

**Dear Participants!**

各位參賽者

In the laboratory "ANIMAL MORPHOLOGY, ANATOMY AND SYSTEMATICS" you will be given the following three tasks:

在「動物形態、解剖及分類」實驗中，你將回答下列三題：

**Task 1. Detaching pedes (extremities) of crayfish (*Astacus*) and determination of their function.**  
第一題 分離蝦（螯蝦屬）的附肢並決定它們的功能

**Task 2. Test for knowledge of animal taxa.**  
第二題 測驗你動物分類上的知識

**Task 3. Determination of species name of freshwater gastropod molluscs.**  
第三題 決定淡水棲腹足類軟類動物的分類地位

The duration of the lab work is **60 minutes.**  
實驗時間為 60 分鐘

Maximum number of points – **66.**  
你最高可以得到 66 分

You have to write down your results and answers into the **ANSWER SHEET** which will be collected by an assistant when the time elapses. It is not necessary to write anything in the task sheets.

**Result lists taken away from the laboratory will not be accepted!**  
各項結果表格不可拿出實驗室。

Please note that the results from the task 1 must be shown to the assistant **BEFORE** the time limit!  
請注意第一題的結果必須在時間結束之前給助教看過！

**Please do not forget to put zoological objects and instruments in their  
結束時，請不要忘記把動物材料及器材歸回原位，好讓下一組使用。  
original positions when finished, as these will be used by the next group.**

Should the mollusc shells become damaged, you can ask for a replacement.  
如果軟體動物的殼有損壞，你可以要求更換。

Good luck!  
祝 好運

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**Country** \_\_\_\_\_

國家

**First name** \_\_\_\_\_ **Family name** \_\_\_\_\_

名

姓

**Code** \_\_\_\_\_

編號

**Task 1. (36 points) Detaching pedes (extremities) of crayfish (*Astacus*) and determination of their function.**  
**第一題 (36分) 分離蝦 (螯蝦屬) 的附肢並決定它們的功能**

**Material, instruments and equipment**  
**材料、用具及設備**

1.	<i>Astacus leptodactylus</i> (♂). 螯蝦 (♂)	1
2.	A set of instruments (2 forceps, scissors, scalpel, dissecting needles). 工具一套 (2支鑷子、剪刀、解剖刀及解剖針)	1
3.	Dissecting tray. 解剖盤	1
4.	A magnifying glass. 放大鏡	1
5.	Cotton sheet. 棉紙	1
6.	Latex gloves. 橡皮手套	1
7.	Pins marked 1 to 18. 編號1至18的編號針	18
8.	Foam plate for pins. 插針用的泡棉平盤	1

The narrow-fingered crayfish (*Astacus leptodactylus*) is quite common in fresh water bodies in

窄指蝦 (狹趾螯蝦) 在溫帶淡水中常見，溫帶淡水的特徵是溶氧及礦物質濃度較 temperate climates which are characterised by a relatively high content of dissolved oxygen and 高。用放大鏡即足以研究蝦類附肢的構造。

mineral salts. A magnifying glass is sufficient to study the structure of pedes (extremities) of crayfish.

You need to observe the details of animal's segmentation, to find its body parts and 你必須觀察動物分節的詳細情形，找到牠身體各部分之後，逐一將動物身體 sequentially detach the pedes (appendages excluding the first (antennuales or smallest) pair of

antennae) from one side of animal's body, assembling them in order on a 一側的附肢分離 (不包括第一對最小的觸角)，在一板子上按次序用編號針排好， plate with the help of pins. Then it is necessary to determine the function of each ped and write it 然後必須決定每一附肢的功能，並寫在答案紙上。 down in the answer sheet.

**Description of the techniques.**

**關於技術的描述**

1. Take the animal in your hand abdominal (ventral) side up. It is recommended to use a cotton sheet

將動物拿在手中，腹面朝上，要求使用棉紙及橡皮手套，要小心在背甲上的

and latex glove. Beware of small spicules **on the carapace!** Carefully study the pedes of all body parts (with the help of a magnifying glass if necessary).

2. Using forceps sequentially detach all pedes from one side of animal's body. To do this, 用鑷子將動物身體一側的附肢一一分解下來，操作時用鑷子由附肢基部挾緊並拉 hold the ped at its base with the forceps and pull away from the crayfish. You can also use 開，如有必要，你也可以使用剪刀及／或解剖刀。 scissors and/or scalpel if necessary.

