WAH YAN COLLEGE, HONG KONG

F.6 Mock Examination 2020

BIOLOGY PAPER 2

Name: _____

Class: _____ Class No.: _____

Time allowed: 1 hour
This paper must be answered in English.

INSTRUCTIONS

1 There are **TWO** sections, A and B in this Paper. Attempt **ALL** questions in these **TWO** sections.

2 **You are provided with an answer book. Put the question number on the front cover of the answer book.**

3 Each section carries 20 marks.

4 Present your answers in paragraphs wherever appropriate.

5 Illustrate your answers with diagrams wherever appropriate.

6 The diagrams in this Paper are **NOT** necessarily drawn to scale.

Not to be taken away before the end of the examination

SECTION A Human Physiology: Regulation and Control

Answer ALL parts of the question. Put your answers in the answer book.

1a) Kidney failure can be caused by inflammation that damages the glomeruli or the loss of a large volume of blood. Patients with kidney failure can be treated using haemodialysis. During the process, the patient's blood is passed along a long dialysis tubing immersed in dialysing fluid. The table below shows the concentrations of certain substances in the plasma and the dialysing fluid before and after haemodialysis.

Substance	Concentration (%)		
	Plasma entering the nephron	Dialysing fluid before haemodialysis	Dialysing fluid after haemodialysis
Glucose	0.100	0.100	0.100
Protein	6.823	0.000	0.000
Sodium	0.239	0.239	0.239
Urea	0.028	0.000	0.018
Water	91.820	92.050	97.002

(i) Explain why the loss of a large volume of blood

(1) will trigger an increase in the secretion of antidiuretic hormone (ADH). With reference to the action of the hormone, explain the importance of the increase in ADH secretion to the body. (3 marks)

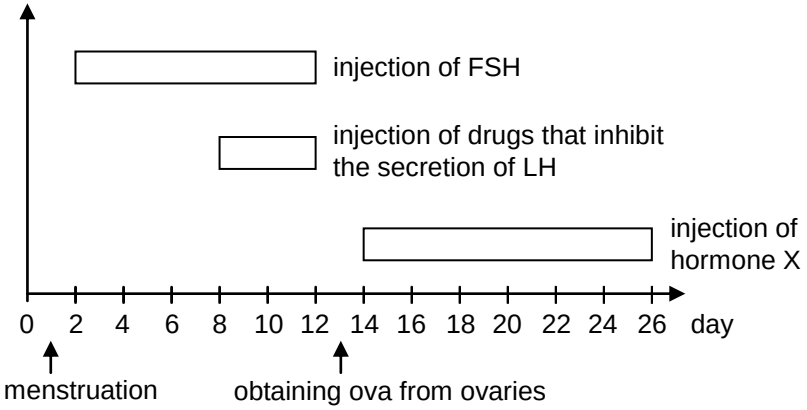
(2) may lead to kidney failure. (2 marks)

(ii) Why is it important to ensure that the dialysing fluid before haemodialysis contains 0.100% glucose? (2 marks)

(iii) How does haemodialysis remove urea? Explain with reference to the data provided. (2 marks)

(iv) Why must patients undergoing haemodialysis adopt a low-protein diet? (1 mark)

1b) *In vitro* fertilization (IVF) is a technique for infertility treatment. During the process of IVF, different drugs and hormones are used in the female patient to obtain mature ova. The diagram below shows some of these drugs and hormones.



(i) Describe the use of FSH injections in IVF. (2 marks)

(ii) Hormone X is given to the female patient after ova were obtained from the ovaries. It helps the implantation of embryos. What is hormone X? How can it help the implantation of embryos? (2 marks)

(iii) Suggest why drugs that inhibit the secretion of LH from the pituitary gland are also used during the process of IVF. (2 marks)

(iv) The FSH injections used in IVF can be produced by recombinant DNA technology (r-FSH) or extracted from the urine of postmenopausal women (u-FSH). The table below shows the effectiveness of r-FSH and u-FSH in two groups of female patients undergoing IVF.

