題號： 357
科目：基礎昆蟲學
節次： 1

國立臺灣大學 102 學年度碩士班招生考試試題

題號： 357
共 2 頁之第 1 頁

一、詳細描述 spermatogenesis, spermatophore, spermatheca 的重要性及三者之間的關係。如果某一種昆蟲缺少其中一個，會對這種昆蟲產生什麼影響? (5%)

二、詳細描述昆蟲的 circulatory system。哪些物質是在此系統內運轉? (5%)

三、昆蟲體型小，對種族繁衍的好處及壞處?昆蟲體型小的限制因子為何? (5%)

四、為何大多數傳病的昆蟲都具有刺吸式口器?此種口器與絕咀嚼式口器有何差別? (5%)

五、如何透過行為的研究，而了解昆蟲物種之間的親緣關係?試舉例說明。(5%)

六、描述並說明下列特徵：(10%)
　　1. 嚙蟲的小顎特化情況
　　2. 撚翅蟲雄成蟲複眼、觸角形態
　　3. 蚤蝨的發音器構造
　　4. 螻蛄的後翅形態
　　5. 薊馬的口器

七、分類鑑定昆蟲種類時常用到檢索表(Diagnostic key)，如果你手頭有一個類群需要你親自製作檢索表時，你會注意哪些原則以避免將來製成的檢索表窒礙難行? (5%)

八、比較下列各題中兩者的差異：(10%)
　　1. Homoplasy vs. Homology
　　2. Synapomorphy vs. Autapomorphy
　　3. Symphyta vs. Apocrita (in Hymenoptera)
　　4. Monotrysia vs. Ditrysia (in Lepidoptera)
　　5. Orthorrhapha vs. Cyclorrhapha (in Diptera)

九、The following table shows the data (N_x and F_x) and estimated parameters (S_x and I_x) based on a hypothetical cohort life table study. N_x is the number of individuals alive at age x. F_x is the average number of female offspring born to a female of age x. S_x is the proportion of individuals of age x that survive to age $x+1$. I_x is the proportion of individuals that survive from birth to age x. The estimated finite rate of increase (期限增殖率) based on this study is 0.2, and the stable age distribution (穩定年齡分佈) is {age-0 : age-1 : age-2 = 0.5 : 0.25 : 0.25}.

Age, x	Number alive, N_x	Fecundity, F_x	Survival rate, S_x	Survivorship, I_x
0	A	0	0.1	1
1	B	1	C	E
2	10	1	D	0.02
3	0			

1. What are the values of the missing entries (i.e., **A, B, C, D,** and **E**)? (5 %)

2. A population of this species reached its stable age distribution several years ago, and there are 100 age-0 individuals now. What is the total number of individuals (i.e., all ages combined) at present? (4 %)

3. A population of this species reached its stable age distribution several years ago, and there are 100 age-0 individuals now. What is the number of age-1 individuals that were present one year ago? (4 %)

見背面

題號： 357
科目：基礎昆蟲學
節次： 1

國立臺灣大學 102 學年度碩士班招生考試試題

題號： 357
共 2 頁之第 2 頁

十、The Lotka-Volterra competition model is,

$$\frac{dN_1}{dt} = r_1 N_1 \left(\frac{K_1 - N_1 - \alpha N_2}{K_1} \right)$$

$$\frac{dN_2}{dt} = r_2 N_2 \left(\frac{K_2 - N_2 - \beta N_1}{K_2} \right)$$

where N_i, r_i, K_i, are the density, intrinsic rate of increase (內在增殖率), and carrying capacity of species i. α and β are the competition coefficients. In the following questions, assume K_1=100, K_2=50, r_1=0.1, r_2=0.1, α=10, and β=5.

1. Draw the phase-plane (相平面) diagram. Label the diagram completely. (7 %)
2. Suppose the initial densities are N_1=5 and N_2=10. Select *all appropriate choices* that describe the fate of this community. (5 %)
   a. Species 1 will be excluded (i.e., N_1=0).
   b. Species 2 will be excluded (i.e., N_2=0).
   c. Species 1 will reach its stable density (i.e., N_1=100).
   d. Species 2 will reach its stable density (i.e., N_2=50).
   e. Species 1 will reach its stable density (i.e., N_1=400/49).
   f. Species 2 will reach its stable density (i.e., N_2=450/49).
   g. The two species will exhibit cyclic dynamics.
   h. None of the above.

十一、昆蟲的 chordotonal organs 是由 scolopidia 所組成的。試繪圖說明 scolopidium 結構，並標出 cap cell, scolopale 以及 nerve cell dendrite 等位置。(5%)

十二、試定義何謂 Semiochemicals?semiochemicals 可分為 allelochemical 及 pheromone 兩大類，試定義之，並各舉三例說明之。(5%)

十三、昆蟲飛行時翅的拍撲頻率(wing-beat frequency)可達 100~1000 Hz。其神經系統與肌肉系統有何生理特性? (5%)

十四、設計一實驗流程，以量測昆蟲呼吸效率。請敘述其材料與方法。(5%)

十五、下圖呈現出 Juvenile hormone 在昆蟲血體腔中劑量的調控。請條列說明其生合成與降解排出受哪些因子影響與其過程。(5%)

試題隨卷繳回