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AFNS DAY-5

Lecture #9: Biology for AFNS Academic Test

Assalam-o-Alaikum future AFNS officers. Welcome to **AFNS Day-5 Lecture #9: Biology**.

Biology is one of the most important subjects in the AFNS academic test because AFNS is related to nursing, health sciences, human body systems, diseases, immunity, nutrition, respiration, reproduction, and biotechnology.

This lecture covers the complete AFNS Biology syllabus in one organized lecture.

Complete Biology Syllabus

1. Cell Biology
2. Cell Division: Mitosis and Meiosis
3. DNA, RNA and Protein Synthesis
4. Human Body Systems
5. Nervous System
6. Endocrine System
7. Immune System
8. Plant Physiology
9. Reproduction
10. Microorganisms
11. Nutrition
12. Metabolism and Enzymes
13. Evolution
14. Biomolecules
15. Excretory System
16. Respiration
17. Blood and Circulation
18. Diseases
19. Biotechnology and Genetic Engineering

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Topic 1: Cell Biology

Explanation

Cell is the basic structural and functional unit of life. All living organisms are made up of cells.

There are two main types of cells:

Prokaryotic cells: These cells have no true nucleus. Example: bacteria.

Eukaryotic cells: These cells have true nucleus and membrane-bound organelles. Example: plant and animal cells.

Important Cell Organelles

- **Plasma membrane:** Controls movement of substances in and out of cell.
- **Cytoplasm:** Jelly-like material inside the cell.
- **Nucleus:** Control center of cell; contains DNA.
- **Ribosomes:** Site of protein synthesis.
- **Mitochondria:** Powerhouse of cell; produces ATP.
- **Endoplasmic reticulum:** Helps in transport of materials.
- **Golgi apparatus:** Modifies, packages, and transports proteins.

Practice MCQs

Q1. Basic unit of life is:

- a) Tissue
 - b) Organ
 - c) Cell
 - d) System
- Answer:** c) Cell

Q2. Powerhouse of cell is:

- a) Nucleus
- b) Ribosome
- c) Mitochondria

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d) Golgi body

Answer: c) Mitochondria

Q3. Protein synthesis occurs on:

a) Ribosomes

b) Nucleus

c) Cell wall

d) Lysosome

Answer: a) Ribosomes

Q4. Prokaryotic cells have:

a) True nucleus

b) No true nucleus

c) Many nuclei

d) No cytoplasm

Answer: b) No true nucleus

Q5. Control center of cell is:

a) Nucleus

b) Mitochondria

c) Cytoplasm

d) Cell membrane

Answer: a) Nucleus

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Topic 2: Cell Division

Explanation

Cell division is the process by which one cell divides into new cells.

Mitosis

Mitosis produces two identical daughter cells. It helps in growth, repair, and replacement of damaged cells.

Stages of mitosis:

1. Prophase
2. Metaphase
3. Anaphase
4. Telophase

Meiosis

Meiosis produces four daughter cells with half number of chromosomes. It forms gametes and creates genetic variation.

Practice MCQs

Q1. Mitosis produces:

- a) Two identical cells
 - b) Four different cells
 - c) Gametes only
 - d) No cells
- Answer:** a) Two identical cells

Q2. Meiosis produces:

- a) Body cells
- b) Gametes
- c) Nerve cells

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d) Muscle cells

Answer: b) Gametes

Q3. Chromosome number in meiosis becomes:

a) Double

b) Half

c) Same

d) Zero

Answer: b) Half

Q4. Mitosis is important for:

a) Growth and repair

b) Only digestion

c) Breathing

d) Excretion

Answer: a) Growth and repair

Q5. Meiosis produces:

a) Two cells

b) Four cells

c) One cell

d) No cells

Answer: b) Four cells

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Topic 3: DNA, RNA and Protein Synthesis

Explanation

DNA and RNA are nucleic acids. DNA stores genetic information, while RNA helps in protein synthesis.

DNA has a double helix structure. It contains genes that control inherited characters.

Types of RNA

- **mRNA:** Carries message from DNA to ribosome.
- **tRNA:** Brings amino acids.
- **rRNA:** Forms part of ribosomes.

