2013-1-3 What is the Valsalva manoeuvre? Explain the cardiovascular response and include graphs in your answer.

Valsalva manoeuvre
- Forced expiration against closed glottis
  ➢ Requires airway pressures of 40mmHg for 15 seconds

Phase I
- Onset of manoeuvre
  ➢ Transient increase in blood pressure with a baroreflex bradycardia
    ◇ Intrathoracic pressure transmitted to LV and aorta → Increased ventricular transmural pressure and decreased afterload → Increased cardiac output
    ◇ Increased CO causing hypertension and stretch of aortic and carotid baroreceptors → inhibits sympathetic output and promotes vagal output from the medullary vasomotor centre → Bradycardia

Phase II
- Decreased venous return
  ➢ Decreased blood pressure and baroreflex tachycardia
    ◇ Continual increase in intrathoracic pressure decreases venous return to RV
    ◇ Decreased Venous return → Decreased preload
    ◇ Decreased RV CO secondary to Frank-Starling Mechanism
    ◇ Decreased RV CO → Decreased LV Preload → Decreased LV Cardiac Output
    ◇ Decreased output causes decreased blood pressure → carotid and aortic baroreceptor not stretched → release of sympathetic inhibition and decreased vagal output from medullary vasomotor centre → Tachycardia
  ➢ Reflex tachycardia and sympathetic stimulation tends to restore BP

Phase III
- Release of intrathoracic pressure
- Transient further decrease in blood pressure and further tachycardia
  - Decreased transmural pressure on LV and aorta leading to increased afterload → Decreased cardiac output → Decreased stretch of baroreceptors → Tachycardia

Phase IV
- Normalization of venous return
  - Venous return to RV promoted by negative intrathoracic pressure on normal respiration → Increased VR → increased RV CO → increased LV VR → Increased LV Cardiac output
  - Increased LV CO → stretch of baroreceptors → Reflex bradycardia

![Graph showing blood pressure and heart rate changes during the Valsalva manoeuvre.](image-url)
Examiners Comments:
A good answer to this question required attention to detail and an ability to describe changes in many variables at each stage e.g. intrathoracic pressure, blood volumes, baroreceptor firing and the subsequent cardiovascular response (e.g. heart rate and blood pressure). Using graph(s) is a useful way to assist in the explanation and was required as part of the answer. Dividing the response into four stages makes answering the question much easier. Overall there was a deficiency in a deep understanding of the integrated physiology associated with the Valsalva manoeuvre. The most common mistakes were describing a change but not saying why it happened, not considering each element at each stage and confusing terms e.g. saying increased cardiac output when the response was increased mean arterial pressure. Very few candidates drew accurate graphs. Graphs required were those of the changes in intrathoracic pressure, the pulse pressure response and the heart rate response.