總分100分 ；I 30分選擇題, 15題; II. 40分問答題A組, 5題; III. 30分問答題B組, 4題

I. 選擇題 (2 points each; total 30 points)

1. Zymogens are activated by:
   A. Peptide bond hydrolysis
   B. Proline isomerization
   C Ubiquitylation
   D. Phosphorylation
   E. Salt bridge formation
2. People with urea cycle defects need to maintain a high caloric diet. Which of the following is the best for this?
   A. It is essential that they have enough energy to continually produce large quantities of arginine for direct nitrogen disposal.
   B. The extra calories ensure that they will have minimal dependence on the TCA cycle, a cycle intimately linked to the urea cycle.
   C. They need to avoid further stressing the liver by ensuring that gluconeogenesis is kept down regulated.
   D. A high caloric diet allows them to dispose of more of their excess nitrogen as uric acid.
   E. A high caloric diet prevents the breakdown of muscle protein to amino acids.
3. Liver damage and liver disease cause an increase in blood bilirubin. Which of the following correctly describes the normal metabolism of bilirubin.
   A. Bilirubin is produced by the breakdown of heme, is transported to and conjugated in the liver, and is then secreted with other bile components into the small intestine.
   B. Bilirubin is a by-product of heme synthesis that is conjugated with glucuronic acid in the liver.
   C. Bilirubin is produced when heme metabolism is blocked due to liver dysfunction.
   D. Bilirubin is a small protein that gets glycosylated in the liver before it can be disposed of.
   E. Bilirubin is produced by the breakdown of heme and is transported to the liver where it is further metabolized to TCA cycle intermediates.
4. Which of the following best describes the role of vitamin B 12 (cobalamine) is involved in folate metabolism.
   A. to help the intestine absorb folate from the diet.
   B. to be required for the electron transfer between the various forms of folates.
   C. to be a cofactor of an enzyme involved in regenerating one of the forms of folate.
   D. to be a cofactor of dihydrofolate reductase.
   E. to transfer acetyl groups between the various forms of folates.
5. Fatty acid oxidation take places in:
   A. peroxisomes, mitochindria, lysosome
   B. mitochondria, peroxisomes, endoplasmic reticulum
   C. endoplasmic reticulum, mitochondria, Golgi
   D. peroxidsomes, endoplasmic reticulum, Golgi
   E. mitochondria, lysosome, Golgi
6. Which of the following is not correct concerning aminoacyl-tRNA synthetases?
   A. they are able to recognize and hydrolyze incorrect aminoacyl-tRNAs that may have been produced.
   B. interaction with the tRNA can occur in the anticodon region and on the inside of the tRNA “L” structure
   C. there is a separate aminoacyl-tRNA synthetase for every amino acid
   D. only A and C are correct.
   E. all are correct.
7. Puromycin
   A. enhances the concentration of GTP within the cell
   B. effectively accelerates the synthesis of a protein
   C. accelerates the binding of a protein to the ribosomal complex
   D. effectively terminates the synthesis of a protein prematurely
   E. block the necessary initiation factors required for protein synthesis

