UPCATET Agriculture Zoology Sample Paper-10

Duration: 20 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks. Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. The cells of the stratum germinativum in the skin of mammals are characterized by which type of epithelial tissue?

(A) Simple columnar epithelium

(B) Cuboidal epithelium

(C) Stratified squamous keratinized epithelium

(D) Ciliated columnar epithelium

Q2. Which phylum contains organisms that are coelomate, triploblastic, and possess a chitinous exoskeleton, making them highly diverse in agricultural ecosystems?

(A) Annelida

(B) Arthropoda

(C) Nematoda

(D) Mollusca

Q3. The destructive phase of the desert locust (Schistocerca gregaria) that forms dense, highly mobile swarms capable of devastating vast agricultural fields is known as the:

(A) Solitary phase

(B) Migratory phase

(C) Gregarious phase

(D) Transient phase

Q4. In the anatomy of the Indian earthworm Pheretima posthuma, the prominent glandular band of tissue forming a ring around the segments 14, 15, and 16 is called the:

(A) Prostomium

(B) Peristomium

(C) Clitellum

(D) Typhlosole

Q5. Termites, often classified as major agricultural and structural pests, belong to which insect order?

(A) Isoptera

(B) Orthoptera

(C) Lepidoptera

(D) Hemiptera

Q6. The destructive root-knot disease affecting various economic crops is caused by organisms belonging to which invertebrate phylum?

(A) Platyhelminthes

(B) Nematoda

(C) Annelida

(D) Echinodermata

Q7. Which structure in the digestive canal of the earthworm Pheretima posthuma is specifically adapted for grinding soil particles and organic matter?

(A) Pharynx

(B) Gizzard

(C) Typhlosole

(D) Intestine

Q8. The fluid connective tissue found in animals that lacks collagen fibers and helps in transporting nutrients and oxygen to various organs is:

(A) Adipose tissue

(B) Areolar tissue

(C) Blood

(D) Lymphatic cartilage

Q9. In the life cycle of the agricultural pest Helicoverpa armigera (Gram pod borer), which specific developmental stage causes direct and maximum damage to the crops?

(A) Adult moth

(B) Pupa

(C) Larva (Caterpillar)

(D) Egg

Q10. The respiration in an adult cockroach (Periplaneta americana) occurs through a network of internal tubes. This system opens to the exterior via how many pairs of spiracles?

(A) 8 pairs

(B) 10 pairs

(C) 12 pairs D 6 pairs

Q11. Which of the following phyla possesses a water vascular system that functions in locomotion, capture, and transport of food, but contains no representatives adapted to terrestrial farm environments?

(A) Porifera

(B) Cnidaria

(C) Echinodermata

(D) Mollusca

Q12. The specialized structure used by worker termites to digest cellulose from agricultural residues and wooden structures contains symbiotic:

(A) Cyanobacteria

(B) Protozoans (like Trichonympha)

(C) Green algae

(D) Parasitic nematodes

Q13. Earthworms are highly valued in agriculture as "friends of farmers" primarily because their burrowing and feeding activities result in:

(A) Increasing the soil alkalinity

(B) Enhancing soil aeration, drainage, and structural porosity

(C) Eradicating microbial populations from the root zones

(D) Reducing the overall moisture retention capacity of soil

Q14. Which cellular organelle is responsible for the synthesis of lipids and steroidal hormones in animal secretory cells?

(A) Rough Endoplasmic Reticulum

(B) Smooth Endoplasmic Reticulum

(C) Lysosome

(D) Nucleolus

Q15. The phenomenon of "Phase Polymorphism" where individuals transform morphologically and behaviorally due to changes in population density is prominently observed in:

(A) Crop-damaging aphids

(B) Desert locusts

(C) Rice weevils

(D) Mustard sawflies

Q16. The excretion of nitrogenous waste in a cockroach is primarily executed by which specialized structures attached at the junction of the midgut and hindgut?

