Queen's College

Mock Examination, 2020 – 2021

Biology Paper 2

Suggested Answers

Paper 2 Section A

Marks

1. (a) (i)
- the LH level remains fairly constant / there is no LH surge over the period (1)
- in the ovaries, ovulation is not triggered (1) (2)

(ii)
- as the menstrual cycle length becomes much longer than normal, (1)
- the uterine lining becomes excessively thick with blood supply and nutrients (1)
- heavy menstrual bleeding results when this thickened uterine lining sheds (1) (3)

(iii)
- high levels of oestrogen and progesterone inhibit FSH secretion (1) by the pituitary gland (1)
- due to the low level of FSH in blood, follicle development in the ovaries stops and cysts do not develop (1) (3)

8 marks

(b) (i)
- the body temperature increases during exercise (1)
- during exercise, strong muscle contractions generate a large amount of heat (1)
- the amount of heat generated is greater than the amount of heat lost from the body, leading to a rise in body temperature (1) (3)

(ii) (1)
- in both males and females, the rate of sweat production increases steadily during exercise (1)
- however, the increase in the rate of sweat production in males is larger than that in females (1) (2)

(2)
- males produce more body heat during exercise than females due to their larger body size (1)
- however, a larger body size means a smaller surface area to volume ratio, which is proportional to the rate of heat loss from the body (1)
- that means males lose heat from the skin surface less efficiently than females by convection, conduction and radiation (1)
- males produce sweat at a higher rate to allow faster heat loss from the body by sweat evaporation (1) (4)

Marks

(iii) · during exercise, the cardiovascular centre in the medulla oblongata sends more nerve impulses via the sympathetic nerve (1)

· the sympathetic nerve releases more noradrenaline, which stimulates the activity of the SA node and cardiac muscle of the heart. As a result, the heart beats more frequently and more strongly (1)

Any ***one*** of the following:

· this supplies more oxygen and nutrients to the skeletal muscles and cardiac muscle so that the muscle cells can respire at a higher rate to release more energy for muscle contractions (1)

· this removes carbon dioxide and lactic acid from muscle cells faster, preventing the accumulation of carbon dioxide and lactic acid in the muscles (1) (3)

12 marks

Paper 2 Section D

Marks

4. (a) (i) · the body was completely buried in ice so that it was not eaten by predators (1)
· the body was frozen quickly so that little decomposition occurred (1) (2)

(ii) (1) · the cloning of the woolly involves two different species as the egg cell comes from the Asian elephant; while in cloning Dolly, both the adult body cell and egg cell belongs to the same species (1)
· in cloning the woolly mammoth, the surrogate mother and the embryo belongs to different species; while in cloning Dolly, both the surrogate mother and the embryo belong to the same species (1) (2)

(2) · the genetic make-up of the baby woolly mammoth is identical to the frozen woolly mammoth (1)
· because the nucleus of the cells of the baby woolly mammoth is derived from the nucleus of the cell of the frozen woolly mammoth by mitotic cell division (1) (2)

(3) Any ***one*** of the following:
· the woolly mammoth clone might suffer from premature ageing and have a shorter lifespan (1) since its genetic material comes from an adult mammoth (1)
· there is no suitable environment for the woolly mammoth clone to live, (1) as the natural habitat of the woolly mammoth has disappeared / changed drastically today (1) (2)

(iii) reasons for continuing the research:
· scientists can study how woolly mammoth genes function to allow mammoths to survive in cold climates (1)
· the mammoth-elephant hybrid can survive and reproduce in colder regions where human disturbances are less severe, as the survival of Asian elephants is threatened by habitat loss and hunting, which may help prevent them from extinction (1)

(accept other reasonable answers)

reasons for banning the research:
· if the mammoth-elephant hybrids are released into the wild, they may out-compete other animals, which may result in a reduction of biodiversity and upset the ecological balance (1)
· efforts and resources could be better spent in conserving and restoring the habitats of Asian elephants, since the suitable habitat for the mammoth-elephant hybrid is shrinking due to global warming, it is doubtful whether the hybrid can help preserve elephants (1) (2)

10 marks

Marks

(b) (i) · the jellyfish gene is used as a marker gene to identify which cells have taken up the recombinant DNA (1)

· cells which have taken up the recombinant DNA glow green under ultraviolet light (1) (2)

(ii) · use the same restriction enzyme to cut the gene for factor IX from human DNA and the jellyfish gene from jellyfish DNA to produce complementary sticky ends on the genes (1)

· use DNA ligase to catalyse the joining of the gene for factor IX and the jellyfish gene (1) by covalent bonds (2)

(iii) · the insertion of the recombinant DNA into the DNA of the body cell may have disrupted genes and affected protein synthesis, thus the embryos fail to grow (1)

· the embryos are rejected or attacked by the immune system of the surrogate sheep (1) (2)

(iv) (1) · cells from an 8-celled embryo can differentiate into any types of specialised cells but the cells from a blastocyst cannot (1) (1)

(2) · all the offspring produced in method I are female sheep but some of the offspring produced in method II may be male sheep (1)

· all the offspring produced in method I are genetically identical to the GM sheep but the offspring produced in method II are genetically different from one another and the GM sheep (1)

· method I is more suitable because all the offspring produced are female sheep which can secrete factor IX in their milk (1) (3)

10 marks