Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Foundation

Resource Set Topic 7: Animal Coordination, Control and Homeostasis

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1 Insulin is produced by an endocrine gland and is transported in the blood.

(a) (i) Which row shows the endocrine gland and the target organs for insulin?

(1)

	endocrine gland	target organs
☒ **A**	adrenal	liver and muscles
☒ **B**	adrenal	small and large intestines
☒ **C**	pancreas	liver and muscles
☒ **D**	pancreas	small and large intestines

(ii) Which part of the blood transports insulin to its target organs?

(1)

☒ **A** plasma

☒ **B** red blood cells

☒ **C** white blood cells

☒ **D** platelets

(b) Figure 1 shows the blood glucose and blood insulin concentration for a healthy person during one day.

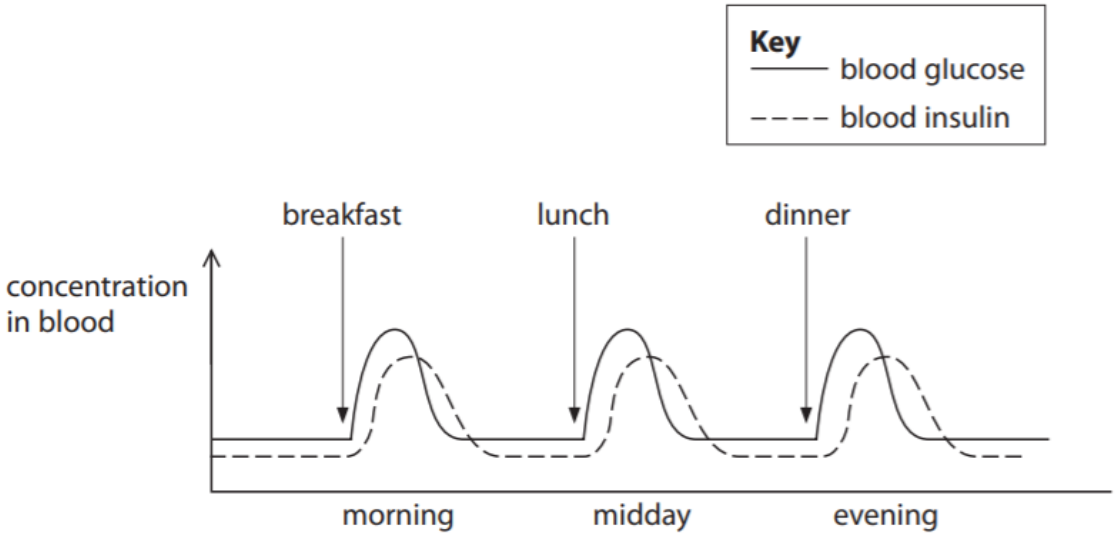

Figure 1

The blood glucose concentration increases after a meal.

Explain why the blood glucose concentration then decreases.

(2)

- insulin produced from pancreas
- extra glucose converted into glycogen in liver, increase aerobic respiration to use up extra glucose
- blood glucose concentration therefore decreases

(c) State **one** cause of type 1 diabetes.

(1)

pancreas naturally doesn't produce enough insulin

(d) Explain how controlling the diet can be used to treat type 2 diabetes.

(2)

- less glucose intake avoids sudden rise in glucose
- body can still control blood glucose concentration with less insulin produced

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

State **two** other factors that the scientist should consider when selecting the 300 volunteers.

(2)

1 same age

2 same gender

7 Figure 16 shows the urinary system of a human.

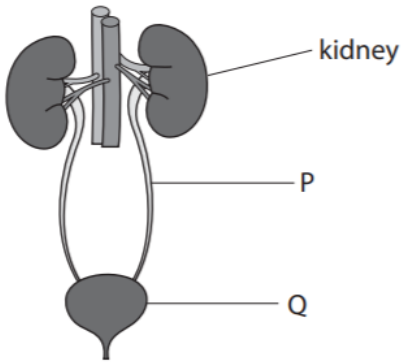

Figure 16

(a) Name the structures labelled P and Q.

