Shek Lei Catholic Secondary School
Final Examination 2021-2022
F6 Biology Paper 2
Suggested Answers

Section A

1. (a)(i) (13–7) dm^3/min (1 mark)
= 6 dm^3/min (1 mark)

(ii) During exercise, the cardiovascular centre is stimulated to send more nerve impulses (1 mark)
along the sympathetic nerve to the pacemaker. (1 mark)
The adrenal glands are also stimulated to secrete more adrenaline. (1 mark)
The activity of the pacemaker therefore increases, (1 mark)
which causes both the heart rate and the stroke volume and hence the cardiac output to increase. (1 mark)

(iii) Increase in rate of breathing. (1 mark)
Increase in depth of breathing. (1 mark)

Total: 9marks

(b)(i) Husband: not enough sperm / sperm have low motility / sperm have structural defect / vasa deferentia are blocked (1 mark)
Wife: fails to produce mature ova / fails to ovulate / oviducts are blocked / embryo fails to implant. (1 mark)

(ii) FSH stimulates follicle development (1 mark)
so that more mature ova can be collected to increase the rate of successful pregnancy. (1 mark)
Progesterone stimulates the thickening of the uterine lining (1 mark)
to prepare for the implantation of embryo(s). (1 mark)

(iii) Contraceptive pills contain synthetic progesterone or a combination of synthetic oestrogen and progesterone. (1 mark)
High levels of these hormones inhibit FSH and LH secretion (1 mark)
from the pituitary gland. (1 mark)
Low levels of FSH and LH prevent follicle development and ovulation, (1 mark)
therefore no ova are released into the oviducts for fertilization. (1 mark)

Total: 11 marks

Section B

2. (a) (i) Dissolved oxygen in the water is consumed by microorganisms (1 mark)
in the decomposition of organic matter. (1 mark)
A high BOD value reflects that a large amount of organic matter is present and a large amount of oxygen is required for microbial decomposition. (1 mark)

(ii) Excess nitrate and phosphate in the water may lead to an algal bloom. (1 mark)
The algae use up the oxygen in the water for respiration at night, causing suffocation of aquatic organisms. (1 mark)
The decomposition of algae releases toxic substances, which may kill aquatic organisms. (1 mark)

(iii) Organic nitrogen in the sewage is converted to ammonium compounds / ammonia through decomposition by microorganisms / decomposers / putrefying bacteria in the artificial wetland. (1 mark)
The ammonium compounds / ammonia can be converted to nitrates through nitrification by nitrifying bacteria. (1 mark)
The nitrates are absorbed by the wetland plants for growth. / The nitrates are converted to nitrogen gas through denitrification by denitrifying bacteria. (1 mark)
All these processes lead to a decrease in the total nitrogen content in the effluent compared with the influent. (1 mark)

(iv) Perennial plants can grow for many years without harvest / without the need of replanting every year. (1 mark)
This allows the accumulation/storage of pollutants in the plant bodies over a long period of time. / This can reduce the maintenance cost of the wetland system. (1 mark)

Total: 12 marks

2. (b) (i) Starch-based plastics are made from starch which is renewable, while conventional plastics are made from non-renewable petroleum / fossil fuels. (1 mark)

(ii) Carbon dioxide (1 mark)
Water (1 mark)

(iii) Reduce the use of disposable plastic items / Reuse plastic items / Bring you own bags / Separate plastic waste for recycling (1 mark)
(Accept other reasonable answers.)

(iv) (1) At pH 7.0, increasing the temperature from 30 °C to 40 °C increases the amount of the plastic being broken down. (1 mark)
At pH 9.0, increasing the temperature from 30 °C to 40 °C decreases the amount of the plastic being broken down. (1 mark)

(2) Any ***two*** of the following: (2 marks)
-Size/thickness of the plastic sheets
-Concentration of the enzyme solution
-Time of immersion

Total: 8 marks

Section C

3. (a) (i) simple sugars → ethanol + carbon dioxide (2 marks)

(ii) The fungus uses its hyphae (1 mark)
to spread over and penetrate the steamed rice. (1 mark)
Enzymes are secreted from the hyphae to digest the starch in the rice. (1 mark)