3. Assemble the pedes on pins with the corresponding numbers (1, 2, 3, etc.). Start numbering from the head. Put the pedes on the foam plate in the correct order.  
3.以編號針按順序重組附肢（1、2、3．．．等），由頭部開始將附肢依正確次序排在板子上。

**Attention! The practical results of task 1 must be registered by an assistant on a special control sheet. The correctness of pedes preparation and numbering is scored. If a ped is damaged in the process of preparation to such an extent that cannot be recognized, the points for this ped are not scored.**  
注意！第一題的實驗結果，必須交給助教登記在特別的紙上，所有附肢的製作及編號也會計分。如果有任何附肢在操作過程中有受損到不能被辨認的話，那個附肢就不能被計分。

**Please raise your hand when finished with the first task so that your work can be checked. If the assistant is busy with another participant, you should continue with the next task, but please note that the results of task 1 are not counted if they were shown to the assistant after the total time limit (60 minutes).**  
當結束第一題時請舉手，如讓助教來檢查；如果助教很忙，你可以先做下一題，但是請注意，第一題結果如果在全部時間（60分鐘）內都沒有給助教看過，第一題就不計分了。

In the answer list of **task 1** each ped has 3 variants of its possible function. Study the table, 在第一題的答案紙上，每個附肢的可能功能有三個選項，研究該表格，決定每一附肢的功能，用把圓圈塗滿的方式標記每一附肢的正確功能，每答對一題得一分，答錯一題則倒扣0.5分。  
determine the function for each ped, then mark the correct function for each ped in the table with painting a circle (●). Note: a participant gets 1 point for every correct answer and losses 0.5 point for every wrong answer.

<b>Pedes (extremities)</b>			
足肢(附肢)			
<b>№</b>	<b>Functions</b>		
	功能		
<b>1.</b>	○ sensory	○ respiratory	○ reproductive
	感覺	呼吸	生殖
<b>2.</b>	○ swimming	○ food grinding	○ respiratory
	游泳	磨碎食物	呼吸
<b>3.</b>	○ transferring food to mouth	○ respiratory	○ reproductive
	將食物移送到口中	呼吸	生殖
<b>4.</b>	○ reproductive	○ transferring food to mouth	○ sensory
	生殖	將食物移送到口中	感覺
<b>5.</b>	○ transferring food to mouth	○ walking	○ defence/attack
	將食物移送到口中	行走	防禦／攻擊
<b>6.</b>	○ defence/attack	○ transferring food to mouth	○ reproductive
	防禦／攻擊	將食物移送到口中	生殖
<b>7.</b>	○ reproductive	○ swimming	○ respiratory
	生殖	游泳	呼吸
<b>8.</b>	○ swimming	○ capturing and holding food	○ reproductive
	游泳	捕捉並抓緊食物	生殖
<b>9.</b>	○ reproductive	○ respiratory	○ defence/attack
	生殖	呼吸	防禦／攻擊
<b>10.</b>	○ reproductive	○ walking	○ sensory
	生殖	行走	感覺
<b>11.</b>	○ reproductive	○ transferring food to mouth	○ walking
	生殖	將食物移送到口中	行走
<b>12.</b>	○ walking	○ food grinding	○ sensory
	行走	磨碎食物	感覺
<b>13.</b>	○ walking	○ reproductive	○ defence/attack
	行走	生殖	防禦／攻擊
<b>14.</b>	○ walking	○ respiratory	○ reproductive
	行走	呼吸	生殖
<b>15.</b>	○ defence/attack	○ swimming	○ walking
	防禦／攻擊	游泳	行走
<b>16.</b>	○ swimming	○ food grinding	○ respiratory
	游泳	磨碎食物	呼吸
<b>17.</b>	○ reproductive	○ sensory	○ swimming
	生殖	感覺	游泳
<b>18.</b>	○ swimming	○ transferring food to mouth	○ respiratory
	游泳	將食物移送到口中	呼吸

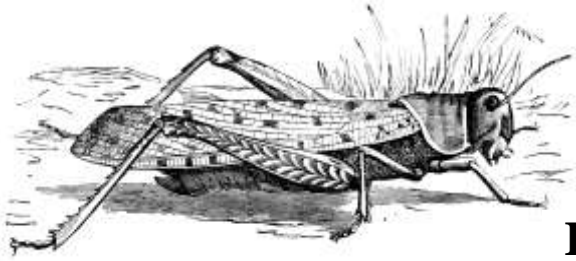
**Task 2. (10 points) Animal taxonomy test.****第二題 (10分) 動物分類測驗**

Page 7 has pictures of ten animals numbered with roman numerals. The table below has  
 第七頁中有十種以羅馬數字編號的動物圖片，下表中有動物門 (A – K)、亞門或  
 綱 (a – k) 及屬 (1 – 10) 的名稱。  
 the names of animal phyla (A–K), subphyla or classes (a–k) and genera (1–10).

