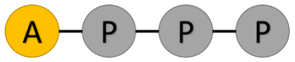
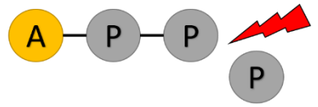
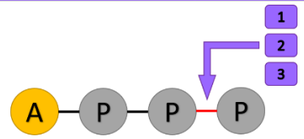
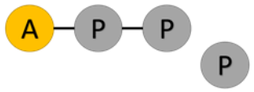
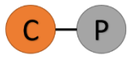
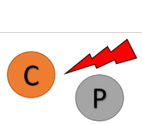
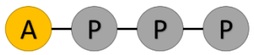
KNOWLEDGE ORGANISER — Unit 1 Anatomy & Physiology: Energy Systems

THE ROLE OF ATP IN EXERCISE

1. ATP Availability	2. ATP Structure	3. ATP Breakdown	4. ATP Resynthesis
			
ATP is stored in the muscles. It is readily available to be broken down. No other compound can be used by the body.	ATP consists of 3 phosphates attached to an Adenine group.	The final phosphate is broken off & energy is released. Energy is now available for muscular contraction. ADP is left.	Resynthesis of ATP from ADP occurs via 3 pathways. The pathway used will be determined by intensity/duration, fuel source & availability of oxygen.

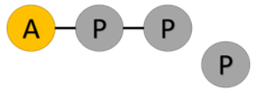
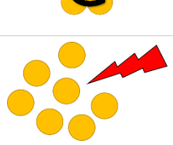
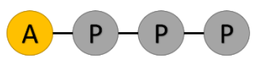
1. THE ATP-PC (ALACTIC) ENERGY SYSTEM

Type: Anaerobic
Fuel Source: Creatine Phosphate (PC)
Duration: Approx. 6-10 seconds
Recovery Time: About 3 mins
Used in: Sports requiring explosive power

1		ATP requires resynthesizing
2		Creatine Phosphate is present in the muscle cell
3		Creatine Phosphate is broken down to provide the energy required.
4		**1 PC molecule produces 1 new ATP molecule.**

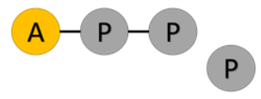
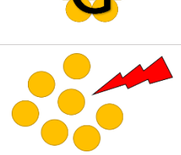
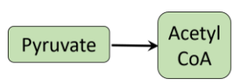
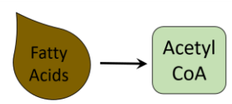
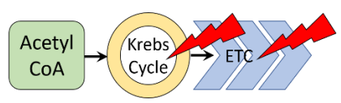
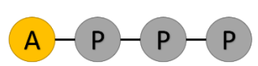
2. THE LACTATE ENERGY SYSTEM

Type: Anaerobic Glycolysis
Fuel Source: Glycogen
Duration: Approx. 10 secs to 2 mins
Recovery Time: 1-2 hours
Used in: Stop/start games, field & court sports

1		ATP requires resynthesizing
2		Glycogen is present in the muscle cell and in the liver. Glucose is present in the bloodstream
3		Glucose/Glycogen is broken down to provide the energy required. Enzymes speed up the process.
4		Pyruvate is also produced. Since no oxygen is available this is converted into lactate.
5		**1 Glycogen molecule produces 3 new ATP molecules.**

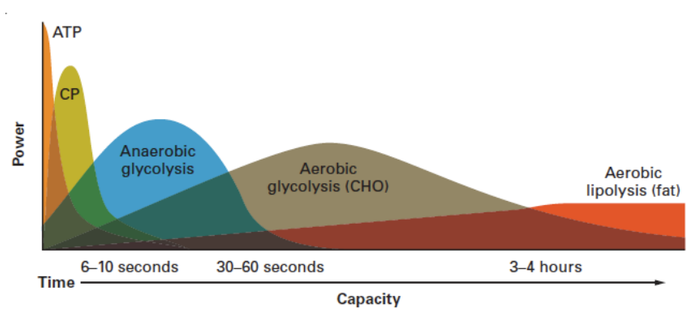
3. THE AEROBIC ENERGY SYSTEM

Type: Aerobic Glycolysis (& Lipolysis)
Fuel Source: Glycogen and Fat
Duration: Longer than 2 mins
Recovery Time: 24-48 hours
Used in: Long distance & endurance events

1		ATP requires resynthesizing
2		Glycogen is present in the muscle cell and in the liver. Glucose is present in the bloodstream
3		Glucose/Glycogen is broken down to provide the energy required. Enzymes speed up the process.
4		Pyruvate is also produced. Oxygen is available so pyruvate is broken down into Acetyl CoA
5		Or, Acetyl CoA can be created from fats by a process called beta-oxidation
6		Acetyl CoA passes through the Krebs Cycle and the Electron Transport Chain (ETC) By products include CO_2, O_2 and H_2O. More energy is produced here.
7		**1 Glycogen molecule produces about 34 new ATP molecules.**

ENERGY CONTINUUM

At any given time, all the energy systems are in use. The proportion is determined by intensity of demand for energy.



ADAPTATIONS TO EXERCISE (Long Term)

ATP-PC (alactic) energy system
1. Increased creatine stores.

Lactate energy system
1. Increase tolerance to lactate.

Aerobic energy system
1. Increased use of fats as an energy source.
2. Increased storage of glycogen.
3. Increased numbers of mitochondria.

ADDITIONAL FACTORS
1. Diabetes (hypoglycaemic attack)
2. Children's lack of a lactate system

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