

※ 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。

生命科學試題

1. The development of Lithium-ion battery technology by Akira Yoshino created the first commercially viable lithium-ion battery in 1985. Dr. Yoshino was awarded the 2019 Nobel Prize in Chemistry along with Professor John B. Goodenough and Professor M. Stanley Whittingham. This award proved how important energy management is. Since energy storage and production are not only very important for computer appliances but also crucial for living organisms, please describe (a) what are the main energy-producing substances for human body; (b) how are these energy-producing substances stored; (c) what are the energy forms that are biological available to human cells and (d) how do our cells convert the energy sources to the biological available forms. (25%)

2. Certain microorganisms including SARS, MERS and influenza viruses have high pathogenicity for the respiratory tract. Please describe the (a) cellular and (b) acellular responses of the body when a pathogenic virus infects the respiratory tract of a healthy adult who was vaccinated with an influenza vaccine 3 months ago. (25%)

3. Patients with adult-immunodeficiency syndrome (AIDS) tend to have higher chance to develop cancers and their cancers are not well controlled by anti-tumor immunity. It was reported that these cancers are related to infections by some non-HIV viruses. Please answer: (a) why do these cancers occur more often on AIDS patients than other people? (b) why cannot immune cells control the development of these cancers? (25%)

4. Please define and explain the following biological terms (5% each)

- (a) endolysosome
- (b) reactive oxygen species
- (c) amyloid deposition
- (d) aerobic glycolysis
- (e) CRISPR-Cas9 genome editing