(A) Nephridia

(B) Green glands

(C) Malpighian tubules

(D) Coxal glands

Q17. Snails and slugs that act as pests of horticultural crops and vectors for certain livestock parasites belong to which phylum?

(A) Arthropoda

(B) Mollusca

(C) Annelida

(D) Aschelminthes

Q18. Which of the following crop pests exhibits a classic lifestyle where the larva creates tunnels inside the stems of monocot crops like maize and sorghum, leading to a condition known as "dead heart"?

(A) Whitefly

(B) Stem borer

(C) Red cotton bug

(D) Gundhi bug

Q19. The internal surface area of the earthworm's intestine is highly increased for efficient nutrient absorption by a dorsal median fold of the intestinal wall called the:

(A) Gizzard inner lining B Typhlosole

(B) Intestinal caeca

(C) Internal villi

Q20. The caste system in a termite colony represents highly evolved social structures. Which caste is structurally blind, wingless, sterile, and primarily responsible for constructing mounds and gathering food?

(A) King

(B) Queen

(C) Soldier

(D) Worker

Q21. In the reproductive system of the earthworm Pheretima posthuma, the function of the spermathecae is to:

(A) Produce active spermatozoa

(B) Store foreign sperms received during copulation

(C) Secrete a slimy substance to form the cocoon

(D) Nourish the developing embryos

Q22. Leeches and earthworms share a common characteristic feature of having a segmented body structure. This true segmental division of the body is technically termed as:

(A) Metamerism

(B) Strobilisation

(C) Tagmatization

(D) Pseudosegmentation

Q23. The insect pest Leptocorisa varicornis (Gundhi bug) causes substantial economic loss to rice fields by attacking the crop during which critical growth phase?

(A) Seedling stage

(B) Tillering stage

(C) Milky stage of grains

(D) Harvesting stage

Q24. The mouthparts of a cockroach are structurally adapted to perform which of the following mechanical feeding functions?

(A) Piercing and sucking

(B) Biting and chewing

(C) Siphoning

(D) Sponging

Q25. The type of development seen in locusts and cockroaches, where the young nymphs resemble adults but lack wings and mature reproductive systems, is called:

(A) Holometabolous development

(B) Paurometabolous development

(C) Ametabolous development

(D) Hypermetabolous development

Detailed Solutions

Q1.

Solution

Concept:
The mammalian skin epidermis is a stratified epithelium composed of multiple cellular layers. The innermost basal layer, known as the stratum germinativum or stratum basale, rests directly on the basement membrane. This layer contains actively dividing stem cells responsible for continuous tissue regeneration.

Solution:

(a) The cells of the stratum germinativum are single layered and exhibit a distinct cuboidal to low columnar morphology with vertically elongated nuclei.

(b) These cells undergo rapid mitotic divisions to produce new keratinocytes, which are gradually pushed upward toward the outer layers of the skin.

(c) As these generated cells migrate superficially, they flatten out, accumulate keratin, lose their organelles, and eventually form the protective stratified squamous keratinized layer at the surface.

(d) While the entire epidermis is classified broadly as a stratified squamous keratinized epithelium due to its superficial cell shapes, the specific individual layer of the stratum germinativum consists characteristically of cuboidal epithelial units.

(e) Simple or ciliated columnar variants are localized to internal absorptive or secretory tracts rather than the cutaneous germinative layers.

Final Answer: The cells are characterized by cuboidal epithelium.

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:
Animal phyla are classified based on structural organization, symmetry, coelom type, and skeletal configurations. In agricultural fields and ecosystems, identifying the phylum with high species abundance and protective adaptations is vital for pest management and biodiversity studies.
Solution:

(a) Phylum Arthropoda represents the largest assemblage in the animal kingdom, containing insects, arachnids, and crustaceans that dominate agricultural landscapes.