	r-FSH	**u-FSH**
Level of oestrogen in the blood (arbitrary unit)	7.55	4.95

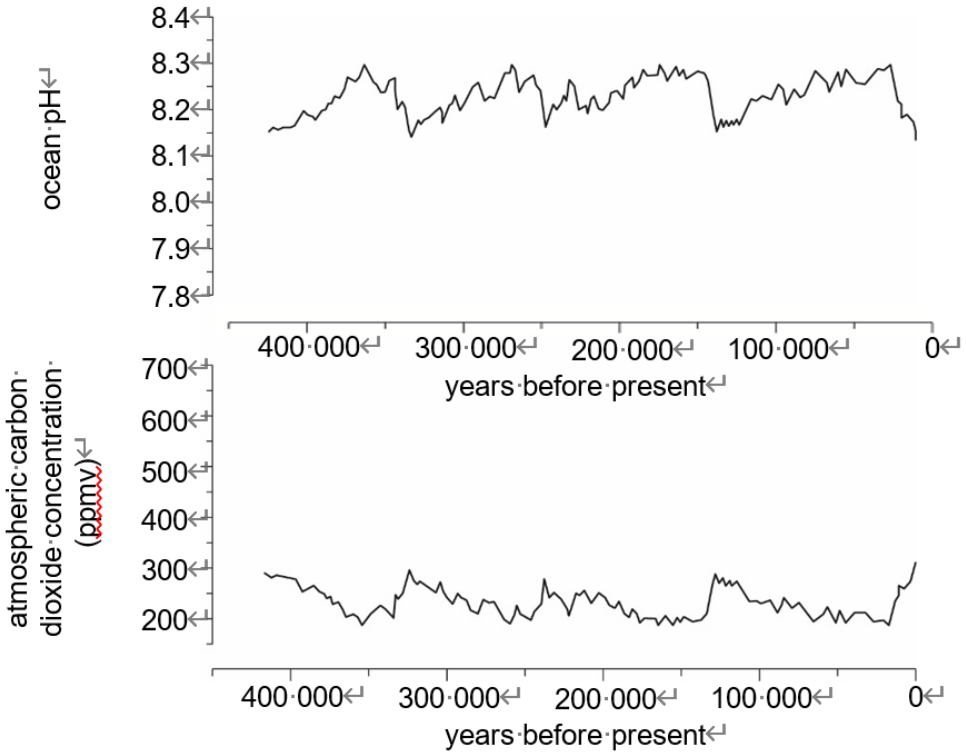
Which type of FSH injection can help obtain more mature ova? Briefly explain your answer. (2 marks)

(v) Why does the urine of postmenopausal women usually contain high levels of FSH and LH? (2 marks)

SECTION B Applied Ecology

Answer ALL parts of the question. Put your answers in the answer book.

2a) The graphs below show the changes in ocean pH and carbon dioxide concentration in the atmosphere over the past 400 000 years.



(i) Based on the graphs, state the relationship between atmospheric carbon dioxide concentration and ocean pH. Suggest an explanation for the relationship. (3 marks)

(ii) It is suggested that an increase in carbon dioxide concentration may lead to a decrease in the thickness of the shells of shellfish. To investigate whether this is the case, a study was conducted to compare the thickness of the shells of a species of sea snail found at two different sites in the ocean. The carbon dioxide concentration and population size of algae (which is the main food source of the sea snail) at each site were also recorded. The results are shown below.

	Site A	**Site B**
Carbon dioxide concentration	Normal	High
Average thickness of the shell (mm)	2.6	3.4
Algae population size (arbitrary unit)	3.5	12

(1) Explain whether the results agree with the suggestion. (2 marks)

(2) With reference to the table of results, suggest an explanation for the difference in the thickness of the shells for the sea snails at the two sites. (5 marks)

2b) Read the passage below and answer the questions that follow:

Conservation of Horseshoe Crab in Hong Kong

Horseshoe crabs have been around for more than 300 million years, making them even older than dinosaurs.

Horseshoe crabs utilize different habitats depending on their stage of development. The eggs are laid on coastal beaches in late spring and summer. After hatching, the juvenile horseshoe crabs can be found offshore on the sandy ocean floor of tidal flats. Adult horseshoe crabs feed deeper in the ocean until they return to the beach to spawn.

Horseshoe crab populations are rapidly declining around the world. Hong Kong is no exception. Recent surveys show that since 2002 juvenile horseshoe crab populations has declined by over 90% at some locations in Hong Kong.

(i) Suggest and explain TWO human activities that imposed threats on the survival of horseshoe crabs in Hong Kong. (4 marks)

(ii) Hong Kong Ocean Park is now launching a Juvenile Horseshoe Crab Rearing Programme for secondary school students to rear the artificially-bred juvenile horseshoe crabs and then release them back to the wild.

Do you think that this helps conservation of the species? Give reasons to support your answer. (2 marks)

(iii) Horseshoe crabs feed on worms, small fishes and shrimps living on seabed. Horseshoe crabs are more easily poisoned to death by the effluent released by the factories, when compared with their preys. Explain why. (4 marks)

END OF PAPER