PUZZLE
1131 – BASIC SCIENCES - PHYSIOLOGY
UNIT II – CARDIOVASUCLAR SYSTEM

Cardiac Cycle Logic Puzzle: Phase and Event Matching

Scenario: **Total marks: 10 marks**

A medical student is analyzing an ECG and pressure tracings during the cardiac cycle of a healthy adult heart. The cycle includes systole and diastole phases with key events: atrial contraction, isovolumetric contraction, ventricular ejection, isovolumetric relaxation, and rapid ventricular filling. A pathology has disrupted timing, and the student must match each phase/event to its primary hemodynamic feature, valve states, and ECG correlation. Only one event per phase, ensuring sequential logic.

Clues:

1. Atrial contraction (atrial systole) occurs late in diastole, contributing ~20% ventricular filling, corresponding to P wave on ECG; AV valves open, semilunar closed.
2. Isovolumetric contraction begins ventricular systole with all valves closed, pressure rising rapidly but no volume change, after QRS complex.
3. Ventricular ejection follows when ventricular pressure exceeds aortic pressure, semilunar valves open, AV closed; corresponds to ST segment/T wave start.
4. Isovolumetric relaxation starts early diastole with all valves closed, ventricular pressure falling rapidly, no blood flow.
5. Rapid ventricular filling is early diastole with AV valves open, semilunar closed; passive filling ~70-80% stroke volume, before P wave.
6. The disrupted pathology affects pressure-volume relationships, specifically targeting phases with closed valves (isovolumetric), not flow phases.
7. Sequence must follow: diastole → atrial systole → systole → ejection → diastole; ECG waves (P-QRS-T) align temporally.

Question: Match each major event to its phase, valve states, and ECG correlation, and identify which phase is most affected by the pathology disrupting pressure-volume loops.

Rubrics

Criterion	**Points**
Key Elements	2 pts
Logical Steps	4 pts
Correct Solution	2 pts
Biological Insight	2 pts
Total	**10 pts**