mutations in sex cells can be passed on and may be harmful, so B is wrong, and mutations in somatic (body) cells die with the individual, so D is also wrong.

Textbook: Biology Grade 12, Unit 4 Evolution, section 4.1.6 Mutation (page 208).

28. If the particular triplet of bases in the sense strand of DNA is AGT, Then the corresponding codon for the transcribed mRNA will be (1)
- A. UCA
 - B. ✓ **AGU**
 - C. ACU
 - D. UGA

Answer: B

RNA polymerase copies the template (antisense) strand, so the mRNA it builds carries the same sequence as the sense strand, with one change: uracil replaces thymine. The sense strand triplet AGT therefore appears in the mRNA as AGU.

UCA is the complement of the sense strand, which would only be correct if AGT had been given as the template strand.

Textbook: Biology Grade 11, Unit 4 Genetics, section 4.4 Protein synthesis (page 133).

29. What is the theory that states disease is caused by microorganisms? (1)
- A. Endosymbiotic theory
 - B. ✓ **Germ theory**
 - C. Spontaneous generation
 - D. Biogenesis theory

Answer: B

The germ theory of disease, established by Louis Pasteur and Robert Koch, states that infectious diseases are caused by microorganisms that invade the body.

Spontaneous generation was the disproved idea that life arises from non living matter, biogenesis states that life comes only from existing life, and the endosymbiotic theory explains how mitochondria and chloroplasts originated from engulfed bacteria.

Textbook: Biology Grade 10, Unit 1 Sub-fields of Biology, section 1.3 Major discoveries that revolutionized biology.

30. In the bare bottom of a newly formed pond a biologist observed emergence of new algae. The form of succession he observed can be best described as (1)
- A. secondary succession
 - B. ✓ **primary succession**
 - C. early succession
 - D. late succession

Answer: B

The bottom of a newly formed pond is a lifeless surface that has never carried a community before. When organisms such as algae colonize such a bare, new area for the first time, the process is primary succession.

Secondary succession happens where a community existed before and was disturbed, for example after a fire, with soil and some organisms still present. Early and late succession are only stages, not forms, of succession.

Textbook: Biology Grade 9, Unit 6 Ecology, section 6.1.6 Ecological succession (page 153).

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