（背面仍有題目,請繼續作答）

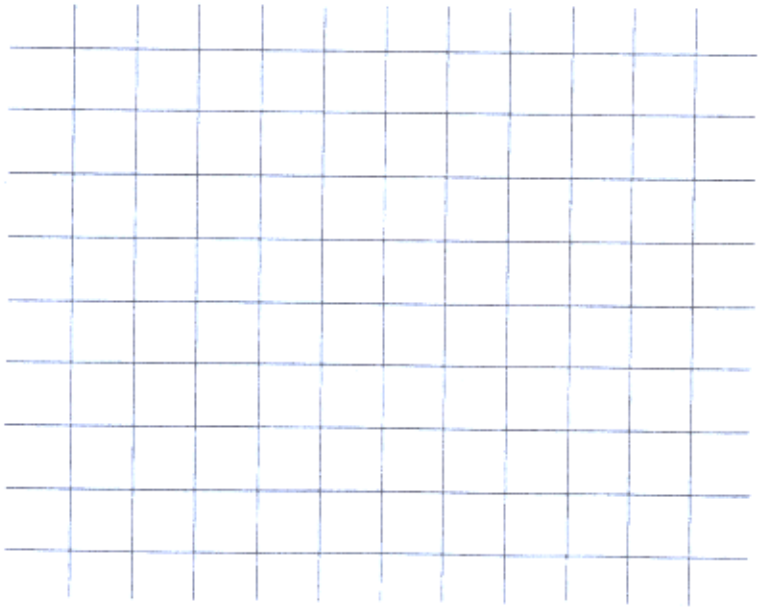
8. Which of the following is not a detection method for DNA detection?
   A. autoradiography
   B. DNase reactions
   C. color dye detection
   D. fluorescence dye detection
   E. chemoluminescence reactions
9. Which is the best description of a salvage pathway in nucleotide biosynthesis? Ribonucleotides are reduced by the enzyme ribonucleotide reductase to 2' deoxynucleotides.
   A. Free purine bases are attached to fructose 6-phosphate generated by the pentose phosphate pathway to make nucleotides.
   B. Free purine or pyrimidine bases are attached to 5-phosphoribosyl-1-pyrophosphate PRPP) to make nucleotides.
   C. Uric acid is reduced to form the nucleotides GMP or AMP.
   D. Nucleosides are phosphorylated with both specific and general kinases to make nucleoside monophosphates, diphosphates and triphosphates.
   E. None
10. The major enzymes involved in processes of detoxication via increase of solubilization of hydrophobic xenobiotics are:
   A. cytochromes P_{450} and sulfotransferases
   B. superoxide dismutase and catalase
   C. cytochromes b_5 and glutathione peroxidase
   D. cytochromes P_{450} and NADPH oxidase
   E. cytochromes b_5 and glucuronyl transferases
12. People who have genetic defects in either carbamoyl phosphate synthetase I, ornithine transcarbamoylase or arginosuccinate synthetase are often given the aromatic acids benzoate and phenylacetate as part of their life-long treatment. Why?
   A. These aromatic acids can be converted to the purine nucleotide inosine monophosphate, allowing these people to synthesize sufficient quantities of ATP and GTP.
   B. These components can enter the TCA cycle by anaplerotic pathways, allowing the liver to produce the needed glucose by gluconeogenesis.
   C. These compounds can be decarboxylated to form the neurotransmitters dopamine and serotonin, essentially bypassing the need for these enzymes.
   D. The metabolism of these compounds involves attachment of a non-essential amino acid, followed by their excretion, ultimately lowering the concentration of excess nitrogen in the body.
   E. none
13. The brush border complex that is responsible for hydrolyzing oligosaccharides is:
   A. glucoamylase.
   B. sucrase-isomaltase.
   C. α-amylase.
   D. β-galactosidase.
   E. trehalase.
14. Phenylketonuria, alcaptonuria and albinism are all caused by deficiencies in enzymes involved in the metabolism of
   A. tyrosine
   B. urea
   C. tryptophan
   D. AMP
   E. threonine
15. In prokaryotes the N-terminal amino acid is
   A. methionine.
   B. N-acetyl-methionine.
   C. glutamine.
   D. N-acetyl-glucosamine.
   E. N-formyl-methionine.

II. 問答題 A 組 (total 40 points)

1. (8 points) short answers for the following question
   a. List the three major forms in which energy is stored
   b. The two types of gradients that are created by the electron transport (respiratory) chain are:_
   d. Citric acid cycle activity is boosted by increased concentration of: _____
2. (3 points) Which organ is the most responsible for de novo cholesterol biosynthesis and what is the key regulated enzyme in this pathway?
3. (10 points) What class of metabolites can be found at high concentrations in the blood of undiagnosed Type I diabetics, and in people who have starved for 10 days?
   What is the biochemical explanation for the high level of these metabolites in: Diabetes?
   What is the biochemical explanation for the high level of these metabolites in: Starvation?
4. (10 points) Indicate the regulation of glycolysis and gluconeogenesis in a hepatocyte if the phosphofructokinase-2 enzyme lacked any residues that could be phosphorylated by protein kinase.
5. (9 points) The steady state kinetics of an enzyme are studied in the absence and presence of an inhibitor (inhibitor A). In this case, two different concentrations of inhibitor are used. Data are as follows.

	V[(mmol/L)min^{-1}]		
[S] (mmol/L)	No inhibitor	3 mM inhibitor A	5 mM inhibitor A
1.25	1.72	1.25	1.01
1.67	2.04	1.54	1.26
2.5	2.63	2.00	1.72
5.0	3.33	2.86	2.56
10.0	4.17	3.70	3.49

(a) What kind of inhibitior is inhibitor A?
(b) Determine the apparent *Vmax* and K_M at each inhibitor concentration.
(c) Estimate K_I from these data.



III 問答題B組 (total 30 points)

1. (5 points) What is the principal start codon and to what amino acid does it correspond?
2. (10 points) What RNA polymerases exist in eukaryotic cells? What are their locations and their functions in vivo?
3. (10 points) Many enzymes are aggregates of identical subunits. Explain the biological advantages of this phenomenon.
4. (5 points) Which amino acids are linked in a disulfide bond?