

國立屏東科技大學 107 學年度 碩士班暨碩士在職專班 招生考試
動物疫苗科技研究所 生物化學試題 (Biochemistry)

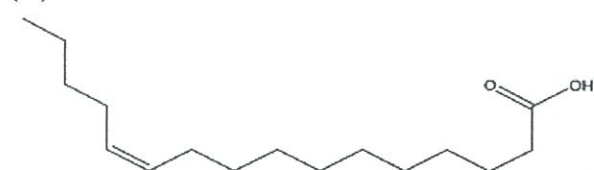
一、選擇題(單選題；每題3分)

Multiple choice questions (Please choose the most appropriate answer; 3 points per question)

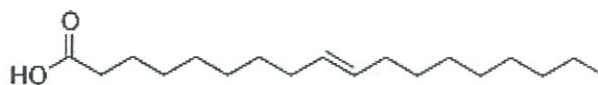
1. 下列哪一個分子是反式脂肪酸?

Which of the following molecules is a trans fatty acid?

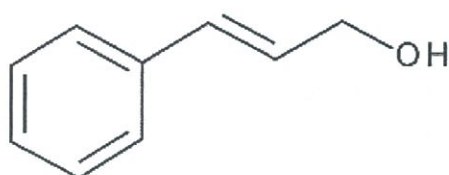
(A)



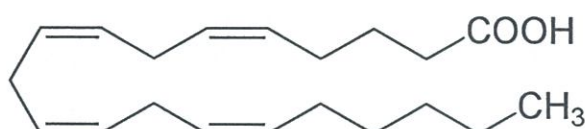
(B)



(C)



(D)



2. 下列哪一類分子的結構中含有至少 3 個單糖?

Which of the following types of molecules contains at least 3 monosaccharides?

(A) Glucocerebroside (葡萄糖腦苷脂)

(B) Cholesterol (膽固醇)

(C) Palmitic acid (棕櫚酸)

(D) Gangliosides (神經苷脂類)

3. 白三烯素是哪一種分子的衍生物?

Leukotrienes are derived from?

(A) Cholesterol (膽固醇)

(B) Glucose (葡萄糖)

(C) Arachidonic acid (花生四烯酸)

(D) Glutamic acid (麩胺酸)

4. 以下哪一個單糖是酮糖?

Which of the following monosaccharides is a ketose?

(A) Fructose (果糖)

(B) Mannose (甘露糖)

(C) Glucose (葡萄糖)

(D) Arabinose (阿拉伯糖)

5. 葡萄糖與甘露糖，這兩種分子彼此互為:

Structurally, glucose and mannose are:

(A) enantiomers (對掌異構物)

(B) constitutional isomers (結構異構體)

(C) anomers (異頭物)

(D) epimers (差像異構物)

6. 以下哪一種分子結構中含有磷酸根?

Which of the following molecules contains a phosphate group in its structure?

(A) Ceramide

(B) Sphingomyelin

(C) Ganglioside

(D) Diacylglycerol

背面有試題

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7. 下列哪一個不是還原糖?

Which of the following molecules is not a reducing sugar?

- (A) Glucose (葡萄糖) (B) Mannose (甘露糖)
(C) Sucrose (蔗糖) (D) Lactose (乳糖)

8. 以下哪一個分子是 D-galactose 的 enantiomer (對掌異構物)?

Which of the following molecules is the enantiomer of D-galactose?

- (A) L-galactose (B) α -D-fructose
(C) L-ribose (D) D-Idose

9. 以下哪一種分子屬於 glycosaminoglycan (糖胺聚糖)?

Which of the following molecules is a type of glycosaminoglycan?

- (A) Cellulose (纖維素) (B) Glycogen (肝糖)
(C) Chondroitin sulfate (硫酸軟骨素) (D) Pectin (果膠)

10. 下列哪一個胺基酸的結構中含有硫(S)原子?

Which of the following amino acids contains an S atom in its structure?

