



General Certificate of Education

Applied Science **8771/8773/8776/8779**

SC02 Energy Transfer Systems

Mark Scheme

2008 examination – June series

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Question 1

(a)	There is an element of risk attached to any surgical procedure / adverse reactions following surgery The transplant / new organs might be rejected (by the girl) The girl will need to take (immunosuppressive) drugs for the rest of her life (to try to prevent rejection of transplanted organs) Recovery time The likely success rate take <u>or</u> converse i.e. operation might not succeed / without surgery life expectancy might be reduced How long the operation might Ensure that girl (and parents) understand what the operation entails Any 2 of above – allow any other valid points	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) Max 2	2
(b)	Reduction in the number of chest infections More active / more able to participate in sports Improved breathing: Accept any reference to improved lung function Any 2 of above	(1) (AO2) (1) (AO2) (1) (AO2) Max 2	2
(c)	(Much) lower	(1) (AO1)	1
(d)(i)	To trap or filter dirt / dust / debris Prevent it from reaching the <u>lungs</u> / keep <u>airways</u> clear	(1) (AO1) (1) (AO1)	2
(ii)	Cilia	(1) (AO1)	1
(e)(i)	Spirometer	(1) (AO1)	1
(ii)	400 – 500 (cm ³) Accept any value between 400 and 500	(1) (AO1)	1
(iii)	Allow 3.1 – 4.25 (dm ³)	(1) (AO1)	1

Total Mark: 11

Question 2

(a)(i)	Uses <u>oxygen</u>	(1) (AO1)	1
(ii)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (ignore any references to energy or ATP) correct inputs correct outputs balanced equation (as shown above) [Accept input as 'C(H ₂ O) ₂ + O ₂ ' as this is given in some textbooks. If this is used, accept outputs without the '6's', but do not award the mark for balancing the equation].	(1) (AO1) (1) (AO1) (1) (AO1)	3
(iii)	RQ = $\frac{5.7}{8.15}$ = 0.7 Accept 0.699 but not 0.69 Ignore any units given Full 2 marks for correct answer on its own	(1) (AO2) (1) (AO2)	2
(b)(i)	Level would be higher / move closer to respiration chamber	(1) (AO3)	1
(ii)	More oxygen consumed / more respiration	(1) (AO3)	1

(c)(i)	Fluid at equal height / level in left and right arms of manometer: B	(1) (AO3)	1
(ii)	(KOH absorbs carbon dioxide) and as the volume of oxygen taken up (by woodlice) equals the volume of carbon dioxide given out, fluid reaches same level in both arms of manometer / less or no carbon dioxide will be absorbed	(1) (AO3)	1

Total Mark: 10**Question 3**

(a)(i)	60 - 80 (bpm)	(1) (AO1)	1
(ii)	Participant F	(1) (AO2)	1
(iii)	Time taken for pulse rate to return to normal (resting) rate, following a period of exercise, is a measure of cardiovascular fitness The shorter the time, the fitter the person Participant F took the least time for their pulse rate to return to normal (resting) rate / for all participants (other than F) pulse rate did not return to normal (resting) rate 3 min after exercising <u>or</u> reverse argument Allow: Participant F pulse rate returns to normal after 2/3 min exercise (even if no comparison made)	(1) (AO2) (1) (AO2) (1) (AO2)	3
(b)	Tachycardia	(1) (AO1)	1
(c)	(Chemo) receptors (in carotid artery) detect a change (rise) in CO ₂ (in blood) Increased frequency of nerve impulses Sent from the cardiovascular centre / brain / medulla Along nerves / spinal cord Sympathetic / accelerator (nerves) To the sino-atrial node (SAN) In the <u>right</u> atrium Of the heart Any 3 of above	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) Max 3	3
(d)	135 / 85 (mmHg)	(1) (AO1)	1
(e)	Participant C Allow valid alternatives if explanations match those given Explanation: Blood pressure is extremely (<u>very</u> high) / above normal / too high / highest / person suffers from hypertension Pulse rate increased the most after exercising Pulse rate took the longest to return to normal (after exercising) Pulse rate (of C) (after exercising) is <u>very</u> high / above normal Accept any 2 from 4 explanations that are linked to participant (even if participant other than C is given)	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) Max 3	3

(f)	<p>The lumen of the artery increases with the increased flow of blood / increased blood pressure</p> <p>(During systole) the walls of the artery stretch / expand</p> <p>Preventing pressure from increasing (in artery)</p> <p>(During diastole) the walls of the artery recoil</p> <p>Lumen (of artery) returns to normal</p> <p>Preventing a fall in blood pressure</p> <p>If BP is low the muscular tissue of artery will contract (constrict) making the lumen smaller (will increase BP)</p> <p>Thick layer of muscle in wall helps artery to withstand <u>high</u> pressure / supports artery</p> <p>Muscle able to contract or relax, changing lumen of artery</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>Max 3</p>	3
(g)	<p>(Trace 2)</p> <p>Breathing more rapidly (faster) than normal / person 1</p>	<p>(1) (AO1)</p>	1

