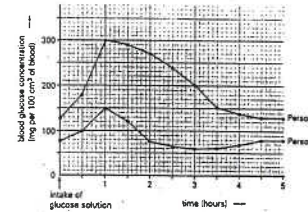


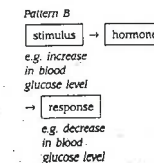
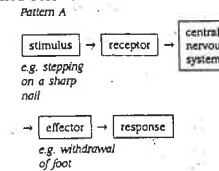
Past HKCEE Questions
Hormonal Co-ordination
Paper I

1. In an experiment, a normal person A and a person B with a defective pancreas were starved for 12 hours, and were then allowed to drink an equal volume of the same glucose solution. The blood glucose concentration of each person was measured immediately and then at half-hour intervals. The results are shown in the graph below:



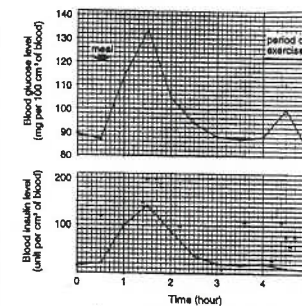
- Explain why the blood glucose concentration of person A rose during the first hour. (1 mark)
 - For person A, state TWO processes that took place in his liver to lower the blood glucose concentration after the first hour. (2 marks)
 - When the blood glucose concentration of a person exceeds 180 mg per 100 cm³ of blood, glucose appears in the urine. State the period in which glucose might appear in the urine of person B. (1 mark)
 - Describe a test used to detect the presence of glucose in a sample of urine. (2 marks)
 - What function does the pancreas of person B fail to carry out that results in his high blood glucose concentration? (1 mark)
- (HKCEE 1988)

2. Two patterns of response shown by the human body towards stimuli of different nature are outlined below:



- Referring to the specific cell types involved, describe the sequence of events that leads to the withdrawal of the foot. (4 marks)
 - Referring to the specific organs and hormone involved, describe the sequence of events that leads to a decrease in blood glucose level. (4 marks)
 - With reference to the mechanisms involved, explain why the response in pattern A occurs much faster than that in pattern B. (2 marks)
 - Regulation of the blood glucose level is an example of the feedback mechanism in the body. State another example. What is the importance of the feedback mechanism to the body? (2 marks)
- (HKCEE 1993)

3. The following graphs show the changes in the levels of glucose and insulin in the blood of a man over a 5-hour period. At different times during this period, the man took a meal of rice and carried out exercise.

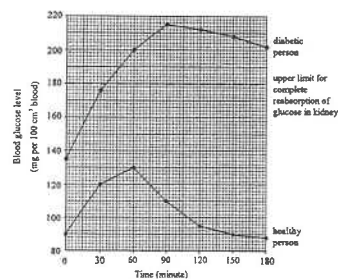


- Explain why the blood glucose level increased after the meal. (2 marks)
 - Which organ in the body provided the additional glucose to the blood between hour 4 and hour 4.5? What process in this organ caused this rise in the blood glucose level? (2 marks)
 - Explain the significance of such a rise in the blood glucose level? (2 marks)
 - Explain the changes in the blood insulin level from hour 0.5 to hour 3. (5 marks)
- (HKCEE 1994)

4. Diabetes mellitus is a disease found in humans and other mammals. The main symptom of this disease is the presence of glucose in the urine. In the early twentieth century, the cause of diabetes mellitus was still unknown. In order to study this disease, a scientist performed the following experiments on dogs:

Experiment	Experimental subject	Treatment	Result
1	Healthy dogs	Removing the pancreas	Symptoms of diabetes appeared
2	Diabetic dogs from experiment 1	Injecting extracts of pancreas	Symptoms of diabetes disappeared
3	Diabetic dogs from experiment 1	(a) Injecting extracts of pancreas which had been treated with protease	Symptoms of diabetes remained
		(b) Injecting extracts of pancreas which had been treated with lipase	Symptoms of diabetes disappeared

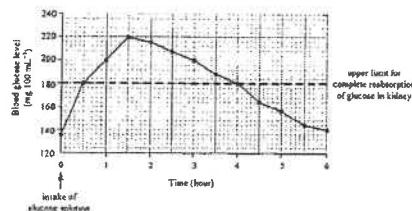
- (i) Comparing the results of experiments 1 and 2, what conclusion can be drawn? (2 marks)
- (ii) What is the aim of performing experiment 3? (2 marks)
- (iii) Based on the results of experiments 2 and 3 (a), explain whether the diabetic dogs would show symptoms of the disease if they were treated with the extracts of pancreas by feeding instead of by injection. (3 marks)
- (iv) Based on your biological knowledge, explain why the urine of a diabetic person usually contains glucose. (5 marks)
- (HKCEE 2000)
5. In a study, a healthy person and a person with diabetes mellitus fasted for 12 hours. They then stayed at rest in the same room and drank equal volumes of glucose solutions of the same concentration. Their blood glucose levels were measured immediately afterwards and at 30-minute intervals for three hours. The results are shown in the graph below:



