一、選擇題（單選，共二十四題，每題二分，答錯倒扣 0.5 分）

1. Ketogenesis occurs primarily in

   A. brain
   B. heart
   C. liver
   D. intestine
   E. lung

2. One major function of the HDLs is to

   A. deliver cholesterol from the liver to non-hepatic tissues.
   B. catalyze the synthesis of LCAT.
   C. catalyze the synthesis of ACAT.
   D. transfer cholesterol from peripheral tissues to the liver.
   E. transfer cholesterol from chylomicrons to VLDLs.

3. Fatty acids enter the mitochondrial matrix for oxidation:

   A. as free fatty acid
   B. citrate serves as a carrier
   C. complexed with acyl carrier protein
   D. complexed with carnitine
   E. in the form of acyl-CoAs directly by active transport

4. Lipid storage diseases result from:

   A. abnormal or missing enzymes involved in the synthesis of complex glycolipids.
   B. abnormal or missing enzymes involved in the synthesis of fatty acids.
   C. abnormal or missing enzymes involved in the catabolism of fatty acids.
   D. defective production of lysosomes that are involved in lipid catabolism.
   E. abnormal or missing of enzymes involved in the catabolism of complex glycolipids.

(背面仍有題目,請繼續作答)

5. Your patient is a 55-year-old man with abdominal pain. Blood tests reveal very high concentrations of chylomicron, even after an overnight fast. Triglycerides are also elevated. What is the probable defect in your patient?

   A. He has a deficiency of apolipoprotein C-II.
   B. He has a deficiency of apolipoprotein B-48.
   C. He has a deficiency of apolipoprotein B-100.
   D. He has a deficiency of LDL receptor.
   E. He has a deficiency of HMG-CoA reductase.

6. The major function of bile acids is to:

   A. form the core of HDLs, allowing them to remove cholesterol from membranes.
   B. form the surface of VLDLs in order to prevent loss of cholesterol.
   C. provide precursor carbons for cholesteryl ester synthesis
   D. aid in the emulsification of dietary lipids.
   E. form the core of VLDLs to which cholesteryl esters attach.

7. During fasting or starvation, the brain receives energy in the form of

   A. acetyl-CoA
   B. acetoacetyl-CoA
   C. hydroxylmethylglutaryl-CoA
   D. γ-hydroxybutyrate
   E. glucose

8. Familial hypercholesterolemia is characterized by

   A. an increase in cholesterol biosynthesis beyond the needs of the body.
   B. defects in LDL receptor structure and/or function.
   C. defects in the synthesis of the apoprotein responsible for activation of lipoprotein lipase.
   D. an increase in the hepatic synthesis of VLDLs.
   E. a decrease in the ability of liver take up chylomicron remnants.

9. Nucleotides are derived from nucleosides by

A. the addition of phosphate to the 3'-OH of the ribose
B. the addition of phosphate to the 5'-OH of the ribose
C. the addition of ribose to a purine or pyrimidine base
D. the removal of phosphate to the 3'-phosphate of the ribose
E. the removal of phosphate from the 5'-phosphate of the ribose

10. The purine nucleotide cycle is the mechanism by which skeletal muscle acquires fumarate, the TCA cycle intermediate, during;

A. the interconversion of GMP to AMP
B. the interconversion of GMP to IMP
C. the interconversion of ATP to GTPP
D. the interconversion of IMP to AMP
E. the interconversion of ADP to GDPP

11. Catabolism of deoxythymine can feed the TCA cycle in the form of:

A. malonyl-CoA
B. succinyl-CoA
C. acetyl-CoA
D. fumarate
E. aspartate

12. Synthesis of PRPP is predominantly controlled by which nucleotide

A. TTP
B. GTP
C. CTP
D. ATP
E. UTP

13. Folate analogs are useful anticancer drugs because:

A. they inhibit thymidine kinase
B. they inhibit ribonucleotide reductase by increasing the production of dATP
C. they inhibit thymidylate synthase

(背面仍有題目,請繼續作答)

D. they activate purine nucleoside phosphorylase, thereby inhibiting purine salvage
E. they inhibit dihydrofolate reductase

14. The conversion of one mole of glyceraldehyde-3-phosphate to one mole of pyruvate by the glycolytic pathway results in a net formation of

A. one mole of NADH and one mole of ATP.
B. two moles of NADH and one mole of ATP.
C. one mole of NADH and two moles of ATP.
D. two moles of NADH and four moles of ATP.
E. two moles of ATP.

15. Glycogen phosphorylase

A. catalyzes a hydrolytic cleavage of $\alpha(1\rightarrow 4)$ bonds.
B. catalyzes a cleavage of $\beta(1\rightarrow 4)$ bonds.
C. uses glucose-6-phosphate as a substrate.
D. is activated by phosphorylation.
E. none of the above.

16. Which of the following would occur upon addition of 2,4-dinitrophenol to a suspension of mitochondria carrying out oxidative phosphorylation?

A. phosphorylation reaction would proceed.
B. oxygen consumption would decrease.
C. oxygen consumption would increase.
D. substrate oxidation would not proceed.
E. none of the above.

17. Fructose-2,6-bisphosphate

A. is a positive modulator of phosphofructokinase-1.
B. is synthesized by the enzyme phosphofructokinase-1.
C. inhibits glycolysis in liver.
D. stimulates gluconeogenesis in liver.
E. activates cAMP-dependent protein kinase.