(2)

P ureter

Q bladder

(b) The kidney contains nephrons.

Figure 17 shows the concentration of glucose and protein found in the blood plasma and in the filtrate inside a nephron.

	concentration in the blood plasma	concentration in the filtrate in the nephron
glucose	1 mg per cm^3	1 mg per cm^3
protein	47 g per dm^3	0 g per dm^3

Figure 17

(i) Explain the difference in the concentration of protein in the blood plasma and in the filtrate in the nephron.

(2)

- blood filtered out from capillaries into long tubules as ultrafiltration as glomerular filtrate
- protein in blood is too big to be filtered through capillary wall & basement membrane so remains in blood plasma so none in filtrate in nephron

(ii) Explain how glucose moves from the blood plasma into the nephron.

(3)

- ultrafiltration
- due to higher pressure in blood plasma
- across a partially permeable membrane into the nephron
- from glomerulus into bowman's capsule

*(c) Figure 18 shows a patient undergoing kidney dialysis.

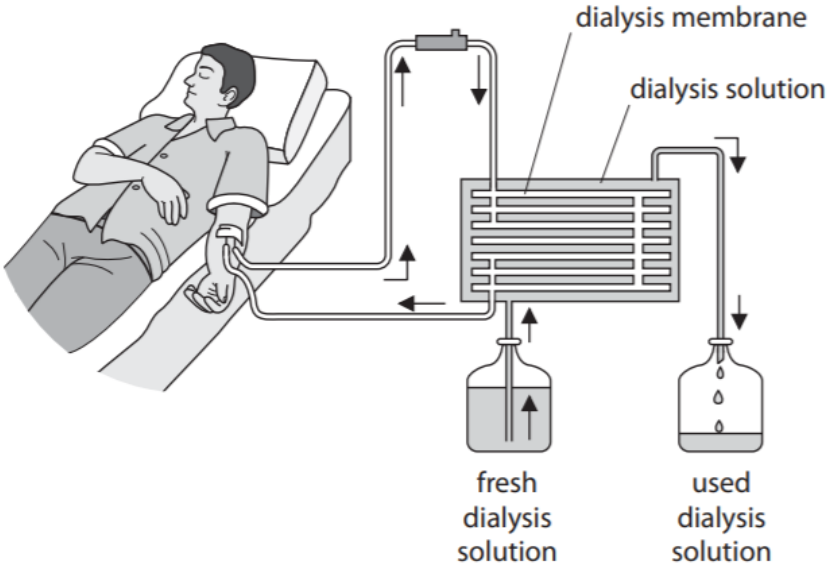

Figure 18

Describe how dialysis removes unwanted substances from the blood.

Include examples of unwanted substances in your answer.

(6)

BLOOD TO MACHINE

- kidney dialysis used when a person's kidneys are damaged so don't remove urea from blood
- blood taken from arm passes into dialysis machine
- blood is separated from dialysis solution by a partially permeable membrane
- blood returned to body

UNWANTED SUBSTANCES

- toxic substances : urea, alcohol, excess ions (Na, Cl)

HOW SUBSTANCES REMOVED FROM BLOOD

- unwanted substances move into dialysis fluid
- by diffusion across membrane
- down a concentration gradient
- fresh dialysis fluid is pumped through to maintain the concentration gradient

