Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

$100/120 \approx 0.83$ day

about **20** hours

2.2

muscle has no glucose-6-phosphatase

glucose 6-phosphate cannot leave the cell, so it is used by the muscle itself

2.3

lactate from red cells and working muscle

glycerol from fat breakdown

amino acids (such as alanine) from muscle protein

2.4

$+2 - 6$

$= -$**4** ATP per round

it keeps blood glucose up for the brain and red cells, using energy from fat in the liver

3.1

(a) the muscle cannot break down its glycogen, its fast fuel, so ATP runs short in hard exercise and the muscle cannot relax properly

(b) little glucose from glycogen enters glycolysis, so little pyruvate and lactate are made

(c) blood flow rises and brings glucose and fatty acids from outside the muscle; these fuels replace the missing glycogen

(d) the liver has a different form of the enzyme, which works

3.2

(a) both glycogen breakdown and gluconeogenesis end at glucose 6-phosphate; without the enzyme no free glucose reaches the blood, so sugar falls between feeds; glycogen keeps being made but cannot be used, so the liver fills and enlarges

(b) frequent feeds by day; a slowly digested starch (such as uncooked cornstarch) or a night feed to cover the night

3.3

(a) $100/160 \times 24 =$ **15** hours

(b) $160 \times 1.75 =$ **280** g per day

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(c) the liver makes ketones from fat, and the brain uses them in place of part of its glucose; by day 3 they cover about a third of brain energy, so less protein is broken down

(d) give glucose in a drip

(e) keep fasts as short as safely possible, with clear fluids or a carbohydrate drink until shortly before surgery; restart feeding early afterwards, and check blood glucose