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1st Year



GNM Exam Excellence Solved Papers

Biosciences

2025-2015

As Per the INC Syllabus

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JAYPEE

CONTENTS

1. Anatomy, Physiology and Microbiology—July 2025 1
2. Anatomy, Physiology and Microbiology—December 2024 7
3. Anatomy, Physiology and Microbiology—December 2023 13
4. Anatomy, Physiology and Microbiology—February 2023 21
5. Anatomy, Physiology and Microbiology—October 2022 25
6. Anatomy, Physiology and Microbiology—February 2022 31
7. Anatomy, Physiology and Microbiology—August 2021 37
8. Anatomy, Physiology and Microbiology—January 2021 42
9. Anatomy, Physiology and Microbiology—August 2020 51
10. Anatomy, Physiology and Microbiology—November 2019 58
11. Anatomy, Physiology and Microbiology—July 2019 65
12. Anatomy, Physiology and Microbiology—December 2018 71
13. Anatomy, Physiology and Microbiology—July 2018 81
14. Anatomy, Physiology and Microbiology—November 2017 91
15. Anatomy, Physiology and Microbiology—July 2017 100
16. Anatomy, Physiology and Microbiology—November 2016 109
17. Anatomy, Physiology and Microbiology—May 2016 118
18. Anatomy, Physiology and Microbiology—October 2015 127
19. Anatomy, Physiology and Microbiology—September 2015 137
20. Anatomy, Physiology and Microbiology—February 2015 145

DECEMBER 2023

ANATOMY, PHYSIOLOGY AND MICROBIOLOGY

Time: 3 hours **Maximum Marks:** 75

Note: Attempt all the questions in serial order

Q1. Define any five terms: **(2 × 5 = 10)**

a. Microscope
b. Respiration
c. Bacteria
d. Anatomy
e. Organ
f. Nerve

Q2. Describe any three of the following: **(5 × 3 = 15)**

a. Functions of kidney
b. Respiration system
c. Collection of specimen
d. Active and passive immunity

Q3. Write about the following: **(5 × 3 = 15)**

a. Mechanism of blood clotting
b. Sterilization and disinfection
c. Healing of fracture

Q4. Explain any three of the following: **(5 × 3 = 15)**

a. Modes of transmission of bacteria and viruses
b. Immune system
c. Digestive system
d. Biomedical waste management

Q5. Write short notes on any four of the following: **(5 × 4 = 20)**

a. Cardiac cycle
b. Different phases of menstrual cycle
c. Blood groups
d. Functions of liver
e. Joint

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Q1. Define any five terms:

a. Microscope
b. Respiration
c. Bacteria
d. Anatomy
e. Organ
f. Nerve

Ans:

a. Microscope

A microscope is an instrument used to magnify and view objects that are too small to be seen with the naked eye.

b. Respiration

Respiration is the biological process in which cells use oxygen to break down glucose and produce energy, releasing carbon dioxide and water.

c. Bacteria

Bacteria are microscopic single-celled organisms without a true nucleus, which may be either beneficial or harmful to humans.

d. Anatomy

Anatomy is the branch of science that deals with the study of the structure and organization of the human body.

e. Organ

An organ is a group of different tissues working together to perform a specific function in the body.

f. Nerve

A nerve is a bundle of nerve fibers that carry impulses between the brain, spinal cord, and different parts of the body.

Q2. Describe any three of the following:

a. Functions of kidney
b. Respiration system
c. Collection of specimen
d. Active and passive immunity

Ans:

a. Functions of Kidney

Refer to Solved Question Paper, July 2018, Question No. 3d.

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b. Respiration System

Definition

The respiratory system is the system of organs responsible for exchange of gases, i.e., intake of oxygen and removal of carbon dioxide from the body.

Parts of Respiratory System

1. **Nose and nasal cavity:** Filters, warms, and moistens air.
2. **Pharynx:** Common passage for air and food.
3. **Larynx:** Voice box; prevents entry of food into airway.
4. **Trachea:** Windpipe; conducts air to lungs.
5. **Bronchi and bronchioles:** Distribute air inside lungs.
6. **Lungs:** Contain alveoli where gaseous exchange occurs.
7. **Diaphragm and intercostal muscles:** Help in breathing movements.