2 Figure 3 shows the positions of the endocrine glands in a woman and a man.

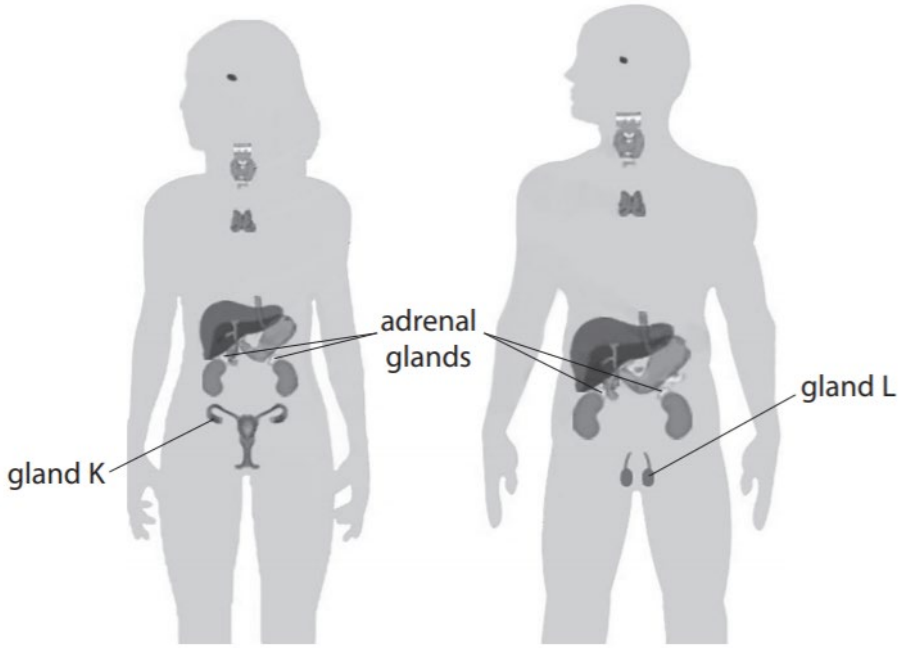

Figure 3

(a) Draw **one** straight line from each hormone to the effect of the hormone on the body.

(2)

hormone	effect of hormone
	increases glucose levels
hormone from gland K in the woman	prepares the uterus lining for a fertilised egg
hormone from gland L in the man	causes facial hair to grow
	controls the water content of the body
	decreases sweating

(b) How is adrenalin transported from the adrenal glands to its target organs?

(1)

- ☒ **A** by transpiration
- ☒ **B** by osmosis
- ☒ **C** dissolved in blood plasma
- ☒ **D** carried by red blood cells

(c) What name is given to the process of maintaining the internal body conditions?

(1)

- ☒ **A** respiration
- ☒ **B** diffusion
- ☒ **C** digestion
- ☒ **D** homeostasis

(d) Figure 4 shows the concentration of glucose in the blood of a person.