18. In the urea cycle, ornithine transcarbamoylase catalyzes:

A. formation of urea from arginine.
B. formation of ornithine from citrulline and other reactants.
C. transamination of arginine.
D. formation of citrulline from ornithine and other reactants.
E. cleavage of urea to ammonia.

19. The metabolic defect of human genetic disease, maple syrup urine disease, involves:

A. transamination of amino acids.
B. oxidative decarboxylation.
C. a deficiency of the vitamin pyridoxal.
D. uptake of branched chain amino acids into liver.
E. synthesis of branched chain amino acids.

20. The metabolic defect of human genetic disease phenylketonurea involves:

A. synthesis of phenylketones.
B. inability to catabolize ketone bodies.
C. inability to convert phenylalanine to tyrosine.
D. uptake of phenylalanine.
E. inability to catabolize phenylketones.

21. Serine and cysteine may enter the citric acid cycle after conversion to :

A. oxaloacetate.
B. succinate.
C. succinly-CoA.
D. propionyl-CoA.
E. pyruvate.

22. Which of the following amino acids are pure glycogenic?

1. histidine.
2. valine

(背面仍有題目,請繼續作答)

3. proline
4. isoleucine
5. glutamine

A. 1 and 5
B. 2 and 4
C. 2, 3 and 4.
D. 1, 3 and 5.
E. 2 ,4 and 5

23. The amino acid that does not derive its carbon skeleton, at least in part, from α-ketoglutarate is:

A. glutamate.
B. lysine.
C. proline.
D. arginine.
E. glutamine.

24. δ-aminolevulinic acid is formed from :

A. serine and succinyl-CoA.
B. serine and glycine.
C. threonine and succinyl-CoA.
D. threonine and acetyl-CoA.
E. glycine and succinyl-CoA.

二、選擇題（單選，共七題，每題二分，答錯倒扣 0.5 分）

Answer the following questions using the key outlined below:

(A) if 1, 2, and 3 are correct
(B) if 1 and 3 are correct
(C) if 2 and 4 are correct
(D) if only 4 is correct
(E) if all four are correct

25. Types of covalent modifications that control the activities of enzymes include

1. phosphorylation.
2. adenylylation.
3. ADP-ribosylation.
4. glycosylation.

26. The reaction in glycolysis that results in the formation of an energy-rich compound is catalyzed by

1. pyruvate kinase.
2. enolase.
3. phosphoglycerate kinase.
4. glyceraldehyde-3-phosphate dehydrogenase.

27. The oxidative decarboxylation of pyruvate to acetyl-CoA by pyruvate dehydrogenase requires the participation of

1. NAD^+.
2. FAD.
3. lipoic acid.
4. thiamine pyrophosphate.

28. Citrate

1. acts to transport acetyl-CoA to the cytosol from the mitochondrial matrix.
2. regulates glycolysis by activating phosphofructokinse-1.
3. stimulates synthesis of fatty acids.
4. inhibits acetyl-CoA carboxylase.

29. Activity of the citric acid cycle is decreased when

1. [AMP] is high.
2. the ratio of [NADH]/[NAD^+] is high.
3. [oxaloacetate] is high.
4. the ratio of [ATP]/[ADP] is high.

(背面仍有題目,請繼續作答)

30. Which of the following compounds can serve as the starting material for the synthesis of glucose via gluconeogenesis?

1. Oxaloacetate
2. Acetate
3. Glycerol
4. Palmitate

31. Glucagon in liver

1. acts by increasing the concentration of cAMP.
2. activates glycogen phosphorylase and inactivates glycogen synthase.
3. inhibits glycogen synthesis.
4. has the same effect as insulin.

三、選擇題（單選，共四題，每題一分，答錯倒扣 0.25 分）

32. Which of the following statements about pentose phosphate pathway is **INCORRECT** ?

A. It is a reductive pathway; it produces NADPH.
B. It generates CO_2 from C-6 of glucose.
C. It is active in lactating mammary gland.
D. It provides precursors for the synthesis of nucleic acids.
E. None of the above.

33. Glucose-6-phosphatase is absent in the

A. liver.
B. kidney cortex.
C. muscle.
D. small intestine.
E. none of the above.

34. Which one of the following enzymes catalyzes the formation of oxaloacetate during gluconeogenesis.

A. Malic enzyme
B. Pyruvate kinase
C. Pyruvate dehydrogenase
D. Pyruvate carboxylase
E. None of the above

35. Which of the following amino acids is NOT essential in the diet of humans?

A. lysine
B. phenylalanine
C. valine
D. cysteine
E. threonine

四、簡答題及問答題

36. Melittin is a protein in bee venom that activates phospholipaseA_2. How might this effect contribute to the local inflammation that is caused by bee stings? (3%)

37. What would be the effect on fatty acid synthesis of an increase in intramitochondria oxaloacetate level? Briefly explain your answer. (3%)

38. Explain the biochemical basis for the fact that one can synchronize cell populations by treating them with deoxythymine. (3%)

(背面仍有題目,請繼續作答)

39. Your patient has breast cancer. You are treating her with 5-fluorouracil (5-FU). She has very severe neurological reaction to 5-FU. Her urinary of uracil and thymine are very high. (a) Name the defective enzyme and show the reaction that it catalyzes. (b) Show the pathways in which this enzyme plays a part. (c) Why do you think the 5-FU was so toxic for your patient? (5%)

40. Describe the biological roles of the following molecules in the cell ? (20%)

A. inositiol triphosphate
B. glucagon
C. diacylglycerol
D. fructose 2,6-bisphosphate
E. G protein