

CHAPTER D — CARDIOVASCULAR PHYSIOLOGY

D1 — The Sudden Drop in Pulse Pressure

During bedside observation, a physiotherapy intern notices a patient whose systolic pressure remains stable but diastolic pressure rises during a cold exposure test. The pulse pressure narrows noticeably. The supervising physiologist asks what physiological mechanism best explains this change.

Options

- A. Increased cardiac output
- B. Peripheral vasoconstriction
- C. Reduced venous return
- D. Decreased heart rate

Reasoning

Cold exposure triggers sympathetic vasoconstriction → increased diastolic pressure → reduced pulse pressure.

Correct: B

D2 — The Silent ECG Change

A student reviewing an ECG during a lab session notices a prolonged PR interval without change in QRS or T wave morphology. The tutor asks what physiological process is most likely slowed.

Options

- A. Ventricular depolarization
- B. Atrial repolarization
- C. AV nodal conduction
- D. Purkinje fiber transmission

Reasoning

PR interval reflects AV nodal delay.

Correct: C

D3 — The Exercise Recovery Puzzle

A physiotherapy student monitors heart rate after moderate cycling exercise. One individual shows delayed heart rate recovery despite normal resting values. The tutor asks which physiological mechanism primarily governs rapid recovery.

Options

- A. Increased sympathetic discharge
- B. Withdrawal of parasympathetic tone
- C. Rapid lactate clearance
- D. Increased stroke volume

Reasoning

Post-exercise HR recovery depends on parasympathetic reactivation.

Correct: B

D4 — The Heart Sound Confusion

During auscultation practice, an intern hears a split second heart sound that widens during inspiration. The mentor asks for the physiological explanation.

Options

- A. Delayed aortic valve closure
- B. Early mitral valve opening
- C. Increased venous return to right heart
- D. Reduced pulmonary resistance

Reasoning

Inspiration increases venous return → delayed pulmonic valve closure.

✓ **Correct: C**

D5 — The Stroke Volume Debate

Two students debate why stroke volume increases during early exercise. The mentor asks which mechanism contributes most initially.

Options

- A. Increased afterload
- B. Reduced myocardial contractility
- C. Increased venous return (Frank–Starling mechanism)
- D. Increased blood viscosity

Reasoning

Early exercise → venous return ↑ → SV ↑ via Frank–Starling.

✓ **Correct: C**

D6 — The Mean Arterial Pressure Question

A physiotherapy intern calculates mean arterial pressure (MAP) and notices it remains stable despite fluctuations in systolic pressure. The tutor asks which factor primarily stabilizes MAP.

Options

- A. Baroreceptor reflex
- B. Plasma protein concentration
- C. Blood viscosity
- D. Ventricular compliance

Reasoning

Baroreceptors rapidly adjust HR and vessel tone to stabilize MAP.

Correct: A

D7 — The Regional Circulation Scenario

During a neurorehabilitation session, cerebral perfusion remains constant despite changes in systemic blood pressure. The mentor asks which physiological principle explains this.

Options

- A. Baroreceptor sensitivity
- B. Autoregulation of cerebral blood flow
- C. Increased cardiac output
- D. Reduced blood viscosity

Reasoning

Cerebral vessels autoregulate to maintain constant flow.

Correct: B

D8 — The Coronary Flow Insight

A physiotherapy student notices that coronary blood flow increases during diastole rather than systole. The tutor asks why.

Options

- A. Lower heart rate during diastole
- B. Reduced myocardial compression of vessels
- C. Increased aortic pressure
- D. Decreased oxygen demand

Reasoning

During systole, myocardial contraction compresses coronary vessels; flow improves in diastole.

Correct: B

D9 — The Blood Pressure During Exercise

A student measures blood pressure during dynamic exercise and notes increased systolic but unchanged diastolic pressure. The tutor asks why diastolic pressure remains stable.

Options

- A. Increased peripheral resistance
- B. Reduced venous return
- C. Vasodilation in exercising muscles
- D. Reduced stroke volume

Reasoning

Exercise causes vasodilation in active muscles → diastolic pressure stable.

Correct: C

D10 — The Fainting Episode

A physiotherapy intern observes a subject fainting after standing suddenly from supine position. The tutor asks which physiological failure is responsible.

Options

- A. Failure of chemoreceptor reflex
- B. Reduced oxygen extraction
- C. Delayed baroreceptor response
- D. Excess parasympathetic tone at rest

Reasoning

Orthostatic hypotension occurs when baroreceptor compensation is delayed.

Correct: C