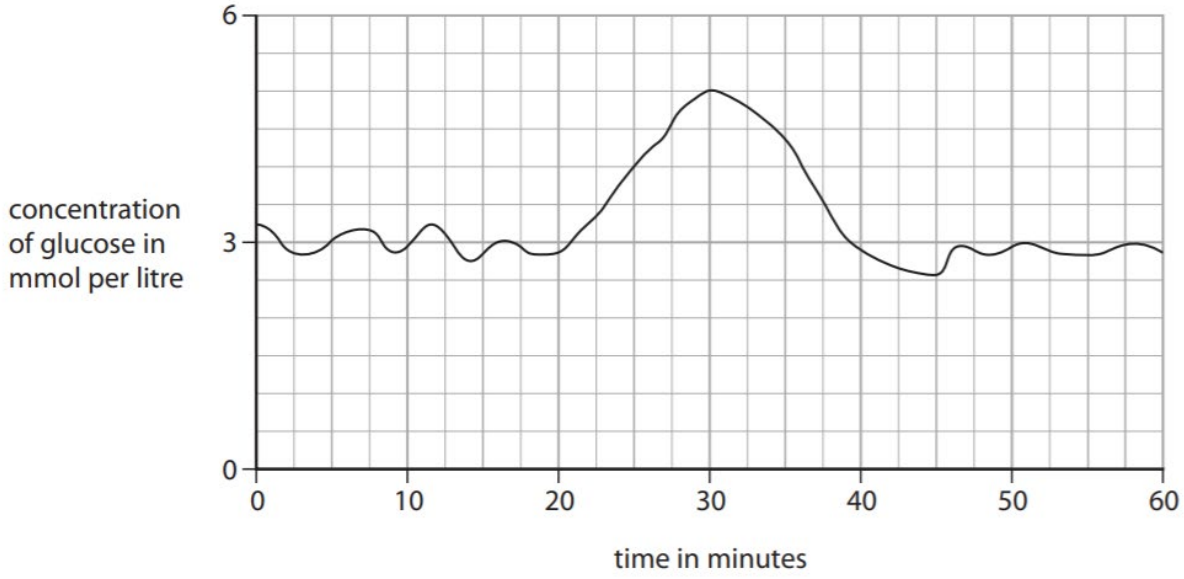

Figure 4

(i) Describe the trends shown in Figure 4 from 0 minutes to 30 minutes.

(2)

- remains around a constant concentration of glucose around 3 mmol per L for first 20 minutes
- concentration increases from 20 to 30 minutes from 3 to 5 mmol per L

(ii) Explain why the concentration of glucose decreases from 30 minutes to 40 minutes.

(2)

- insulin has been produced
- insulin increases uptake of glucose into cells, rate of respiration, using excess glucose and cause extra glucose to be converted into glycogen to be stored in liver

10 A student was investigating the effect of sweating.

The student set up two conical flasks each with a thermometer as shown in Figure 18.

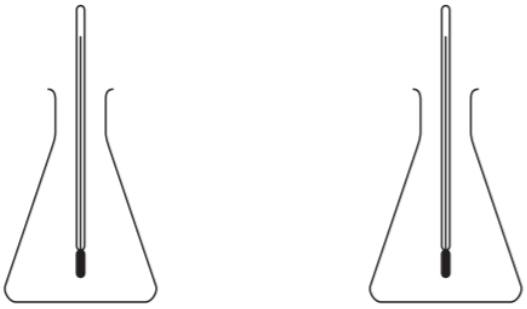

Figure 18

Flask 1 was covered in **wet** tissue paper.

Flask 2 was covered with **dry** tissue paper.

Hot water was added to each of the flasks.

The temperature of the water in each flask was recorded every minute for 10 minutes.

(a) State **two** variables that would need to be controlled in this investigation.

(2)

1 starting temperature of water

2 volume of water

(b) The results of this investigation are shown in Figure 19.

time in minutes	flask 1 (wet tissue paper) temperature in °C	flask 2 (dry tissue paper) temperature in °C
1	98	98
2	82	91
3	71	84
4	60	76
5	50	69
6	39	61
7	31	56
8	22	49
9	22	42
10	22	37

Figure 19

(i) Calculate the rate of temperature change in flask 1 from 1 to 8 minutes.

(2)

$$\frac{98 - 22}{8} = 9.5$$

9.5 °C per minute

(ii) Compare the trends shown in the data for flask 1 and flask 2.

(2)

- flask 1 & 2 decrease in temperature
- temperature in flask 1 decreases faster than in flask 2

(c) Explain how sweating helps to cool the body.

(2)

- sweat released onto skin
- evaporates
- transferring thermal energy

(d) Which part of the brain controls internal body temperature?

(1)

- ☐ **A** cerebellum
- ☐ **B** medulla oblongata
- ☒ **C** hypothalamus
- ☐ **D** pituitary gland

(e) Explain why it is important to control the internal temperature of the human body.

(2)

- internal temperature is kept at the optimum
- for enzyme action to take place

5 (a) (i) Which row of the table shows the endocrine gland and hormone involved in the control of blood glucose concentration?

(1)

	endocrine gland	hormone
☒ **A**	ovary	oestrogen
☒ **B**	ovary	insulin
☒ **C**	pancreas	oestrogen
☒ **D**	pancreas	insulin

(ii) State a target organ for the hormone that controls blood glucose concentration.

