Sacred Heart Canossian College
2022-2023 Mock Examination
S6 Biology
Marking Scheme

Paper 2

SECTION A Human Physiology: Regulation and Control

1. (a) (i) Thermoreceptors in the hypothalamus detect an increase in the blood/internal body temperature (1) [No marks for thermoreceptors in the skin.]
and they send nerve impulses to stimulate the heat loss centre (1)
The heat loss centre sends nerve impulses to the arterioles near the skin surface causing vasodilation/them to dilate. (1) Hence their diameter increases during period A.

(ii) This allows more blood to flow through the superficial capillaries (1) to bring more heat to the skin surface (1) to promote heat loss by conduction, convection and radiation. (1)

(iii)

Concept for mark award:
Vasoconstriction under cold condition (1)
Effect of hot water bath on skin arterioles (1)
Change in blood flow to skin surface (1)
Reduced blood supply to the brain (1)

On a very cold day, skin arterioles constrict to minimise heat loss (1)
Having a very hot water bath results in the dilation of skin arterioles (1)
The blood flow to the skin surface increases drastically. (1)
Fainting may occur when the blood supply to the brain is reduced suddenly. (1)

Total: 10 marks

(b) (i) Aerobic respiration alone cannot provide enough energy to meet the increase in energy demand as the intensity of exercise increases (1)
The skeletal muscles have to undergo anaerobic respiration to produce additional energy to support the body's need and lactic acid is formed (1)
The lactic acid diffuses from the muscle tissues and enters the bloodstream (1) leading to a rise in the blood lactate concentration.

(ii) It can be an increase in mitochondria level.(1)
This increases the energy output by aerobic respiration and delays anaerobic respiration and lactic acid production. (1)

(iii)

Concept for mark award:
Correct identification of
-control variable (1) (e.g. same type of exercise and increase in intensity)
-independent variable (1) (e.g. two groups of volunteers: athletes/untrained)
-dependent variable (1) (e.g. collection of blood sample and test for the concentration of lactic acids at regular time interval)

1. (b) (iii) Two groups/individuals (athlete and untrained person) should be monitored under the same conditions (1) [accept using an example e.g. same room temperature] and treated with the same increase in exercise intensity. (1)
When the exercise intensity increases, the blood sample of each group is collected at regular time interval and tested for the concentration of lactic acid in the blood (1)

(iv) Athletes may have higher stroke volume / higher cardiac output (1) to supply more blood to the muscles and maintain a steep concentration gradient for lactic acid to diffuse into the bloodstream more efficiently.

Total: 10 marks

SECTION B Applied Ecology

2. (a) (i) Ploughing allow more oxygen to enter the soil for aerobic respiration of decomposers/microorganisms. (1) This allows faster decomposition of organic matter into inorganic matter. The increased activities of decomposers/microorganisms can improve the soil fertility. (1) OR
There is more oxygen for aerobic respiration of roots of seedlings (1) so that more energy is released for absorption of minerals by active transport (1) or
An increase in the amount of air spaces in the soil after ploughing allows more room for root growth (1) so roots can grow longer to absorb more water and minerals/ for better anchorage. (1)

(ii) The beetle bank provides habitats/food for the predatory insects and birds, leading to an increase in their population size (1)
The predatory insects and birds in the beetle bank move to the farmlands and feed on the pests that damage the crops, (1)
leading to a decrease in the size of the pest population on the farmlands. (1)
The crop yield increases/crops grow better (1)

(iii) Any ***two*** of the following:
Chemical pesticides may kill beneficial insects on farmlands/damage crops while beetle banks do not. (1)

Consuming crops with pesticide residues may cause food poisoning while beetle banks do not pose such a risk. (1)

Chemical pesticides may leach into nearby water sources and cause water pollution while beetle banks do not. (1)

Chemical pesticides may not be biodegradable and it may accumulate along food chain, reaching a toxic level in top consumers while beetle banks do not have this problem. (1)

2. (a) (iv) During the first few years of establishment, the weeds need to be cleared regularly to avoid them competing with the plants in the beetle bank for resources, such as water and nutrients. (1) This may cause poor growth/reduce the population size of the plants in the beetle bank. (1)
When the plants in the beetle bank form a larger/stable population/the plants in the beetle bank grow taller and become the dominant vegetation, (1)
reducing the frequency of clearing weeds can minimise the disturbance to the organisms in the beetle bank. (1)

Total: 11 marks

2 (b) (i) Any one set of the following:
The trawling ban helps fish stocks to recover (1) by allowing fish to grow and reproduce/reducing the disturbance to the marine ecosystem. (1) /
A ban on bottom trawling allows restoration of corals (1) which provide shelter/breeding grounds for many marine species. (1)
A ban on bottom trawling can avoid the sediments from ocean bed to be stirred up/ reduce its effect on increasing the turbidity of water (1) which can increase the biodiversity(1)

(ii) The pellets provide a constant food supply/more proteins for the growth of the farmed fish. (1)
The farmed fish have less energy expenditure because their movement is limited by the cages. (1)
Therefore, more food substances can be converted into the biomass/can be used for growth. (1)

(iii) Any two sets of the following:
Decomposition of organic matter by bacteria uses up oxygen in the water (1) causing aquatic organisms to die of suffocation. (1)/

Decomposition of organic matter results in an increase in inorganic nutrients/eutrophication, which causes algal bloom. (1) Some algae produce toxins which may cause harm to aquatic organisms/Algae compete oxygen with aquatic organism at night and cause oxygen depletion in the water leading to suffocation of aquatic species (1)/

Organic matter increases the turbidity/ blocks sunlight (1) so that submerged plants cannot obtain enough sunlight for photosynthesis and die.(1)

Total: 9 marks