18th INTERNATIONAL BIOLOGY OLYMPIAD
JULY 15 - 22, 2007

PRACTICAL EXAMINATION 2

PLANT ANATOMY, MORPHOLOGY AND PHYSIOLOGY
植物解剖、形態、生理

EXAM BOOKLET 1
試卷一

TASK A. Identification of plant structures and organs 16 marks
鑑定植物構造及器官（16 分）

Time allowed: 20 minutes
操作時間：20 分鐘

WRITE YOUR 4-DIGIT STUDENT NUMBER IN THE BOX BELOW 務必將 4 碼學生代碼填入下欄

STUDENT CODE 學生代碼	

PLANT MORPHOLOGY

TASK A. Identification of plant structures and organs from images shown in a PowerPoint presentation (16 marks)
根據投影片顯示的影像來鑑定植物的構造及器官（16 分）

In this task, you are required to answer the following questions, each of which relates to a slide that you will be shown. **Each slide will be shown twice**.
在 A 部分，你須回答下列問題，每題都會顯示一張投影片 ，並且會放映**兩次**。

In the first showing, each slide will be displayed for 45 seconds, then the second slide will be shown for 45 seconds and so on until all 16 slides have been once.
第一次放映時，每張投影片放映 45 秒，接著是第二張投影片 ，同樣放映 45 秒，直至 16 張全部放映完畢。

The second showing is to give you the opportunity to review your answers. In this showing, each slide will be displayed for 15 seconds.
第二次放映乃供你檢查答案，但每張投影片僅放映 **15** 秒。

FOR EACH QUESTION,
WRITE THE LETTER OF YOUR ANSWER IN THE SPACE PROVIDED
在空格中，填入每題對應答案的英文字母編號

1. What mutualistic relationship between roots of land plants and specific soil fungi is displayed in the slide?
此投影片顯示陸生植物根部與特定土壤真菌所產生的共生關係

a. mycorrhizae 菌根
b. mycelium 菌絲
c. lichens 地衣
d. root hairs 根毛

ANSWER: _____

2. This leaf venation is commonly found in which group of plants?
此葉脈型式常見於下列何者植物中？

a. hornworts 角蘚
b. dicotyledons 雙子葉植物
c. ferns 蕨類
d. monocotyledons 單子葉植物
e. gymnosperms 裸子植物

ANSWER: _____

3. Aerenchyma stem tissue in the dicot, is characteristic of its adaptation as a:
此雙子葉植物莖中的通氣組織顯示此植物適應情形為何？

a) mesophyte 中生植物
b) xerophyte 旱生植物
c) halophyte 鹽生植物
d) hydrophyte 水生植物

ANSWER: _____

4. What type of angiosperm do these leaf cross-sections represent?
這些葉片的橫切面代表何類被子植物？

a) a monocot 單子葉植物
b) a dicot 雙子葉植物
c) a eudicot 核心雙子葉植物
d) a tree 樹木
e) a shrub 灌木

ANSWER: _____

5. In this picture of a fern sorus, what is the ploidy level of the structure indicated by the arrow?
蕨類孢子囊中，箭頭所指的染色體套數為何？

a) triploid (3N)
b) diploid (2N)
c) haploid (N)

ANSWER: _____

6. In this longitudinal section of a dicot angiosperm stem, name the structure indicated by 'X'.
此為雙子葉植物莖的縱切片，標示「X」處為何構造？
   a) shoot apical meristem 莖頂分生組織
   b) axillary bud 腋芽
   c) lateral inflorescence 側生花序
   d) lateral root 側根
   e) leaf primordium 葉始原 **ANSWER: _____**

7. The arrow in this slide is indicating:
圖中箭頭所指為何？
   a) sclerenchyma fibre 厚壁纖維
   b) sieve tube element 篩管細胞
   c) vessel element 導管細胞
   d) chlorenchyma 厚角組織
   e) sclerid 石細胞 **ANSWER: _____**

