一、選擇題 (32% 每題 0.8 分)　※ 注意：本大題請於試卷上「選擇題作答區」依序作答。

1. Which of the following carbon bonds are digested by α amylase?
   a. α –1,4　b. α –1,6　c. β –1,4　d. β –1,6
2. What is the process by which fructose crosses the mucosal cells?
   a. diffusion　b. facilitated diffusion　c. active transport　d. pinocytosis
3. The glucose transporter which is sensitive to insulin is
   a. GLUT 1.　b. GLUT 2.　c. GLUT 4.　d. SGLT1.
4. Which hormonal changes occur in response to a fall in blood glucose concentration?
   a. increased insulin, decreased glucagon　b. decreased insulin, increased glucagons
   c. decreased insulin, decreased glucocorticoids　d. increased insulin, increased glucagon
5. In what organelle are the enzymes that catalyze the citric acid cycle located?
   a. cytoplasmic matrix　b. endoplasmic reticulum　c. mitochondrion　d. lysosome
6. All of the following are substrates for gluconeogenesis EXCEPT
   a. fatty acids.　b. lactate.　c. glycerol.　d. glucogenic amino acids.
7. What is the primary noncarbohydrate component of fiber?
   a. gums　b. hemicellulose　c. lignin　d. cellulose
8. Which fiber type is not fermentable?
   a. lignin　b. pectin　c. gums　d. resistant starch
9. Which of the following is NOT a typical gastrointestinal response to ingestion of dietary fiber?
   a. increased glucose absorption　b. delayed gastric emptying
   c. increased bile-acid excretion　d. increased fecal bulk
10. Fiber lowers serum cholesterol concentrations by all of the following mechanisms EXCEPT _____.
    a. decreased transit time.
    b. increased excretion of bile acids in the feces
    c. shift of bile acid pools toward chenodeoxycholic acid which inhibits HMGCoA reductase
    d. production of propionate from gut fermentation of fiber.
11. Phytochemicals are
    a. new vitamins being found in plants.　b. non-nutrient plant compounds that are biologically active.
    c. mineral compounds derived from plants.　d. another name for herbal medicines.
12. What is the carrier for short chain fatty acids in portal circulation?
    a. triacylglycerides　b. cholesterol　c. chylomicrons　d. albumin
13. All of the following are functions of apolipoproteins EXCEPT:
    a. Stimulate enzymatic reactions which regulate the metabolic functions of lipoproteins.
    b. Stabilize circulating lipoproteins in the blood.
    c. Decrease the density of the lipoprotein.
    d. Confer specificity for recognition by receptors on cells.
14. Which of the following lipoproteins are normally NOT present in blood in the fasting state?
    a. VLDL　b. chylomicrons　c. LDL　d. HDL
15. Which of the following lipoproteins is the major carrier of cholesterol to tissues for use in construction of membranes or steroid hormones?
    a. VLDL　b. HDL　c. LDL　d. chylomicrons

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16. The key to the cell's internalization of LDL is the interaction between the receptors and _____.
a. cholesterol acyltransferase b. HMG COA reductase c. apoprotein B-100 d. apoprotein C-100

17. What dietary fatty acid exerts anti-atherogenic properties?
a. palmitic acid b. eicosapentaenoic acid (EPA) c. myristic acid d. stearic acid

18. What is the carrier molecule needed for mitochondrial membrane transport of fatty acids and their CoA derivatives?
a. carnitine b. creatine c. creatinine d. cysteine

19. Ketones are produced from:
a. cholesterol. b. hormones. c. amino groups. d. acetyl-CoA.

20. Thromboxane A_2 is a hormone-like substance made from:
a. stearic acid. b. arachidonic acid. c. palmitic acid. d. myristic acid.

21. Which hormone is considered to be an antagonist of lipolysis?
a. insulin b. epinephrine c. glucagon d. thyroxine

22. What organ provides the major site for lipoprotein formation from exogenously derived lipids?
a. pancreas b. adipocytes c. intestine d. liver

23. When the diet is lacking in the amino acids lysine and threonine
a. proteins will be made without one amino acid. b. the body will synthesize them.
c. protein synthesis will be limited. d. another amino acid will be substituted so that synthesis is uninterrupted.

24. Which two amino acids cannot undergo transamination to an appreciable amount making them totally indispensable?
a. leucine & isoleucine b. lysine & threonine c. valine & tryptophan d. methionine & phenylalanine

25. Urea synthesis occurs partly in the mitochondria and partly in the cytosol of the _____.
a. glomeruli b. tubules c. enterocytes d. hepatocytes

26. What is the primary mechanism for regulation of amino acids in excess of need for synthesis of protein?
a. oxidation b. decarboxylation c. phosphorylation d. hydrogenation

27. Which of the following amino acids represent the branched-chain amino acids found in systemic circulation?
a. glycine, alanine, threonine b. phenylalanine, tyrosine, tryptophan
c. valine, leucine, isoleucine d. arginine, lysine, histidine

28. Which amino acids are metabolized mostly in skeletal muscles?
a. those with side chains containing aromatic rings b. those with side chains that are branched
c. those with side chains containing basic groups d. those with side chains containing sulfur atoms

29. What are the two amino acids primarily released from muscle during starvation?
a. leucine and isoleucine b. alanine and glutamine
c. threonine and phenylalanine d. arginine and histidine

30. Serotonin is made from which amino acid?
a. tyrosine b. niacin c. threonine d. tryptophan

31. One of the more common ways to evaluate protein quality in a food that does not involve nitrogen balance studies is:
a. chemical score. b. net dietary protein calories percent. c. biological value. d. net protein utilization.

