

Food fuels and the three energy systems

Chapter 5

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Session Outline

- Welcome students and session goals 2 mins
- Review: Thinking through questions 8 mins
- SAC 1 Hand back 15 mins
- Three energy systems
 - ATP-PC 10 mins
 - Anaerobic Glycolysis 10 mins
 - Aerobic 10 mins
- Summary Table 7 mins
- 10 point challenge 15 mins
- Maximal Sprint Lab 40 mins
- Homework tasks 3 mins

The three energy systems

Energy for muscular contractions is produced anaerobically or aerobically via three energy systems including

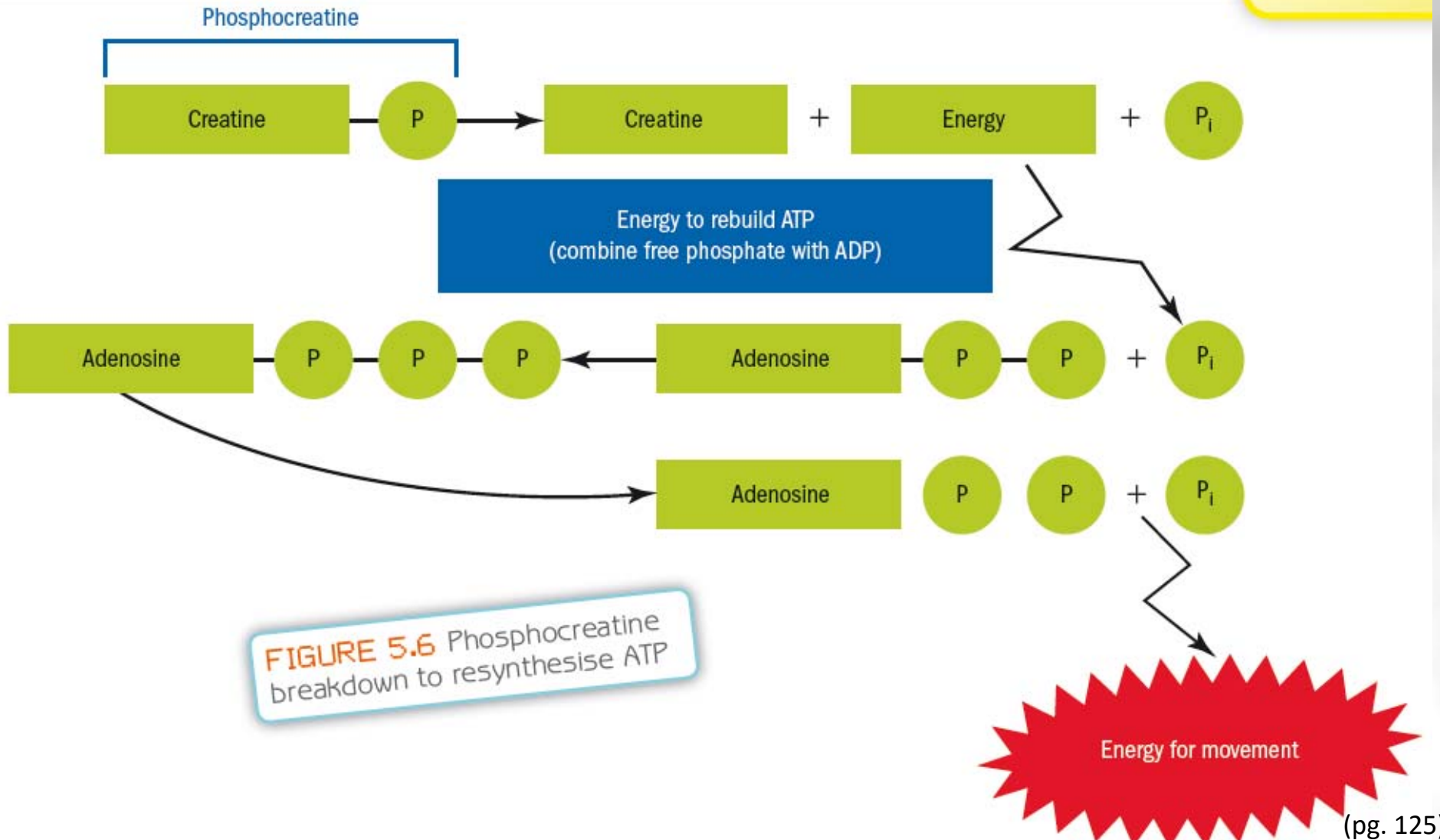
1. ATP-PC (anaerobic system)
2. Anaerobic glycolysis
3. Aerobic system

All systems never work in isolation, instead all work together via the process of interplay to supply energy and rebuild ATP.