Protein Synthesis

Protein synthesis has two main steps:

1. **Transcription:** DNA message is copied into mRNA.
2. **Translation:** mRNA message is used to make protein.

Practice MCQs

Q1. DNA stands for:

- a) Deoxyribonucleic Acid
- b) Double Nitrogen Acid
- c) Deoxy Nitrogen Acid
- d) Ribonucleic Acid

Answer: a) Deoxyribonucleic Acid

Q2. RNA helps in:

- a) Protein synthesis
- b) Blood clotting
- c) Digestion



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d) Breathing

Answer: a) Protein synthesis

Q3. mRNA carries message from:

a) DNA to ribosome

b) Ribosome to DNA

c) Blood to heart

d) Kidney to bladder

Answer: a) DNA to ribosome

Q4. tRNA carries:

a) Amino acids

b) Oxygen

c) Glucose

d) Water

Answer: a) Amino acids

Q5. DNA structure is:

a) Single helix

b) Double helix

c) Triple helix

d) No helix

Answer: b) Double helix



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Topic 4: Human Body Systems

Explanation

The human body has different systems that work together.

Important Systems

- **Skeletal system:** Support, shape, protection, movement.
- **Muscular system:** Movement and posture.
- **Digestive system:** Digestion and absorption of food.
- **Respiratory system:** Breathing and gas exchange.
- **Circulatory system:** Transport of blood, oxygen, nutrients, and wastes.
- **Excretory system:** Removal of wastes.

Practice MCQs

Q1. Skeletal system is made of:

- a) Bones and joints
 - b) Blood and heart
 - c) Lungs and trachea
 - d) Stomach and liver
- Answer:** a) Bones and joints

Q2. Digestive system helps in:

- a) Food breakdown
 - b) Breathing
 - c) Thinking
 - d) Blood clotting
- Answer:** a) Food breakdown

Q3. Gas exchange occurs in:

- a) Alveoli
- b) Stomach
- c) Liver

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d) Kidney

Answer: a) Alveoli

Q4. Heart belongs to:

a) Circulatory system

b) Digestive system

c) Excretory system

d) Skeletal system

Answer: a) Circulatory system

Q5. Kidneys belong to:

a) Excretory system

b) Respiratory system

c) Muscular system

d) Nervous system

Answer: a) Excretory system

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Topic 5: Nervous System

Explanation

The nervous system controls and coordinates body activities. It helps the body respond to stimuli.

Main Parts

- Brain
- Spinal cord
- Nerves

Neuron is the basic unit of nervous system.

Reflex Action

A reflex action is a quick automatic response to a stimulus.

Example: Removing hand from hot object.

Practice MCQs

Q1. Basic unit of nervous system is:

- a) Neuron
- b) Nephron
- c) Alveolus
- d) Platelet

Answer: a) Neuron

Q2. Brain controls:

- a) Body activities
- b) Only digestion
- c) Only urine formation
- d) Only blood clotting

Answer: a) Body activities

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Q3. Reflex action is:

- a) Slow response
- b) Quick automatic response
- c) Digestion
- d) Respiration

Answer: b) Quick automatic response

Q4. Spinal cord connects brain with:

- a) Rest of body
- b) Only heart
- c) Only liver
- d) Only stomach

Answer: a) Rest of body

Q5. Nerves carry:

- a) Messages
- b) Oxygen only
- c) Urine
- d) Food

Answer: a) Messages

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Topic 6: Endocrine System

Explanation

The endocrine system consists of glands that secrete hormones. Hormones are chemical messengers that control body functions.

Important Glands

- **Pituitary gland:** Master gland.
- **Thyroid gland:** Controls metabolism.
- **Adrenal glands:** Produce adrenaline.
- **Pancreas:** Produces insulin.
- **Ovaries:** Produce estrogen.
- **Testes:** Produce testosterone.