Total Mark: 17**Question 4**

(a)	<p>Silver reflects the radiation (as a form of heat transfer)</p> <p>avoids heat loss through wall / reflects heat back into the room</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p>	3
(b)	<p>(low ceiling) less air to heat / room heats faster</p> <p>and heat wasted (heating upper air) / less heat needed</p> <p>less wall area so less heat lost</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>Max 1</p>	1
(c)	<p>Hot air rises / convection / so upper air would be hottest</p> <p>NOT 'heat rises'</p>	<p>(1) (AO1)</p>	1
(d)	<p>foam</p> <p>traps air / pockets of air</p> <p>in <u>small</u> pockets</p> <p>preventing convection</p> <p>air is an insulator / little conduction</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>Max 3</p>	3
(e)	<p>Draughts: draught excluders</p> <p>Doors: draught excluders / double glazed / auto-shut mechanism (door closure)</p> <p>Windows: double-glazed</p> <p>Through roof: loft insulation</p> <p>Floor: insulation built into or on floor / carpet</p> <p>N.B. Mark allocated for explanation only.</p> <p>Same method not to be allowed twice</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>Max 2</p>	2
(f)	<p>high temperature (in room)</p> <p>closes valve</p> <p>less hot water to radiator</p> <p>heat lost > heat received (to the room)</p> <p>so room cools</p> <p>Allow reverse argument</p>	<p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>(1) (AO1)</p> <p>Max 3</p>	3

(g)(i)	less temperature <u>difference</u> (with respect to the outside) less heat lost (per second) so less energy (power) needed to replace energy lost / to heat the room	(1) (AO1) (1) (AO1) (1) (AO1) Max 2	2
(ii)	Less fuel /less heat / less energy required / less electrical energy Do not accept 'less electricity'	(1) (AO1)	1
(h)	less CO ₂ / greenhouse gases produced / carbon emissions / greenhouse effect less use of fossil fuels / acid rain / SO _x / NO _x less global warming	(1) (AO1) (1) (AO1) (1) (AO1) Max 2	2

Total Mark: 18**Question 5**

(a)	mass x g x height change / $720 \times 10 \times 5$ / $[720 \times 9.81 \times 5]$ [Accept 9.81 instead of 10] $36\,000 \text{ (J)} / [35316 \text{ (J)}]$ 2 marks for correct answer	(1) (AO2) (1) (AO2)	2
(b)	power = energy per second / power = $36000 \div 60$ / power = energy \div <u>time</u> power = $600 \text{ (W)} / [589 \text{ (W)}]$ (allow ecf if working shown) 2 marks for correct answer	(1) (AO2) (1) (AO2)	2
(c)	output = 0.75×600 (allow ecf if working shown) $450 \text{ (W)} / [442 \text{ (W)}]$ 2 marks for correct answer N.B. No credit if calculation shows output > input	(1) (AO2) (1) (AO2)	2
(d)	Heat Sound	(1) (AO1) (1) (AO1)	2
(e)	no fossil fuels needed renewable (energy) source no CO ₂ or greenhouse gases emitted / acid rain / SO _x / NO _x / greenhouse effect / fewer carbon emissions quieter / less noise Ignore any reference to cost	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) Max 2	2
(f)	dry spell / lack of water water storage area prevents farming in that place animals (including fish) might die / destroy habitat	(1) (AO1) (1) (AO1) (1) (AO1) Max 1	1
(g)	$1.5 \times 60 \times 12 \text{ (p)}$ $1080 \text{ p} / \text{£}10.80$ No credit for use of watts instead of kilowatts (Max 1 for wrong d.p.)	(1) (AO2) (1) (AO2)	2

Total Mark: 13

Question 6

(a)	foam / cardboard / crumpled paper / polystyrene / cotton wool / bubble wrap	(1) (AO1)	1
(b)	more time / distance to stop same change of momentum / impulse / energy force = change of momentum / time rate of change of momentum is less acceleration is less smaller force No credit for 'impact'	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) Max 4	4
(c)	height dropped weight / mass of plates / number of plates weight / thickness / material of <u>crate</u> / distance of spacers surface dropped onto	(1) (AO3) (1) (AO3) (1) (AO3) Max 2	2
(d)	thickness of padding	(1) (AO3)	1
(e)	repeat tests (to get an average)	(1) (AO3)	1
(f)	bigger crate needed / weight of crate increases (extra) cost of <u>material</u> / <u>transport</u> pollution caused by disposal of material afterwards energy / materials required to make the packaging less space for plates / fewer plates possible	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) Max 2	2

Total Mark: 11