

Advanced Entomology: Ecology and Evolution

Entomology · Answer Key · 15 Questions

1. Which insect order is characterized by obligate endoparasitism, where the larval stage develops within a host, often leading to its death and manipulation?

A) Hymenoptera

B) Diptera

C) Coleoptera

D) Lepidoptera

2. The phenomenon of Batesian mimicry in insects, where a harmless species evolves to resemble a harmful one, is most prominently observed in which insect group?

A) Mantodea

B) Hemiptera

C) Syrphidae (hoverflies)

D) Odonata

3. What is the primary ecological role of detritivorous insects, such as many beetle larvae and springtails, in forest ecosystems?

A) Pollination

B) Predation of other insects

C) Decomposition of organic matter

D) Dispersal of seeds

4. The evolution of eusociality, characterized by cooperative brood care, overlapping generations, and reproductive division of labor, is a complex trait that has independently arisen multiple times. Which insect order is most renowned for its highly developed eusocial species?

A) Orthoptera

B) Blattodea (termites and cockroaches)

C) Phasmatodea

D) Ephemeroptera

5. Insect flight, a crucial adaptation for dispersal and foraging, is powered by direct or indirect muscular action on the wings. The evolution of wings in insects is theorized to have originated from modifications of which ancestral body part?

A) Cervical sclerites

B) Thoracic tergites

C) Coxal exites

D) Abdominal cerci

6. The 'Trojan horse' effect in insect-plant interactions, where plants evolve traits to attract beneficial insects that then prey on herbivores, is a sophisticated form of:

- A) Mutualism
- B) Parasitism
- C) Facilitation**
- D) Commensalism

7. Which specialized feeding adaptation is observed in certain predatory insects, such as some larval damselflies, that allows them to extend their mouthparts rapidly to capture prey?

- A) Labial palps
- B) Proboscis
- C) Labium (forming a raptorial mask)**
- D) Mandibles

8. The phenomenon of crypsis, where an insect's appearance allows it to blend in with its surroundings, is a primary strategy for avoiding predation. Which insect group exhibits particularly diverse and effective forms of crypsis, often through morphological mimicry of leaves or twigs?

- A) Cicadellidae (leafhoppers)
- B) Phasmatodea (stick and leaf insects)**
- C) Formicidae (ants)
- D) Scolopendromorpha (centipedes)

9. Bioluminescence in insects, such as in fireflies (Lampyridae), serves multiple purposes including mate attraction and defense. This light production is a result of a chemical reaction involving luciferin and:

- A) Oxygen and ATP**
- B) Nitrogen and UV light
- C) Carbon dioxide and heat
- D) Water and pressure

10. The process of metamorphosis, a hallmark of many insect life cycles, allows for niche partitioning between larval and adult stages. Complete metamorphosis (holometabolism) involves a pupal stage, a quiescent phase during which significant internal reorganization occurs. What is a primary evolutionary advantage of this pupal stage?

- A) Increased mobility for finding mates
- B) Enhanced nutrient absorption from food
- C) Protection from environmental extremes and predators during transformation**
- D) Accelerated growth rate of adult tissues

11. In the context of insect-arthropod symbiosis, myrmecophily refers to the specialized relationship between ants and other invertebrates. Which of the following is a common characteristic of myrmecophiles that facilitates their integration into ant colonies?

- A) Production of strong defensive venoms
- B) Mimicry of ant pheromones or the secretion of appeasing substances**
- C) Rapid escape mechanisms
- D) Aggressive territorial defense

12. The evolution of antibiotic resistance in insect-associated bacteria, such as *Serratia entomophila* which infects New Zealand grass grub, poses a significant challenge for biological control. This resistance often arises due to:

- A) Vertical gene transfer from host plants
- B) Horizontal gene transfer between bacterial species**
- C) Spontaneous mutations in bacteriophages
- D) Acquired immunity from environmental pollutants

13. Which specific ecological role do thrips (Thysanoptera) often play in agricultural and natural ecosystems, beyond being pests?

- A) Primary decomposers of woody debris
- B) Predators of small mites and insect eggs
- C) Vectors for plant viruses**
- D) Symbiotic nitrogen fixers in soil

14. The evolution of xerophilic adaptations, allowing insects to survive in arid environments, often involves specialized structures to prevent water loss. Which of these is a crucial adaptation for many desert insects?

- A) Thick, permeable cuticle
- B) High rate of evaporative cooling through respiration
- C) Reduced surface area to volume ratio
- D) Wax layer on the cuticle and efficient water reabsorption in the hindgut**

15. Insect sensory organs, such as Johnston's organ in the antenna, are highly specialized. What is the primary function of Johnston's organ in many flying insects?

- A) Detecting airborne chemical signals (pheromones)
- B) Sensing changes in air pressure and movement for flight control**
- C) Detecting visual patterns for navigation
- D) Hearing high-frequency sounds