Answers of Midterm Exam

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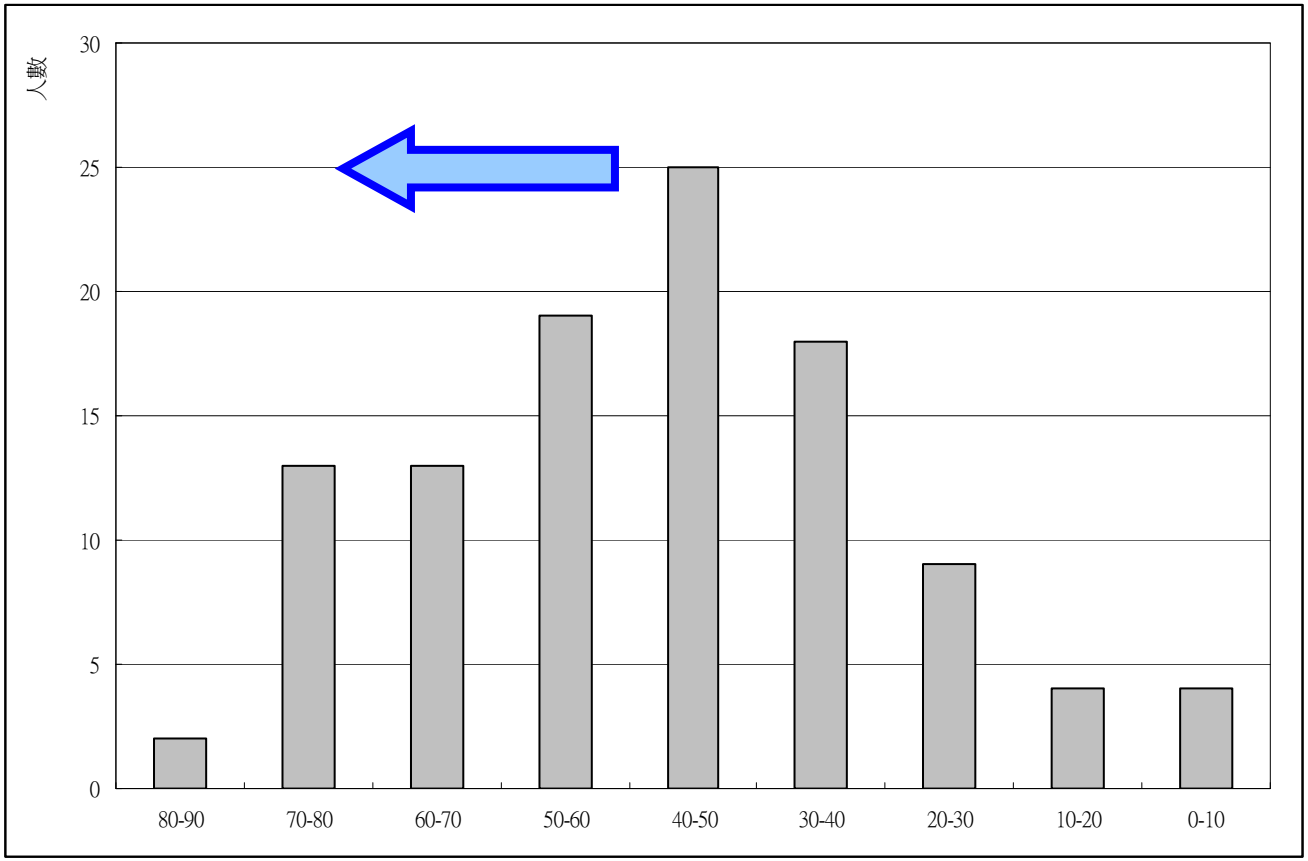
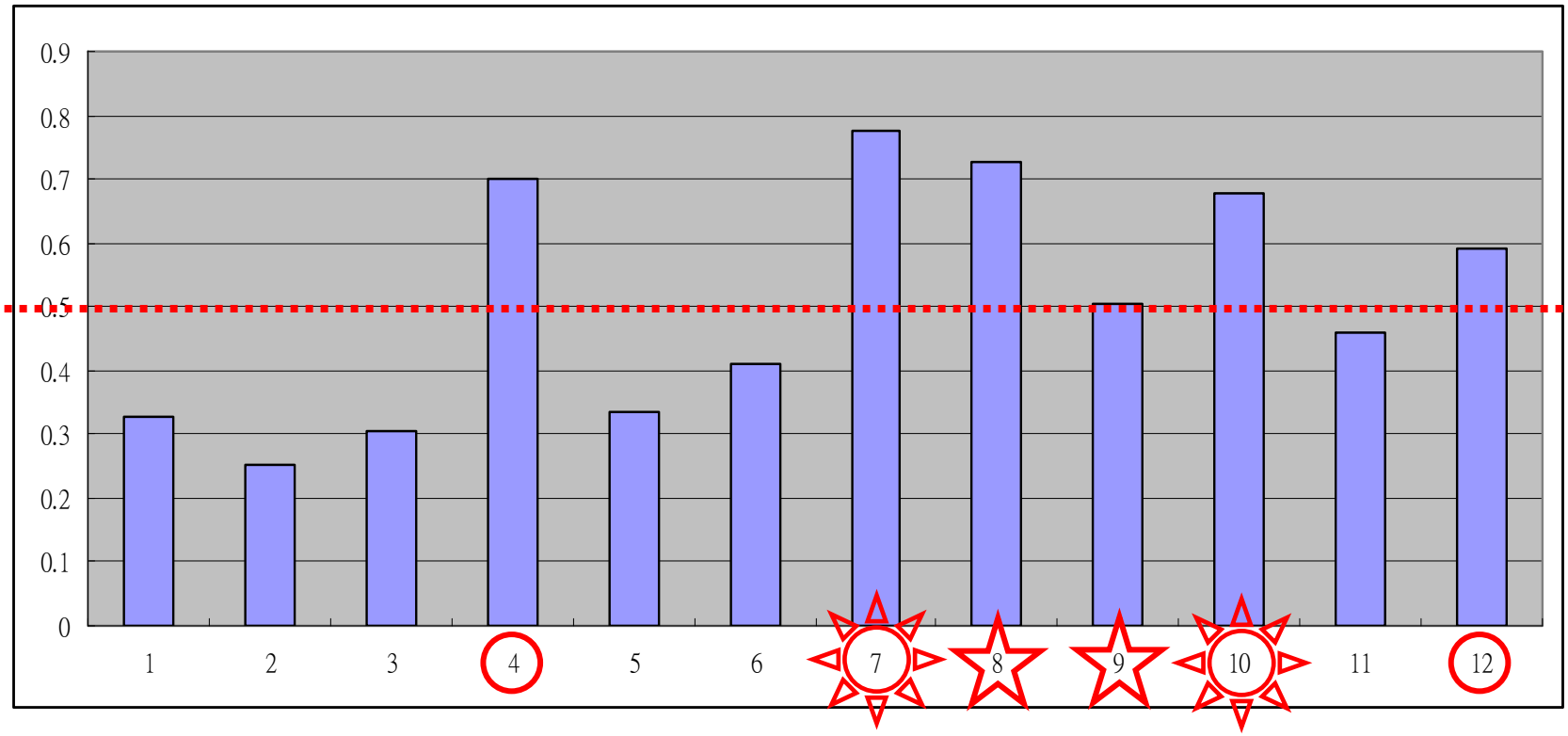
級距和人數



