THE OPEN UNIVERISITY OF SRI LANKA
B.Sc DEGREE PROGRAMME – LEVEL 5
COURSE TITLE – INSECT BIOLOGY
COURSE CODE – ZLU 3186/ZLE 5186

OPEN BOOK TEST – I
DURATION: ONE HOUR (01)

Registration No.....

Date: 17th February2013 Time: 11.00 am – 12. 00noon

ANSWER ALL QUESTIONS IN PARTS A & B.

- Part A consists of three Sections with thirty five blanks and the blanks should be filled with suitable word/s.

- Part B is a structured essay question consisting of ten parts from 2.1 – 2.9. Answers should be written in the space provided.

At the end of the examination the whole paper should be handed over to the examiners.

Part A

1.0. Fill in the blanks in the articles given below with the most appropriate word/s.

1. Social Insects:

Insects are usually placed in the class **(1)**..... The body of a typical adult insect is divided into head, thorax (bearing the legs and wings), and abdomen. The class includes many familiar forms, such as flies, bees, wasps, moths, beetles, grasshoppers, and cockroaches. Insects are the most numerous animals in both numbers of individuals and of different kinds, with more than a million species in all habitats except the sea, and they are of enormous economic importance as pests and carriers of disease, and also as pollinators. Human life, however, would have a difficult time continuing without insects, because they are **(2)**..... **of** plants that are food sources for many **(3)**.....

One very interesting and useful social insect is the honey **(4)**..... Bees are considered social insects because they live and work together. They cooperate and communicate in order to survive. The bee lives in a **(5)**..... and these workers and drones, with the queen, who can lay thousands of eggs a day. The **(6)**..... bees make wax that is used to create new cells within the **(7)**..... inside the hive. Humans use this valuable **(8)** .....in candles, cosmetics, in expensive furniture polish, and in other products. Worker bees also make honey from nectar collected as they go from flower to flower. During these flights, bees carry pollen that fertilizes plants so that plants will reproduce. Thus bees help to keep plants growing. They also produce honey, a valuable food for humans as well as for bees.

Another fascinating social insect is the ant. Many types of ants live in colonies underground. They cooperate to provide food, sometimes in a manner that looks human. For example, some ants actually raise their own food. One type of ant "farmer ant" keeps and cares for aphids. Aphids are tiny insects that **suck** sweet sap from plants. Ant farmers milk their aphids for this sap, just like actual farmers milk

cows. The sap is then given as food to young ants and to the queen, whose main duty is to lay **(9).....**

Similar to bee, ants belong to order **(10).....**but the termites are social insects but they belong to order **(11) .....**

2. Insects in biodiversity conservation:

The Insecta is the most speciose class in the Animal **(12).....** The insect-plant relationship is the dominant biotic interaction, yet plants have many times the biomass of all animals together. The functional significance of **(13).....** is enormous, owing to the**(14) .....** numbers of individuals and great intra-and interspecific variety. Lack of human appreciation of importance of which coupled with the general disregard and dislike of insects is an enormous threat to their conservation. Further, at most only about 7 -10% of insects have been successfully described. As it is not possible to know all the species relative to the rate at which they are becoming **(15).....**, it is essential to conserve as many biotypes and landscapes as possible. These would be for typical species and communities, as well as for endemic sinks. Recognition, functional importance, taxic uniqueness, typicalness, genetic variation and important behavioural traits place much more emphasis on qualitative biodiversity conservation than on quantitative approaches. There are well-known inherent and environmental risks with many traditional control methods and high risks with the use of genetically engineered biopesticide baculoviruses. Ecological entomologists use preservation technologies, where individuals are held in suspended animation, must be developed soon. However, such technologies, as with restoration activities such as site restoration, captive breeding, reintroductions and translocations, all require considerable knowledge and economic input to be predictably successful. Ecological restoration involves so many biotic and **(16).....** interactions in even the simplest of communities, that prediction under all potential conditions is virtually unattainable.

3. Insect Defenses:

For many insects, a quick escape by running or **(17).....** is the primary mode of defense. A cockroach, for example, has mechanoreceptive hairs (setae) on the cerci that are sensitive enough to detect the change in air pressure that precedes a fast moving object (like your foot).

Tiger moths can detect ultrasonic echolocation by bats. At low intensity, they **(18).....** away from the bat, but if the bat's call increases to a certain threshold they quickly drop from the air in an evasive, looping dive. Other alarm reactions may be less dramatic, but just as effective: Madagascar cockroaches hiss when disturbed; cuckoo wasps curl up into hard, rigid balls; tortoise beetles have strong adhesive pads on their tarsi and hold themselves tight and flat against a leaf or stem. Other insects simply "play dead" (**thanatosis**) -- they release their grip on the substrate and fall to the ground where they are hard to find as long as they remain **(19).....** . An insect's hard **(20).....** may serve as an effective defense against some predators and parasites. Large weevils are notorious for their hard bodies. Most diving beetles are hard, slick, and streamlined; even if you can catch them, they will often squirm out of your grip.