(b) These organisms exhibit bilateral symmetry, triploblastic embryonic germ layers, and a true coelom that is structurally reduced to a hemocoel.

(c) A defining evolutionary feature of arthropods is their hard, protective exoskeleton composed entirely of chitin, which prevents desiccation and provides structural support.

(d) Annelids possess true coeloms but lack a chitinous outer exoskeleton, while Nematodes possess a false coelom or pseudocoelom. 5. Molluscs are also coelomate but are characterized by soft bodies typically enclosed within calcium carbonate shells rather than segmented chitinous plates.

Final Answer: The phylum containing these organisms is Arthropoda.

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept:
The desert locust, Schistocerca gregaria, exhibits phase polymorphism, changing behaviorally and morphologically in response to population density fluctuations. This physiological transition is a critical survival mechanism that directly impacts large scale agricultural security.

Solution:

(a) At low population densities, locusts remain in the solitary phase, characterized by green coloration, isolated feeding habits, and an avoidance of other locusts.

(b) Environmental triggers such as rainfall cause sudden vegetation growth followed by crowding, inducing tactile and chemical stimuli among individual insects.

(c) This crowding triggers a transition through a transient phase into the highly destructive gregarious phase.

(d) In the gregarious phase, individuals change color to bright pink or yellow, become highly social, aggregate into massive swarms, and develop high mobility.

(e) These swarms travel vast distances across agricultural belts, devouring tons of standing crops daily, making this specific density dependent phase the primary agricultural threat.

Final Answer: The destructive phase is known as the gregarious phase.

Answer: (C)

Go Back to Question 3

Q4.

Solution

Concept:
The terrestrial oligochaete Pheretima posthuma exhibits external and internal segmentation. Morphological regions of the earthworm are identified by specific glandular and non glandular segments that perform specialized roles in reproductive physiology.

Solution:

(a) The body of a mature earthworm shows a distinct, thick, dark circular band of glandular tissue located anteriorly.

(b) This glandular ring completely encompasses body segments 14, 15, and 16, and is morphologically designated as the clitellum.

(c) The primary physiological role of the clitellum is to secrete mucus and nutritive fluid necessary for forming a protective cocoon during copulation.

(d) The prostomium is a small, non cellular fleshy lobe projecting over the mouth, while the peristomium forms the first true body segment.

(e) The typhlosole is an internal structural adaptation consisting of a dorsal fold in the intestinal wall to increase nutrient absorption surface area.

Final Answer: The prominent glandular band of tissue is called the clitellum.

Answer: (C)

Go Back to Question 4

Q5.

Solution

Concept:
Termites are social insects that form complex subterranean or arboreal colonies. Understanding their precise taxonomic position within class Insecta helps agriculturalists design targeted biological and chemical control methods against structural damage.

Solution:

(a) Termites are traditionally classified under the insect order Isoptera due to the identical structure, size, and venation of their two pairs of wings during reproductive flights.

(b) Modern phylogenetic classifications sometimes group them as a specialized epifamily within the dictyopteran order, closely allied with cockroaches, but Isoptera remains standard in economic entomology.

(c) Order Orthoptera encompasses grasshoppers and locusts, which possess chewing mouthparts and modified hind legs for jumping.

(d) Order Lepidoptera contains butterflies and moths, whose larval caterpillars act as primary defoliators and borers on agricultural vegetation.

(e) Order Hemiptera constitutes the true bugs, which possess specialized piercing and sucking mouthparts used to drain plant sap.

Final Answer: Termites belong to the insect order Isoptera.

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept:
Root knot disease is a highly destructive plant pathology that causes galling or knotting of agricultural root systems, severely inhibiting water and nutrient uptake. The causal microscopic pathogens belong to a distinct worm phylum.

Solution:

(a) Root knot disease is caused by obligate sedentary endoparasites belonging to the genus Meloidogyne.

