Solutions

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

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

2.1

$18/2 - 1 = \mathbf{8}$ cycles

9 acetyl-CoA

2.2

$8 \times 10 = 80$

$7 \times 1.5 + 7 \times 2.5 = 28$

$80 + 28 - 2 = \mathbf{106}$

2.3

palmitate $106/16 \approx \mathbf{6.6}$

glucose $32/6 \approx \mathbf{5.3}$: fat gives more per carbon

2.4

oxaloacetate is used for gluconeogenesis, so acetyl-CoA cannot all enter the TCA cycle

the liver turns the extra acetyl-CoA into ketones and sends them out

ketones are small and water-soluble and enter the brain; fatty acids are carried on albumin and hardly cross into it

3.1

(a) without insulin, fat cells break down fat without control; the liver gets far more fatty acids than it can burn and makes ketones; ketones are acids, so the blood pH falls

(b) the body blows off CO_2 to reduce acid, because less CO_2 means less carbonic acid in the blood

(c) insulin stops fat breakdown, so fewer fatty acids reach the liver, and it lets cells take up glucose, so the body stops acting as if it is starving

3.2

(a) LDL is removed from blood by the LDL receptor, mostly in the liver; with faulty receptors it stays in the blood

(b) LDL enters artery walls and forms fatty plaques, which narrow the coronary arteries and can break, causing a clot

(c) with less cholesterol inside, the liver makes more LDL receptors from its working copy, so it takes up more LDL

3.3

(a) fat cannot be broken down to acetyl-CoA, so the liver cannot make ketones; without energy from fat the liver cannot run gluconeogenesis well, and all tissues use glucose, so it runs out

(b) with regular meals, glucose is enough; only a long fast forces the body onto fat

(c) $30\,000/15\,000 = \mathbf{2}$ cases a year

(d) never let the child fast for long; give sugary drinks when ill; have a written emergency plan for glucose through a drip if the child cannot eat

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