

## Answers for support worksheet – Option B

- 1 a** Pulse can be measured at the wrist or on an artery in the neck. The first two fingers should be pressed lightly on the pulsating artery and reading(s) taken for 1 minute. (1)
- b** A pulse is due to the elastic recoil of the muscles in the artery walls following a pulse of blood pumped from the heart. (2)
- c** Stroke volume is the volume of blood pumped out with each contraction of the heart. (1)
- d** Cardiac output is the volume of blood pumped out by the heart per minute. (1)
- e** cardiac output = pulse rate  $\times$  stroke volume  
 $= 90 \times 109 = 9810 \text{ cm}^3 \text{ min}^{-1}$   
 $= 9.81 \text{ dm}^3 \text{ min}^{-1}$  (2)
- f** Training has improved the cardiac system so that the trained athlete has stronger heart muscle and can pump more strongly. The heart volume has also increased so that a greater volume of blood is pumped with each beat. The pulse rate falls as blood is delivered more efficiently. (3)

- 2** (5 – 1 mark per comparison and 2 marks for explaining adaptations)

<b>Fast-twitch</b>	<b>Slow-twitch</b>
few mitochondria	many mitochondria
little myoglobin	large amounts of myoglobin
few capillaries	many capillaries to supply blood
adaptations make fast-twitch fibres suitable for producing ATP anaerobically during short bursts of activity such as sprinting	adaptations make slow-twitch fibres suitable for aerobic respiration and ATP production for sustained periods of time, during endurance activities such as long-distance running

- 3 a** The concentration of lactate in the blood rises as the athlete works harder and produces more power. There is a small increase in the lactate concentration in the blood up to point A because some respiration must be anaerobic. (2)
- b** the liver (1)
- c** During the training period, the following changes occur to improve the person's fitness, resulting in a greater proportion of ATP being generated by aerobic rather than anaerobic respiration, and therefore lower blood lactate levels:
- 1 an increased number of capillaries supply blood to working muscles more efficiently
  - 2  $\text{VO}_2$  max increases to supply oxygen to muscles
  - 3 an increase in the stroke volume of the heart increases blood supply. (3)