(iii) The simple sugars made available by the starter mould serve as the substrates for fermentation by the lactic acid bacteria and the yeast. (1 mark)
The lactic acid bacteria produce lactic acid which inhibits the growth of unwanted microorganisms / provides flavour and smooth mouthful to the sake. (1 mark)

(iv) Pasteurization has relatively little effects on the flavour, texture and alcohol level of the sake. (1 mark)

(v) Some microorganisms are not killed at 65 °C (1 mark)
and refrigeration is needed to inhibit the growth of the remaining living microorganisms. (1 mark)

Total: 10 marks

3. (b) (i) The freshwater fish / water may be contaminated with the bacterium. (1 mark)
If wounds are present on hands, direct contact with contaminated fish/water with bare hands allows the bacteria to enter the body through the wounds in the skin. (1 mark)

(ii) Any ***two*** of the following: (2 marks)

-Cover all wounds when handling raw aquatic products and wear protective gloves.

-Do not touch the fish or use any towel provided in the market stalls when buying fish from the market.

-Wash hands with liquid soap and water as soon as possible if having contact with raw aquatic products.

-Do not eat raw or undercooked freshwater aquatic products. / Ensure that the food is thoroughly cooked.

-Store raw and cooked foods separately, and use different knives and cutting boards to handle them separately to avoid cross-contamination.

(Accept other reasonable answers.)

(iii) (1) Sterilize the culture medium in an autoclave. (1 mark)
The high temperature and pressure of the autoclave (1 mark)
will kill bacteria and fungi and their spores. (1 mark)

(2) DNA fingerprinting / DNA sequencing (1 mark)

(iv) Treating a specific bacterial infection using specific antibiotics is more effective / can avoid killing beneficial bacteria naturally present in our body. (1 mark)
The indiscriminate use of antibiotics may speed up the development of antibiotic resistance in bacteria. (1 mark)

Total: 10 marks

Section D

4. (a) (i) The stem cells are cultured and allowed to divide to increase in number. (1 mark)
The stem cells are stimulated to differentiate into epithelium stem cells. (1 mark)
The epithelium stem cells are introduced into the patient's lungs. (1 mark)
The epithelium stem cells would continuously divide and differentiate into epithelial cells to repair the damaged epithelium. (1 mark)

(ii) The stem cells are obtained from another individual and these cells carry antigens that are different from the patient. (1 mark)
The patient's immune system may recognize the transplanted stem cells as foreign cells (1 mark)
and initiates immune responses to destroy the transplanted stem cells. (1 mark)

(iii) The transplanted stem cells may continue to proliferate uncontrollably and become cancerous. (1 mark)

(iv) Any ***two*** of the following: (2 marks)
-The isolation of embryonic stem cells often involves the destruction of embryos, which can be considered as an act of murder.
-Embryos may be created through cloning for obtaining embryonic stem cells. This lowers the value of life.
-It is difficult to decide who has to right to decide the fate of excess embryos.
-The technique used to clone human embryos may be misused for human reproductive cloning.
(Accept other reasonable answers.)

Total: 10 marks

4. (b) (i) BamHI could be used because it would cut on the plasmid and at both ends of the HGH gene / its restriction site is present on the plasmid and at both ends of the HGH gene. (1 mark)
EcoRV could not be used because it would cut and interrupt the HGH gene.(1 mark)
NotI could not cut out the HGH gene from the DNA segment because it only has one restriction site at one end of the HGH gene. (1 mark)

(ii) DNA ligase (1 mark)

(iii) Any ***one set*** of the following: (2 mars)
-To select the bacteria that picked up a plasmid / the transformed bacteria.
-The plasmid contains the tetracycline resistance gene. The transformed bacteria can survive and divide to form colonies on the agar plate containing tetracycline.

OR

-To eliminate the bacteria that did not pick up a plasmid / are not transformed. As they do not carry the tetracycline resistance gene, they are killed by the tetracycline in the agar plate.

(iv) Three (1 mark)
The insertion of the HGH gene into the plasmid interrupts the ampicillin resistance gene. (1 mark)
Transformed bacteria with a recombinant plasmid cannot survive on plate B in presence of ampicillin (1 mark)
Three of the colonies found on plate A are not found on plate B. Those are colonies of transformed bacteria with a recombinant plasmid. (1 mark)

Total: 10 marks

--End of Suggested Answers--