考生注意事項：所有考題務必在答案卷上作答，在問題卷上作答者不計分。

I. 選擇題（1-16 題，每題一分，均為單選，答錯倒扣 0.25 分）

1. Which of the following is the largest energy reserve in human?

A. Blood glucose.
B. Adipose triacylglycerol.
C. Liver glycogen.
D. Muscle glycogen.
E. Muscle protein.

2. Under the stress condition adipose tissue responds to hormone by

A. stimulating the deposition of fat.
B. increasing the amount of pyruvate kinase.
C. stimulating hormone sensitive lipase.
D. inhibiting the glycolysis.
E. stimulating the glycerol kinase.

3. The enzyme catalyzed the regulatory step in cholesterol biosynthesis is

A. HMG-CoA synthase.
B. mevalonate kinase.
C. Sequalene monooxygenase.
D. HMG-CoA reductase.
E. none of the above.

4. α-glycerol 3-phosphate, an important intermediate in the triacylglycerol biosynthesis in adipose tissue is mainly derived from

A. the glycolysis pathway.
B. the action of glycerol kinase.
C. the citric acid cycle.
D. the pentose cycle.
E. none of the above.

(背面仍有題目,請繼續作答)

5. Which of the following metabolites is the carrier of fatty acid to cross the inner mitochondrial membrane for oxidation?

A. Fatty acyl CoA.
B. Malonyl CoA.
C. Acetyl CoA.
D. Fatty acyl carnitine.
E. None of the above.

6. In the process of oxidation, a fatty acid with an odd number of carbons will enter the citric acid cycle as acetyl CoA and

A. α-ketoglutarate.
B. malate.
C. succinyl-CoA.
D. citrate.
E. butyrate.

7. Which of the following compounds is not an intermediate in the synthesis of cholesterol from acetylCoA?

A. Isopentenyl pyrophosphate.
B. Mevalonate.
C. β-hydroxy-β-methylglutaryl-CoA.
D. Malonyl CoA.
E. Squalene.

8. In the synthesis of phosphatidylcholine from phosphatidylethanolamine, the methyl group donor is

A. methanol.
B. s-adenosylmethionine.
C. a tetrahydrofolate derivative.
D. choline.
E. serine.

9. The common structural feature for all prostaglandins is

A. 20 carbons atoms.
B. a oxygen-containing internal heterocyclic ring.
C. A peroxide group at C-15.
D. Two double bonds.
E. A ketone group.

10. Which of the following scientists won the Noble Prize in physiology and medicine in 1985 for their discovery of LDL pathway?

A. Smith and Brown.
B. Brown and Goldstein.
C. Bornstein and Smith.
D. Wang and Bornstein.
E. Bloch and Huang.

11. Malonyl CoA is formed from acetylCoA by the action of acetylCoA carboxylase and is an important intermediate in the fatty acid biosynthesis. It also regulates lipid metabolism by inhibiting

A. fatty acid synthase.
B. cylcarnitine transferase I.
C. β-oxidation of fatty acids.
D. HMG-CoA reductase.
E. all of the above.

12. Which of the following compounds is an important intermediate for both triacylglycerol and phospholipids biosynthesis?

A. Diacylglycerol.
B. Phosphatidic acid.
C. CDP-diacylglycerol.
D. α-glycerol-3-phosphate.
E. None of the above.

13. Which of the following enzymes is specifically for the formation of estrogen or estradiol, that removes carbon 19 on the cholesterol ring?

A. Side chain cleavage enzyme.
B. 11β-hydroxylase.
C. 21 hydroxylase.
D. Aromatase.
E. None of the above.

14. Progesterione, one of the female steroid hormones produced from cholesterol, is a compound of

A. 18 carbons.
B. 19 carbons.
C. 20 carbons.
D. 21 carbons.
E. 22 carbons.

15. The cholesterol present in LDL once entering the cell will

A. enhance the activity of ACAT.
B. is converted to cholesterol.
C. Inhibits the replenishment of LDL receptors.
D. Inhibits the activity of HMCo reductase.
E. do all of the above.

16. In well –fed state, not only glucose uptake is increased, fat deposition is also increased, because

A. NADH is increased.
B. activity of Kreb's cycle is slowed down due to high NADH.
C. formation of α-glycerol-3-phosphate in the adipose tissue is increased.
D. citrate is accumulated.
E. all of the above.

II. 選擇題（17-29 題，每題二分，均為單選，答錯倒扣 0.5 分）

17. Which of the following enzymes results in formation of an enzyme-substrate covalently linked intermediate ?

A. Ribonuclease A
B. Alcohol dehydrogenase
C. Lysozyme
D. Chymotrypsin
E. All of the above

18. Which of the following inhibitor types can be expected to decrease the K_m and V_{max} of an enzyme ?

A. Competitive
B. Noncompetitive
C. Uncompetitive
D. Irreversible
E. V class allosteric

19. The mechanism of an amino transferase catalyzed reaction is a

A. Ping-Pong mechanism.
B. sequential order mechanism.
C. sequential random mechanism.
D. Theorell-Chance mechanism.
E. irreversible reaction.

20. The prosthetic group for most of carboxylation reactions, such as pyruvate carboxylase is

A. vitamin A.
B. folic acid.
C. vitamin B_{12}
D. biotin
E. pyridoxal phosphate

(背面仍有題目,請繼續作答)

21. Deficiency of which cofactor could lead to capillary fragility ?

A. Folic acid
B. Vitamin K
C. α-tocopherol.
D. cholecalciferol
E. ascorbic acid

22. Lactate dehydrogenase is a tetrameric enzyme containing only two distinct subunits. How many forms of lactate dehydorgenase isoenzymes do exist ?

