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**VEER NARMAD SOUTH GUJARAT UNIVERSITY**

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**વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી**

યુનિવર્સિટી કેમ્પસ, ઉદ્ધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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તા.૨૬-૦૯-૨૦૨૫નાં No.: GAD/NT/GIA/Emp. Notice/25862/2025 લેબોરેટરી આસિસ્ટન્ટ (બાયોસાયન્સ) સંવર્ગની સ્પર્ધાત્મક પરીક્ષા સંદર્ભે Detailed અભ્યાસક્રમની અગત્યની સૂચના

લેબોરેટરી આસિસ્ટન્ટ (બાયોસાયન્સ) માટે સંબંધિત વિષય અને તેની ઉપયોગીતા અંગેના પ્રશ્નો:

**PART: B**

**TOTAL MARKS:120**

**1. Physiology of Plants:**

- Cell as a functional unit, Composition of protoplasm; water relations; Absorption and conduction (Diffusion, osmosis, plasmolysis, permeability, water potential, absorption)
- Mineral absorption – functions of mineral elements; essential major elements and trace elements; deficiency symptoms of elements.
- Photosynthesis – significance; site of photosynthesis (functional importance of chlorophyll structure) photochemical and bio synthetic phases, Electron transport system.

**2. Physiology of Animals:**

- Nutrition and its types; nutrients food and vitamins; digestive system of invertebrate (cockroach),
- Digestive system and digestion process in humans (ingestion, digestion, absorption, assimilation, formation of faecal matter, defecation) (Intra cellular and extra cellular); role of enzymes and hormones indigestion.
- Respiration in humans: respiratory organs; mechanism of respiration, glycolysis, fermentation (Alcoholic fermentation, Lactic acid fermentation), aerobic respiration, TCA cycle.
- Human endocrine system: Hormones and their functions; hormonal regulation and diseases; hormones as neurotransmitters and regulators; Hypothelamo-hyperphysical axis, feedback controls.

**3. Blood Physiology:**

Composition of Human blood:

- (i) Blood Plasma – Dissolved solids: Blood proteins (albumin, fibrinogen and globulins) and their roles.,

- (ii) Blood cells: a) RBC-Structure, Total Count, Functions, Composition, b) WBC- Structure, total count, Functions, Classification, c) Platelets -Structure, Total count, Functions.
- Blood coagulation: Brief introduction and significance, Factors involved in blood coagulation.
- Groups and Blood Types: ABO Blood Group, Transfusions, Rh Blood Group.

#### **4. Reproduction, Growth and Development:**

- Modes of reproduction in flowering plants; vegetative propagation (natural and artificial); significance of vegetative propagation; sexual reproduction; development of male and female gametophyte, Pollination (types and factors); Double fertilization, incompatibility, embryo development, parthenogenesis and parthenocarpy.

#### **5. Ecology and Environment:**

- Organism and their environment: factors Air, Water, Soil, temperature, light, biota, range of tolerance; ecological adaptations
- Levels of organisation: Structure and functions, productivity, energy flow, ecological efficiencies; decomposition and nutrient cycling; major biomes forests, grass lands and deserts.
- Ecological succession: types and mechanism; Natural resources types and resources, Environment pollution kinds, sources and abatement of air, water, soil and noise pollution.
- Structure of Eco system: Food Chain & Food Web, Ecological Pyramids, Energy flow.
- Biogeochemical cycles: Carbon cycle, Phosphorous cycle.
- Biodiversity: Genetic diversity, species diversity.

#### **6. Biology and Human Welfare:**

- Population, environment and development; Population growth and factors (Vitality, mortality, immigration, emigration, age and sex ratio)

#### **7. Environment/habitat:**

- Major abiotic factors affecting ecology: light, temperature, water, soil, Basic concepts of Ecology.

#### **8. Population interaction:**

- Mutualism, competition, predation, parasitism, commensalism, mentalism, antagonism.

## **9. The Living World:**

- History of Earth, Theories of origin of life, Living matter, Chemical evolution, Origin of living systems (molecules to first cell).

## **10. Current Trends and Recent Advancements in the Above Fields:**

### **11. Laboratory Instruments: Principle, Mechanism, Operation, Calibration & Applications:**

- Understanding, handling, troubleshooting, and routine maintenance of common laboratory instruments: pH meter, Weighing Balance, Colorimeter, Spectrophotometer, Autoclave, Incubator/BOD Incubator/CO<sub>2</sub> Incubator, Laminar Air Flow (LAF). Centrifuge (Refrigerated & Non-refrigerated), Shakers (Orbital, Vortex, and Incubator Shaker), Microscope, etc.

### **12. Solution Preparation Techniques:**

- Molarity (M), Normality (N), Molality (m)
- % w/v, % w/w % v/v
- Preparation of Buffers
- Serial Dilution & Stock/Sample Preparation
- Standard Solutions & Calibration Curves
- Safe Handling of Acids, Bases, and Volatile Chemicals.

### **13. Good Laboratory Practice:**

Essential guidelines for quality and safety in bioscience labs:

#### **A. Documentation & Data Integrity**

- ALCOA+ principles (Attributable, Legible, Contemporaneous, Original, Accurate)
- Logbook maintenance (instrument log, autoclave log, media preparation log)
- SOP compliance

#### **B. Laboratory Safety & Hygiene**

- Personal Protective Equipment (PPE)
- Hazard symbols (GHS), MSDS handling
- Waste disposal
- Biohazard waste
- Chemical waste

- Sharp waste
- Glass waste

### **C. Aseptic & Sterile Techniques**

- Working in LAF/BSC
- Sterile media preparation
- Sterilization validation
- Aseptic Techniques
- Sterilization Techniques

### **D. Quality Control & Quality Assurance**

- Calibration scheduling
- Preventive maintenance
- Internal audits & external audits (awareness)

### **E. Sample Handling & Storage**

- Labelling standards.
- Cold storage (2-8°C, -20°C, -80°C)
- Avoiding contamination & degradation

### **F. Basic Laboratory Techniques**

- Microbial culture techniques (streaking, inoculation, colony counting)
- Media preparation (agar & broth)
- Pipetting techniques (micro-pipettes)
- Filtration (membrane & vacuum)
- Preparation of slides, staining (Gram staining, simple staining)
- Handling glassware & plasticware

### **G. Bioscience Essentials (Awareness Level for Assistants)**

- Basic microbiology concepts
- Basic biochemistry concepts
- Cell structure fundamentals
- Plant/animal tissue handling basics
- Environmental monitoring (air, surface, water testing)