(1)

liver

(b) People with a high BMI are more likely to develop type 2 diabetes.
Figure 11 shows the mass, height and BMI for two people.

person	mass in kilograms	height in metres	BMI
A	110	2.0	?
B	85	1.5	38

Figure 11

(i) Use the formula to calculate the BMI for person A

$$\text{BMI} = \frac{\text{mass}}{\text{height}^2}$$

(2)

$\text{BMI} = \frac{110\text{ kg}}{2.0^2} = 27.5$

27.5

(ii) Person B develops type 2 diabetes.

Describe **two** lifestyle changes person B should make to help to control their blood glucose concentration.

(2)

1 healthier diet with lower sugar intake

2 exercise more

6 (a) Figure 13 shows a kidney nephron.

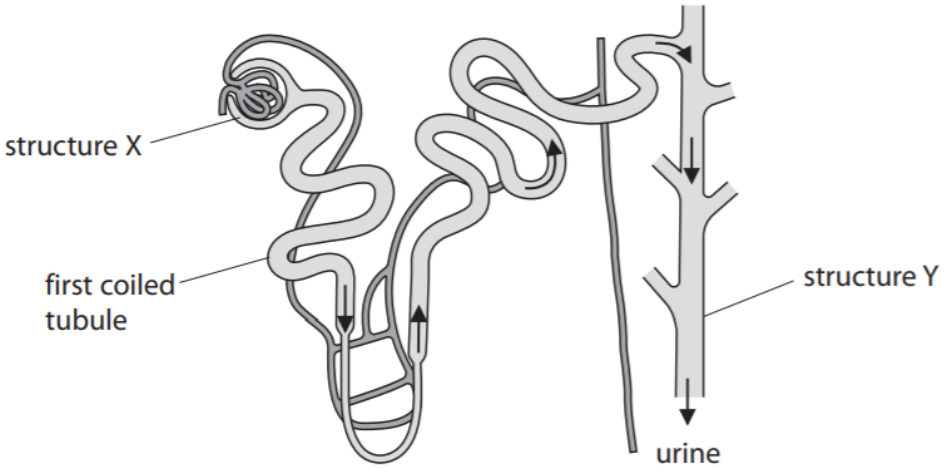

Figure 13

(i) Structure X is the

(1)

☒ **A** glomerulus

☒ **B** Bowman's capsule

☒ **C** collecting duct

☒ **D** capillary

(ii) Figure 14 shows the concentration of glucose in the filtrate in the nephron.

filtrate	mean concentration of glucose in millimoles per litre
filtrate in the start of first coiled tubule	6
filtrate in the end of first coiled tubule	0

Figure 14

Explain why the concentration of glucose changes as it moves through the first coiled tubule.

(2)

- Na^+ ions diffuse down a concentration gradient from tubule into blood capillaries through carrier proteins by facilitated diffusion
- each carries glucose as a co-transport so its concentration decreases

(iii) Name the structure that carries urine from the kidney to the bladder.

(1)

ureter

(b) The concentration of protein in urine from person A and person B was measured each year from 2015 to 2019.
Person A had healthy kidneys. Person B had kidney disease.

year	concentration of protein in urine in arbitrary units	
	person A (with healthy kidneys)	person B (with kidney disease)
2015	2	25
2016	4	37
2017	5	57
2018	4	79
2019	3	106

Figure 15

Use the data in Figure 15 to compare the changes in the concentration of protein in the urine from person A and person B.

(2)

- person B always has much higher concentration of protein than person A over all years
- person A's concentration remains constant in general (4) but person B's is increasing over 4 years (25 → 106)

(c) Person B needs a kidney transplant.
Person B has a twin sister.

Explain why this twin sister could be a suitable kidney donor for Person B.