(b) These plant parasitic organisms are structurally unsegmented, bilaterally symmetrical, pseudocoelomate, and covered by a tough cuticle, placing them in phylum Nematoda.

(c) The larvae penetrate host plant root tips, establishing permanent feeding sites that induce rapid localized cell division, creating visible knots or galls.

(d) Phylum Platyhelminthes consists of flatworms which are acoelomate and primarily parasitize vertebrate hosts rather than root tissue.

(e) Phylum Annelida contains true segmented worms like earthworms which enhance soil fertility, whereas Echinodermata comprises exclusively marine invertebrates with no agricultural relevance.

Final Answer: The disease is caused by organisms belonging to phylum Nematoda.

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept:
The digestive tract of Pheretima posthuma is a straight tube running from the mouth to the anus. Each anatomical region is specialized for processing soil and extracting organic humus efficiently.
Solution:

(a) Earthworms feed on organic debris mixed with large amounts of abrasive soil particles and sand grains.

(b) Following ingestion through the buccal cavity and muscular pharynx, food passes into the esophagus and enters the gizzard, located in the 8th segment.

(c) The gizzard is a highly muscular, thick walled organ lined internally with a tough chitinous cuticle layer.

(d) Contractions of the thick muscular walls of the gizzard grind the ingested soil and coarse organic matter into a fine paste.

(e) The typhlosole and general intestine are located further down the digestive canal, functioning primarily in chemical digestion and nutrient absorption rather than mechanical grinding.

Final Answer: The structure adapted for grinding soil particles is the gizzard.

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept:
Animal tissues are broadly categorized into epithelial, connective, muscular, and nervous types. Connective tissues are characterized by extracellular matrices that can be loose, dense, specialized, or fluid in nature.

Solution:

(a) Fluid connective tissue is a specialized category that includes blood and lymph, which circulate continuously throughout the animal body.

(b) Unlike loose or dense connective tissues, blood lacks structural fibers such as collagen and elastin within its liquid extracellular matrix, known as plasma.

(c) Blood contains specialized cellular components including erythrocytes for oxygen transport, leukocytes for immune defense, and thrombocytes for coagulation.

(d) Adipose and areolar tissues are loose connective variants that possess abundant collagen and elastic fibers to anchor organs and store lipids.

(e) Cartilage is a specialized skeletal tissue with a solid, pliable, intercellular matrix rich in collagen fibers, designed to withstand mechanical compression.

Final Answer: The fluid connective tissue lacking collagen fibers is blood.

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:
The polyphagous agricultural pest Helicoverpa armigera undergoes complete metamorphosis, also known as holometabolous development. This life history strategy involves distinct egg, larval, pupal, and adult morphological stages.

Solution:

(a) The adult stage of Helicoverpa armigera is a nocturnal moth that feeds solely on nectar, causing no direct physical damage to crop yields.

(b) After mating, the female moth deposits eggs on host plant structures, which hatch into young larvae after a brief incubation period.

(c) The larval or caterpillar stage possesses highly developed, strong mandibular mouthparts designed for chewing heavy plant tissue.

(d) These caterpillars feed voraciously on leaves, bore directly into pods, fruits, and stems of valuable crops like cotton, pulses, and tomatoes. 5. The pupal phase is a quiescent, non feeding developmental stage, meaning the larval stage is solely responsible for severe field damage.

Final Answer: The developmental stage causing maximum damage is the larva.

Answer: (C)

Go Back to Question 9

Q10.

Solution

Concept:
The respiratory system of the cockroach Periplaneta americana consists of an integrated network of ectodermal tubes called tracheae. This tracheal system bypasses the circulatory fluid to deliver oxygen directly to tissues via lateral pore openings.
Solution:

(a) Respiratory gas exchange in the cockroach occurs through segmental, slit like openings on the lateral margins of the body wall called spiracles.

(b) There are exactly 10 pairs of spiracles present along the lateral sides of the insect body.