- (A) Y (B) A (C) Q (D) C

11. 下列哪一個胺基酸含酸性側鏈?

Which of the following amino acids contains an acidic side chain?

- (A) F (B) E (C) K (D) M

12. 哪兩種胺基酸經常出現在蛋白質立體結構中的反轉區(reverse turns)?

What are the two amino acids that often appear in the reverse turns in the three-dimensional structures of proteins?

- (A) Ala, Phe (B) Pro, Gly (C) Tyr, Lys (D) Ile, Gln

13. 肌紅素(myoglobin)的立體結構中不含:

Which of the following items is not contained in the structure of myoglobin?

- (A) Fe ion (鐵離子) (B) α -helix (C) β -sheet (D) heme (血基質)

14. 下列哪一個分子可破壞蛋白質結構中的雙硫鍵?

Which molecule can destroy the disulfide bonds in the three-dimensional structures of proteins?

- (A) Fe ion (B) urea (C) sodium dodecyl sulfate (D) beta-mercaptoethanol

15. 以瓊脂糖(agarose)為介質形成的凝膠通常用來分離:

Agarose gels are often used to separate:

- (A) nucleic acids (核酸) (B) proteins (蛋白質)
(C) polysaccharides (多醣類) (D) phospholipids (磷脂質)

16. 在蛋白質的一級結構中, 蛋白酶 trypsin 傾向水解哪一些胺基酸 C 端的胜肽鍵?

In the primary structure of a protein, trypsin prefers to digest at the C-terminal peptide bond of certain amino acid residues. What are these amino acid residues?

- (A) Arg, Lys (B) Trp, Phe (C) Ala, Ile (D) Tyr, Met

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17. 蛋白質的二維電泳通常是利用蛋白質之間哪兩種差異來分開不同的蛋白質?
In the two-dimensional gel electrophoresis of proteins, what are the two properties of proteins that are used to separate different proteins?
(A) 分子量與疏水性(Molecular weight and hydrophobicity)
(B) 電荷與溶解度 (Charge and solubility)
(C) 等電點與分子量(pI and molecular weight)
(D) 極性與等電點 (Polarity and pI)
18. 組織蛋白(histones)的一級結構中含有大量的那些胺基酸使之易與 DNA 結合?
What amino acid residues are contained in higher ratios in the primary structures of histones, so that histones tend to associate with DNA?
(A) Trp, Phe (B) Leu, Ala (C) His, Pro (D) Lys, Arg
19. 小型核 RNA (small nuclear RNA; snRNA)的功能是?
What is the function of small nuclear RNA (snRNA)?
(A) 協助進行轉譯作用(To assist in the process of translation)
(B) 協助將原始 mRNA 修飾為成熟 mRNA (To help process original mRNAs into mature mRNAs)
(C) 干擾轉譯作用的進行(To interfere with the process of translation)
(D) 協助轉錄作用的進行(To help the progress of transcription)
20. 一般認為在生理狀態下，DNA 雙股螺旋結構的主要構形是:
What is the predominant conformation of DNA double helix under physiological conditions?
(A) Z-DNA (B) B-DNA (C) A-DNA (D) C-DNA
21. 下列哪一種酵素與 DNA 超螺旋結構的形成有關?
Which of the following enzymes is involved in the formation of supercoiled DNA?
(A) DNA polymerase (DNA 聚合酶) (B) Telomerase (端粒酶)
(C) Topoisomerase (拓撲異構酶) (D) Exonuclease (外切型核酸酶)
22. 下列 DNA 序列何者可能不是限制酶切割的辨識序列?
Which of the following DNA sequences is probably not a recognition sequence for restriction endonucleases?
(A) 5' AAGCTT 3' (B) 5' TCTAGA 3'
(C) 5' CCCGGG 3' (D) 5' CATAAC 3'
23. 下列哪一種輔酶的結構中含有維生素 B₃?
Which of the following coenzymes contains vitamin B₃ in its structure?
(A) FAD (B) Coenzyme A (C) NAD⁺ (D) Pyridoxal phosphate (PLP)
24. 有一個酵素，其反應速率在基質濃度[S] = K_M 時是 50 nmole/sec，則此反應的 V_{max} 是多少?
The reaction velocity for an enzyme-catalyzed reaction is 50 nmole/sec when the substrate concentration [S] = K_M. Thus, the V_{max} of this reaction is:
(A) 100 nmole/sec (B) 150 nmole/sec
(C) 75 nmole/sec (D) 85 nmole/sec