Spines, bristles, and hairs may be effective mechanical deterrents against predators and parasites. A mouthful of hair can be an unpleasant experience for a predator and parasitic flies or wasps may have a hard time getting close enough to the insect's body to lay their eggs. Some caterpillars incorporate body hairs into the silk of their cocoon as an additional defense against **(21).....**

Chemical Defenses

Many insects are equipped to wage chemical warfare against their enemies. In some cases, they manufacture their own toxic or distasteful compounds. In other cases, the chemicals are acquired from host plants and **(22).....** in the hemolymph or body tissues. When threatened or disturbed, the noxious compounds may be released onto the surface of the body as a glandular ooze, into the air as a repellent volatile, or aimed as a spray directly at the offending target. Defensive chemicals typically work in one of four ways:

Repellency - a foul **(23)**..... or a bad taste is often enough to discourage a potential predator. Stink bugs, for example, have specialized exocrine glands located in the thorax or abdomen that produce foul-smelling hydrocarbons.

Induce cleaning - irritant compounds often induce cleaning behavior by a predator, giving the prey time **(24)** ... . Some blister beetles produce cantharidin, a strong irritant and blistering agent that circulates in their hemolymph. Droplets of this blood ooze from the beetle's leg joints when it is disturbed or threatened.

Adhesion – (25)..... compounds that harden like glue to incapacitate an attacker. Several species of cockroach guard their backsides with a slimy anal secretion that quickly cripples any worker ants that launch an attack.

Cause pain or discomfort – Saddleback caterpillars, larvae of the moth, and various other Lepidopteran larvae have hollow body **(26)** ..... that contain a painful irritant. Simply brushing against these **urticating hairs** will cause them to break and release their contents onto your skin. The consequence is an intense burning sensation that may last for several hours. Many ants, bees, and **(27)**..... (Hymenoptera) deliver **venom** to their enemies by means of a formidable **(28)** ..... (modified ovipositor).

Protective Coloration

The shapes or colors or spots on the wings or parallel ridges on the pronotum found in insects have contributed in some way for protection from predators and parasites. These patterns, collectively known as **protective coloration**, fall into four broad categories:

Crypsis - Insects that blend in with their surroundings often manage to escape detection by predators and parasites. This tactic, called **cryptic coloration**, involves not only matching the colors of the **(29)**..... ,but also disrupting the outline of the body. Many ground-dwelling grasshoppers and katydids, for example, have colors of mottled gray and brown that helps them "disappear" against a background of dried leaves or gravel.

Warning Colors - Insects that have an active means of defense (like a sting or a repellent spray) frequently display bright colors or contrasting patterns that tend to attract attention. These visually conspicuous insects illustrate **aposematic coloration**, A predator quickly learns to associate the distinctive coloration with an "unpleasant" outcome, and one such encounter is usually enough to insure avoidance of that **(30).....** in the future.

Mimicry - If a distinctive visual appearance is sufficient to protect an unpalatable insect from **(31).....** , then you may expect other insects might also avoid predation by adopting a similar appearance. This ploy, essentially a form of "false advertising", was first recognized and described by Henry W. Bates in 1861. Today, it is commonly known as **Batesian mimicry**. Viceroy butterflies (mostly palatable to birds) are largely protected from predation because they **(32).....** monarch butterflies that are distasteful to birds.

In 1879, Fritz Müller recognized that two or more distasteful species often share the same aposematic color patterns. Many species of wasps, for example, have alternating bands of black and yellow on the abdomen. This defensive **(33).....** , commonly known as **Müllerian mimicry**, benefits all members of the group because it spreads the liability for "educating the predator" over more than one species. In fact, as the number of species in a Müllerian complex increases, there is a greater selective advantage for each individual species.

Although natural selection favors individuals in a population with the best camouflage or mimicry, it also favors the predator or parasite with the best prey-finding insight. As a result of these competing interests, coevolution between predators and **(34).....** populations inevitably leads to an ongoing escalation of offensive and defensive measures -- described as an evolutionary "arms race".

In order to survive in the arms race, both predator and prey must constantly evolve in response to the other's changes. Failure to "keep up" concedes a competitive advantage to the opponent and may lead to **(35).....**

(35 marks)

Part B

Registration No: .....

2.0. Answers should be written in the space provided.

2.1. Explain the following terms with regard to insects

1. Parasitoid :

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2.Hyperparasitism:

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3. Apolysis:

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4. Round dance:

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5. Kinesis:

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2.2. Distinguish between Sub orders Homoptera and Heteroptera and give example/s for each.

No	Homoptera	Heteroptera
E.g		

2.3. Name the order/s with example/s which contain/s the entomophagous insects.

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2.4. List the orders that have aquatic or semi-aquatic insects and state one example for each order

No	Order/s	examples
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2.		
3.		
4.		
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6.		
7.		
8.		
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2.5. List the characteristic features of primitive insects.

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2.6. List the major insect order/s involved in pollination.

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2.7. List the different types of insect wings and their function/s with respect to their modification.

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2.8. List the major features of insects that contribute to their dominance on the land.

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II.....

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III.....

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IV.....

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V.....

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2.9. Distinguish between Exopterygota and Endopterygota

No	Exopterygota	Endopterygota

(65 marks)