Functions of Respiratory System

- The respiratory system supplies oxygen to the body tissues.
- It removes carbon dioxide, which is a waste product of metabolism.
- It helps in maintaining the acid–base balance of the body.
- It produces sound for speech through the larynx.
- It filters, warms, and humidifies the inspired air before it reaches the lungs.

c. Collection of Specimen

Refer to Solved Question Paper, November 2016, Question No. 5c.

d. Active vs Passive Immunity

Point	*Active Immunity*	*Passive Immunity*
Definition	Immunity developed when body's own immune system produces antibodies after exposure to antigen	Immunity provided by transfer of ready-made antibodies from another source
Source of antibodies	Produced by individual's own body	Received from outside (mother, antisera, immunoglobulins)
Methods	Natural (after infection), artificial (vaccination)	Natural (placenta, breast milk), Artificial (injection of antibodies)
Onset	Develops slowly (takes days to weeks)	Immediate protection
Duration	Long lasting, sometimes lifelong	Short-lived (few weeks to months)
Memory	Memory cells formed → provides long-term immunity	No memory cells formed → no long-term protection
Point	Active immunity	Passive immunity

Q3. Write about the following:

a. Mechanism of blood clotting
b. Sterilization and disinfection
c. Healing of fracture

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Ans:

a. Mechanism of Blood Clotting

Refer to Solved Question Paper, February 2023, Question No. 4c.

b. Sterilization and Disinfection

Sterilization is the process of destroying or removing all forms of microorganisms including spores from articles.

Methods

- **Moist heat:** Autoclaving (steam under pressure).
- **Dry heat:** Hot air oven, incineration.
- **Radiation:** Ultraviolet rays, gamma rays.
- **Filtration:** Membrane filters, HEPA filters.
- **Chemical agents:** Ethylene oxide, formaldehyde gas, hydrogen peroxide plasma.

Indications

For surgical instruments, dressing sets, syringes, needles, culture media, glassware, implants.

Disinfection

Definition

Disinfection is the process of destroying or inhibiting **pathogenic microorganisms except spores** on surfaces and instruments.

Methods

- **Physical:** Boiling, pasteurization, ultraviolet light.
- **Chemical agents:** Alcohols, halogens, aldehydes, phenolics, quaternary ammonium compounds.
- **Pasteurization:** For milk and milk products.

Indications

For floors, walls, bedpans, thermometers, endoscopes, linen, medical equipment that cannot be sterilized.

Role of Nurse

- Ensure articles are cleaned and dried before sterilization/disinfection.
- Select appropriate method depending on type of article.
- Operate and monitor sterilization equipment (autoclave, hot air oven).
- Maintain aseptic technique while handling sterilized/disinfected items.
- Label and store sterilized packs with date and expiry.
- Discard used disinfectant solutions safely and prepare fresh as needed.
- Educate staff and patients about infection prevention practices.

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c. Healing of Fracture

Definition

Healing of fracture is the process by which continuity of bone is restored after a break. It occurs in sequential stages.

Stages of Fracture Healing

1. **Hematoma formation (0–7 days)**
   - Blood vessels at fracture site rupture.
   - A clot (hematoma) forms, providing the framework for healing.
2. **Inflammatory stage (1–2 weeks)**
   - Inflammatory cells migrate to site.
   - Granulation tissue forms and new capillaries develop.
3. **Callus formation (2–6 weeks)**
   - Fibroblasts and osteoblasts form soft callus.
   - Later becomes hard callus with deposition of calcium salts.
4. **Consolidation (6–12 weeks)**
   - Callus becomes organized and bone trabeculae form.
   - Union becomes stronger.
5. **Remodeling (months to years)**
   - Excess callus resorbed.
   - Bone regains normal shape, structure, and strength.

Factors Affecting Healing

- **Favorable:** Good blood supply, proper immobilization, healthy nutrition (calcium, vitamin D, protein), young age.
- **Unfavorable:** Infection, poor blood supply, movement at fracture site, osteoporosis, systemic diseases (diabetes, anemia), smoking.

Q4. Explain any three of the following:

a. Modes of transmission of bacteria and viruses
b. Immune system
c. Digestive system
d. Biomedical waste management

Ans:

a. Modes of Transmission of Bacteria and Viruses

Bacteria and viruses are transmitted from one person to another through various modes.

Modes

- **Airborne transmission:** Infection spreads through droplets and dust particles suspended in the air, e.g., tuberculosis, influenza.

