※ 考生請注意：本試題 □可 ☑不可 使用計算機

1. Glucose uptaken by cells is catalyzed and converted to pyruvate, which can either be
   converted to lactic acid or acetyl-CoA. Acetyl-CoA then enters the tricarboxylic acid
   (TCA) cycle for ATP generation. (a), please compare the number of ATPs produced from
   one molecule of glucose if it enters TCA cycle and lactic acid metabolism, respectively.
   (b), what is the important factor(s) decide whether glucose is metabolized via TCA cycle
   or lactic metabolism? (c), in cancer cells, glucose is mainly metabolized via lactic acid
   metabolic pathway. How can cancer cells produce enough ATP to support their growth?
   (25%)

2. What are branched-chain amino acids? What are the functions of these branched-chain
   amino acids in normal human cells? What happens if there are excessive amounts of
   branched chain amino acids in our body? How are they metabolized so the cells will not
   have excessive amount of branched-chain amino acids? (25%)

3. 5 fluorouracil, a uridine derivative, is transformed by the cell into fluorodeoxyuridylate, a
   powerful irreversible inhibitor of thymidylate synthase. Clinical experiments have
   demonstrated that 5 fluorouracil can inhibit the growth of rapidly dividing cancer cells.
   Please explain the biochemical nature how 5 fluorouracil can be used as anti-cancer drug.
   (20%)

4. In contrast to proteins found in the cytosol, many membrane-embedded proteins are
   virtually impossible to remove from the membrane into aqueous solution. Propose a
   simple method to extract membrane proteins into aqueous solution and explain the basis
   of such method. (20%)

5. If a protein contains 100 amino acids, how many nucleotides will be present in the gene
   that encodes for this protein? (10%)