

國立中正大學生命科學系大學個人申請入學
105學年度指定項目測驗試題

生物學考科

— 作答注意事項 —

考試時間： 60 分鐘 (含第壹、貳部分)

作答方式

- 請務必於題號欄標明部分及題號填答。
- 用原子筆在「答案卷」上作答，修正時應以修正液（帶）。

祝考試順利

第壹部分（占 50 分）

問答題

說明：本部分共有五大題，答案必須寫在「答案卷」上，並於題號欄標明部分(壹、貳)、大題號(一、二、……)，作答時不必抄題。作答務必使用筆尖較粗之黑、藍色墨水的筆書寫，且不得使用鉛筆。每一子題配分標於題末。

一、 小鼠為生物醫學研究之常用工具，請問挑選此動物之理由為何？

（請寫出四個答案）（共八分）

二、 請寫出八種在海邊岸上或沿海岸水裡有可能出現的無脊椎動物。

（注意：同一屬只能寫一種。）（共八分）

三、 請舉出五種能力是無脊椎動物有，但人類沒有的。（共十分）

（造句必須依下列形式：無脊椎動物名稱--解釋其功能 人類不能__）

（例如： 昆蟲--有翅膀能飛，人類不能飛）

（“昆蟲有翅膀能飛”這例子已經舉了，因此你不能以此為答案）

四、 請舉出兩種對生物醫學有貢獻的無脊椎動物，並分別說明其貢獻為何。

（共十二分）

五、 在生物醫學上，台灣禁止美國牛肉進口的原因有兩個，請問這兩個原因為何？

請分別說明其可能藉由什麼機制？對人體可能造成什麼傷害？

（共十二分）

第貳部分（占 50 分）

綜合題

說明：本部分共有三大題，答案必須寫在「答案卷」上，並於題號欄標明部分(壹、貳)、大題號(一、二、……)與子題號(a、b、……)，作答時不必抄題。作答務必使用筆尖較粗之黑、藍色墨水的筆書寫，且不得使用鉛筆。每一子題配分標於題末。

一、問答題（10 分）

有一台反應測定儀會顯示生物正向及負向反應的強度及大小，如下列數值為例：在四次反應測定中，正向及負向反應皆為 10 倍不同，但是其測定強度(如反應 A 和 B, C 和 D)和反應方向(如反應 A 和 C, B 和 D)皆有差異，而若單看正負反應比值並不能夠看出這些不同。因此擁有這台生物反應測定儀的老師想請你/妳設計一或二個可計算的簡單衡量以取代比值、並用其代表測得的強度差(比)及(正向及負向)反應方向。而最好能推廣於大型(量)計算。(提示：用簡單數學轉換、運算即可)

反應	A	B	C	D
正反應 (X)	1	10	10	100
負反應 (Y)	10	100	1	10
正負反應比值 (X/Y)	0.1	0.1	10	10

(a) 因為 X/Y 有正、反之別、又 X/Y=0.1 或 10 皆代表二者相差 10 倍、但是單以 X/Y 值很難一一表達這些差別、而計算時又會耗時。因此請在下列數學轉換中、選擇一項較易用於大型計算者以取代 X/Y 比值來代表正、反反應之差別，並說明選用的理由(5 分)：

(1) $\log_{10}(X/Y)$ (2) $\tan(X/Y)$ (3) $\sin(X/Y)$ (4) $|X/Y|$

(b) A 和 B 反應中負向反應皆為正反應的 10 倍，但是二者反應強度 B 反應明顯較 A 反應中讀值為強(A 反應中讀值接近背景值、通常不會被採計)。因此請在下列數學轉換中、選擇一項較易用於大型計算者以取代 X/Y 比值，來代表反應的強度，並說明選用的理由(5 分)：

(1) $0.5 \times \log_{10}(X \times Y)$ (2) $0.5 \times |X \times Y|$ (3) $0.5 \times \tan(X \times Y)$
 (4) $0.5 \times \sin(X \times Y)$

二、問答題(20分，每小題兩分)請在”快速”閱讀下列文章後，對文章後題目的敘述，圈指出該敘述是事實(Fact)或個人觀點/猜測(Opinion)，並回答後面選擇題。(請先看題目、將有助答題)

Manta rays are first fish to recognize themselves in a mirror.

Looking good. Giant manta rays have been filmed checking out their reflections in a way that suggests they are self-aware.

Only a small number of animals, mostly primates, have passed the mirror test, widely used as a tentative test of self-awareness.

“This new discovery is incredibly important,” says Marc Bekoff, of the University of Colorado in Boulder. “It shows that we really need to expand the range of animals we study.”

But not everyone is convinced that the new study proves conclusively that manta rays, which have the largest brains of any fish, can do this – or indeed, that the mirror test itself is an appropriate measure of self-awareness.

Csilla Ari, of the University of South Florida in Tampa, filmed two giant manta rays in a tank, with and without a mirror inside. The fish changed their behaviour in a way that suggested that they recognized the reflections as themselves as opposed to another manta ray.

They did not show signs of social interaction with the image, which is what you would expect if they perceived it to be another individual. Instead, the rays repeatedly moved their fins and circled in front of the mirror. This suggests they could see whether their reflection moved when they moved. The frequency of these movements was much higher when the mirror was in the tank than when it was not.

The rays also blew bubbles in front of the mirror, behaviour that Ari had not observed in the rays before.

“The behavioural responses strongly imply the ability for self-awareness, especially considering that similar, or analogous, behavioural responses are considered proof of self-awareness in great apes,” Ari says.

Diana Reiss, of Hunter College in New York, says that it is interesting that manta rays did not show social behaviour towards the mirror image, as fish usually do. But she says it is unclear whether the rays actually recognize themselves in the mirror.