Practice MCQs

Q1. Chemical messengers are called:

- a) Hormones
- b) Enzymes
- c) Vitamins
- d) Antibodies

Answer: a) Hormones

Q2. Master gland is:

- a) Pituitary
- b) Thyroid
- c) Adrenal
- d) Pancreas

Answer: a) Pituitary

Q3. Insulin is secreted by:

- a) Pancreas
- b) Liver

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- c) Kidney
- d) Stomach

Answer: a) Pancreas

Q4. Thyroid controls:

- a) Metabolism
- b) Blood clotting
- c) Urine formation
- d) Hearing

Answer: a) Metabolism

Q5. Adrenaline is secreted by:

- a) Adrenal gland
- b) Thyroid
- c) Pancreas
- d) Ovary

Answer: a) Adrenal gland

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Topic 7: Immune System

Explanation

The immune system protects the body from harmful microorganisms and diseases.

Important Components

- White blood cells
- Antibodies
- Lymph nodes
- Spleen
- Bone marrow

Immunity

Immunity is the ability of body to fight diseases.

Practice MCQs

Q1. Immune system protects body from:

- a) Diseases
- b) Digestion
- c) Photosynthesis
- d) Movement

Answer: a) Diseases

Q2. Antibodies are produced by:

- a) White blood cells
- b) Red blood cells
- c) Platelets
- d) Plasma only

Answer: a) White blood cells

Q3. WBCs help in:

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- Answer:** a) Defense

- a) Ability to fight disease
- b) Ability to digest food
- c) Ability to breathe
- d) Ability to see

Answer: a) Ability to fight disease

- Answer:** a) Ability to fight disease

a) Developing immunity
b) Causing disease only
c) Stopping breathing
d) Destroying bones
Answer: a) Developing immunity

- Answer:** a) Developing immunity

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Topic 8: Plant Physiology

Explanation

Plant physiology deals with functions of plants.

Important Processes

Photosynthesis

Plants make food using sunlight, carbon dioxide, and water.

Transpiration

Loss of water from aerial parts of plant.

Respiration

Plants break food to release energy.

Transport in Plants

Xylem transports water and minerals.
Phloem transports food.

Practice MCQs

Q1. Photosynthesis occurs in:

- a) Chloroplast
- b) Mitochondria
- c) Nucleus
- d) Ribosome

Answer: a) Chloroplast

Q2. Green pigment is:



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- a) Chlorophyll
- b) Hemoglobin
- c) Insulin
- d) Keratin

Answer: a) Chlorophyll

Q3. Xylem transports:

- a) Water and minerals
- b) Food
- c) Hormones only
- d) Oxygen only

Answer: a) Water and minerals

Q4. Phloem transports:

- a) Food
- b) Water only
- c) Minerals only
- d) Carbon dioxide

Answer: a) Food

Q5. Transpiration is loss of:

- a) Water
- b) Food
- c) Oxygen
- d) Protein

Answer: a) Water

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Topic 9: Reproduction

Explanation

Reproduction is the process by which organisms produce offspring.

Types

Asexual Reproduction

Only one parent is involved. No gametes are formed.

Sexual Reproduction

Two parents are involved. Male and female gametes fuse to form zygote.

Human Reproduction

Male reproductive system produces sperm.

Female reproductive system produces ova.

Fertilization is the fusion of male and female gametes.

Practice MCQs

Q1. Reproduction means:

- a) Production of offspring
- b) Digestion
- c) Respiration
- d) Excretion

Answer: a) Production of offspring

Q2. Fusion of gametes is called:

- a) Fertilization
- b) Germination



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- c) Digestion
- d) Transpiration

Answer: a) Fertilization

Q3. Male gamete is:

- a) Sperm
- b) Ovum
- c) Zygote
- d) Embryo

Answer: a) Sperm

Q4. Female gamete is:

- a) Ovum
- b) Sperm
- c) Pollen
- d) Testis

Answer: a) Ovum

Q5. Zygote is formed after:

- a) Fertilization
- b) Digestion
- c) Respiration
- d) Circulation

Answer: a) Fertilization

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Topic 10: Microorganisms

Explanation

Microorganisms are tiny organisms that cannot be seen with naked eye.

