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Examiners' Report/ Principal Examiner Feedback

November 2009

IGCSE

IGCSE Science (Double Award) (4437) Paper 4H

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General

This paper was taken by a much smaller number of candidates than in the summer. Most candidates attempted all of the questions and there was no evidence of candidates running out of time on the paper.

Question 1 (a) presented candidates with a photograph of a red blood cell. Almost all of the candidates were able to name haemoglobin as the red pigment that absorbs oxygen. A few could also explain how the biconcave shape increased the surface area for diffusion of oxygen. Part (b) asked candidates to draw and label a phagocyte. Marks were awarded for the correct shape of cell and for labelling cell membrane, correctly shaped nucleus and cytoplasm. Most candidates were also able to describe how a phagocyte helps to destroy pathogens.

Question 2 showed candidates a diagram of a section through the human thorax. Candidates had to identify the ribs, diaphragm and the spine from the diagram. Most could identify the ribs and the diaphragm but some could not correctly identify the spine. In part (b) some candidates were able to describe the contraction and flattening of the diaphragm as a person breathes in. Part (c) gave candidates a diagram showing an alveolus of a normal person and an alveolus for a person with emphysema and asked candidates to suggest why a person with emphysema would find it difficult to walk upstairs. The best responses explained how the surface area of the alveoli are reduced in a person with emphysema and how this would reduce the availability of oxygen for respiration and energy release in the muscle cells.

Question 3 showed a diagram of a root hair cell. In a) almost all responses correctly labelled the nucleus but in (b) some were unable to correctly label the cell membrane often pointing to the cell wall or cytoplasm. Most could in (c) give osmosis as the mechanism of absorption of water and the better candidates could explain that energy is required to absorb mineral ions into the roots against a concentration gradient. Finally, only the best candidates could give chlorophyll as a molecule made using magnesium and amino acids / proteins etc. as a molecule made using nitrates.

Question 4 was about the carbon cycle. Part (a) asked candidates to name two molecules found in plants that contain carbon. Most were able to do this common answers being starch, glucose, cellulose and amino acids. They then had to give two ways that carbon in plants is released into the atmosphere. The great majority were able to name respiration but only a few could name decomposition, or combustion, as the second. Part (b) required candidates to explain the consequences of releasing sulphur dioxide into the atmosphere. The best answers described how the gas dissolves in water to form acid rain which then falls to earth were it can harm plant and aquatic life.

Question 5 required a longer prose answer explaining how glasshouses increase crop yield for a named plant. Although most candidates were able to score well few named a crop and those that did often suggested rice or corn or crops not normally grown in a glasshouse. Most candidates gained credit for suggesting increased lighting, increased heat, increased carbon dioxide and regulating water supply and how this leads to a higher rate of photosynthesis.

Question 6 provided information on cloning wolves. In part (a) most were able to name at least two reasons for the decline in the number of wolves. The third reason proved more difficult with many candidates giving hunting for fur or hunting for sport as different reasons. We expected loss of habitat, shortage of food, predation and disease as possible answers. Part (b) required candidates to describe the process of production of a cloned embryo. The best candidates were able to describe how the nucleus of an adult cell from the parent would be fused with an enucleated egg cell and be allowed to divide by mitosis in a suitable culture solution. Candidates could generally give the role of a surrogate mother but struggled with the percentage calculation and often suggested that 1 or 2 or sometimes even 251 male wolves were involved in the production of Snuwolf and Snuwolfy.

Question 7 (a) asked candidates to label the cornea from a diagram of the eye and most got this correct. Part (b) asked about the genotype of a person whose cornea would not go cloudy and most struggled to do this. Part (c) required the candidates to explain why a transplanted cornea might be rejected. Only the very best candidates earned some credit for explaining how the transplanted cornea contains antigens which have a genetic difference to the host tissue so the host white blood cells would secrete antibodies that would attack the cornea. Candidates were then asked to explain the term 'immunosuppressive' (drugs) and too many merely restated that these would suppress the immune system. The answer we wanted was that these would stop or slow down the rejection of the cornea. Few candidates were able to calculate 95% or 950 successful transplants.

Question 8 (a) gave candidates a simple food chain and asked them to say how many trophic levels were present and give the term for the fish in the chain. They were also given data in part b) about energy transfer and most could give two reasons for the energy loss between the microscopic animals and the insects. A few candidates could use the formula provided to correctly calculate the energy transfer. The best candidates were also able to examine the data and explain that since fish took in 500 kJ per m^2 from all sources but could only obtain 300 kJ per m^2 from the insects they must eat other organisms.

Question 9 described how the bark of trees can be used to treat prostrate cancer. Most candidates were able to correctly explain the meaning of endangered. Very few were able to concisely explain why removing the phloem would kill a tree. The best candidates explained how the phloem transports sucrose around the plant so that it can be used by other cells for respiration. Part (b) on micropropagation was not answered well with few candidates correctly suggesting why sterile cotton wool is used to enable oxygen and carbon dioxide to enter for respiration and photosynthesis. Most were able to suggest a suitable energy source in the agar and give two reasons why micropropagation is an effective method.

Question 10 required candidates to calculate the surface area to volume ratio of a rectangle. Only a small number of the best candidates were able to carry out this simple mathematical exercise. However, most candidates could explain why chip A gained mass, then explain the differences between the other conditions due to water potential of the solutions, temperature of the solutions and differences in surface area to volume ratio.

Question 11 (a) gave students data on the mass and oxygen consumption of a range of shrews. Almost all candidates were able to describe how the oxygen consumption decreased with increasing mass. The better students could explain this by referring to greater heat loss from smaller shrews as they have a larger surface area to volume ratio so will need to respire faster. Again only a few of the best candidates could correctly calculate the volume of oxygen used in one day by the largest shrew. In part (b) most could give a change that would take place in the skin of a shrew as it moves to a cold area. Some candidates confused vasoconstriction with vasodilation. In part (c) most could name the sensory neurone and synapse and almost all could correctly show the direction of an impulse on the motor neurone.

Question 12 was also a longer prose question. Candidates were asked to use their knowledge of natural selection to explain why few albino giraffes are found in the wild. The best candidates were able to explain how the albino animals are poorly adapted due to lack of camouflage so are easily seen by predators. Thus, they are unlikely to survive to reproduce and therefore the allele for albinism will reduce in the population.

SCIENCE (DOUBLE AWARD) 4437, GRADE BOUNDARIES

Option 1 : with Paper 7 (Biology) & Paper 8 (Chemistry)

	A*	A	B	C	D	E	F	G
Foundation Tier				52	42	32	23	14
Higher Tier	76	65	54	44	35	30		

Option 2 : with Paper 7 (Biology) & Paper 9 (Physics)

	A*	A	B	C	D	E	F	G
Foundation Tier				52	42	32	23	14
Higher Tier	76	65	54	43	35	31		

Option 3 : with Paper 8 (Chemistry) & Paper 9 (Physics)

	A*	A	B	C	D	E	F	G
Foundation Tier				53	43	33	24	15
Higher Tier	N/A	N/A	N/A	N/A	N/A	N/A		

No candidates at higher tier entered so there are no grade boundaries for this category.

Option 4: with Coursework (Paper 10)

	A*	A	B	C	D	E	F	G
Foundation Tier				N/A	N/A	N/A	N/A	N/A
Higher Tier	N/A	N/A	N/A	N/A	N/A	N/A		

No candidates entered coursework so there are no grade boundaries for this option.

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demand of the question paper.

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