- (i) What is the increase in the blood glucose level after 1 hour in
- (1) the healthy person,
 - (2) the diabetic person?
- (2 marks)

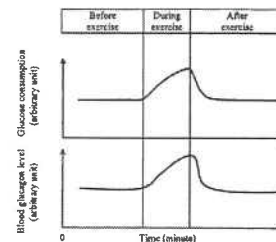
- (ii) Explain why the healthy person had a smaller increase in blood glucose level in the first hour when compared with the diabetic person. (4 marks)
- (iii) During the study, a larger volume of urine was produced by the diabetic person than the healthy person. Suggest an explanation for this. (4 marks)
- (HKCEE 2002)

6. In a medical test, George drank a glass of glucose solution. The graph below shows the subsequent changes in his blood glucose level:

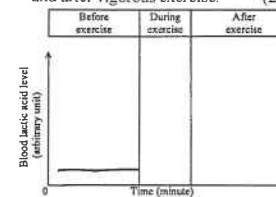


- (i) Based on the graph, state the period in which the urine of George would contain glucose. Explain why glucose in the blood would appear in the urine during this period. (4 marks)
- (ii) The doctor diagnosed that George had diabetes mellitus and advised him to get insulin injections for treatment. Which organ of George was likely to be defective? (1 mark)
- (iii) The insulin used for treating diabetes mellitus can be obtained from pigs and cattle, or produced by genetically modified bacteria. State two advantages of using insulin produced by the bacteria over that obtained from mammals. (2 marks)
- (iv) (1) Besides insulin, name another hormone that is responsible for the regulation of blood glucose level. (1 mark)
- (2) State *one* effect of this hormone on the activity of liver cells. (1 mark)
- (HKCEE 2005)

7. The graphs below show the changes in the glucose consumption and the blood glucagon level in a person before, during and after exercise:



- (i) Explain the change in glucose consumption during exercise. (3 marks)
- (ii) During exercise the blood glucose level remains relatively steady. Explain this phenomenon by referring to the change in the blood glucagon level. (3 marks)
- (iii) Draw a line on the graph below to show the change in the blood lactic acid level during and after vigorous exercise. (2 marks)

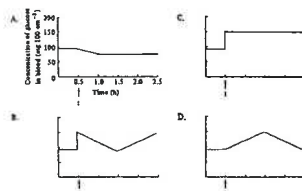


(HKCEE 2007)

Past HKCEE Questions
Hormonal Co-ordination
Paper II

90-47

A healthy person drank 100 cm³ of a 80% glucose solution at time t. Which of the following graphs shows the probable changes in his blood glucose concentration?



92-42

Injection of insulin into the vein of a mammal lowers its blood glucose level. This is because
A. glucose is excreted in the urine.
B. glucose is broken down by insulin.
C. glucose is changed to glycogen in the liver.
D. glucose is absorbed from the small intestine.

92-43

Which of the following statements about insulin is true?
A. It is an enzyme.
B. It is carried by blood.
C. It is secreted by the liver.
D. It exerts its action in the pancreas.

94-30

Which of the following statements about insulin is incorrect?
A. It is a protein.
B. It is secreted by an endocrine gland.
C. It is carried by blood to all parts of the body.
D. It catalyses the conversion of glucose to glycogen.

95-37

Which of the following statements about insulin is correct?
A. It catalyses the conversion of glucose into glycogen in the liver.
B. A lack of insulin will result in a high blood sugar level.
C. Blocking the pancreatic duct will stop the release of insulin from the pancreas.
D. When the blood sugar level is high, the brain stimulates the pancreas to produce more insulin.

05-50

A hormone differs from an enzyme in that
A. it is not made up of protein.
B. it is produced by a gland.
C. it is carried by blood to the target organ.
D. it catalyses a wide range of metabolic reactions.

05-59

Which of the following processes is controlled by hormones?
A. combination of antibodies with antigens
B. emulsification of fat in the small intestine
C. development of mammary glands at puberty
D. breakdown of excess amino acids in the liver

06-51

In humans, which of the following is / are under the influence of hormones?

- (1) production of sperms
(2) shivering
(3) uptake of glucose into body cells
A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only

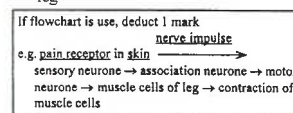
06-52

Which of the following statements about hormones is correct?
A. The effect of glucagon is localized.
B. The target sites of sex hormones are specific.
C. All hormones are made of polypeptides.
D. Insulin is released from the pancreas through the pancreatic duct.