8. What is the function of the structure indicated by the arrow?
箭頭所指的構造具有何種功能？
   a) to prevent an insect proboscis reaching phloem sap
   避免昆蟲口器取得韌皮部汁液
   b) to provide mechanical support to the xylem tissue
   為木質部組織提供支撐力
   c) to initiate the formation of interfascicular vascular cambium
   分化為束間形成層
   d) all of the above
   以上皆是
   e) none of the above **ANSWER: _____**
   以上皆非

9. The name of the meristem responsible for generating the tissues labelled 'X' is
圖中標示為「X」的組織是由何種分生組織所產生？
   a) vascular cambium 維管束形成層
   b) shoot apical meristem 莖頂分生組織
   c) root apical meristem 根尖分生組織
   d) cork cambium 木栓形成層
   e) lenticel 皮孔

ANSWER: _____

10. The presence of which of the following cells gives *Pyrus communis* L. (pears) their gritty texture?
梨果肉中的「沙狀」顆粒為下列何種細胞？
   a) chlorenchyma 綠色細胞
   b) guard cell 保衛細胞
   c) tracheary element 輸導細胞
   d) collenchyma 厚角細胞
   e) sclerid 石細胞

ANSWER: _____

11. This type of phyllotaxy is best described as:
圖中顯示出何種葉的排列方式
   a) whorled 輪生
   b) distichous 十字對生
   c) opposite 對生
   d) alternate 互生

ANSWER: _____

12. The hormone auxin, produced at the terminal meristem, inhibits lateral shoot growth which results in a phenomenon known as
植物生長素是由頂端分生組織產生，可抑制側枝生長，此現象稱為？
    a) conical shape 圓錐狀
    b) deciduousness 落葉性
    c) apical dominance 頂芽優勢
    d) axillary dominance 側芽優勢

ANSWER: _____

13. These tendrils and spines represent evolutionary adaptation of what structures?
此捲鬚及刺是由何種構造適應演化而來？
    a) leaves 葉
    b) branches 枝條
    c) axillary shoots 腋生側枝
    d) adventitious roots 不定根
    e) trichomes 毛狀物

ANSWER: _____

14. What plant cell type shown has the potential to give rise to all the other cells in the section?
切片中的哪種細胞型具有衍生成其他細胞型之潛力？
    a) parenchyma 薄壁細胞
    b) companion 伴細胞
    c) collenchyma 厚角細胞
    d) sclerid 石細胞
    e) tracheary element 輸導細胞

ANSWER: _____

15. In embryo development, the structure indicated by the arrow is known as the
胚胎發育過程中，箭頭所指的構造為何？
    a) filament 絲狀構造
    b) endosperm 胚乳
    c) heart-shaped embryo 心型胚
    d) suspensor 胚胎支持細胞
    e) basal cell 基細胞

ANSWER: _____

16. What plant group does this slide represent?
此為何類植物？

a) angiosperms 被子植物
b) bryophytes 苔蘚植物
c) tracheophytes 維管束植物
d) pteridophytes 蕨類植物

ANSWER: _____

- THE END –

HAVE YOU WRITTEN YOUR STUDENT NUMBER ON THE FIRST PAGE OF THIS EXAM BOOKLET AND ON THE TOP OF EVERY OTHER PAGE?

檢查你是否在第一頁及每一頁上方填入學生代碼(student code)？

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PRACTICAL EXAMINATION 2
PLANT ANATOMY, MORPHOLOGY AND PHYSIOLOGY
植物解剖、形態、生理

EXAM BOOKLET 2
試卷二

Task B.	Identification of flowering plants 開花植物鑑定 （23 分）	23 marks
Task C.	Dissection of a seed and a flower 種子及花的解剖 （23 分）	23 marks
Task D.	Plant evolution 植物演化（5 分）	5 points
Task E.	Graphing and interpretation of data 繪圖及解釋數據（8 分）	8 marks

Time allowed: 70 minutes **操作時間：70 分鐘**

(Total time allowed for Practical Examination 2 = 90 minutes)