(c) Out of these ten pairs, 2 pairs are structurally located in the thoracic segments, while the remaining 8 pairs are distributed across the abdominal segments.

(d) The opening and closing of these spiracles are regulated by muscular sphincters responding to internal carbon dioxide concentrations.

(e) Options indicating 6, 8, or 12 pairs are morphologically incorrect for typical blattid respiratory anatomy.

Final Answer: The tracheal system opens to the exterior via 10 pairs of spiracles.

$\boxed{\textbf{Answer: (B)}}$

Go Back to Question 10

Q11.

Solution

Concept:
Animal phyla exhibit distinctive physiological systems adapted to specific ecological niches. Taxonomic identification relies on unique anatomical traits, such as the water vascular system, alongside their environmental distribution patterns within agricultural frameworks.

Solution:

(a) The water vascular system, also known as the ambulacral system, is a specialized network of fluid filled canals unique to organisms within phylum Echinodermata.

(b) This hydraulic system drives essential physiological operations including locomotion via tube feet, food capture, respiration, and metabolic waste excretion.

(c) Evolutionary traits restrict echinoderms entirely to marine biomes, meaning they possess zero biological adaptation for survival in terrestrial or farm environments.

(d) Phylum Porifera features a simpler water transport canal system lined with collar cells rather than an advanced coelom based hydraulic network.

(e) Phylum Cnidaria utilizes a central gastrovascular cavity for circulation, while phylum Mollusca possesses an open circulatory system and mantle cavity containing gills.

Final Answer: The phylum possessing a water vascular system is Echinodermata.

Answer: (C)

Go Back to Question 11

Q12.

Solution

Concept:
Termites play a significant dual role as decomposers and destructive agricultural pests due to their wood eating feeding habits. Because animals lack endogenous machinery to degrade complex plant structural polymers, they rely on specialized endosymbionts.

Solution:

(a) The primary diet of worker termites consists of wood, dry plant matter, and crop residues containing high levels of complex cellulose molecules.

(b) Termites cannot produce sufficient quantities of cellulase enzymes independently to process this high fiber diet.

(c) To solve this, the termite hindgut hosts a dense colony of symbiotic flagellated protozoans, specifically belonging to genera like Trichonympha.

(d) These protozoans ingest the wood particles and produce the essential enzyme cellulase, which converts raw cellulose into digestible simple sugars.

(e) This metabolic breakdown provides a usable energy source for the termite while offering a protected nutrient rich habitat for the microparasites.

Final Answer: The specialized structure contains symbiotic protozoans.

$\boxed{\textbf{Answer: (B)}}$

Go Back to Question 12

Q13.

Solution

Concept:
Earthworms act as vital biological agents within sustainable agricultural systems. Their ecological behavior directly modifies the physical, chemical, and biological architecture of the soil profile, earning them high value in agroecology.

Solution:

(a) Earthworms continuously tunnel through soil layers, ingestion channels of organic matter mixed with inorganic earth particles.

(b) This physical burrowing action loosens packed earth, significantly improving soil aeration and gaseous exchange near root systems.

(c) The resulting structural channels create pathways that enhance water infiltration and drainage, effectively mitigating surface runoff and soil erosion.

(d) Their feeding behavior converts organic debris into nutrient rich castings that improve soil aggregation and porosity without raising toxic alkalinity.

(e) This structural optimization creates an ideal microenvironment for beneficial root growth and microflora expansion rather than destroying native microbial communities.

Final Answer: Their activities result in enhancing soil aeration, drainage, and structural porosity.

Answer: (B)

Go Back to Question 13

Q14.

Solution

Concept:
Eukaryotic cells contain specialized membrane bound organelles that compartmentalize specific metabolic functions. Animal cells specialized for secretion alter the abundance of these structures based on their primary chemical products.
Solution:

(a) The endoplasmic reticulum forms an interconnected network of flattened sacs and tubules extending throughout the cytoplasm of the cell.