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- **Direct contact:** Transmission occurs by touching, kissing, or sexual contact with an infected person.
- **Indirect contact (fomites):** Spread occurs through contaminated objects such as utensils, clothes, and medical instruments.
- **Vector-borne transmission:** Insects like mosquitoes, flies, and ticks transmit diseases such as malaria and dengue.
- **Food and water-borne transmission:** Contaminated food and water carry pathogens, e.g., cholera, typhoid.
- **Blood-borne transmission:** Spread occurs by transfusion of infected blood, use of unsterile needles, or mother-to-child transmission.

b. Immunity

Immunity is the ability of the body to resist, prevent, and fight against infections and harmful foreign substances.

Types of Immunity

1. **Innate immunity:** It is the natural immunity present at birth which provides immediate and nonspecific defense against infections.
2. **Acquired immunity:** It develops after exposure to antigens and provides specific protection.
   - *Active immunity:* It occurs when the body produces its own antibodies, either naturally after infection or artificially through vaccination.
   - *Passive immunity:* It occurs when ready-made antibodies are transferred, either naturally through placenta or breast milk, or artificially by administration of antiserum.

Functions of Immunity

- It protects the body from bacterial, viral, and other infections.
- It identifies and destroys harmful pathogens and foreign substances.
- It provides immunological memory to respond faster in future infections.
- It removes damaged, abnormal, and cancerous cells from the body.
- It helps in maintaining the internal balance and homeostasis of the body.

c. Digestive System

The digestive system is a group of organs that work together to ingest, digest, absorb, and eliminate food.

Main Organs of Digestive System

- **Mouth:** The mouth helps in chewing and mixing food with saliva for easy swallowing.
- **Pharynx:** The pharynx passes chewed food from the mouth to the esophagus.
- **Esophagus:** The esophagus carries food from the pharynx to the stomach by peristalsis.
- **Stomach:** The stomach stores food and secretes gastric juices that help in protein digestion.
- **Small intestine:** The small intestine is the main site for digestion and absorption of nutrients.
- **Large intestine:** The large intestine absorbs water and forms feces for elimination.
- **Rectum and anus:** The rectum stores feces and the anus helps in excretion of waste.

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Accessory Organs of Digestive System

- **Liver:** The liver produces bile which helps in fat digestion.
- **Gallbladder:** The gallbladder stores and releases bile into the small intestine.
- **Pancreas:** The pancreas secretes digestive enzymes and bicarbonates that aid in digestion.
- **Salivary glands:** The salivary glands secrete saliva containing enzymes for carbohydrate digestion.

Functions of Digestive System

- The digestive system breaks down food into simple substances.
- It absorbs nutrients and water for body use.
- It eliminates undigested waste from the body.

d. Biomedical Waste Management

Refer to Solved Question Paper, May 2016, Question No. 5e.

Q5. Write short notes on any four of the following:

a. Cardiac cycle
b. Different phases of menstrual cycle
c. Blood groups
d. Functions of liver
e. Joint

Ans:

a. Cardiac Cycle

The cardiac cycle is the sequence of events that occur during one complete heartbeat, including contraction (systole) and relaxation (diastole) of the atria and ventricles.

Phases of Cardiac Cycle

- **Atrial systole:** Atria contract and push blood into the ventricles.
- **Ventricular systole (isovolumetric contraction):** Ventricles contract, AV valves close producing the first heart sound.
- **Ventricular ejection:** Blood is pumped into the aorta and pulmonary artery as semilunar valves open.
- **Ventricular diastole (isovolumetric relaxation):** Ventricles relax, semilunar valves close producing the second heart sound.
- **Ventricular filling:** Blood flows passively from atria to ventricles through AV valves.

Duration

- One complete cardiac cycle lasts about 0.8 seconds at a heart rate of 72 beats per minute.
- **Atrial systole:** 0.1 second, ventricular systole: 0.3 second, complete diastole: 0.4 second.

Significance

The cardiac cycle ensures continuous pumping of blood for circulation, supplying oxygen and nutrients to the body and removing waste products.

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b. Different Phases of Menstrual Cycle

Refer to Solved Question Paper, September 2015, Question No. 5e.

c. Blood Groups

Refer to Solved Question Paper, August 2020, Question No. 4a.

d. Functions of Liver

Refer to Solved Question Paper, December 2018, Question No. 4d.

e. Joint

Refer to Solved Question Paper, November 2019, Question No. 4a.

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