80-90	2
70-80	13
60-70	13
50-60	19
40-50	25
30-40	18
20-30	9
10-20	4
0-10	4
	107

得分率



得分率較低的題目

1.

- Define horizontal gene transfer and explain how it complicates phylogenetic trees. (8%)
  - Define horizontal gene transfer (4%)
  - Explain how it complicates phylogenetic trees (4%)

Define horizontal gene transfer (4%)

- Horizontal gene transfer is the movement of genes from one genome to another through mechanisms such as exchange of transposable elements and plasmid, viral infection and perhaps fusions of organisms.

Explain how it complicates phylogenetic trees (4%)

- 說明演化樹一般都是根據垂直基因轉移（親代傳給子代），因此若是增加了物種間的水平基因轉移，會使得演化樹變得複雜，不易根據基因或序列去推估演化樹。

2.

- Explain molecular clocks and discuss their limitations. (8%)
  - Explain molecular clocks (4%)
  - Discuss their limitations (4%)

Explain molecular clocks (4%)

Molecular Clocks

- A **molecular clock** uses constant rates of evolution in some genes to estimate the absolute time of evolutionary change **(2%)**
- In orthologous genes, nucleotide substitutions are proportional to the time since they last shared a common ancestor
- In paralogous genes, nucleotide substitutions are proportional to the time since the genes became duplicated
- Molecular clocks are calibrated against branches whose dates are known from the fossil record **(2%)**

Discuss their limitations (4%)

Difficulties with Molecular Clocks

- The molecular clock does not run as smoothly as neutral theory predicts
- Irregularities result from natural selection in which some DNA changes are favored over others **(2%)**
- Estimates of evolutionary divergences older than the fossil record have a high degree of uncertainty **(2%)**
- The use of multiple genes may improve estimates

3.

- Explain how R plasmids confer antibiotic resistance on bacteria. (6%)

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R Plasmids and Antibiotic Resistance

- **R plasmids** carry genes for antibiotic resistance
- Antibiotics select for bacteria with genes that are resistant to the antibiotics
- Antibiotic resistant strains of bacteria are becoming more common

From textbook

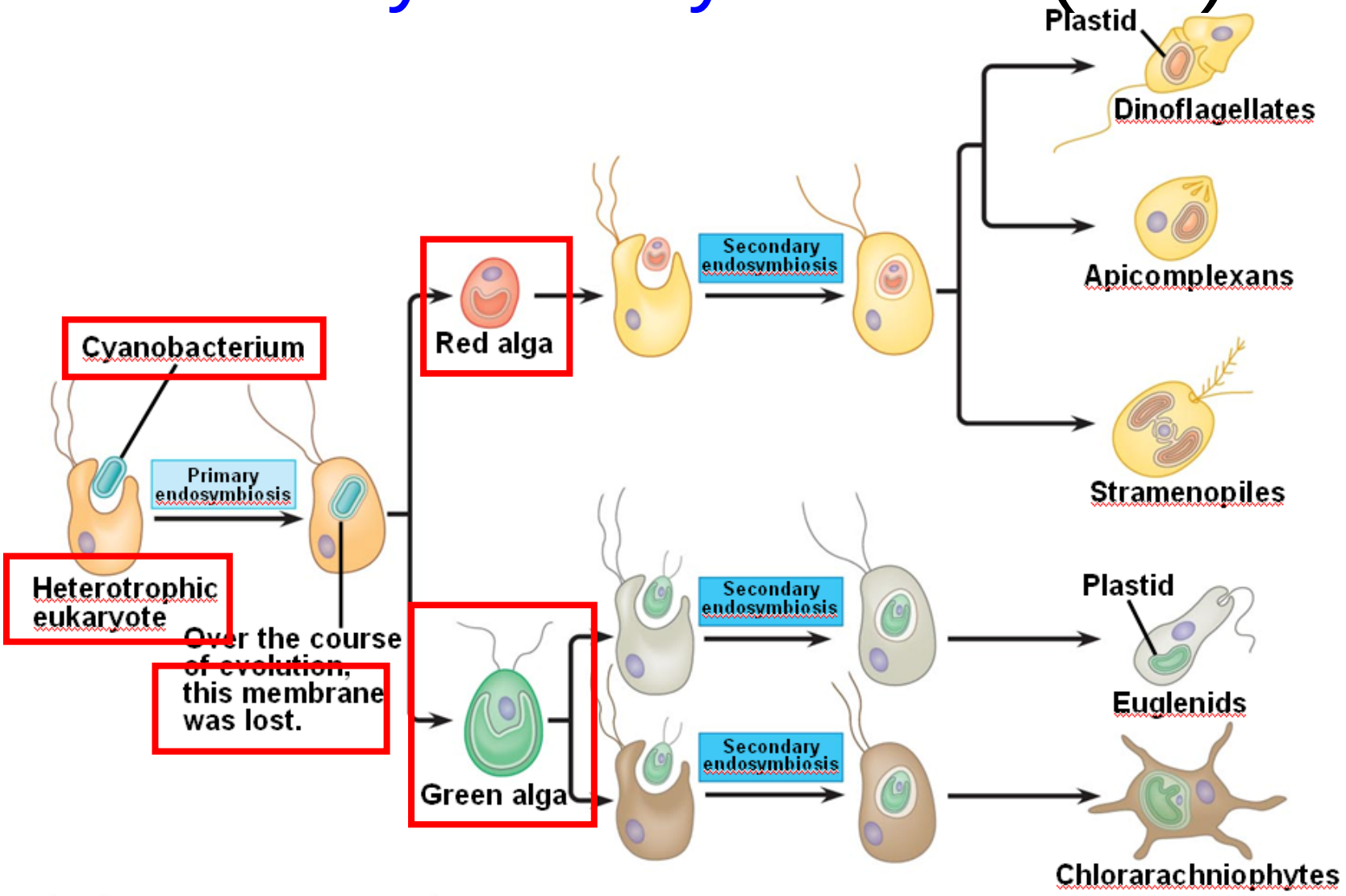
- Many R plasmids have genes that encode sex pili and enable plasmid transfer from one bacteria cell to another by conjugation. Antibiotic resistant strains of bacteria are becoming more common. (4%)