Curious behaviour

Gordon G. Gallup Jr, of the University at Albany, New York, who originally developed the mirror test, is also sceptical. The unusual movements in front of the mirror might have merely been a sign of curiosity or exploratory behaviour, he says.

Other studies have suggested that dolphins, elephants, monkeys and magpies, and even a robot, can recognize themselves in the mirror. But Gallup says these were usually conducted on just one or two animals and the results were not reproducible.

“Humans, chimpanzees and orangutans are the only species for which there is compelling, reproducible evidence for mirror self-recognition,” he says. This implies that self-awareness may be limited to humans and some great apes.

But Bekoff says that the mirror test may not be the litmus test for self-awareness in all animals. It is a visual measure, so it might not work in species that navigate their worlds primarily using senses other than vision. Such species may fail the mirror test, but they may still be self-aware, Bekoff says.

He thinks it is time to raise the bar on the way we study self-awareness in animals, including manta rays.

“It would be nice if someone could do neuroimaging while these animals are doing something in response to seeing a reflection,” he says.

Journal reference: Journal of Ethology, DOI: 10.1007/s10164-016-0462-z

答題方式：

“George Monbiot’s explanations is poetically” is a/an “Fact” or “Opinion”?

問題：請圈選填至答案卷

(a) “The Manta rays repeatedly moved their fins and circled in front of the mirror.” is a/an

“Fact” or “Opinion”?

(b) “manta rays, which have the largest brains of any fish” is a/an

“Fact” or “Opinion”?

(c) “the mirror test, is widely used as a tentative test of self-awareness.” is a/an

“Fact” or “Opinion”?

(d) “Self-awareness may be limited to humans and some great apes” is a/an

“Fact” or “Opinion”?

(e) “The unusual movements in front of the mirror might have merely been a sign of curiosity or exploratory behaviour” is a/an

“Fact” or “Opinion”?

選擇題：請填至答案卷

(f) () 文章中指出那些現象、行為說明魷魚在面對鏡子時能意識自我：

- (1) 無社會行為互動 (2) 對鏡子吹泡泡 (3) 對鏡子重複特定動作
(4) 以上皆是。

(g) () 下列何者做了對魷魚鏡子測試之行為反應記錄：

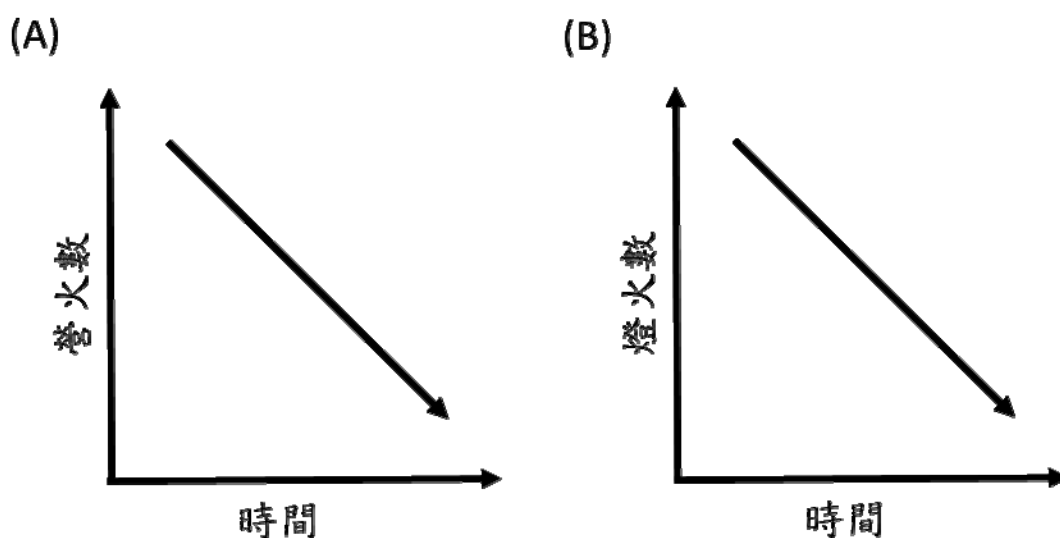
- (1) Marc Bekoff (2) Csilla Ari (3) Gordon G. Gallup Jr
(4) Diana Reiss。

(h) () 作者認為、若能做下列那項實驗更能加強現有論點(魷魚在面對鏡子時能意識自我): (1) “filmed two giant manta rays in a tank, with and without a mirror inside.” (2) “neuroimaging while these animals are doing something in response to seeing a reflection.” (3) Do more observation like on: dolphins, elephants, monkeys and magpies, and even a robot. (4)以上皆非。

(i) () 根據文章 Manta rays 是：
(1) great apes (2) magpies (3) fish (4) 以上皆是。

(j) () 下列何者是文中提到利用鏡子測試各種生物是否能辨別自我的最大可能缺點？(1) 為利用視覺能力鑑別、對利用其他感官活動的生物則受限 (2) 對軟骨魚類較有效、對硬骨魚類則無效 (3) 對靈長類有效、所以其他生物皆不適用 (4) 以上皆是。

三、問答題 (20 分)



在上繪(A)圖中、如古籍記載、軍隊常追蹤或觀察敵軍營火數或灶口數，以推估敵軍人數，若營火數如圖中遞減，那麼主帥會認為敵軍多逃兵，已不戰而潰。但也有反被利用，盲目追擊而致失敗者。

在(B)圖中、在若干年調查後於某北部工商混合地區，顯示該地區的燈火數逐年下降，亦因此被推估其產業繁景不在或開發不足。請問：可否據此數據說明或下結論“該地區開發不足”。並請說明你/妳認定的原因及其和前例(A)是否可比？