實作 2（試卷一&二） 總共 90 分鐘

WRITE YOUR 4-DIGIT STUDENT CODE IN THE BOX BELOW AND ON THE TOP OF EACH PAGE OF THIS EXAM BOOKLET

務必將 4 碼學生代碼填入下欄及試卷每頁上方欄位

STUDENT CODE 學生代碼	

GENERAL INSTRUCTIONS
IMPORTANT

●考前會先進行色盲檢查。

- Read the exam paper carefully before commencing the exam.
  在操作開始前，請仔細閱讀試卷內文
- It is recommended that you allocate your time according to the mark value of the Task.
  建議請按照各試題配分的比重來規劃作答時間
- Write your answers in the exam booklet.
  將答案寫在本試卷上
- **Do not forget to hand in your graph prepared in Task E with your exam booklet**.
  別忘了將 **Task E** 作圖的方格紙與試卷一同交回

BE SURE THAT YOU HAVE WRITTEN YOUR 4-DIGIT STUDENT CODE ON THE FIRST PAGE OF EACH EXAM BOOKLET
and
ON THE TOP OF EACH PAGE OF THIS BOOKLET

務必將 4 位數學生代碼寫於封面及每頁答案卷的頁首的欄位上。

IMPORTANT INFORMATION FOR TASKS B AND C

- **Handle the plant samples with care**. Some samples will be used in more than one TASK.
  小心操作！有些材料可能會在不同的操作部分再用到！
- When you have completed Part 7 of Task B, please indicate so by placing your plastic bag cover back on top of the microscope and a lab assistant will grade the quality of your section.
  當完成 TASK B 的第 7 題時，將顯微鏡的塑膠外罩蓋上，以知會監考人員，**【繼續你其他部分的操作】**監考人員將會評定切片技術的分數。
- Make sure that you have completed Parts 5, 6 and 7 of TASK B before commencing TASK C.
  確定已完成 Task B 的第 5, 6 and 7 題，再繼續 Task C
- It is important that you cover your dissection with a paper towel after you have completed Task C1 (Seed Dissection) and Task C3 (Flower Dissection), by doing so a lab assistant will come to collect the result. (You don't need to notify a lab assistant in person！) In each case, a lab assistant will ask you to sign your specimen board, photograph your dissection and then remove the dissection for marking.
  Task C1（種子解剖）及 Task C3（花的解剖）完成後，用紙巾將解剖結果蓋住，【繼續你其他部分的操作】，監考人員會前來收你操作的結果。他會要求你在板上簽名並照相存證，然後把它拿去評分。

PLANT ANATOMY and MORPHOLOGY
植物解剖及形態

Materials 材料

- 10 petri dishes containing plant samples 1 to 10
  10 個培養皿中各含有一種植物材料（編號 1-10）
- 1 foam core specimen board labeled **SEED DISSECTION** with four coloured pins (1 black, 1white, 1 yellow, 1 blue)
  1 個標示「種子解剖」的保利龍標本板，板上有 4 根不同顏色的針（黑色、白色、黃色、藍色）
- 1 foam core specimen board labeled **FLOWER DISSECTION** with seven coloured pins (1 orange, 1 white, 1 yellow, 1 blue, 1 pink, 1 green, 1 black)
  1 個標示「花的解剖」的保利龍標本板，板上有 7 根不同顏色的針（橘色、白色、黃色、藍色、粉紅色、綠色、黑色）
- 1 single-edge razor blade
  1 個單面刀片
- 1 dissecting kit
  1 組解剖用具
- 6 glass microscope slides
  6 片載玻片
- 1 box of cover slips
  1 盒蓋玻片
- 1 drop bottle containing toluedine blue stainng solution
  1 個含有藍色染劑（toluedine blue）的滴瓶
- 1 drop bottle containing distilled water
  1 個含有蒸餾水的滴瓶
- 3 tissues
  3 種組織

- 1 light microscope

  1 台光學顯微鏡

- 1 pair disposable gloves

  1 副丟棄式手套

- Paper towel

  紙巾

NOTE: Before beginning this task, be sure that you have all the materials listed above. If you do not, notify a lab assistant immediately by raising your hand.