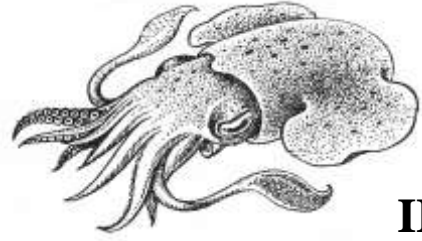
Phylum		Subphylum/Class		Genus	
	動物門		亞門/綱		屬
A.	<i>Annelida</i> . 環節	a.	<i>Anthozoa</i> . 珊瑚蟲	1.	<i>Araneus</i> . 蛛形屬
B.	<i>Arthropoda</i> . 節肢	b.	<i>Cephalopoda</i> . 頭足	2.	<i>Asterias</i> . 海星屬
C.	<i>Chordata</i> . 脊索	c.	<i>Chelicerata</i> . 鉗角	3.	<i>Corallium</i> . 珊瑚屬
D.	<i>Cnidaria</i> . 腔腸	d.	<i>Crustacea</i> . 甲殼	4.	<i>Cyclops</i> . 水蚤屬
E.	<i>Echinodermata</i> . 棘皮	e.	<i>Hydrozoa</i> . 水螅蟲	5.	<i>Fasciola</i> . 肝吸蟲屬
F.	<i>Mollusca</i> . 軟體	f.	<i>Insecta</i> . 昆蟲	6.	<i>Hydra</i> . 水螅屬
G.	<i>Nematoda</i> 線蟲 ( <i>Nemathelminthe</i> 線形)	g.	<i>Polychaeta</i> . 多毛	7.	<i>Locusta</i> . 蝗屬
H.	<i>Platyhelminthes</i> . 扁形	h.	<i>Scyphozoa</i> . 鉢水母	8.	<i>Musca</i> . 蠅屬
J.	<i>Porifera</i> . 海綿	j.	<i>Asteroidea</i> 海星 ( <i>Stellaroidea</i> ) 星形	9.	<i>Nereis</i> . 沙蠶屬
K.	"Protozoa". 「原生」	k.	<i>Trematoda</i> . 吸蟲	10.	<i>Sepia</i> . 烏賊屬

Please label the taxonomic position of each animal using the information from the table –  
put

由表中的資料按分類的地位來標示下列動物 – 在答案紙上的動物圖片旁邊註明該動  
the corresponding code for phylum, subphylum/class and genus next to animal picture in the  
 物的動物門、亞門或綱、屬的名稱編號  
answer sheet.



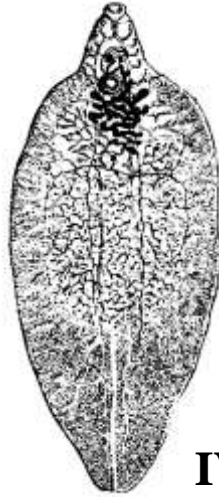
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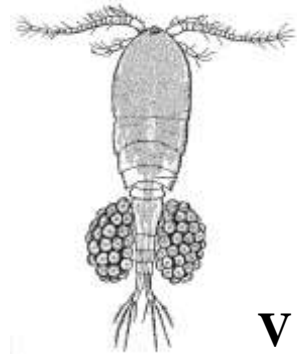
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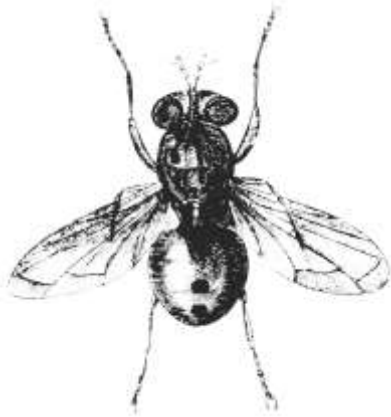
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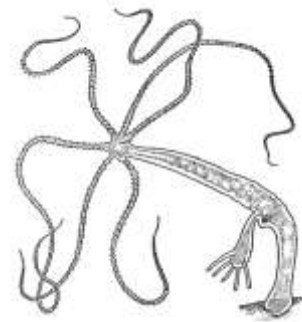
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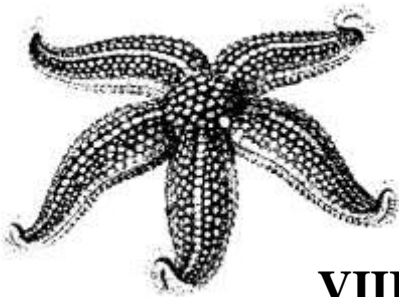
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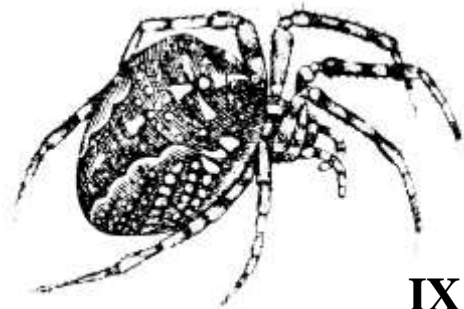
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VII