Which of the three systems is the predominant energy system being used is dependant on:

- The duration of the exercise
- The intensity of the exercise
- Whether or not oxygen is present
- The depletion of chemical and food fuels during exercise

ATP-PC system



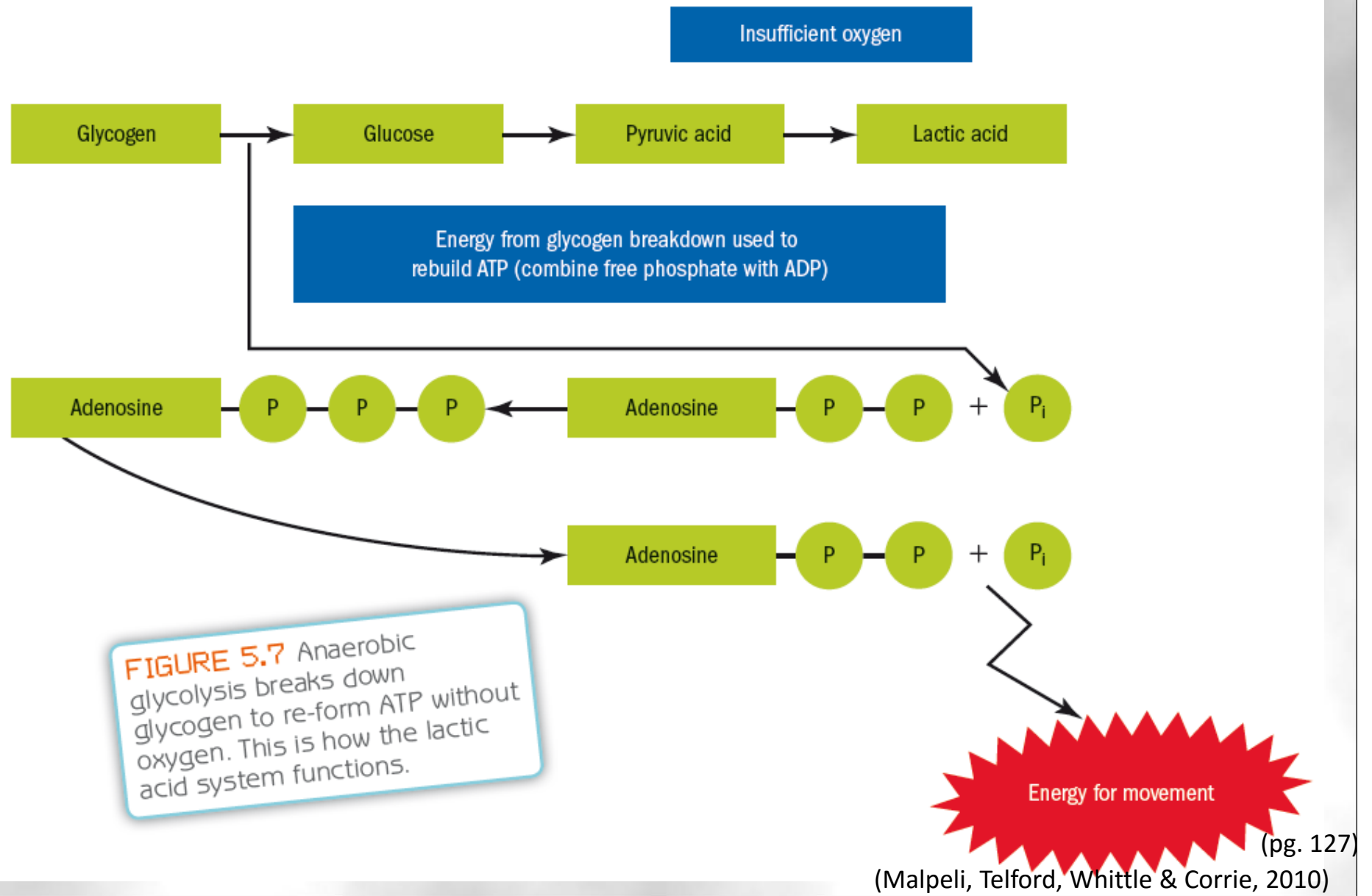
ATP- PC system

- Anaerobic, doesn't depend on oxygen being transported to working muscles to release energy
- Provision of most rapid source of ATP, due to the short chemical reaction and the ready availability of PC in the muscles
- Limited amounts of PC in muscles - more intense the activity the faster PC stores are utilised
- Amount of PC stored lasts about 10 seconds at maximal intensity
- Once PC is depleted it can only be replenished when there is sufficient energy in the body
- Once PC is depleted at the muscle, ATP must be resynthesised from another substance (glycogen) via anaerobic glycolysis

