

Answers for extension worksheet – Option B

- 1**
- a** Cardiac output is the volume of blood pumped out by the heart per minute. (1)
- b** Working muscles require increased supplies of glucose and oxygen, which are delivered with each heart beat, and waste carbon dioxide must be carried back to the lungs. Increased cardiac output supplies blood to the muscles more quickly so supplies can be delivered and waste products removed more rapidly. (2)
- c** Muscles produce additional carbon dioxide as they respire during vigorous exercise and if respiration is anaerobic, lactic acid will be produced. Carbon dioxide and lactic acid both lower blood pH. (1)
- d** Blood pH is monitored by the brain. If pH falls, impulses are sent to the pacemaker (SAN) to increase the heart rate and volume of blood pumped per beat (cardiac output). (2)
- 2**
- a** two from:
training can increase muscle size;
increase width of slow-twitch fibres;
increase the number of mitochondria;
increase the number of capillaries;
increase the amount of stored glycogen (2)
- b** three from:
slow-twitch muscle fibres respire aerobically, which avoids the production and build up of lactic acid;
contain many mitochondria for increased respiration;
contain glycogen as a store of energy;
have a rich supply of capillaries to bring oxygen and glucose and remove carbon dioxide (3)
- c** three from:
high blood pressure due to water retention;
weight gain;
cramps;
nausea;
dehydration (3)
- 3**
- a** fat (1)
- b** Fat contains 4000 kJ per 100 g whereas carbohydrate contains 1760 kJ per 100 g. (1)
- c** Glycogen is stored in muscle cells (and in the liver). It is readily available for use as muscles begin to exercise. (2)
- d** VO_2 max is a person's maximum rate of oxygen consumption and it gives a measure of the ability to generate energy for endurance activities. (1)
- e** As intensity of exercise increases and an individual's VO_2 max is reached, carbohydrates account for almost 100% of the energy source used. (2)



- f** The person is exercising for four hours, and is therefore undertaking an endurance event such as a marathon or long-distance cycle. As the exercise proceeds, the person depletes his/her supplies of blood glucose and muscle glycogen stores and uses stored fat as a source of energy. (2)
- 4** Warm up routines are exercises carried out before an event, which cause muscle temperature to rise before the main activity. Blood flow is stimulated so more oxygen is carried to the muscles and respiration increases. There is no conclusive scientific evidence to support the need for warming up, but it is difficult to carry out fair tests. Warm ups may be important in psychologically preparing an athlete for competition. (3)