(b) The smooth endoplasmic reticulum lacks attached ribosomes on its outer surface, distinguishing it structurally from the rough variant.

(c) This ribosome free surface hosts enzymes responsible for the synthesis of lipids, phospholipids, and essential cholesterol derivatives.

(d) In animal secretory cells, such as those in the testes, ovaries, and adrenal cortex, it synthesizes steroidal hormones. 5. Rough endoplasmic reticulum handles protein translation, lysosomes manage cellular digestion, and the nucleolus oversees the assembly of ribosomal subunits.

Final Answer: The cellular organelle responsible is the Smooth Endoplasmic Reticulum.

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept:
Phase polymorphism describes a biological phenomenon where a single species exhibits distinct phenotypic changes driven by population density. Tracking this ecological shift allows agricultural managers to predict insect behavior changes.

Solution:

(a) Desert locusts display dramatic phase polymorphism, transitioning smoothly between solitary and gregarious phases based on local crowding.

(b) When physical contact increases due to high density populations, hormonal shifts trigger modifications in coloration, body shape, and physiology.

(c) The individual insects transform from slow moving, solitary green nymphs into highly active, yellow and black social gregarious swarms.

(d) This phenotypic plasticity enables the population to migrate cohesively across vast agricultural belts in search of new foraging grounds.

(e) While aphids exhibit seasonal wing variations, none match the systemic behavioral and structural shifts seen in crowded desert locust populations.

Final Answer: The phenomenon is prominently observed in desert locusts.

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept:
The excretory system of insect types is highly adapted to conserve water while eliminating toxic nitrogenous metabolic byproducts. Pinpointing the anatomical location of these structures is fundamental in entomological studies.
Solution:

(a) The cockroach Periplaneta americana processes metabolic wastes using fine, yellow, blind tubules called Malpighian tubules.

(b) A cluster of roughly one hundred to one hundred and fifty of these tubules floats freely within the circulating hemolymph.

(c) They are attached structurally at the boundary junction where the midgut ends and the hindgut begins.

(d) The tubules extract water, salts, and nitrogenous wastes from the surrounding blood, converting them into insoluble uric acid.

(e) This uric acid passes into the hindgut and exits along with digestive waste, making the insect primarily uricotelic.

Final Answer: The excretion is executed by Malpighian tubules.

Answer: (C)

Go Back to Question 16

Q17.

Solution

Concept:
Horticultural production often faces significant management challenges from soft bodied, unsegmented invertebrates. Classifying these pests taxonomically helps determine their susceptibility to targeted chemical mulluscicides.

Solution:

(a) Snails and slugs are soft bodied invertebrates that possess a muscular foot used for locomotion and a specialized scraping organ called a radula.

(b) These structural traits, along with a protective dorsal mantle layer, place them under the phylum Mollusca.

(c) Many terrestrial species feed heavily on succulent plant leaves, stems, and roots within high moisture greenhouse and horticultural environments.

(d) Beyond direct crop consumption, these molluscs serve as essential intermediate hosts for parasitic flatworms that cause diseases in domestic farm livestock. 5. Arthropods feature jointed appendages, annelids are segmented, and aschelminthes are microscopic roundworms, excluding them from this classification.

Final Answer: Snails and slugs belong to the phylum Mollusca.

Answer: (B)

Go Back to Question 17

Q18.

Solution

Concept:
Stem borers are destructive insect pests affecting major cereal crops. Recognizing the distinct symptoms of their larval feeding behavior is critical for accurate field diagnosis and timing pest control actions.

Solution:

(a) The adult female stem borer moth deposits eggs on the leaf surfaces of host monocot crops like maize and sorghum.

(b) Upon hatching, the young larvae tunnel directly into the central core of the plant stem to feed on internal tissues.

(c) This internal chewing severs the primary vascular bundles, disrupting the flow of water and nutrients to the upper terminal whorl.