Types

- Bacteria
- Viruses
- Fungi
- Protozoa
- Algae

Uses

- Decomposition
- Nitrogen fixation
- Antibiotics
- Vaccines
- Fermentation

Practice MCQs

Q1. Microorganisms are:

- a) Very small organisms
- b) Large animals
- c) Plants only
- d) Rocks

Answer: a) Very small organisms

Q2. Bacteria are:

- a) Microorganisms
- b) Mammals
- c) Birds

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d) Fish

Answer: a) Microorganisms

Q3. Antibiotics are mainly used against:

a) Bacteria

b) Stones

c) Bones

d) Water

Answer: a) Bacteria

Q4. Virus causes:

a) Viral diseases

b) Bone formation

c) Photosynthesis

d) Digestion

Answer: a) Viral diseases

Q5. Decomposers help in:

a) Recycling nutrients

b) Making bones

c) Making blood

d) Making oxygen only

Answer: a) Recycling nutrients

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Topic 11: Nutrition

Explanation

Nutrition is the process of taking and using food for energy, growth, and repair.

Nutrients

Macronutrients

- Carbohydrates
- Proteins
- Fats

Micronutrients

- Vitamins
- Minerals

Balanced Diet

A balanced diet contains all nutrients in proper amounts.

Practice MCQs

Q1. Main energy-giving nutrient is:

- a) Carbohydrate
- b) Vitamin
- c) Mineral
- d) Water

Answer: a) Carbohydrate

Q2. Proteins help in:

- a) Growth and repair
- b) Only breathing
- c) Vision only

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d) Hearing only

Answer: a) Growth and repair

Q3. Vitamins are:

- a) Micronutrients
- b) Macronutrients
- c) Proteins
- d) Fats

Answer: a) Micronutrients

Q4. Balanced diet contains:

- a) All nutrients in proper amount
- b) Only fats
- c) Only sugar
- d) Only water

Answer: a) All nutrients in proper amount

Q5. Deficiency of nutrients causes:

- a) Malnutrition
- b) Photosynthesis
- c) Respiration
- d) Reproduction

Answer: a) Malnutrition

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Topic 12: Metabolism and Enzymes

Explanation

Metabolism includes all chemical reactions occurring in the body.

Types

Catabolism: Breakdown of molecules to release energy.

Anabolism: Formation of complex molecules from simple molecules.

Enzymes

Enzymes are biological catalysts. They speed up chemical reactions.

Practice MCQs

Q1. Metabolism means:

- a) All chemical reactions in body
- b) Only breathing
- c) Only walking
- d) Only sleeping

Answer: a) All chemical reactions in body

Q2. Breakdown of molecules is:

- a) Catabolism
- b) Anabolism
- c) Photosynthesis
- d) Fertilization

Answer: a) Catabolism

Q3. Formation of complex molecules is:

- a) Anabolism
- b) Catabolism
- c) Excretion

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d) Respiration only

Answer: a) Anabolism

Q4. Enzymes are:

a) Biological catalysts

b) Bones

c) Hormones only

d) Blood cells

Answer: a) Biological catalysts

Q5. ATP is:

a) Energy currency of cell

b) Genetic material

c) Hormone

d) Vitamin

Answer: a) Energy currency of cell

Topic 13: Evolution

Explanation

Evolution means gradual change in organisms over time.

Important Ideas

- Darwin gave theory of natural selection.
- Lamarck gave theory of acquired characters.
- Adaptation helps organisms survive.
- Speciation means formation of new species.

Practice MCQs

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Q1. Evolution means:

- a) Gradual change in organisms
- b) Digestion
- c) Circulation
- d) Excretion

Answer: a) Gradual change in organisms

Q2. Natural selection was proposed by:

- a) Darwin
- b) Newton
- c) Einstein
- d) Mendel

Answer: a) Darwin

Q3. Adaptation helps in:

- a) Survival
 - b) Digestion only
 - c) Sleeping
 - d) Blood clotting
- Answer:** a) Survival

Q4. Formation of new species is:

- a) Speciation
- b) Digestion
- c) Transpiration
- d) Fertilization

Answer: a) Speciation

Q5. Fossils are evidence of:

- a) Evolution
- b) Respiration
- c) Digestion
- d) Excretion

Answer: a) Evolution

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Topic 14: Biomolecules

Explanation

Biomolecules are molecules found in living organisms.

Main Biomolecules

- Carbohydrates
- Proteins
- Lipids
- Nucleic acids

Functions

Carbohydrates provide energy.

Proteins help in growth and repair.

Lipids store energy.

Nucleic acids store genetic information.

