編號： 447　系所：藥理學研究所　　科目：生物化學

本試題是否可以使用計算機：□可使用，☑不可使用　（請命題老師勾選）

Part I: 50%

一、選擇題、填充題（單選一分、複選二分；複選題有加註；作答時請標示題號）(共 37 分)

1. Glucose ___①___ 為（A）aldose　（B）ketose
   ___②___ 有幾個不對稱碳　（A）6　（B）5　（C）4　（D）3
   ___③___ 直鏈 Glucose 有幾種立體異構物　（A）64（B）32　（C）16　（D）8
   α-D-Glucose 是___④___（複選）（A）α-D-Galactose 的 epimer　(B) α-D-Galactose 的 anomer　(C) β-D-Glucose 的 anomer　(D) glycogen 的組成份。

2. Cellulose 是以哪一種 glycosidic bond 鍵結其 Glucose 分子？ ___⑤___（A）α-(1->6)　(B) α-(1->4) 和 α-(1->6)　（C）β-(1->4)　(D) α-(1->1)

3. 下列哪些敘述為真？ ___⑥___（複選）（A）單糖水溶液多為直鏈結構　（B）環狀 Glucose 其 chair form 多於 boat form　（C）β-D-Glucose 之 C1 與 C6 皆在環平面之上方　（D）Ribose 多為五邊環。

4. 下列何者為 amino sugars？ ___⑦___（複選）(A) Cluconic acid　(B) Mannitol　(C) Glucosamine　(D) Muramic acid　(E) Sialic acid

5. 下列何種 Glycolysis 酵素所催化之步驟為不可逆反應？ ___⑧___（複選）(A) Hexokinase　(B) Phosphofructokinase　(C) Aldolase　(D) Glyceraldehyde-3-phosphate dehydrogenase　(E) Pyruvate kinase

6. 下列哪一個核酸參與 Galactose 代謝為 Glucose-6-phosphate 的過程？___⑨___
   (A) ATP　(B) GTP　(C) CTP　(E) UTP

7. Phosphofructokinase-1 會受到下列何種因素所活化？ ___⑩___（複選）(A) Fructose 1,6 bisphosphate↑　(B) Fructose 2,6 bisphosphate↑　(C) ATP↑　(D) ADP↑　(E) Acetyl-CoA↑　(F) citrate↑　(G) 被磷酸化時

8. 下列何者可 transcribe 成 RNA？ ___⑪___（複選）(1) satellite DNA　(2) rRNA

(背面仍有題目,請繼續作答)

gene (3) telomere sequence (4) pseudogene (5) Alu element

9. 下列何種 cell cycle 為 4N genome？⑫（複選）(1) G0 (2) G1 (3) early S (4) late S (5) G2 (6) early M (7) late M

10. Eukaryotic protein 常有 phosphorylation 的情形，下列哪些胺基酸為其 target site？⑬（複選）(A) Serine (B) Proline (C) Threonine (D) Tyrosine (E) Tryptophan

11. 一段雙股 DNA 共有幾個可能的 reading frame？⑭ (A) 1 (B) 3 (C) 6。

12. 一些需送至細胞外、細胞膜或送至 lysosome 分解之 protein 其運送次序為：⑮
(A) ER → Cis Golgi → Trans Golgi (B) Cis Golgi → Trans Golgi → ER (C) ER → Trans Golgi → Cis Golgi (ER=endoplasmic reticulum)

13. 下列何種修補酵素可認知 cyclobutane pyrimidine dimers (CPD)？⑯
（複選）(A) Photolyase (B) UvrABC excinuclease (C) CPD glycosylase (D) Alkyltransferase.