- 突變，天擇……答非所問！

5.

- Explain the process of primary and secondary endosymbiosis and state what living organisms are likely relatives of mitochondria and plastids. (8%)
  - Explain the process of primary and secondary endosymbiosis (4%)
  - State what living organisms are likely relatives of mitochondria and plastids (4%)

Explain the process of primary and secondary endosymbiosis (4%)



- primary endosymbiosis
  - Eat mitochondria
- secondary endosymbiosis
  - Eat plastid

State (說明) what living organisms are likely relatives of mitochondria and plastids (4%)

Endosymbiosis in Eukaryotic Evolution

- There is now considerable evidence that much protist diversity has its origins in endosymbiosis
- Mitochondria evolved by endosymbiosis of an aerobic prokaryote **(2%)**
- Plastids evolved by endosymbiosis of a photosynthetic cyanobacterium **(2%)**

6.

- Describe four shared characteristics and four distinct characteristics between charophytes and land plants. (8%)
  - Four shared characteristics (4%)
  - Four distinct characteristics (4%)

- 說明答案所寫是shared或是distinct

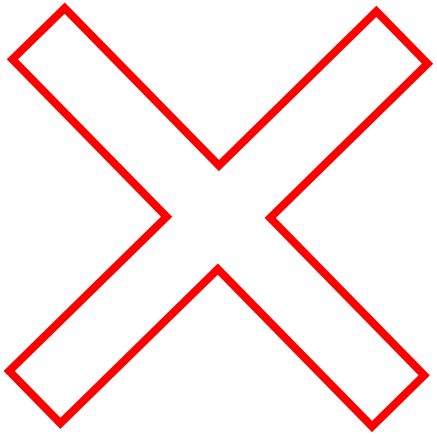
Four shared characteristics (4%)

Morphological and Molecular Evidence

- Many characteristics of land plants also appear in a variety of algal clades, mainly algae
- However, land plants share four key traits only with charophytes:
  - Rose-shaped complexes for cellulose synthesis
  - Peroxisome enzymes
  - Structure of flagellated sperm
  - Formation of a **phragmoplast**

Four shared characteristics (4%)

- 都是真核細胞
- 都可以行光合作用
- 都有細胞壁
- ……



Four distinct characteristics (4%)

Derived Traits of Plants

- Four key traits appear in nearly all land plants but are absent in the charophytes:
  - Alternation of generations (with multicellular, dependent embryos)
  - Walled spores produced in sporangia
  - Multicellular gametangia
  - Apical meristems

說明下列答案是charophytes或是land plants所擁有的特色

11.

