

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF MEDICINE

MEDICAL SCHOOL

BACHELOR OF MEDICINE AND BACHELOR OF SURGERY DEGREE
PART I EXAMINATIONS

(MHO 1202) : RESPIRATORY & CARDIOVASCULAR SYSTEMS

DATE : DECEMBER 2005

TIME : 3 HOURS

Instructions to Candidates

Answer **all** questions

SECTION A

1. a) What are the functions of the diaphragm? (5)
b) State the three main openings of the diaphragm, the levels at which they lie and the structures they transmit. (15)
2. a) List five congenital heart abnormalities. (5)
b) Write short notes on the right atrium. (4)
3. Briefly describe the azygous veins (5)
4. Describe the blood supply of the heart. (10)
5. What are the boundaries of the superior and inferior mediastinum. (2)

SECTION B

1. a) Describe the chemical structure, and discuss the physiological and /or pathophysiological implications of those structures for each of the following.

HbF	(2)
HbS	(2)

- b) Describe (diagrammatically) the Hemoglobin dissociation curve (include normal values in your diagram). (2)

- c) A 70 Kg man presents with the following parameters.

Hb concentration 15 g/dl,
Oxygen saturation in arterial blood 90%
Oxygen saturation in venous blood 40%

Given the following:
Solubility coefficient for oxygen in blood is 0.003ml/dl/mmHg
Oxygen carrying capacity for Hb is 1.34ml/dl and assuming the normal values for oxygen partial pressures for both arterial and venous blood.

 - i) What is the oxygen content per liter of this man's arterial blood? (1)
 - ii) What is the oxygen content per liter of his venous blood? (1)
 - iii) If his cardiac output is 5 L/minute, what is the oxygen extraction ratio in the tissues? (1)
 - iv) Discuss the difference in oxygen extraction ratios of cardiac and skeletal muscle in normal individuals and the implications of these differences in the face of a diminishing cardiac output such as may occur in cardiac failure? (3)

2. Describe the uptake of CO₂ and release of O₂ from red blood cells in tissue capillaries. (4)

3. Discuss the differences in carbon dioxide carrying capacity of arterial and venous blood and the factors that contribute to these differences (2)

4. Using a diagram and explanatory notes describe the action potential of cardiac muscle and the factors that contribute to its characteristics. (4)

5. Describe the mechanism of cardiac muscle contraction and relaxation (4)

6. Discuss the effect of digoxin on cardiac muscle contractility and the mechanism of its action. (2)
7. Discuss the effect of norepinephrine on cardiac tissues and its mechanisms of action. (2)
8. Use a labeled diagram to describe the pressure volume relationship for the normal left ventricle. (4)
Indicate on your diagram how one can calculate the following:
 - a) the mechanical work done by the left ventricle (1)
 - b) the potential energy generated by the left ventricle. (1)
9. For each of the following, discuss how the pressure volume characteristics for the left ventricle change:
 - a) when there is an increase in end diastolic volume (1½)
 - b) when there is an increase in after-load. (1½)
10. Discuss the cardiovascular response to hemorrhage? (10)
11. Discuss what strategies one can use for the resuscitation of a patient who presents with acute hemorrhage. (5)

END OF EXAMINATION