第一大題 單選 (60%) ※ 本大題請於試卷內之「選擇題作答區」依序作答。

Section I:

El Niño is a climate pattern that describes the unusual warming of surface waters in the eastern tropical Pacific Ocean. El Niño is the "warm phase" of a larger phenomenon called the El Niño-Southern Oscillation (ENSO). La Niña, the "cool phase" of ENSO, is a pattern that describes the unusual cooling of the region's surface waters. El Niño and La Niña are considered the ocean part of ENSO, while the Southern Oscillation is its atmospheric changes.

El Niño has an impact on ocean temperatures, the speed and strength of ocean currents, the health of coastal fisheries, and local weather from Australia to South America and beyond. El Niño events occur irregularly at two- to seven-year intervals. However, El Niño is not a regular cycle, or predictable in the sense that ocean tides are.

El Niño was recognized by fishers off the coast of Peru as the appearance of unusually warm water. We have no real record of what indigenous Peruvians called the phenomenon, but Spanish immigrants called it El Niño, meaning "the little boy" in Spanish. When capitalized, El Niño means the Christ Child, and was used because the phenomenon often arrived around Christmas. El Niño soon came to describe irregular and intense climate changes rather than just the warming of coastal surface waters.

Led by the work of Sir Gilbert Walker in the 1930s, climatologists determined that El Niño occurs simultaneously with the Southern Oscillation. The Southern Oscillation is a change in air pressure over the tropical Pacific Ocean. When coastal waters become warmer in the eastern tropical Pacific (El Niño), the atmospheric pressure above the ocean decreases. Climatologists define these linked phenomena as El Niño-Southern Oscillation (ENSO). Today, most scientists use the terms El Niño and ENSO interchangeably.

Scientists use the Oceanic Nino Index (ONI) to measure deviations from normal sea-surface temperatures. El Niño events are indicated by sea surface temperature increases of more than 0.9° Fahrenheit for at least five successive three-month seasons. The intensity of El Niño events varies from weak temperature increases (about 4–5° F) with only moderate local effects on weather and climate to very strong increases (14–18° F) associated with worldwide climatic changes.

1. In paragraph 1, the word "pattern" in the passage does not close in meaning to
   (1) form (2) shape (3) function (4) sort

2. In paragraph 2, the word "intervals" in the passage is closest in meaning to
   (1) hiatus (2) numbers (3) records (4) cycles

3. In paragraph 2, the word "predictable" in the passage is closest in meaning to
   (1) initiation (2) pilot (3) preliminary (4) foreseeable

4. In paragraph 3, the word "indigenous" in the passage does not close in meaning to
   (1) aboriginal (2) original (3) native (4) exotic

5. In paragraph 3, the word "irregular" in the passage is closest in meaning to
   (1) normal (2) capricious (3) constant (4) steady

6. In paragraph 4, the word "simultaneously" in the passage is closest in meaning to
   (1) regularly (2) suddenly (3) asynchronously (4) together

7. In paragraph 4, the word "interchangeably" in the passage does not close in meaning to
   (1) vice versa (2) mutually (3) intensively (4) reciprocally

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8. In paragraph 5, the word "moderate" in the passage is closest in meaning to
(1) mitigate (2) aggravate (3) incite (4) magnify

Section II:

Many signals that animals make seem to impose on the signalers costs that are overly damaging. A classic example is noisy begging by nestling songbirds when a parent returns to the nest with food. These loud cheeps and peeps might give the location of the nest away to a listening hawk or raccoon, resulting in the death of the defenseless nestlings. In fact, when tapes of begging tree swallows were played at an artificial swallow nest containing an egg, the egg in that "noisy" nest was taken or destroyed by predators before the egg in a nearby quiet nest in 29 of 37 trials.

Further evidence for the costs of begging comes from a study of differences in the begging calls of warbler species that nest on the ground versus those that nest in the relative safety of trees. The young of ground-nesting warblers produce begging cheeps of higher frequencies than do their tree-nesting relatives. These higher-frequency sounds do not travel as far, and so may better conceal the individuals producing them, who are especially vulnerable to predators in their ground nests. David Haskell created artificial nests with clay eggs and placed them on the ground beside a tape recorder that played the begging calls of either tree-nesting or of ground-nesting warblers. The eggs "advertised" by the tree-nesters' begging calls were found bitten significantly more often than the eggs associated with the ground-nesters' calls.

The hypothesis that begging calls have evolved properties that reduce their potential for attracting predators yields a prediction: baby birds of species that experience high rates of nest predation should produce softer begging signals of higher frequency than nestlings of other species less often victimized by nest predators. This prediction was supported by data collected in one survey of 24 species from an Arizona forest, more evidence that predator pressure favors the evolution of begging calls that are hard to detect and pinpoint.