(Malpeli, Telford, Whittle & Corrie, 2010)

List some sports that the ATP-PC system would be the predominant energy system in

Anaerobic glycolysis system



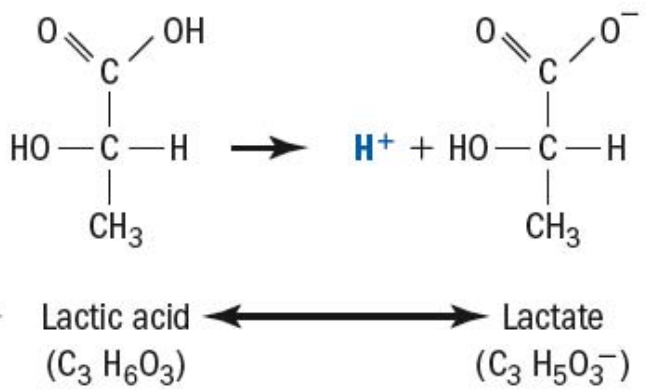
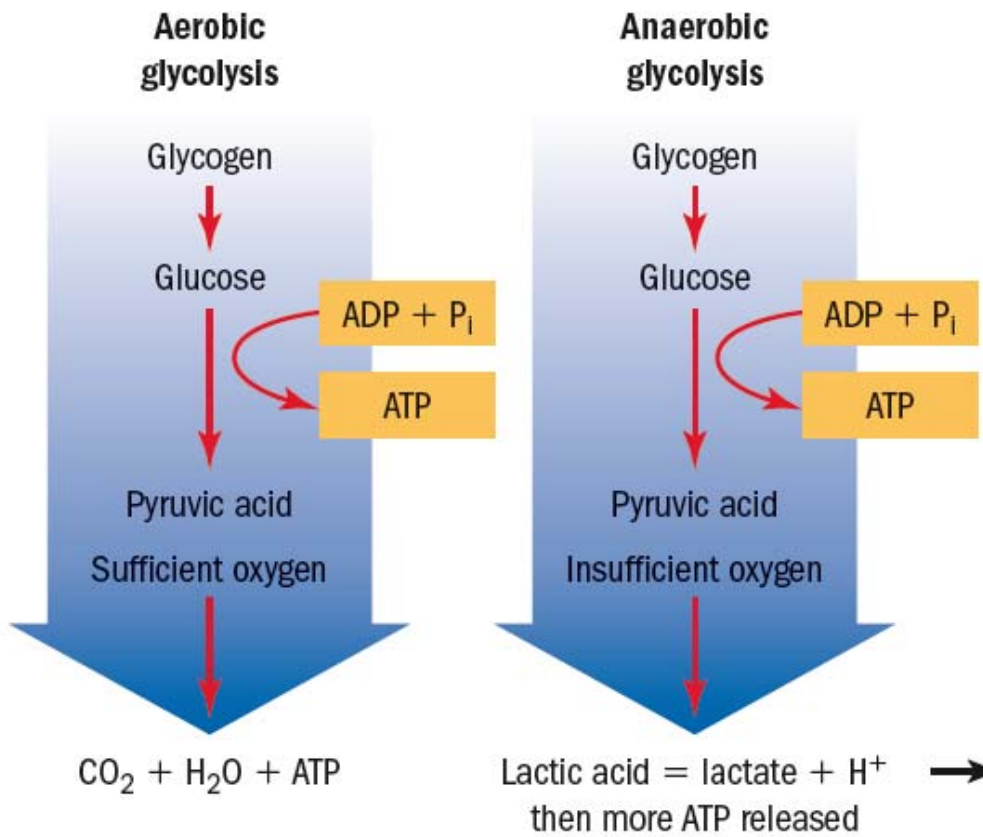
Anaerobic glycolysis system

- Produces lactic acid that can be broken down (without oxygen) to glycogen to provide energy (ATP)
- Supplies ATP at a slower rate than ATP-PC system, longer chemical process
- Supplies energy from the start of intense exercise , with peak power between 5-15 seconds, however system continues to contribute ATP until it fatigues at 2-3 minutes
- Provides twice as much energy for ATP resynthesis as ATP-PC system, it increases its ATP contribution if performance intensity exceeds the **lactate inflection point**
- Provides energy for longer during sub maximal activities when PC is depleted and lactic acid accumulation is slower

The exercise intensity beyond which lactate production can exceed removal

List some sports that the anaerobic glycolysis system would be the predominant energy system in

