

Please answer a total of four questions

1. Heparin is a commonly used drug in critical care. In a **case study**, a relatively unknown and unforeseen event resulted in **clot formation**: heparin-induced thrombocytopenia and thrombosis syndrome in a 36-year-old woman who initially admitted to the coronary care unit with complaints of chest pain.

According to the theoretic basis of this syndrome, an immune-mediated response has been proposed.

1-1 Please describe 4 major processes of hemostasis in detail (12%).

1-2 Based on this case, please postulate why this patient needs heparin and how heparin works (8%).

1-3 Based on this hypothesis, please explain what is immune-mediated response and why heparin causes clot formation (5%).

2. A 58-year-old man suffered from end-stage ischemic cardiomyopathy. Later on, two episodes of **acute pulmonary edema** occurred. He died from **heart failure** 4 1/2 months after the first episode of pulmonary edema. Postmortem findings revealed an anterior left **ventricular infarct**.

2-1 Based on your understanding in edema formation, please describe all factors causing fluid accumulation in interstitial space (12%)

2-2 Based on this case, please list most possible factors causing acute pulmonary edema (4%).

2-3 According to your understanding in the regulation of cardiac output, please explain how cardiac ischemia leads to heart failure (4%)

2-4 Please explain how cardiac malfunctions lead to pulmonary edema. (5%).

(背面仍有題目,請繼續作答)

3. A 59-year-old woman presents to the emergency room with shortness of breath and chest pain on deep inspiration. She has been immobilized for the past two weeks due to fracture of her left foot and ankle. On physical exam, she is dyspneic and tachycardic with a respiratory rate of 22 and a heart rate of 100. Her lungs are clear on auscultation. There is moderate swelling of her left lower extremity. Her oxygen saturation is 93% on room air and her ECG is unremarkable. After a examination by ventilation-perfusion (V/Q) scintigraphy, it is thought that V/Q mismatch is the cause of dyspneic and tachycardic.

3-1 Please describe the physiological significance of V/Q mismatch (5%).

3-2 Based on this case, please explain why the immobilized patient has the complication of swelling of her left lower extremity on the basis of your knowledge in physiology (5%).

3-3 Please explain why V/Q mismatch causes dyspneic and tachycardic (15%).

4. Please give an example to describe the terms of membrane potential and how the potential is measured (25%).

- a. membrane potential
- b. equilibrium potential
- c. graded potential synaptic potential
- d. receptor potential
- e. pacemaker potential