(2)

- has same genetic material / DNA
- same antigens on kidney means that it will likely be not rejected by body due to immune response after transplant

7 People produce sweat when they are hot.

Sweat consists of substances dissolved in water.

Figure 16 shows the concentration of dissolved substances in the sweat of two patients in a hospital.

substance in sweat	concentration in mmol per dm^3	
	patient A	patient B
urea	8.0	32.0
glucose	0.5	0.4
sodium ions	40.0	36.0
chloride ions	35.0	32.0

Figure 16

(a) (i) Calculate the ratio of the concentration of urea in the sweat of patient A to the concentration of urea in the sweat of patient B.

Give your answer in its simplest form.

(2)

8 : 32

1 : 4

1 : 4

(ii) Describe how urea is produced in the body.

(2)

- produced in liver as a metabolite, breakdown product, of amino acids
- ammonium ions formed in breakdown of amino acids and excess converted to urea

(iii) The blood of patient B has a very high concentration of urea.

Which organ removes most urea from the blood?

(1)

☒ **A** kidney

☐ **B** lung

☐ **C** liver

☐ **D** stomach

(b) The human body can regulate the temperature of the blood.

(i) Which part of the brain controls body temperature?

(1)

☐ **A** cerebral hemispheres

☐ **B** medulla oblongata

☐ **C** cerebellum

☒ **D** hypothalamus

*(ii) Figure 17 shows a diagram of the skin.

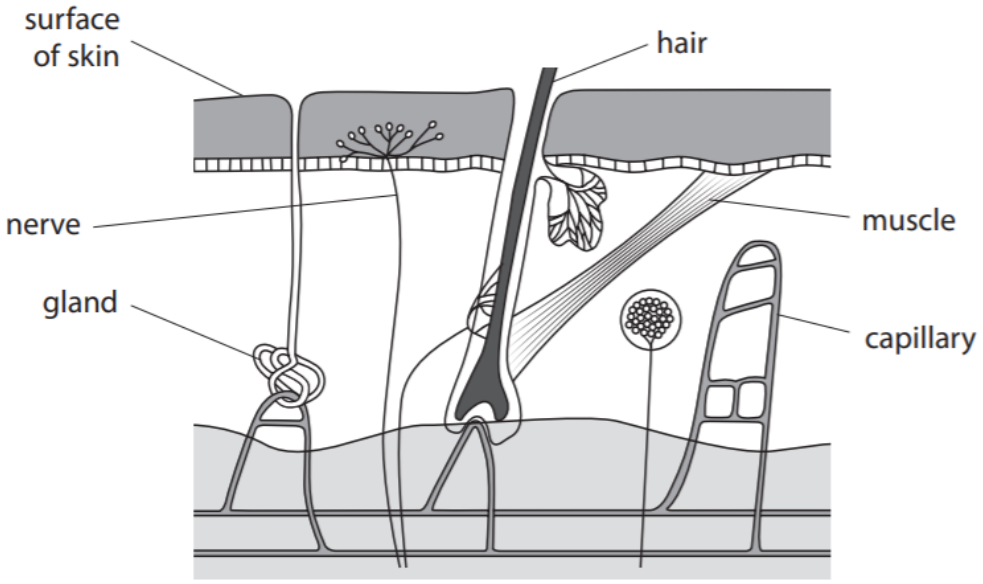

Figure 17

Explain how structures in the skin help to reduce body temperature during hot weather.

(6)

- dilated blood vessels near skin allows heat loss by radiation (vasodilation)
- sweating where sweat is evaporated from skin surface, which uses heat and due to high specific heat capacity and specific latent heat of vapourisation, requires lots of energy to evaporate sweat to allow cooling by loss of heat
- lower body hair as hair erector muscles in skin relax and elasticity of skin causes them to flatten against body to reduce thickness of insulating layer for more heat loss
- prevents body temperature from rising in hot weather

TOTAL = 63 MARKS