FIGURE 5.8 Aerobic versus anaerobic glycolysis



Aerobic system

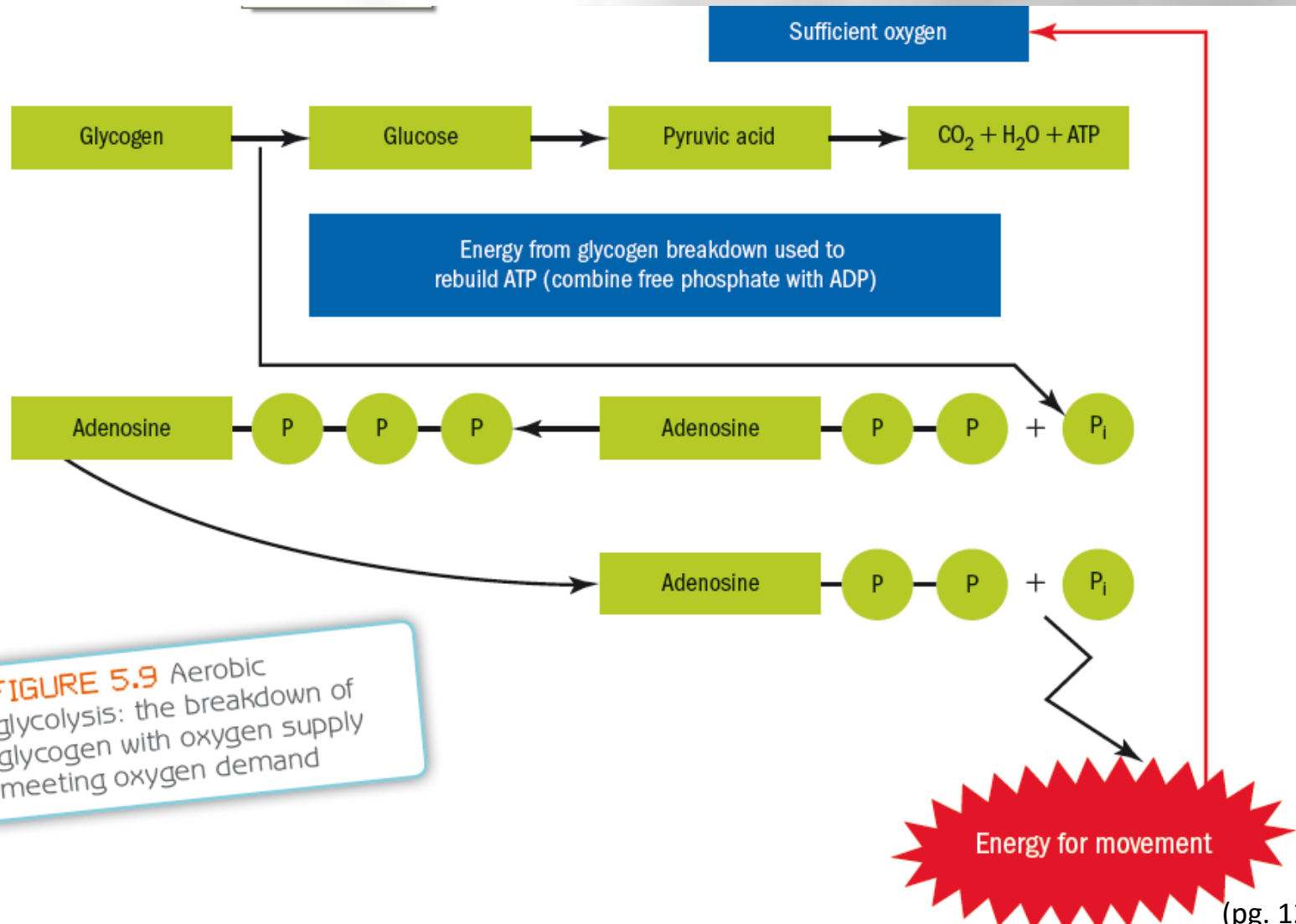


FIGURE 5.9 Aerobic glycolysis: the breakdown of glycogen with oxygen supply meeting oxygen demand

(pg. 129)

Aerobic system

- Slowest system to contribute towards ATP resynthesis, involves many complex reactions to release energy
- Provides 30-50 times as much ATP as the other systems combined
- Requires oxygen
- Preferentially breaks down carbohydrates rather than fats to release energy
- Does not release toxic or fatiguing products and can be utilised indefinitely

List some sports that the aerobic system would be the predominant energy system in

Summary Table

refer to handout