14. E. coli 之 DNA —G(CH_3)— 經過修補後會成為 ⑰ (A) —A— —T— (B) —G— —C—
—T—
上述 DNA 何者為 newly synthesized DNA？⑱ (A) G-containing 股 (B) T-containing 股

15. 下列反應位置在真核細胞之 (A) 核質 (B) 核仁 (C) 細胞質
ribosome assemble ⑲
tRNA processing ⑳
mRNA processing ㉑
translation ㉒

16. 請寫出三種真核細胞之 mRNA post-transcriptional modifications:
㉓ （2 分）
㉔ （2 分）
㉕ （2 分）

二、問答題（共 13 分）

1. Glycogen phosphorylase 所催化的反應為何？其在肌肉與肝臟細胞分別受到哪些因子所調控？（需針對 hormones, allelosteric effectors, phosphorylation 等方面作說明）(6 分)

2. 你在 identify 了一段 DNA sequence 後，要如何：（需簡述其過程）(7 分)
   A. 增量此 DNA sequence?
   B. 將此 DNA sequence 表現成 RNA？
   C. 將此 DNA sequence 表現成 protein？
   D. 判斷此 DNA sequence 是否在細胞中有表達成 mRNA?
   E. 判斷此 DNA sequence 是否在細胞中有表達成 protein?
   F. 確定這段 putative gene sequences 之 exon-intron junction？
   G. 確定哪一段 sequences 具有 promoter activity？

Part II：50%

Simple choice

1. Animals can convert cholesterol into each of the following except (2%)
   (A) lanosterol
   (B) estrogen
   (C) testosterone
   (D) aldosterone
   (E) cholic acid

2. Lovastatin lowers blood cholesterol levels by (2%)
   (A) increasing the rate at which cholesterol is converted to bile acids.
   (B) binding to bile acids so that they are excreted.
   (C) stimulating lysosomal enzymes.
   (D) inhibiting HMG-CoA reductase
   (E) stimulating lecithin:cholesterol acyltransferase

3. Each of the following enzymes is needed to convert glycerol-3-phosphate and fatty acids to

triacylglycerol **except** (2%)

(A) fatty acyl-CoA synthase

(B) lysophophatidate acyltransferase

(C) phosphatidate phosphatase

(D) monoacyldihydroxyacetone phosphate reductase

(E) glycerol-3-phosphate acyltransferase

4. Each of the following has a phosphate group **except** (2%)

(A) lecithin

(B) phosphatidylglycerol

(C) cardiolipin

(D) phosphatidylinositol

(E) ceramide

Multiple choices

5. Which of the following statement(s) is correct? (5%)

(A) The pentapeptide Gly-Tyr-Thr-Cys-Leu is the same molecule as the pentapeptide Leu-Cys-Thr-Tyr-Gly.

(B) The disulfide bond in a protein is because of the amino acids cystine and methionine containing –SH functional group.

(C) Histidine, lysine, and arginine are basic amino acids

(D) Protein phosphorylation might occur on the side chains of tyrosine, serine, and threonine.

(E) Small molecules flow more rapidly through a gel-filtration column than larger molecules do.

6. The octapeptide AVGWRVKS was digested with chymotrypsin. Would ion exchange or molecular exclusion be most appropriate for separating the products? Explain your answer. (5%)

7. A protein was purified to homogeneity. Determination of the molecular weight by molecular exclusion chromatography yields 60 kDa. Chromatography in the presence of 6 M urea yields a 30-kDa species. When the chromatography is repeated in the presence of 6 M urea and 10 mM beta-mercaptoethanol, a single molecular species of 15 kDa results. Please describe the structure of the molecule? (5%)

8. Why are most unsaturated fatty acids found in phospholipids in the cis rather than the trans conformation? Draw the structure of a 16-carbon fatty acid as cis monounsaturated and trans monounsaturated. (the unsaturated position can be anywhere as you like) (5%)

9. The potassium channel and the sodium channel have similar structures and are arranged in the same orientation in the cell membrane. Yet, the sodium channel allows sodium ions to flow into the cell and the potassium channel allows potassium to flow out of the cell. Please explain it. (5%)

10. Antibodies have two identical antigen-binding sites. Remarkably, antibodies to the extracellular parts of grow-factor receptors often lead to the same cellular effects as does exposure to growth factors. Please explain this observation. (5%)

11. Why should phenlketonurics avoid using aspartame, an artificial sweetner? (aspartame is L-aspartyl-L-lphenylalanine methyl ester) (5%)

12. Phosphatidylethaolamine is the most common lipid in the E. coli cell membrane.

(A) Please draw the structure of phosphatidylethanolamine. (2%)

(B) what products will be formed when phosphatidylethanolamine is treated with each of the following phospholipases? (5%)

(i) phospholipase A1

(ii) phospholipase A2

(iii) phospholipase C

(iv) phospholipase D