注意：在考試之前，請確定你有上列所有材料，若有缺者，請立即舉手找監考人員！

TASK B. Identification and classification of flowering plant samples based on their anatomy and morphology. (23 marks)

根據解剖及形態特徵，鑑定並分類這些開花植物材料。（23 分）

Procedure:

步驟

1. Using the razor blade, cut a thin cross section of each of the samples 1 to 4.

   使用單片刀片，將材料 1 – 4 作徒手切片（橫切）
2. Transfer each section to a microscope slide and place 1 drop of toluedine blue staining solution and 1 drop of water on the section.

   將切下的薄片放在載玻片上，滴一滴藍色染料及一滴蒸餾水在切片上
3. Put a cover slip on the section (try to avoid air bubbles when placing the cover slip) and remove excess stain by placing the corner of a piece of tissue paper against one edge of the cover slip.

   蓋上蓋玻片（避免有氣泡），並用紙巾的一角吸去多餘的染料
4. Starting first with the 4X objective and then using either the 10X or the 40X objective, examine each slide under the microscope and observe the structure of the tissue.

   將切片放在顯微鏡下，由低倍（4X）至高倍（10X or 40X）觀察材料 1 – 4 的組織

5. Based on your observation of each slide prepared for samples 1 to 4, identify the tissue/organ sectioned. For each sample, enter the appropriate letter from the column labeled **KEY** in the table below. (8 marks)
根據你觀察材料 1 – 4 的結果，鑑定其組織或器官。從下表右（**KEY**）的構造名稱中，選出適當的字母填入材料 1 – 4 旁的空格中。(8 分)

Sample	Tissue/Organ
1	
2	
3	
4	

KEY

A = leaf 葉

B = stem 莖

C = root 根

D = petiole 葉柄

6. Examine the sections you prepared for Samples 1 to 4, and the plant parts of Samples 5 to 10. Identify whether each sample is from a monocot plant or from a dicot plant and indicate your answer by writing an **"X"** in the appropriate column of the following table. (10 marks)
檢視材料 1 – 4 的切片，以及材料 5 – 10 （植物的某部分構造），鑑定出每種材料其屬於單子葉或雙子葉植物。在適當空格中畫下「X」。（10 分）

Plant Sample	**Monocot** 單子葉	**Dicot** 雙子葉
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

7. **Once you have completed Part 6, place the slide with your best section on the microscope, focus the microscope and** please indicate so by placing your plastic bag cover back on top of the microscope and a lab assistant will grade the quality of your section. (5 marks)**.**

當完成第六題後，把你切得最好的切片放在顯微鏡上，對好焦距，*把顯微鏡蓋上塑膠外罩，以知會監考人員，*【繼續你其他部分的操作】監考人員將會評定切片技術的分數（**5** 分）。

After grading, this slide will be labeled with your student code and your signature, and be taken for storage.

在評分後，此切片會被標記上你的編號並經由你簽名，作為存證。

TASK C. SEED AND FLOWER ANATOMY AND MORPHOLOGY (25 marks)
種子及花的解剖及形態（25 分）

IMPORTANT. **Make sure that you have completed TASK B before starting TASK C.**
注意： **你必須先完成 B 部分，再進入 C 部分。**

TASK C1. SEED ANATOMY (8 marks)
種子解剖（8 分）

Procedure 步驟

1. Write your student number on the specimen board labeled **SEED DISSECTION**.
   在標示有「種子的解剖」的標本板上寫上你的學生代碼

2. Using **Sample 5**, cut the seed longitudinally with the razor blade and dissect the seed into its component parts.
   用**材料 5**，以單面刀片將種子縱切，並將種子的各部分組成小心解剖開來。

3. Use the pins provided to pin the correct seed part on the specimen board
   用所提供不同顏色的針，把種子各部組成分別插在「種子的解剖」標本板上

   - **black** pin for the **testa** (seed coat)
     黑色針：種皮
   - **white** pin for the **cotyledon**
     白色針：子葉
   - **yellow** pin for the **plumule** (foliage leaves)
     黃色針：胚芽
   - **blue** pin for the **radicle**.
     藍色針：胚根