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25. 亞麻油酸(linoleic acid)的結構可用哪一個代號來表示?

Which of the following abbreviated symbols represents linoleic acid?

- (A) 18:2- $\Delta^{9,12}$ (B) 16:0 (C) 18:1- Δ^9 (D) 20:4- $\Delta^{5,8,11,14}$

二、簡答題

Short-answer questions:

26. Cellobiose (纖維二糖)與 maltose (麥芽糖)結構上有何不同? (5 分)

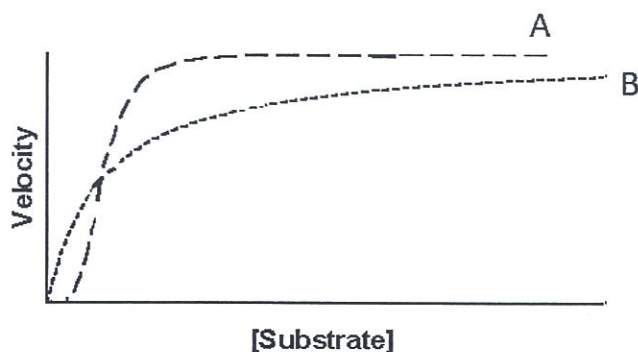
What is the structural difference between cellobiose and maltose? (5 points)

27. 酵素 X 的行為符合 Michaelis-Menten kinetics，實驗求得其動力學參數為: $V_{\max}=100 \mu\text{M}/\text{min}$, $K_M=10 \text{ mM}$ 。則當其基質濃度[S]等於 15 mM 時，反應之初始速度(initial velocity; V_0) 是多少? (提醒: 答案要附上速度的單位) (5 分)

The behavior of enzyme X obeys the Michaelis-Menten kinetics. Its kinetic parameters calculated from experimental results are: $V_{\max}=100 \mu\text{M}/\text{min}$, $K_M=10 \text{ mM}$. Thus, what is the initial velocity (V_0) of enzyme X-catalyzed reaction when substrate concentration [S] is 15 mM? (Reminder: please include the unit of velocity in the answer) (5 points)

28. 下圖是酵素 A 與酵素 B 的基質濃度與初始速度(initial velocity)的關係圖。請問，哪一個酵素可能是一個異位調節酵素(allosteric enzyme)? (5 分)

The graph below reveals the relationship between the substrate concentration and the initial velocity of enzyme A and that of enzyme B. Which enzyme (A or B) is likely an allosteric enzyme? (5 points)



29. 以下脂肪酸分子哪一些屬於 $\omega 3$ 脂肪酸? (5 分)

Which fatty acids in the following list are $\omega 3$ fatty acids? (5 points)

- A. Linolenic acid B. 16:1- Δ^9 C. 20:5- $\Delta^{5,8,11,14,17}$ D. Stearic acid

30. X, Y, Z 為 3 個不同的蛋白質，其分子量分別為: A = 77 kDa; B = 145 kDa; C = 35 kDa。

請問: 若以膠體過濾層析法(gel filtration chromatography)來分離這 3 個蛋白質，它們由管柱中流出來的先後順序是? (5 分)

X, Y, and Z are three different proteins. Their molecular weights are: A = 77 kDa; B = 145 kDa; C = 35 kDa. If they are subjected to gel filtration chromatography for separation, which one will be the first, the second, or the third protein that comes out the column, respectively? (5 points)