

AEROBIC ENERGY SYSTEM

Critically evaluate the use of the energy systems to re-synthesise ATP in different sporting situations

(20)

1.	(ATP)	<ul style="list-style-type: none"> energy currency of body stores last up to 2 seconds ATPase structure of ATP
2.	(ATP resynthesis)	<ul style="list-style-type: none"> reversible reaction exothermic/endothemic reactions
3.	Energy Continuum (accept graph)	<ul style="list-style-type: none"> systems do not work in isolation/they interact to resynthesise ATP energy system thresholds/the point at which one system is taken over by another as the predominant system
4.	Exercise intensity and duration of the activity being undertaken will affect which energy system is predominant	<ul style="list-style-type: none"> high intensity/short duration – predominant systems are ATP/PC and LA low to medium intensity/long duration – predominant system will be aerobic
5.	Fitness level of the performer will affect which energy system is used and when	<ul style="list-style-type: none"> thresholds will change depending upon training done oxygen supply will vary fuel available will vary enzyme activation levels will vary
6. ATP/PC system	ATP can be resynthesised via ATP/PC system/alactic system/PC system	<ul style="list-style-type: none"> sufficient detail about this system eg involves coupled reactions PC is broken down into P + C + energy This is an exothermic reaction Energy released + ADP + P -----ATP Site= muscle cell sarcoplasm Enzyme = creatine kinase
7.	Identify use with a high intensity and short duration activity	<ul style="list-style-type: none"> suitable example up to 10 seconds

8. E	Advantages of this system identified	<ul style="list-style-type: none"> no fatiguing by products are produced allows for the quick re synthesis of ATP/doesn't need oxygen or few reactions PC can be quickly re synthesised (so recovery is quick)/50% recovery in 30 seconds/100% recovery in 180 seconds PC is readily available in the muscle
9. E	Disadvantages of this system identified	<ul style="list-style-type: none"> only small amounts of fuel stored in muscle cell (PC) low energy yield/only 1 ATP re synthesised can only provide energy for short period of time/2-10 seconds
10. Lactic Acid system	ATP can be resynthesised via Lactic Acid system/lactacid system/anaerobic glycolysis	<ul style="list-style-type: none"> sufficient detail about this system eg Glucose is (partially) broken down by the enzyme phosphofructokinase (PFK) Into pyruvic acid/pyruvate This is further broken down into lactic acid by the enzyme lactate dehydrogenase (LDH) Site= muscle cell sarcoplasm Glucose is stored as glycogen Glycogen is broken down by the enzyme glycogen phosphorylase (GPP) into glucose
11.	Identify use with a high intensity and short duration activity	<ul style="list-style-type: none"> suitable example 10 seconds-180 seconds
12. E	Advantages of this system identified	<ul style="list-style-type: none"> large potential fuel store of glycogen available (stored in muscles and liver) requires few reactions can work anaerobically/in the absence of oxygen can provide energy quickly/faster/quicker (than the aerobic energy system)

13. E	Disadvantages of this system identified	<ul style="list-style-type: none"> • produces the by-product Lactic acid/Reduces pH/inhibits enzyme action/Causes pain/stimulates pain receptors/causes fatigue • (relatively) low yield of ATP (in comparison to aerobic system) • Long recovery
14. Aerobic system / oxidative	ATP can be resynthesised via Aerobic system/oxidative system	<ul style="list-style-type: none"> • sufficient detail about this system eg has 3 stages/stage 1 = aerobic glycolysis/stage 2 = Krebs cycle/stage 3 = electron transport chain (ETC) • Stage 1 site = muscle cell sarcoplasm • Glucose is broken down into pyruvic acid • This combines with coenzyme A to form Acetyl CoA • Stage 2 site = matrix of the mitochondria • Carbon Dioxide is produced • Hydrogen atoms are removed (oxidised) • Stage 3 site = cristae of the mitochondria • Hydrogen atoms combine with NAD & FAD • Carried along the ETC • Hydrogen electron splits from the hydrogen atom • Combines with oxygen to form water
15.	Identify use with a low/medium intensity and long duration activity	<ul style="list-style-type: none"> • suitable example • 180 seconds +
16. E	Advantages of this system identified	<ul style="list-style-type: none"> • large energy yield of ATP/34-38 ATP's in total/2 in anaerobic glycolysis, 2 in Krebs cycle/34 in the electron transport chain • no fatiguing by products are produced/carbon dioxide & water easily removed • able to work for long periods of time • fats can also be used / provide more energy • fat can also be used as a fuel
17. E	Disadvantages of this system identified	<ul style="list-style-type: none"> • slower rate of ATP re synthesis/due to delay in getting enough oxygen at the start of exercise • more complex series of reaction/anaerobic glycolysis & Krebs (citric acid) cycle & electron transport chain • requires more oxygen/15% more to break down free fatty acids (FFE's)/fats