- Describe some of the roles of fungi in ecosystems, lichens, animal-fungi mutualistic symbioses, food production, and medicine and as pathogens. (12%)
  - ① Ecosystems (2%)
  - ② Lichens (2%)
  - ③ Animal-fungi mutualistic symbioses (2%)
  - ④ Food production (2%)
  - ⑤ Medicine (2%)
  - ⑥ As pathogens (2%)

名詞解釋以及分辨

4.

- Distinguish among the following sets of terms:
  ① photoautotrophs, chemoautotrophs, photoheterotrophs, and chemoheterotrophs;
  ② obligate aerobe, facultative anaerobe, and obligate anaerobe;
  ③ mutualism, commensalism, and parasitism;
  ④ exotoxins and endotoxins

Distinguish among the following sets of terms:

1) photoautotrophs
2) chemoautotrophs
3) photoheterotrophs
4) chemoheterotrophs
5) obligate aerobe
6) facultative anaerobe
7) obligate anaerobe
8) mutualism
9) commensalism
10) parasitism
11) exotoxins
12) endotoxins

12.

- Distinguish between the following pairs or sets of terms:
  ① radial and bilateral symmetry (2%)
  ② diploblastic and triploblastic (2%)
  ③ spiral and radial cleavage (2%)
  ④ determinate and indeterminate cleavage(2%)
  ⑤ acoelomate, pseudocoelomate, and coelomate grades (2%)

Cleavage

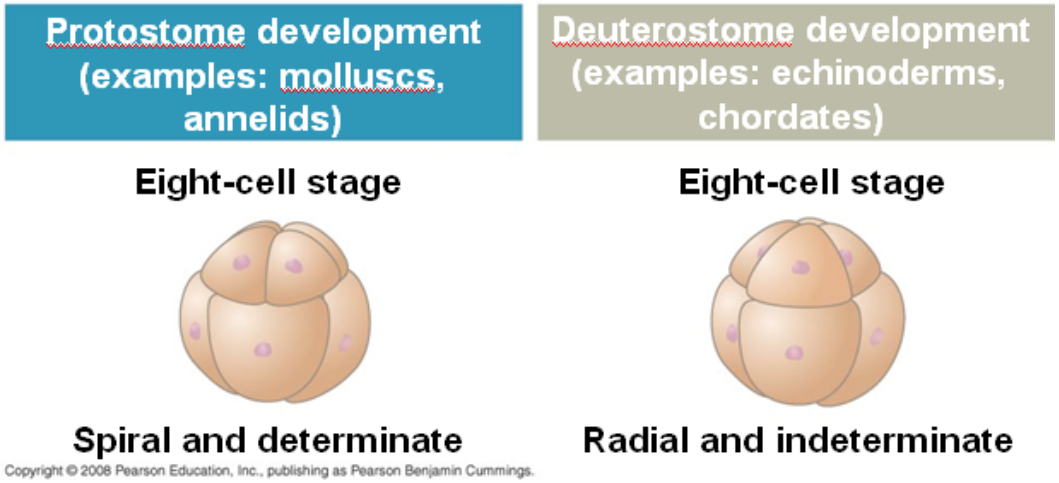
③④

- In protostome development, cleavage is **spiral** and **determinate**
- In deuterostome development, cleavage is **radial** and **indeterminate**

④

- With indeterminate cleavage, each cell in the early stages of cleavage retains the capacity to develop into a complete embryo
- Indeterminate cleavage makes possible identical twins, and embryonic stem cells

③



How to study?

- Preview (pre-lecture)
- In class (pre-lecture)
- Review (lecture ppt + textbook)

- 作答方式
  - 分小題作答
  - 畫圖要加說明
  - 不要答非所問

They can do it, and you?

- 電機系：期中考34→期末考88 (第一名)
- 數學系：上學期40→本學期77 (第三名)

Yes, all of you can do it!

Thanks for your attention!