(d) Consequently, the central growing shoot dries up and dies, producing a highly characteristic field symptom known as dead heart.

(e) Sucking insects like whiteflies and gundhi bugs sap fluids without severing internal stem tissues, avoiding this specific damage pattern.

Final Answer: This classic lifestyle is exhibited by the stem borer.

$\boxed{\textbf{Answer: (B)}}$

Go Back to Question 18

Q19.

Solution

Concept:
The digestive canal of the earthworm Pheretima posthuma features internal adaptations designed to maximize chemical processing efficiency within a short, straight body design.

Solution:

(a) The earthworm intestine extends from the 15th segment to the final posterior anus, acting as the primary site for nutrient absorption.

(b) Starting from the 26th segment and continuing until roughly the last twenty five segments, a unique internal structural feature appears.

(c) The dorsal wall of the intestine folds downward into the lumen, forming a prominent median longitudinal ridge called the typhlosole.

(d) This folding pattern significantly increases the internal absorptive surface area, facilitating thorough extraction of organic nutrients from processed soil paste. 5. The gizzard relies on a tough internal cuticle to grind food, whereas intestinal caeca provide localized enzymatic secretion rather than long term absorption.

Final Answer: The dorsal median fold of the intestinal wall is called the typhlosole.

$\boxed{\textbf{Answer: (B)}}$

Go Back to Question 19

Q20.

Solution

Concept:
Social insects display a distinct division of labor, supported by morphologically distinct castes within a single colony. Understanding this caste specialization clarifies how colonies expand and damage timber or crops.

Solution:

(a) A termite colony contains reproductive castes like kings and queens alongside sterile somatic populations including soldiers and workers.

(b) The worker caste represents the most numerous group, consisting of sterile, wingless, and structurally blind individuals.

(c) Workers carry out all manual maintenance tasks including foraging, feeding other castes, excavating galleries, and building the mud mound.

(d) The queen focuses strictly on egg production, the king manages reproduction, and the soldier caste utilizes specialized mandibles for defense.

(e) Because of this labor division, workers cause the actual structural and crop damage by gathering cellulose to feed the nest.

Final Answer: The caste primarily responsible for constructing mounds and gathering food is the worker.

Answer: (D)

Go Back to Question 20

Q21.

Solution

Concept:

The reproductive physiology of the common Indian earthworm Pheretima posthuma is characterized by a monoecious or hermaphroditic organization. Despite being bisexual, earthworms practice mandatory cross fertilization mediated by specific segmentally arranged storage organs.

Solution:

(a) In Pheretima posthuma, there are exactly four pairs of small, flask shaped structures known as spermathecae located ventrolaterally in segments 6, 7, 8, and 9.

(b) Each spermatheca consists of a main ampulla and a small diverticulum, opening externally to receive reproductive material from a partner.

(c) During the process of copulation, two mature earthworms align in opposite directions to approximate their male genital pores with these spermathecal openings.

(d) The primary physiological function of the spermathecae is to receive and temporarily store the foreign spermatozoa transferred by the partner worm. 5. These stored sperm cells remain viable inside the spermathecae until they are discharged into the external mucus cocoon for final fertilization, while cocoon nutrients are supplied by clitellar glands.

Final Answer: The function of the spermathecae is to store foreign sperms received during copulation.

Answer: (B)

Go Back to Question 21

Q22.

Solution

Concept:
Body symmetry, germ layers, and anatomical segmentation serve as foundational pillars for animal classification. Distinguishing the precise architectural terminology used for serial body divisions helps structural biologists classify diverse macroinvertebrates.
Solution:

(a) Annelids such as leeches and earthworms exhibit a highly advanced structural organization where the elongated body is divided both externally and internally into distinct segments.

(b) This true, linear repetition of homologous body segments along the anteroposterior axis is technically designated as metamerism.