4. **After finishing this task, cover the board with a paper towel and notify a lab assistant that you have completed the dissection .** The lab assistant and yourself will sign the label on the specimen board, and the lab assistant will photograph your dissection. Your dissection will then be removed for grading.
完成後，用紙巾蓋住標本板，以知會監考人員你已完成。監考人員及你將在板上簽名，監考人員會把你的解剖結果照相存證，然後把它拿去評分。

TASK C2. FLOWER MORPHOLOGY (2 marks)
花的形態（2 分）

IMPORTANT. You must have completed TASK B before commencing this task.
注意：你必須完成 B 部分後，再繼續回答以下問題

Procedure 步驟

1. Examine the flower in **Sample 6**. Write an "**X**" against the correct answer for the following questions:
檢視材料 6，在以下問題的正確答案上畫「X」。

(a) The sepals alone make up the
以下何者僅由萼片組成？

i) corolla _____
花冠

ii) calyx _____
花萼

iii) perianth _____
花被

iv) hypanthium _____
花萼筒

(b) The petals alone make up the whorl known as
以下何者僅由花瓣組成？

i) corolla _____
花冠

ii) calyx _____
花萼

iii) perianth _____
花被

iv) hypanthium _____
花萼筒

TASK C3. FLOWER ANATOMY (15 marks)
花的解剖（**15** 分）

IMPORTANT. You must have completed TASK B before commencing this task.
注意：你必須完成 B 部分後，再繼續回答以下問題

Procedure 步驟

1. Write your student number on the specimen board labeled **FLOWER DISSECTION**.
   在標示有「花的解剖」的標本板上寫上你的學生代碼

2. Dissect the flower **(Sample 6)** into its component parts.
   將花（**材料 6**）小心解剖出各組成部分

3. Use the pins provided to pin the correct flower part on the specimen board
   用所提供不同顏色的針，把花各部組成分別插在「花的解剖」標本板上

   - **orange** pin for a sepal (2 mark)
     橘色：一片萼片（2 分）
   - **white pin** for a petal (2 mark)
     白色：一片花瓣（2 分）
   - **yellow** pin for an anther (2 mark)
     黃色：花藥（2 分）
   - **pink** pin for the filament (2 mark)
     粉紅色：花絲（2 分）
   - **green** pin for the style (2 mark)
     綠色：花柱（2 分）
   - **blue** pin the stigma (2 mark)
     藍色：柱頭（2 分）
   - **black** pin for the ovary (1 mark)
     黑色：子房（1 分）

4. Use an "**X**" to indicate the correct classification of the placentation within the ovule of this flower. 這朵花子房中的胎座屬於哪一種？在正確答案上標示「X」。

   i) marginal _____
   邊緣胎座
   ii) axile _____
   中軸胎座
   iii) parietal _____
   側膜胎座
   iv) free-central _____
   分離中央胎座

5. **After finishing this task, cover the board with a paper towel indicating that you have finish dissecting.** A lab assistant will photograph your dissection. Both the lab assistant and yourself will sign the label on the board. Your dissection will then be taken by the lab assistant for grading.

完成後，用紙巾蓋住標本板，以知會監考人員你已完成。監考人員及你將在板上簽名，監考人員會把你的解剖結果照相存證，然後把它拿去評分。

PLANT EVOLUTION

TASK D. Identification of the Time of Evolution of Higher Plants (5 marks)
植物演化時間的鑑定（5 分）

Materials 材料

- Plant samples in dishes labeled H to M. DO NOT OPEN THE PETRI DISHES.
  培養皿 H – M 為植物材料***【勿打開培養皿】***
- Photograph of the evolutionary time scale (Figure 1)
  地質年代表（圖 1）

NOTE: Before beginning this task, be sure that you have all the materials listed above. If you do not, notify a lab assistant immediately by raising your hand.
注意：在考試之前，請確定你有上列所有材料，若有缺者，請立即舉手找監考人員！

Procedure 步驟

These plant samples possess characteristics representative of their ancestral lineages. Read the descriptions in Box A and identify the description that is most correct for each plant sample.
這些植物材料具有代表其祖先譜系的特徵。根據 A 表中的描述，找到與每種植物的適當對應之描述。