VIII



IX



X

**Task 3. (20 points) Determination of species name of freshwater gastropod**  
**第三題 (20分) 決定淡水棲腹足類軟體動物的種名**  
**molluscs.**

**Materials, instruments and equipment**

**材料、用具及設備**

- |    |   |   |
|----|---|---|
| 1. | A tray with 10 shells of gastropod molluscs to be classified.<br>一個盤子中裝有十個要讓你分類的腹足綱軟體動物 | 1 |
| 2. | An accessory tray for used shells.<br>裝用過的殼之盤子  | 1 |
| 3. | A ruler.<br>尺   | 1 |
| 4. | A set of instruments (forceps, dissecting needles).<br>一套工具 (鑷子、解剖針)                    | 1 |
| 5. | A magnifying glass.<br>放大鏡  | 1 |

Many species of gastropod molluscs live in fresh waters. They play an important role in water ecosystems. Many are specific intermediate hosts of helminthes – parasites of humans and domestic animals. In this connection taxonomic identification of freshwater gastropod molluscs has

在本分類實驗中，淡水腹足類動物的鑑定不但具有理論上的價值，同時具有應用上的價值。

The tray has 10 numbered shells of gastropod molluscs. The classification key below allows the identification of species names and includes illustrations explaining the details of shell structure and measurements. Classify the molluscs you are given and place the numbers written on their shells next to species names in the table in the answer sheet.  
 將給你的軟體動物分類，並將其殼的數字編號寫在答案紙上所附的表中。

Species name 種名	Shell number 螺殼編號
<i>Viviparus contectus</i> 內實田螺	
<i>Bithynia tentaculata</i> 觸絲豆螺	
<i>Physa fontinalis</i> 似泉左旋螺	
<i>Aplexa hypnorum</i> 無褶螺	
<i>Radix ovata</i> 卵狀根螺	
<i>Radix auricularia</i> 耳狀根螺	
<i>Lymnaea stagnalis</i> 靜水椎實螺	
<i>Planorbarius corneus</i> 角平捲螺	