Practice MCQs

Q1. Main biomolecules include:

- a) Carbohydrates, proteins, lipids, nucleic acids
- b) Stones and metals
- c) Water only
- d) Oxygen only

Answer: a) Carbohydrates, proteins, lipids, nucleic acids

Q2. Proteins are made of:

- a) Amino acids
- b) Fatty acids
- c) Glucose only
- d) Minerals

Answer: a) Amino acids

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Q3. Nucleic acids include:

- a) DNA and RNA
- b) Fats only
- c) Vitamins only
- d) Minerals only

Answer: a) DNA and RNA

Q4. Lipids mainly store:

- a) Energy
- b) Genetic message only
- c) Oxygen
- d) Water

Answer: a) Energy

Q5. Carbohydrates mainly provide:

- a) Energy
- b) Hormones only
- c) Antibodies only
- d) Bones

Answer: a) Energy

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Topic 15: Excretory System

Explanation

The excretory system removes waste materials from the body.

Main Organs

- Kidneys
- Ureters
- Urinary bladder
- Urethra

Nephron

Nephron is the functional unit of kidney.

Urine Formation

1. Filtration
2. Reabsorption
3. Secretion

Practice MCQs

Q1. Functional unit of kidney is:

- a) Nephron
- b) Neuron
- c) Alveolus
- d) Platelet

Answer: a) Nephron

Q2. Kidneys remove:

- a) Wastes
- b) Oxygen

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- c) Food
- d) Bones

Answer: a) Wastes

Q3. Ureter carries urine from:

- a) Kidney to bladder
- b) Bladder to outside
- c) Heart to lungs
- d) Stomach to intestine

Answer: a) Kidney to bladder

Q4. Urine is stored in:

- a) Urinary bladder
- b) Kidney
- c) Liver
- d) Stomach

Answer: a) Urinary bladder

Q5. First step of urine formation is:

- a) Filtration
- b) Digestion
- c) Respiration
- d) Fertilization

Answer: a) Filtration

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Topic 16: Respiration

Explanation

Respiration is the process of releasing energy from food.

Types

Aerobic Respiration

Occurs in presence of oxygen.

Anaerobic Respiration

Occurs without oxygen.

Human Respiratory System

Main organs:

- Nose
- Trachea
- Bronchi
- Lungs
- Alveoli

Gas exchange occurs in alveoli.

Practice MCQs

Q1. Respiration releases:

- a) Energy
 - b) Blood
 - c) Urine
 - d) Bones
- Answer:** a) Energy

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Q2. Aerobic respiration requires:

- a) Oxygen
- b) Nitrogen
- c) Carbon monoxide
- d) No oxygen

Answer: a) Oxygen

Q3. Gas exchange occurs in:

- a) Alveoli
- b) Stomach
- c) Kidney
- d) Liver

Answer: a) Alveoli

Q4. Anaerobic respiration occurs:

- a) Without oxygen
 - b) With oxygen
 - c) Only in lungs
 - d) Only in bones
- Answer:** a) Without oxygen

Q5. Lungs are part of:

- a) Respiratory system
 - b) Digestive system
 - c) Nervous system
 - d) Excretory system
- Answer:** a) Respiratory system

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Topic 17: Blood and Circulation

Explanation

Blood is a fluid connective tissue. It transports oxygen, nutrients, hormones, and wastes.

Components of Blood

- Plasma
- Red blood cells
- White blood cells
- Platelets

Functions

RBCs carry oxygen.
WBCs fight infections.
Platelets help in blood clotting.
Plasma transports substances.

Practice MCQs

Q1. RBCs transport:

- a) Oxygen
 - b) Urine
 - c) Food only
 - d) Hormones only
- Answer:** a) Oxygen

Q2. WBCs help in:

- a) Defense
 - b) Oxygen transport
 - c) Blood clotting only
 - d) Digestion
- Answer:** a) Defense

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Q3. Platelets help in:

- a) Blood clotting
- b) Breathing
- c) Digestion
- d) Excretion

Answer: a) Blood clotting

Q4. Liquid part of blood is:

- a) Plasma
- b) Platelet
- c) RBC
- d) WBC

Answer: a) Plasma

Q5. Heart pumps:

- a) Blood
- b) Urine
- c) Food
- d) Air

Answer: a) Blood

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Topic 18: Diseases

Explanation

Disease is an abnormal condition that affects body function.