32. When evaluating protein quality which of the following measures represents the gain in body weight on a test protein divided by the grams of protein consumed?
a. chemical score b. BV c. PER d. NPU

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33. Which Krebs cycle intermediate can move from the mitochondria into the cytoplast to become the initiator of fatty acid synthesis?
a. a-ketoglutarate　b. citrate　c. succinyl COA　d. fumarate

34. In the human, most triacylglyerols are synthesized by the
a. adipose tissue.　b. heart.　c. liver.　d. brain.

35. Which of the following amino acids is glucogenic in the post-absorptive state?
a. threonine　b. tyrosine　c. alanine　d. lysine

36. The lack of which muscle enzyme causes glucose when phosphorylated in the muscle to be trapped?
a. glucose-6-phosphatase　b. glycerol-3-phosphatase　c. 6-phosphoglycerate dehydrogenase　d. glucokinase

37. Which amino acid is considered purely ketogenic?
a. methionine　b. histidine　c. tryptophan　d. leucine

38. The brain cannot use fatty acids for energy because
a. it is lacking enzymes for oxidation of fats.　b. it lacks mitochondria.
c. glycerol cannot cross the blood-brain barrier.　d. fatty acids cannot cross the blood-brain barrier.

39. Which amino acid produced by transamination of pyruvate with glutamic acid provides a disposal route for nitrogen produced from the catabolism of muscle amino acids?
a. histidine　b. tyrosine　c. tryptophan　d. alanine

40. Under the influence of insulin, which of the following pathways is increased?
a. glycogenesis　b. glycogenolysis
c. phosphorylation of glycogen synthase　d. phosphorylation of glycogen phosphorylase

二、簡答題：(20%)

1. Ascorbic acid 對 carnitine 以及脂肪代謝有何重要性？(4%)
2. 維生素 D 的主要生理功能為何？經由作用在哪些組織調控？(4%)
3. 維生素 B_{12} 和其他水溶性維生素比較有哪些特點？ 它催化的生化反應有哪些？(6%)
4. 解釋名詞：參與某維生素的吸收與代謝的「CRBPII」、「CRABP」、「RBP」。請寫出全名與所扮演的角色(6%)

三、配合題：每題填寫一個 a 到 f 的選項　(6%)

Vitamer	Function
1. 11-cis retinal	a. interacts with nuclear VDR to increase calbindin
2. retinoic acid	b. required for carboxylation of glutamic acid
3. alpha-tocopherol	c. needed for binding with opsin in the photoreceptor rod cells.
4. calcitriol	d. transported into nucleus to affect gene transcription of keratin proteins
5. hydroquinone	e. alanine aminotransferase; important in amino acid transaminations for facilitating protein synthesis
6. pyridoxal phosphate	f. donates hydrogens to terminate propagation of membrane lipid peroxidation chain reactions

四、某研究探討美國葉酸強化政策，對與同半胱胺酸有關疾病的影響，請針對下圖回答問題：(10%)

1. 此研究的受試對象是正常健康人，還是罹患何種病症的患者？年齡應<50 歲或>50 歲？
2. 縱軸代表什麼？
3. 由此圖可看出葉酸強化前後對同半胱胺酸有何影響？
4. 為何同半胱胺酸濃度受到葉酸營養狀況的影響？
5. 請根據此圖結果寫出簡短結論。