<i>Planorbis planorbis</i> 平捲平捲螺	
<i>Segmentina nitida</i> 光亮有隔扁螺	

### CLASSIFICATION KEY

#### 分類檢索表

- 1a. Shell aperture (opening) has an operculum (lid).....(2)  
殼口（開口）具有口蓋（蓋）
- 1b. Shell aperture without an operculum (lid).....(3)  
殼口不具有口蓋（蓋）
- 2a. Shell is at least 20 mm high, green-brown, sometimes with three dark stripes on the last turn of the whorl.....*Viviparus contectus*  
殼至少有 20 mm 高，棕綠色，在最後一螺旋上有時會有三條暗色的帶狀條紋  
內實田螺
- 2b. Shell is not more than 15 mm high, uniformly brown without stripes.....*Bithynia tentaculata*.  
殼高不會超過 15 mm 高，呈現單一棕色，不具條紋  
觸絲豆螺
- 3a. Shell is like a tower or a cone with variable number of turns.....(4)  
殼呈塔狀或角錐狀，具有不同數目的螺旋
- 3b. Shell is flat.....(8)  
殼呈扁平狀
- 4a. Shell is sinistral.....(5)  
螺殼左旋
- 4b. Shell is dextral.....(6)  
螺殼右旋
- 5a. Shell is egg-shaped. Whorl height is less than aperture height. Yellow- brown or light brown.....*Physa fontinalis*.  
殼呈卵圓形，螺體高度小於殼口高度，呈現黃褐色或淡褐色  
似泉左旋螺
- 5b. Shell has spindle-like shape. Whorl height is twice the aperture height. Brown or dark brown.....*Aplexa hypnorum*.  
殼呈紡錘形，螺體高度為殼口高度的兩倍，呈現褐色或深褐色  
無褶螺
- 6a. Aperture height is significantly more than whorl height.....(7)  
殼口高明顯大於螺體高
- 6b. Whorl height is equal or slightly exceeds aperture height. Shell is up to 60 mm high.....*Lymnaea stagnalis*.  
螺體高等於或略為大於殼口高，殼可達 60mm 高  
靜水椎實螺
- 7a. Aperture height is approximately twice its width. Shell height is up to 25 mm, width – up to 15 mm.....*Radix ovata*  
殼口高度約為寬度的兩倍，殼高可達 25mm，殼寬可達 15mm  
卵狀根螺
- 7b. Aperture height and width are approximately equal. Shell height is up to 40 mm, width – up to 30 mm.....*Radix auricularia*.  
殼口高度與寬度約略相等，殼高可達 40mm，殼寬可達 30mm  
耳狀根螺

- 8a. Aperture has bud-like shape, its height exceeds its width ..... *Planorbarius corneus*.  
 殼口呈花苞狀，殼口高度超過寬度 角平捲螺
- 8b. Aperture has another shape, its width exceeds its height..... (9)  
 殼口呈其他形狀，殼口寬度超過高度
- 9a. Diameter of the shell is over 8 mm, walls are thick, 5–6 turns, curved at top with flat bottom. Shell walls are opaque, dark-brown ..... *Planorbis planorbis*.  
 殼的直徑大於 8mm，殼壁厚，5 至 6 個螺旋，殼頂彎曲，殼底扁平，殼壁不透明，呈深褐色 平捲平捲螺
- 9b. Diameter of the shell is less than 8 mm, walls are thin, 4-5 turns, curved at top with plano-concave bottom. Shell walls are semi-transparent, light-brown. ....  
 殼的直徑小於 8mm，殼壁薄，4 至 5 個螺旋，殼頂彎曲，殼底較平但向內窪陷，殼壁半透明，呈淡褐色

..... *Segmentina nitida*..  
 光亮有隔扁螺

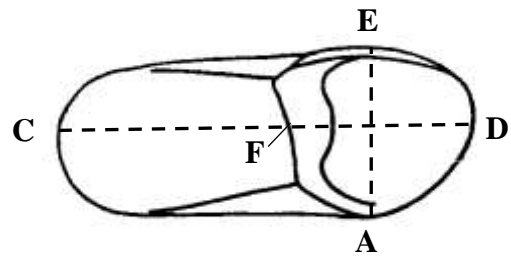
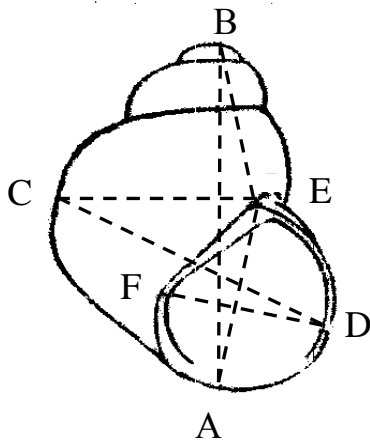


dextral shell

右旋螺殼



sinistral shell



**Shell measurements of gastropod molluscs:**

腹足綱軟體動物殼的測量標準

A-B — shell height,  
 殼高

C-D — shell width,  
 殼寬

A-E — aperture height,

殼口高

**D-F — aperture width,**

殼口寬

**B-E — whorl height.**

螺體高

Should the mollusc shells become damaged, you can ask for a replacement.

假如這些軟體動物的殼有缺損，你可以要求置換。

**Please do not forget to put zoological objects and instruments in their original**

**實驗完，請不要忘記將所有的動物標本及工具歸回原位，方便下一組學生  
positions when finished, as these will be used by the next group.  
使用。**