Types

Infectious Diseases

Caused by microorganisms and can spread.

Examples:

- Flu
- TB
- Malaria

Non-Infectious Diseases

Do not spread from person to person.

Examples:

- Cancer
- Diabetes
- Hypertension

Prevention

- Vaccination
- Clean water
- Balanced diet
- Hygiene
- Proper treatment

Practice MCQs

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Q1. Flu is:

- a) Infectious disease
- b) Non-infectious disease
- c) Genetic only
- d) Nutritional only

Answer: a) Infectious disease

Q2. Diabetes is:

- a) Non-infectious disease
- b) Infectious disease
- c) Viral disease only
- d) Bacterial disease only

Answer: a) Non-infectious disease

Q3. Malaria is spread by:

- a) Mosquito
- b) Dog
- c) Cat
- d) Cow

Answer: a) Mosquito

Q4. Vaccination helps in:

- a) Disease prevention
- b) Causing disease
- c) Breaking bones
- d) Stopping digestion

Answer: a) Disease prevention

Q5. Antibiotics are used against:

- a) Bacterial infections
- b) Stones
- c) Bone fracture
- d) Vitamins

Answer: a) Bacterial infections

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Topic 19: Biotechnology and Genetic Engineering

Explanation

Biotechnology is the use of living organisms or their parts to produce useful products.

Important Techniques

- Genetic engineering
- Cloning
- PCR
- Recombinant DNA technology
- CRISPR-Cas9

Applications

- Medicine
- Agriculture
- Forensics
- Vaccines
- Disease diagnosis

Practice MCQs

Q1. Biotechnology uses:

- a) Living organisms
- b) Only rocks
- c) Only metals
- d) Only air

Answer: a) Living organisms

Q2. PCR is used to:

- a) Amplify DNA
- b) Digest food
- c) Pump blood

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d) Produce urine

Answer: a) Amplify DNA

Q3. Recombinant DNA technology combines:

a) DNA from different sources

b) Only water

c) Only proteins

d) Only fats

Answer: a) DNA from different sources

Q4. Cloning produces:

a) Genetically identical copies

b) Different species only

c) No cells

d) Only hormones

Answer: a) Genetically identical copies

Q5. CRISPR is used for:

a) Gene editing

b) Digestion

c) Respiration

d) Blood clotting

Answer: a) Gene editing

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AFNS Practice Test-8

Q1. Powerhouse of cell is:

- a) Nucleus
- b) Mitochondria
- c) Ribosome
- d) Golgi body

Q2. Functional unit of kidney is:

- a) Neuron
- b) Nephron
- c) Alveolus
- d) Platelet

Q3. Gas exchange occurs in:

- a) Alveoli
- b) Liver
- c) Stomach
- d) Kidney

Q4. Blood clotting is done by:

- a) RBCs
- b) WBCs
- c) Platelets
- d) Plasma

Q5. Natural selection was proposed by:

- a) Darwin
- b) Newton
- c) Einstein
- d) Mendel

Q6. Insulin is secreted by:

- a) Pancreas
- b) Thyroid

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- c) Liver
- d) Kidney

Q7. Fertilization means:

- a) Fusion of gametes
- b) Breakdown of food
- c) Loss of water
- d) Blood clotting

Q8. Photosynthesis occurs in:

- a) Chloroplast
- b) Nucleus
- c) Ribosome
- d) Kidney

Q9. DNA carries:

- a) Genetic information
- b) Oxygen
- c) Urine
- d) Hormones only

Q10. Vaccine helps in:

- a) Immunity
- b) Digestion
- c) Excretion
- d) Breathing

In this lecture, we covered the complete AFNS Biology syllabus in one proper lecture. The topics included cell biology, cell division, DNA and RNA, human body systems, nervous system, endocrine system, immune system, plant physiology, reproduction, microorganisms, nutrition, metabolism, evolution, biomolecules, excretory system, respiration, blood, diseases, and biotechnology.

Biology is a high-scoring subject in AFNS if students revise concepts and practice MCQs regularly.