見背面

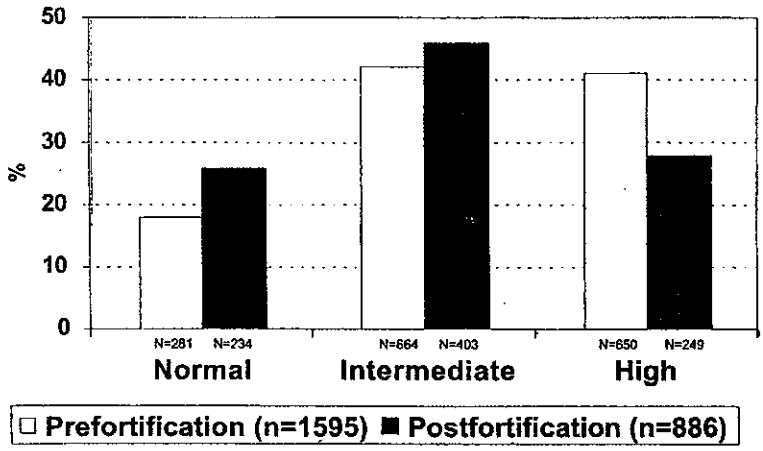


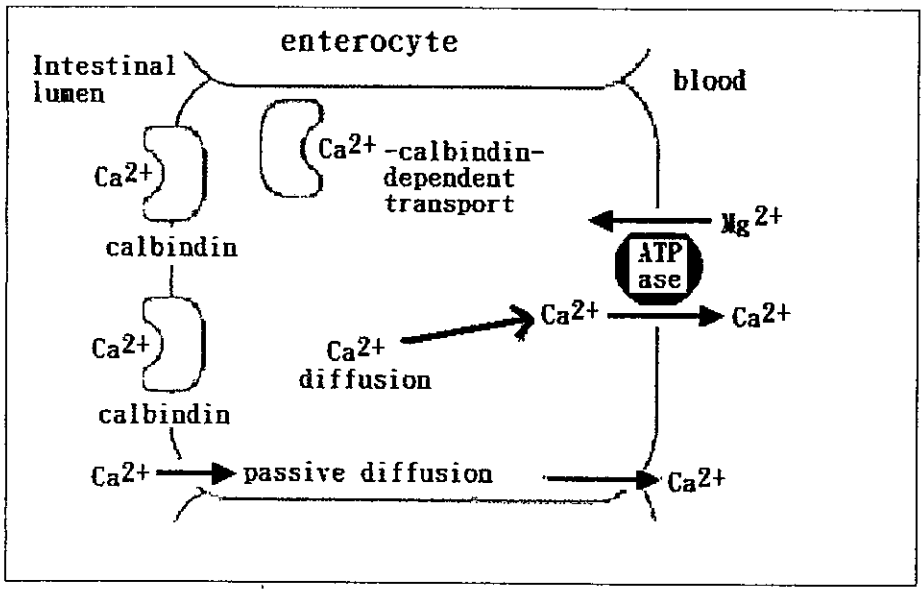
Figure 2. Effect of the folic acid fortification rule on the distribution of patients with coronary artery disease in the three homocysteine categories. Homocysteine levels were classified as normal or low (<10 μmol/L), intermediate (10 to 15 μmol/L), and high (>15 μmol/L).

2.、關於攝取牛奶的必要性長期以來一直存有爭議，飲食指南積極建議每天 1-2 杯鮮奶，但是國人大都有乳糖不耐的問題。爲了再評估奶類建議適當性，請您對乳糖不耐症提供較深度的剖析。請就以下問題提出說明 (6%)

1. 人類發生乳糖不耐症，但有些成人可以適應乳糖的攝取，請問發生與適應的分子機制(轉)是什麼?(2)
2. 乳糖不耐症是疾病嗎? 理由爲何?(2)
3. 依照以上資料，請說明您對國人的奶類攝取建議的看法或意見(2)

7、下圖是某課本上關於小腸細胞(enterocyte)對鈣吸收的分子機制圖示。由於分子營養學的快速進展，有一處錯誤應該更新。(4%)

1. 請您指出此錯誤之處，並且說明根據新知的正確分子或機制 (2%)
2. 請說明維生素 D 促進小腸細胞鈣吸收的機制 (2%)



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七、以下是從 PubMed 檢索獲得的一份關於硒與脂質代謝的文獻紀錄與摘要。請回答以下問題：(22%)

1. 這份文獻的出處爲何？爲何會有兩個年份？您將如何取得全文資料？(4%)
2. 文獻中提及以下與硒、脂質生化代謝與基因分子研究等有關之名詞，據您所知的營養生理與生化學知識，請說明各項名詞之意義與作用 (12%)
   (1) selenocysteine
   (2) selenoproteins
   (3) tRNA([Ser]Sec)
   (4) hepatocyte
   (5) ApoE
   (6) wild type mice
3. 根據以下摘要，請簡述本項研究所探討的問題，實驗的簡要程序以及主要結果 (6%)

Biochem Biophys Res Commun. 2008 Jan 18;365(3):446-52. Epub 2007 Nov 9.

Loss of housekeeping selenoprotein expression in mouse liver modulates lipoprotein metabolism.

Sengupta A, **Carlson BA**, **Hoffmann VJ**, **Gladyshev VN**, **Hatfield DL**.

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Selenium is incorporated into proteins as selenocysteine (Sec), which is dependent on its specific tRNA, designated tRNA([Ser]Sec). Targeted removal of the tRNA([Ser]Sec) gene (Trsp) in mouse hepatocytes previously demonstrated the importance of selenoproteins in liver function. Herein, analysis of plasma proteins in this Trsp knockout mouse revealed increases in apolipoprotein E (ApoE) that was accompanied by elevated plasma cholesterol levels. The expression of genes involved in cholesterol biosynthesis, metabolism and transport were also altered in knockout mice. Additionally, in two transgenic Trsp mutant mouse lines (wherein only housekeeping selenoprotein synthesis was restored), the expression of ApoE, as well as genes involved in cholesterol biosynthesis, metabolism and transport were similar to those observed in wild type mice. These data correlate with reports that selenium deficiency results in increased levels of ApoE, indicating for the first time that housekeeping selenoproteins have a role in regulating lipoprotein biosynthesis and metabolism.

試題隨卷繳回