1. Using the codes (1 to 6) representing the different time periods in the evolutionary time scale shown in Figure 1), indicate the geologic time period that best corresponds to each description.
   用地質年代表（表 1）中的不同年代的編號 1-6，來代表每個描述所出現的地質年代。

2. Enter the two codes (one related to the description and one related to the evolutionary time period) for each sample in Box B.
   把上述兩個對應的代號（一個為特徵描述、一個為地質年代）填入表 B

NOTE: **Not all descriptions in Box A will be used and no letter should be used more than once.** The answer for Sample M is provided.
注意：表 A 中的描述並不一定全會用到，而表中的英文字母最多只能用一次！
（M 材料的答案已提供）

BOX A
表 A
Plant Sample Lineage Characteristics
植物材料譜系的特徵描述

a. This spore-bearing plant group has persisted relatively unchanged for hundreds of millions of years. In this time period, it was likely an important dietary element of herbivore dinosaurs.
此具孢子的植物類群已存在數億年。在此期間，這些植物可能是草食性恐龍的主要食物來源。

b. The first macrofossil evidence of the evolution of grasses appears in the fossil record at the time of the diversification of mammals.
最早出現的大型植物化石證據，顯示禾草植物的演化與哺乳類的分歧大約發生在同時期。

c. In this time period, the indehiscent integumented megasporangium (ovules/seeds) originated. It is represented in the sample by modern plants producing naked seeds on a scale.
胚珠或種子起始於此期間，開始出現在鱗片狀葉上產生裸露種子的現代植物。

d. This group of spore-bearing plants included members with tree-like stature (Sample M) and were common in coal-producing swamp floras (answers provided).
這群具孢子的植物有樹幹狀構造（材料 M），是產生石炭的沼澤植被的主要組成。（已有答案，不必作答）

e. Coniferous seed plants, as represented by the sample, were driven to extinction by the diversification of the superior characteristics of the angiosperms in this time period.
松柏類種子植物的代表，在此時期，因被子植物的更多分歧特徵而逐漸滅絕。

f. The dichotomous branching and sporangia of this plant were characteristics of the first terrestrial tracheophytes, which left some of the earliest land plant macrofossils at this time in history.
此植物具二叉分枝及孢子囊，被認為是最早出現的陸生維管束植物，此也是目前巨大植物化石出現的時期。

g. The evolution of flowering, as represented by this angiosperm, first appears in the fossil in this time period.
此被子植物代表花的演化，也是出現花的化石之最早時期。

STUDENT CODE _____
學生代碼

BOX B
表 **B**

Enter the correct codes for each sample
在每種材料旁填入正確代碼

Sample	**Description** 特徵描述	**Time Period** 地質年代
H ……	_____	_____
I ……	_____	_____
J ……	_____	_____
K ……	_____	_____
L ……	_____	_____
M ……	d	3

PLANT PHYSIOLOGY
植物生理

TASK E. Interpretation of photosynthetic data from plants grown at different light levels (8 marks)
植物生長於不同光強度下的光合作用結果之數據解釋。（8 分）

Materials 材料

- 2 sheets of graph paper, each with the axes labeled differently

2 張方格紙，且其兩軸的標示不同

NOTE: Before beginning this task, be sure that you have all the materials listed above. If you do not, notify a lab assistant immediately by raising your hand.

注意：**在考試之前，請確定你有上列所有材料，若有缺者，請立即舉手找監考人員！**

Introduction 說明

Single leaves from two different plants, one grown in full sun, the other in shade, were removed and placed in separate, clear boxes. The leaves were exposed to increasing light levels and the rate of O_2 release was measured.
兩棵植物，一棵給予全光照、另一棵置於陰暗處，而後各取一片葉子，分別置於透明的箱子中。接著給予漸增的光強度，並記錄其產生氧氣的速率。
The data obtained from this experiment are presented in the following table:
實驗所得數據列於下表中