Given that predators can make it costly to beg for food, what benefit do begging nestlings derive from their communications? One possibility is that a noisy baby bird provides accurate signals of its real hunger and good health, making it worthwhile for the listening parent to give it food in a nest where several other offspring are usually available to be fed. If this hypothesis is true, then it follows that nestlings should adjust the intensity of their signals in relation to the signals produced by their nestmates, who are competing for parental attention. When experimentally deprived baby robins are placed in a nest with normally fed siblings, the hungry nestlings beg more loudly than usual—but so do their better-fed siblings, though not as loudly as the hungrier birds.

9. The phrase "impose on" in the passage is closest in meaning to
(1) increase for (2) remove from (3) place on (4) distribute to

10. According to paragraph 1, the experiment with tapes of begging tree swallows establishes which of the following?
(1) Begging by nestling birds can attract the attention of predators to the nest.
(2) Nest predators attack nests that contain nestlings more frequently than they attack nests that contain only eggs.
(3) Tapes of begging nestlings attract predators to the nest less frequently than real begging calls do.
(4) Nest predators have no other means of locating bird nests except the begging calls of nestling birds.

11. The word "artificial" in the passage is closest in meaning to
(1) attractive (2) not real (3) short-term (4) well designed

12. Paragraph 2 indicates that the begging calls of tree nesting warblers
(1) put them at more risk than ground-nesting warblers experience
(2) can be heard from a greater distance than those of ground-nesting warblers
(3) are more likely to conceal the signaler than those of ground-nesting warblers
(4) have higher frequencies than those of ground nesting warblers

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13. The experiment described in paragraph 2 supports which of the following conclusions?
   (1) Predators are unable to distinguish between the begging cheeps of ground-nesting and those of tree-nesting warblers except by the differing frequencies of the calls.
   (2) When they can find them, predators prefer the eggs of tree-nesting warblers to those of ground-nesting warblers.
   (3) The higher frequencies of the begging cheeps of ground-nesting warblers are an adaptation to the threat that ground-nesting birds face from predators
   (4) The danger of begging depends more on the frequency of the begging cheep than on how loud it is.

14. The word "prediction" in the passage is closest in meaning to
   (1) surprise　(2) discovery　(3) explanation　(4) expectation

15. The word "pinpoint" in the passage is closest in meaning to
   (1) observe　(2) locate exactly　(3) copy accurately　(4) recognize

第二大題 研究結果描述 **(20%)** ※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

下圖是將仿刺參（*Stichopus japonicus*）以紫外線照射處理不同小時後的結果。請根據此圖與圖說，用英文描述圖**(B)**數據所呈現的意思。

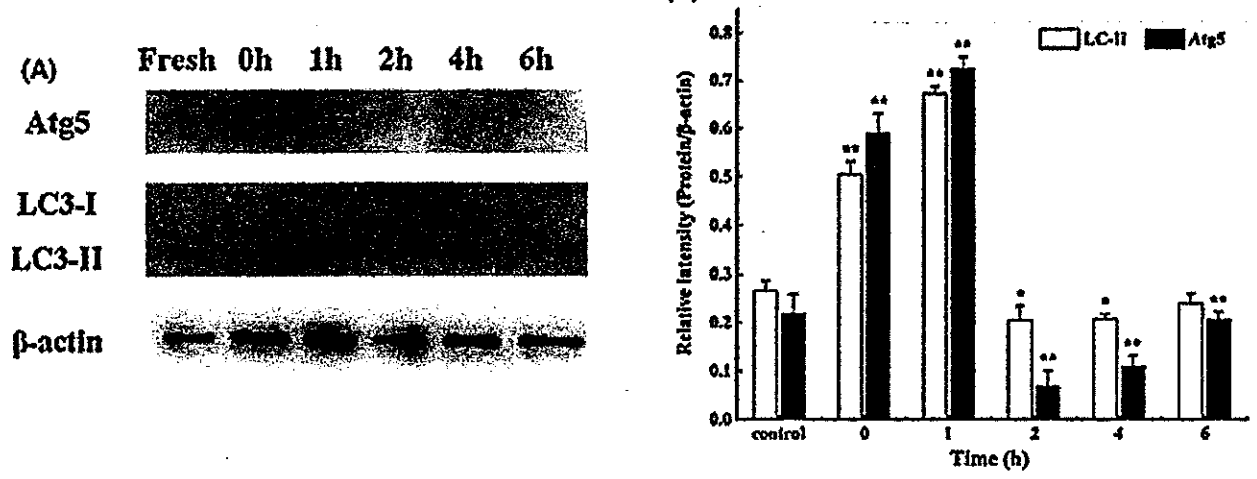

Figure legend: Immunoblots of Atg5, LC3-I, and LC3-II protein expression from *Stichopus japonicus* intestinal tissue after UV treatment. The ß -actin was used as the loading control. (A) The protein expressions result detected by Western blot. (B) Relative quantitative analysis of Atg5 and LC3 were normalized by ß-actin. The "*" means different to the fresh group ($P < 0.05$) and "**""means group ($P < 0.01$).

第三大題 問答題 **(20%)** ※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

What kind of learning abilities and attitudes do you think a master's degree student should possess? Please answer in English.

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