生化所

國立成功大學八十學年度 入学 考試(中间代谢 試題) 共 3 頁 第 1 頁

* 所有考題務必在答案卷上作答，在问题卷上作答为无效。

一. 選擇題(每題兩分)

1. Which of the following bases is (are) purine?

   A. adenine
   B. uracil
   C. thymine
   D. none of the above
   E. all of the above

2. If a cultured mammalian cell cannot grow in HAT medium, which enzyme is deficient in this cell line?

   A. Uridine kinase or cytidine kinase
   B. Dehydrofolate reductase
   C. HGPRTase or thymidine kinase
   D. Ribonucleotide reductase
   E. Xanthine oxidase or adenosine kinase

3. Which of the following amino acids is necessary for IMP de novo synthesis?

   A. Glutamic acid
   B. Lysine
   C. Leucine
   D. Glycine
   E. Cysteine

4. Which of the following statements about the disorder of nucleotide metabolism is INCORRECT?

   A. Gout is a disorder of pyrimidine metabolism.
   B. Lesch-Nyham syndrome is caused by the deficiency of HGPRTase (hypoxanthin guanine phosphoribosyl transferase)
   C. Orotic aciduria is a disorder of pyrimidine metabolism
   D. Xanthinuria is caused by the deficiency of xanthine oxidase
   E. None of the above

5. Which of the following statements about the de novo biosynthesis of purine nucleotides is correct

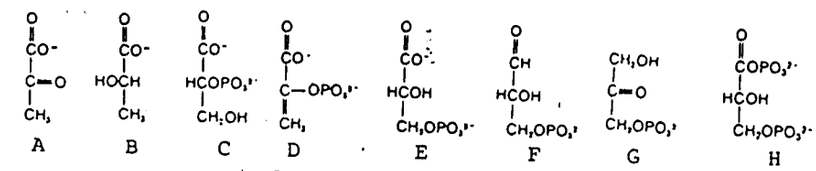
   A. 5-phosphoribosyl-1-pyrophosphate(PRPP) is a key intermediate and is synthesized in reaction catalyzed by PRPP synthetase utilizing ribose-1-p and ATP
   B. Synthesis of AMP from inosinic acid requires NAD and aspartic acid.
   C. Aspartate and glycine form part of the ring system of purine.
   D. The formation of 5-phosphoribosylamine (PRA) is the committed step. This reaction is catalyzed by PRPP amino transferase utilizing ATP and glutamine.
   E. In de novo purine biosynthesis, the ring of purine is formed before the the ribose phosphate is attached.

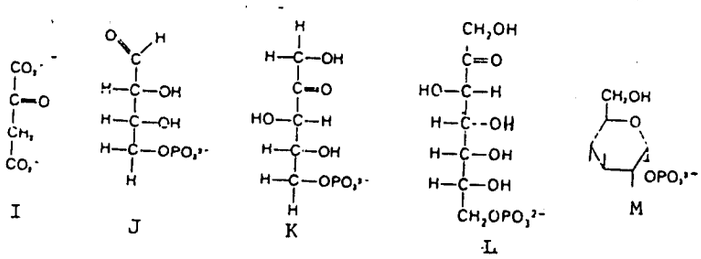
6. Match the enzyme with its substrate(s) and product(s). (14%)

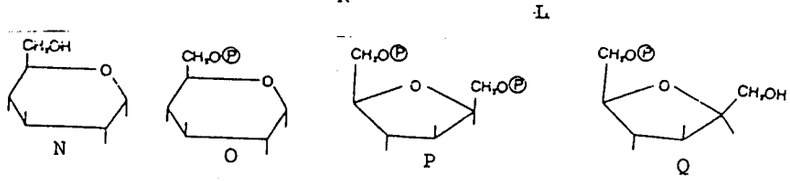
Substrates	Products	Enzymes
_____	_____	pyruvate kinase
_____	_____	6-phosphofructo-1-kinase
_____	_____	glucose-6-phosphatase
_____	_____	lactate dehydrogenase
_____	_____	phosphoglycerate mutase
_____	_____	phosphoenolpyruvate carboxykinase
_____	_____	pyruvate carboxylase
_____	_____	triose phosphate isomerase

