Describe the effects of a tachycardia on myocardial oxygen supply and demand to a normal heart

Myocardial oxygen supply

- Is dependent on the oxygen content of the blood and the flow
  
  **Oxygen content** = \( \text{Hb(Sats)1.34} + \text{dissolved oxygen} \)

- Coronary blood flow is 200-250 ml/min which equals approximately 5% CO flow
  - flow = pressure difference/resistance, the heart demonstrates autoregulation
  - flow is not constant however throughout the coronary system
  - wall tension in the left ventricle creates a Starling resistor model
  - during systole blood flow may become retrograde in the LV as a result

During tachycardia
- the oxygen content is not significantly changed, oxygen is perfusion limited
- only at extreme tachycardia (pulmonary capillary transit time <0.3 seconds) will result in changes

Blood flow is significantly affected however
- during tachycardia diastole is decreased
- therefore there is less filling time and the LV may recent inadequate flow

Myocardial oxygen demand

- Dependent on
  - Wall tension
  - Heart rate
  - Contractility
  - External work
  - Basal metabolic rate

During tachycardia
- by definition increased heart rate will increase demand
- myocardial O2 consumption is very high at 8ml/min/100g, of tissue (up to 20 times skeletal muscle)
- extraction ratio is as high as 75%, the heart cannot compensate by extracting more