Past HKCEE Questions
Hormonal Co-ordination
Suggested Answers

Paper I

1. (i) Glucose in the small intestine was absorbed into blood
- (ii)
 - glucose is converted to glycogen
 - glucose is converted to fat / protein
 - glucose is oxidized (any 2)
- (iii) From $\frac{1}{2}$ hour to $3\frac{1}{4}$ hours (or $2\frac{3}{4}$ hour)
- (iv) Add Benedict's solution to the test sample and heat
appearance of a red ppt. indicates presence of glucose
(Accept the use of clinistix paper, and refer to the chart for colour change)
- (v) the pancreas fails to produce sufficient insulin
2. (i) Reception of stimulus (skin pierced by the sharp nail) by pain receptors / nerve endings in the skin
Generation of a nerve impulse which is transmitted to the muscles of the leg via the following pathway:
 Receptor \rightarrow sensory neurone \rightarrow association neurone \rightarrow motor neurone \rightarrow muscle cells of the leg
 Contraction of the muscles cells resulting in the withdrawal of the leg
- (ii) An increase in blood glucose level stimulates the pancreas to release more insulin into the blood stream
insulin stimulates liver cells to convert more blood glucose into liver glycogen / to increase carbohydrate oxidation resulting in a reduction of blood glucose level
(If flowchart is used, deduct 1 mark)
- (iii) It is because nervous impulses are transmitted along nerve fibres at a very high speed while it takes time for hormones to be transported to target cells via the blood circulation
- (iv) Temperature regulation / osmoregulation to maintain a constant internal environment for the normal functioning of the life processes
3. (i) The starch in the rice is first digested into glucose and absorbed into the blood of the small intestine
- (ii) (1) Liver
Glycogen is broken down into glucose which is then released into the blood.
(2) This provides more glucose for the respiration of muscle to release more energy for muscle contraction during exercise
- (iii) From hour 0.5 to 1.5, the increase in blood glucose level stimulates the pancreas to secrete more insulin
The increased insulin lowers the blood glucose level
From hour 1.5 to 3, a decrease in the blood glucose causes the pancreas to secrete less insulin
4. (i) Diabetes is caused by the absence of certain substance(s) which can be found in the pancreas
- (ii) To determine whether the substance in the pancreas extract effective in treating diabetes is a protein or a fat
- (iii) Symptoms of diabetes would remain
This is because protease in the alimentary canal will digest the active substance which is protein in nature



- (iv) In the diabetic person, the pancreas cannot produce enough insulin
Thus the liver cannot convert excess glucose in the blood into glycogen
His blood glucose concentration remains high
leading to a high level of glucose in the glomerular filtrate
The kidney tubules cannot reabsorb all the glucose from the filtrate thus glucose is excreted in the urine
Effective communication (C) 1
5. (i) (1) 40 mg per 100 cm³ blood 1
(2) 65 mg per 100 cm³ blood 1
- (ii) In the healthy person, the initial rise in blood glucose level stimulates the secretion of insulin by the pancreas
while there is no / less insulin secretion in the diabetic person
Insulin stimulates the conversion of glucose into glycogen in the liver / uptake of glucose by body cells so the increase in blood glucose level in the healthy person is smaller
Effective communication (C) 1
- (iii) Since the 36th minute, the blood glucose level of the diabetic person is higher than the upper limit for complete reabsorption of glucose so glucose is present in the filtrate / urine in the collecting duct
The water potential of the filtrate / urine is lowered by the glucose present
thus the reabsorption of water is reduced
and a larger volume of urine would be produced 1
6. (i) 0.5 to 4 hour 1
Blood glucose is filtered into the kidney tubule 1
In this period, the glucose level in the glomerular filtrate is higher than the upper limit for complete reabsorption of glucose
so some glucose will be left in the glomerular filtrate / cannot be reabsorbed and excreted in the urine 1
- (ii) pancreas 1
- (iii) Any 2 1,1
Less side effects / More effective in action / Insulin produced from genetically modified bacteria is cheaper and in greater supply)
(accept other reasonable answers)
- (iv) (1) *glucagon 1
(2) Glucagon will stimulate the conversion of glycogen in liver cells to glucose 1
7. (i) Glucose consumption increases during exercise 1
because glucose is used in respiration / respiration rate is faster to provide more energy for muscle contraction 1
- (ii) More glucagon is released during exercise 1
Which stimulates the conversion of glycogen to glucose in liver to restore the blood glucose level / compensate for the increase in glucose consumption 1
Effective Communication 1C
- (iii) Trends:
Increase during exercise 1
Decrease after exercise 1

Paper II

90-47	D
92-42	C
92-43	B
94-30	D
95-37	B
05-50	C
05-59	C
06-51	C
06-52	B