Light Level 光強度 (μmol photons m^{-2} s^{-1})	Rate of O_2 production 產氧率 (μmol O_2 m^{-2} s^{-1})	
	Leaf A	Leaf B
0	-20	-2
10	-10	-0.5
25	-5	1.5
50	-1	3
100	5	6
250	15	10
500	28	12
600	30	11

Procedure
步驟

1. Select the sheet of graph paper that has the X-axis and the Y-axis labeled correctly for the set of data above. (1 mark)
   選擇一張顯示與數據表對應正確的 X、Y 軸之方格紙（1 分）
2. Write your name and your student number on the label on the sheet of graph paper you have chosen.
   在你選的方格紙上填入姓名及代碼。
3. Mark the scale of the units on each axis.
   在兩軸上標上適當的尺度
4. Plot the data presented in the table for each leaf to compare the photosynthetic rates (O_2 production) of the leaves with respect to light. Clearly identify which line represents Leaf A and which line represents Leaf B. (2 marks)
   依表中數據作圖，比較兩葉片在不同光強度下的產氧速率，並明確標示兩條曲線，何者為 Leaf A？何者為 Leaf B？（2 分）

5.Examine the graphs you have drawn and determine which leaf (Leaf A or Leaf B) demonstrates the characteristics of a shade-adapted leaf and which demonstrates the characteristics of a sun-adapted leaf. Indicate your answer in the table below by writing an "X" in the correct cell. (1 mark)
檢視所作的曲線圖，判斷這兩個葉片何者為適應陰暗、何者為適應光照？把答案以「X」填入適當空格中。（1 分）

	Leaf A	Leaf B
Shade-adapted 適應陰暗		
Sun-adapted 適應光照		

6. Use the data plots on your graph to answer the following questions:
   利用所作曲線圖回答下列問題
   (a) Is the light compensation point of Leaf A higher than the light compensation point of Leaf B? Circle the correct answer. (0.5 mark)
   Leaf A 的光補償點是否較 Leaf B 高？圈出正確答案。（0.5 分）
   YES NO

   (b) Can the light compensation point be defined as the light level at which the photosynthetic response reaches saturation? Circle the correct answer. (0.5 mark)
   光補償點是否可被定義為「光合作用達到飽合時的光強度」？圈出正確答案。（0.5 分）
   YES NO

(c) Which of the answers below most correctly identifies the light compensation point of Leaf A? Circle the letter of that answer. (1 mark)
下列何者為 Leaf A 的光補償點？圈出正確答案。（1 分）

i) between -10 and -5 µmol O_2 m^{-2} s^{-1}

ii) between 10 and 20 µmol O_2 m^{-2} s^{-1}

iii) between 25 and 50 µmol photons m^{-2} s^{-1}

iv) between 50 and 75 µmol photons m^{-2} s^{-1}

v) between 500 and 600 µmol photons m^{-2} s^{-1}

(d) Which of the answers below best describes the maximum rate of photosynthesis of the sun leaf? Circle the letter of that answer. (1 mark)
下列何者最適宜代表適應光照葉片的最大光合作用速率？圈出正確答案。（1 分）

i) 12 µmol O_2 m^{-2} s^{-1}

ii) 15 µmol O_2 m^{-2} s^{-1}

iii) 30 µmol O_2 m^{-2} s^{-1}

iv) between 250 and 600 µmol photons m^{-2} s^{-1}

v) greater than 600 µmol photons m^{-2} s^{-1}

(e) This graph gives information about the photosynthetic response to light. Can it also be used to estimate the response of respiration rate with regards to light? Circle the correct answer. (1 mark)
此圖提供植物對光之光合作用反應，它是否也能估計植物對光之呼吸作用速率？圈出正確答案。（1 分）

YES NO

- THE END –

HAVE YOU WRITTEN YOUR STUDENT CODE ON THE FIRST PAGE OF THIS EXAM BOOKLET AND ON THE TOP OF EACH PAGE?

檢查你是否在第一頁以及每一頁的最上方填入學生代碼？

REMEMBER TO HAND IN YOUR GRAPH PAPER WITH THIS EXAM BOOKLET.
記得把所畫的方格紙連同此試卷一起交回