(c) Each separate segment is called a metamere or somite, and they are separated internally from one another by thin transverse muscular septa.

(d) Tagmatization refers to the evolutionary fusion of individual body segments into functional specialized units like the head, thorax, and abdomen seen in arthropods. 5. Strobilisation and pseudosegmentation represent superficial, non coelomate segment divisions characteristic of primitive tapeworms, making metamerism the correct term for true coelomate segmentation.

Final Answer: This true segmental division of the body is technically termed as metamerism.

Answer: (A)

Go Back to Question 22

Q23.

Solution

Concept:
The gundhi bug, Leptocorisa varicornis, is a serious insect pest that impacts grain yields in rice growing regions. Identifying the precise crop growth phase vulnerable to this pest allows farmers to execute targeted economic threshold protections.

Solution:

(a) The adult and nymph stages of Leptocorisa varicornis possess specialized piercing and sucking mouthparts designed to feed on plant exudates.

(b) The insect pest attacks the paddy crop precisely when the young, developing grains are filled with a soft, white carbohydrate fluid.

(c) This critical developmental window in the phenology of the rice plant is standardly referred to as the milky stage of grains.

(d) The gundhi bugs puncture the soft glumes to suck out the internal milky sap, leaving behind empty, chalky, and completely chaffy grains. 5. Damage during the seedling or tillering stages is minimal, and hardened harvest ready grains prevent the bug from inserting its delicate feeding stylets.

Final Answer: The insect pest causes substantial economic loss to rice fields by attacking the crop during milky stage of grains.

Answer: (C)

Go Back to Question 23

Q24.

Solution

Concept:
The structural configuration of insect mouthparts reflects their specific dietary adaptations and feeding behaviors. The cockroach Periplaneta americana serves as a classic generalized model for studying omnivorous mandibular structures.
Solution:

(a) Cockroaches are opportunistic nocturnal omnivores that feed on solid agricultural commodities, organic waste, paper, and plant debris.

(b) To manipulate these diverse solid materials, their head features a standard orthopteroid arrangement of biting and chewing mouthparts.

(c) This mouthpart complex includes a labrum acting as the upper lip, a pair of heavy, heavily chitinized mandibles bearing sharp teeth, and a pair of maxillae.

(d) The robust mandibles move horizontally to cut, crush, and grind solid food particles into smaller fragments before ingestion. 5. Piercing, sucking, siphoning, and sponging variations represent highly specialized evolutionary modifications found in fluid feeding insects like mosquitoes, butterflies, and houseflies.

Final Answer: The mouthparts of a cockroach are structurally adapted to perform biting and chewing.

$\boxed{\textbf{Answer: (B)}}$

Go Back to Question 24

Q25.

Solution

Concept:
Metamorphosis in class Insecta is broadly classified into distinct developmental patterns based on the presence, absence, or complexity of transitional life stages between egg hatching and adult maturation.

Solution:

(a) Locusts and cockroaches exhibit a gradual pattern of post embryonic development termed incomplete metamorphosis or paurometabolous development.

(b) The young organism that emerges from the egg capsule is called a nymph, which morphologically resembles a miniature version of the adult.

(c) Nymphs share identical feeding habits and terrestrial habitats with adults but differ structurally by lacking mature wings and functional reproductive organs.

(d) The nymph undergoes a series of successive molts or ecdysis stages, gradually developing wing pads that expand into fully operational structures during the final molt. 5. Holometabolous systems involve a radical pupal transformation stage, while ametabolous development features no structural changes, making paurometabolous the correct designation.

Final Answer: The type of development seen in locusts and cockroaches is called paurometabolous development.

Answer: (B)

Go Back to Question 25

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	B	3	C	4	C	5	A
6	B	7	B	8	C	9	C	10	B
11	C	12	B	13	B	14	B	15	B
16	C	17	B	18	B	19	B	20	D
21	B	22	A	23	C	24	B	25	B