2-2

_____	_____	phosphoglycerate kinase
_____	_____	enolase
_____	_____	aldolase
_____	_____	phosphoglucomutase
_____	_____	transaldolase
_____	_____	transketolase







NAD⁺	NADH + H⁺	ADP^{3-}	ATP^{4-}	GTP^{4-}	GDP^{3-}	CO_2	H_2O	P_i^{2-}
R	S	T	U	V	W	X	Y	Z

二. 填充題 (8%)

7. Heme, is an Fe-containing prosthetic group that is an essential component of many proteins, notably hemoglobin, myoglobin, and cytochrome. The overall pathway of heme biosynthesis is shown in the following equation. Name the components (A, B, D) and coenzyme (C).

$$8\underline{A} + 8\underline{B} \xrightarrow{\text{coenzyme(C)}} 8\ \underline{D} \xrightarrow{\text{coenzyme(C)}}$$

$$4\ \text{porphobilinogen} \xrightarrow{\text{condensation}} 1\ \text{uroporphrinogen III} \xrightarrow[\text{modification}]{} \text{heme}$$

A _____

B _____

C _____

D _____

三. 問答題:

8. What are the functions of glycogen stores in muscle and liver. (2%)

9. What would be the effect of carbohydrate deprivation on the utilization of fats for energy? (3%)

10. If your diet were totally devoid of carbohydrate, would it be better to consume odd-or even-number fatty acids? Explain. (3%)

11. Discuss the regulation of pyruvate dehydrogenase complex. (4%)

12. Several equivalents of ATP are required for the biosynthesis of a mole of urea. The ATP is consumed in the formation of two intermediates of the urea cycle, carbamoyl phosphate and argininosuccinate. Give the equation for the formation of these two intermediates. (4%)

13. Describe a shuttle scheme for production of cytosolic NADPH that utilizes the NADP-dependent malate enzyme and other enzymes known to be in the mitochondrial and cytosolic compartments. (4%)

14. In severe diabetics the acetyl-CoA produced during β oxidation in the liver exceeds the capacity of the citric acid cycle, the excess acetyl-CoA reacts to form the ketone bodies. Although acetyl-CoA is not toxic, the mitochondrion must divert the acetyl-CoA to ketone bodies. Why? (4%)

15. Explain why low density lipoprotein (LDL) receptor is important in regulating plasma cholesterol level? (5%)

16. The adenylate cyclase is coupled with receptor and activated by the G protein, what is the role of GTPase in the process of CAMP formation? (5%)

17. Describe the role of calmodulin in the regulation of glycogenolysis. (5%)

18. Describe the molecular mechanism of the regulation of glycolysis and gluconeogenesis by fructose 2,6-bisphosphate. (5%)

19. A sample of 3-^{14}C-alanine is injected into a rat. After 1 h the animal is sacrificed, the liver removed, and the lipids extracted. The isolated plamitate contains ^{14}C Explain. What is the location of ^{14}C in the isolated palmitate? Can alanine be used as a precursor for the net synthesis of new palmitate? (6%)

20. What is the effect of pernicious anemia on the catabolism of amino acids. (6%)

21. The activity of alanine transaminase is usually measured by including an excess of pure lactate dehydrogenase and NADH in the reaction system. The rate of alanine disappearance is equal to the rate of NADH disappearance measured spectrophotometrically. How does this work? explain. (6%)

22. Methionine is the principle source of methyl groups that are transferred to many diverse acceptors. It has to be activated as the donor of methyl groups. Give the equation for the formation of the activated methionine in vivo and the structure of the activated methionine. (6%)