A. 2
B. 3
C. 4
D. 5
E. 6

23. In the enzyme catalyzed reaction

$$E + KS \rightleftharpoons ES \longrightarrow E + P$$

When the substrate concentration [S] is very low, the reaction order in term of [S] is:

A. zero order
B. first order
C. second order
D. third order
E. a fraction order between first and second

24. The slope of Lineweaver-Burk double-reciprocal plot is:

A. V_{max}/K_m.
B. $1/V_{max}$.
C. V_{max}.
D. K_m.
E. Km/V_{max}.

25. The amide nitrogen of glutamine:

A. can be recovered as ammonia by the action of glutaminase.
B. is used in the synthesis of asparagine, purine and pyrimidines.
C. is a major source of ammonia for urinary excretion.
D. is a nontoxic transport form of ammonia.
E. all of the above are correct.

26. An inability to generate tetrahydrobiopterin might be expected to:

A. inhibit the normal degradative pathway of phenylalanine.
B. lead to albinism.
C. reduce the body's ability to transfer one-carbon unit.
D. have little effect on the production of catecholamines.
E. all of the above are correct.

27. All of the following are correct about ornithine **EXCEPT** it:

A. may be formed from or converted to glutamic semialdehyde.
B. plays a major role in the urea cycle.
C. can be converted to proline.
D. is a precursor of putrescine, a polyamine
E. is a ketogenic amino acid.

28. S-adenosylmethionine:

A. contains a positively charged sulfur (sulfonium) that facilitates the transfer of substituents to the suitable acceptors.
B. yields cysteine in the reaction in which the methyl is transferred.
C. donates a methyl group in an irreversible reaction
D. provides the carbons for the formation of cysteine.
E. forms sulfur conjugates for detoxification of compounds.

29. All the following are correct about glutathione **EXCEPT** it:

A. participates in transport of amino acids across cell membranes
B. scavenges peroxides.
C. forms sulfur conjugates for detoxification of compounds
D. converts methemoglobin to hemoglobin.
E. is synthesized from glutamate, methionine and glycine.

(背面仍有題目,請繼續作答)

III. 選擇題（30-39 題，每題二分，均為單選，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

30. 6-Phosphofructo-1-kinase is inhibited by
    1. ATP at high concentration.
    2. AMP.
    3. citrate.
    4. decreased concentration of fructose-2,6-bisphosphate.

31. Which of the following enzymes is involved in gluconeogenesis but not in glycolysis?
    1. Enolase
    2. Phosphoglycerate kinase
    3. pyruvate kinase
    4. Phosphoenolpyruvate carboxykinase

32. Glycosaminoglycans
    1. are high molecular weight polycationic substances.
    2. are the carbohydrate portion of proteoglycans.
    3. are made up of long homopolysaccharide chains.
    4. contain large segments of a repeating unit typically consisting of a hexosamine and a uronic aicd.

33. The oxidative phase of pentose phosphate pathway includes
    1. the production of two molecules of NADPH.
    2. the production of a CO_2 molecule.
    3. the production of ribulose-5-phosphate by the enzyme 6-phosphogluconate dehydrogenase.
    4. the conversion of ribulose-5-phosphate to xylulose-5-phosphate.

34. Glycogen phosphorylase

1. catalyzes phosphorolysis of the α(1-->4) bonds of glycogen.
2. catalyzes a hydrolytic cleavage of α(1-->4) bonds of glycogen.
3. removes glucose residues from the nonreducing ends of the glycogen chains.
4. is regulated by phosphorylation only.

35. Which of the following statements is correct in the conversion of glyceraldehyde-3-phosphate to 1,3-bisphosphoglycerate?

1. It is an oxidation process.
2. It generates a high-energy compound.
3. The reaction mechanism involves the formation of a thiohemiacetal intermediate.
4. The reaction mechanism involves a phosphorolytic cleavage reaction.

36. Glycogen synthase

1. is covalently regulated by phosphoprotein phosphatase.
2. is activated by glycogen phosphorylase kinase.
3. involves addition of a glucose residue at the nonreducing end of the growing polymer.
4. is activated by Ca^{2+} and diacylglycerol.

37. Glycogenin

1. is the gene that encodes glycogen synthase.
2. is the enzyme that regulates the synthesis of glycogen.
3. catalyzes the formation of branches in glycogen.
4. is the enzyme on which new glycogen chains are initiated.

38. Pyruvate carboxylase

1. is an anaplerotic reaction for TCA cycle.
2. requires thiamine pyrophosphate as a coenzyme.
3. is activated by acetyl-CoA.
4. catalyzes the oxidative decarboxylation of pyruvate.

(背面仍有題目,請繼續作答)

39. The major enzymes or proteins functioning as electron-transfer components in the mitochondrial electron-transfer systems are

1. iron-sulfur proteins.
2. flavin-linked dehydrogenases.
3. NAD^+-linked dehydrogenases.
4. cytochromes.

IV. 問答題（40-45 題，共三十八分，配分如題目說明）

40. 質體 DNA 常被利用於剪接構築基因，質體 DNA 之純屬與濃度常影響各項生化反應，如何鑑定質體 DNA 之純屬及濃度，而如所用之原理為何？ (5%)

41. 分析生物體核酸之組成時除一般的 ATGCU 等五個鹼基外，常發現一些微量的鹼基，它們是如何產生的有何生物特性上的意義？ (5%)

42. 微菌感染時，有時醫師會以 5-Fluorocytosine 治療，請問治療機制為何？ (7%)

43. 請敘述 Gout （痛風）形成的原因及治療方式 (7%)

44. Please draw the chemical structures of aspartic acid, threonine, valine and lysine. (6%)

45. Please describe the biochemical properties of homeodomain and its biological function. (8%)