

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

A. Bacteriology (50%)

Since the dawn of humanity, bacteria has been co-existing with people from the day they were born. In addition, bacteria can also be found everywhere in nature. In recent years, the study of the human microbiome has been very popular due to increasing evidence that bacteria that resides on or inside of us can affect our health in many ways. Below you will find 5 questions that will test your knowledge and logical reasoning in this exciting field of microbiology.

1. The study of microbiology can be divided into bacteriology, virology, parasitology, and mycology. Please describe the differences between bacteria and virus. (5 pts)
2. Please give a short description of what you think "microbiome" means. (5 pts)
3. On top of our skin, inside our mouth, throat, and the intestine are full of bacteria. Please describe at least 1 example of how bacteria inside our body can help us to maintain a healthy body. (10 pts)
4. When a person is infected with bacteria, the most common treatment is antibiotic use. Often the doctor will ask the patient to eat the antibiotics for at least 7 to 10 days due to possibility of antibiotic resistant bacteria. Please describe how bacteria can become resistant to certain antibiotics. (15 pts)
5. In Taiwan, some of the most common bacterial pathogens seen are *E. coli*, *Salmonella*, *Mycobacterium tuberculosis*, and *Streptococcus pyogenes*. Please pick 1 type of bacteria and describe how it can harm our body. Be sure to describe its gram reaction, shape, what type of toxins if any it produces, and name of diseases it can cause. (15 pts)

背面還有題目，請繼續作答。

B. Virology (50%)

Mosquito-borne human viral diseases are always a major threat to public health and society burden. Recently, these viruses catch attention globally, such as chikungunya virus, dengue virus, and zika virus. Timing and correct diagnosis for these mosquito-borne viral diseases are critical to the quality of patient recovery. However, with the similarity of early clinical presentations in patients, to make a correct diagnosis of the illness resulting from which virus during febrile stage is a major challenge task for attending physician. Fortunately, viremia is one of the salient biological features of these viruses in plasma of acute patients. As such, the following questions are your duties to assist the professional health takers to make the differential diagnosis for the virus.

6. Please list at least three technical methods that you think are helpful to differentiate these viruses (15 pts).
7. Please briefly describe each method you are proposing and address the possible interpretation of the results from your technical approach (15 pts).

We are living on earth and are sharing with many other creatures on the same planet. One of such creatures is flying birds. These birds often habitat in every corner of the world, but the weather may prompt them to migrate to different place year round. Hence, the migration paths may introduce an unprecedented human infectious agent to a new territory and initiate the spread of the novel pathogen locally. One of the notorious infectious agents is avian influenza A virus. This virus can go through genetic re-assortment and modification programs, generating a much more virulence virus to human host. For example, a bird-adapted strain of H5N1 is the highly pathogenic causative agent of human beings. There are two known ways for genetic modification programs that occur in influenza A virus, antigenic drift and antigenic shift.

8. What do the H and N stand for in H5N1? (10pts)
9. Please describe what the meaning of antigenic drift and antigenic shift is, and its potential consequence of the outcome in terms of flu endemic, respectively (10pts).