This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls Loueizeh - Baabda

Stage Exam 05
27APR2026

Do NOT write in this box. Your MARK will be placed here.

Subject :	Biology	
Class :	10A	
Teacher :	Miss Rahmeh Hilal	
Duration :	1 hour	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Q1.

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Human kidney disease

Human kidney disease can be caused by infection, high blood pressure, high blood cholesterol levels or diabetes. There is no cure for kidney disease, but suitable treatment can reduce the symptoms and stop the disease getting worse.

The treatments include lifestyle and dietary changes to help you remain as healthy as possible. Medicine is also used to control associated problems such as high blood pressure and high cholesterol levels. Other treatments need to be used for severe kidney disease when the kidneys stop working. These are dialysis and kidney transplants.

Dialysis carries out the excretory function of the kidney. There are two types of dialysis that are commonly used, haemodialysis and peritoneal dialysis. Haemodialysis involves diverting blood into an external machine, where it is filtered before being returned to the body. Peritoneal dialysis (PD) involves pumping dialysis fluid into a space inside your abdomen. Haemodialysis is usually done about three times a week, either at hospital or at home. PD is normally done at home, several times a day or overnight. If the patient does not have a kidney transplant, treatment with dialysis will usually need to continue for life.

PD became an alternative to haemodialysis a few years ago. Many patients prefer the independence PD lets them have. In PD, a soft tube called a catheter is used to fill the abdomen with a dialysis solution. The composition of the dialysis solution is water, glucose, and mineral ions at the same concentration that occurs naturally in the blood. The dialysis solution is prepared according to the individual patient's needs to help regulate their ion balance and remove metabolic waste products.

Inside the abdominal cavity is a natural membrane lining called the peritoneum. This membrane is partially permeable. The waste products and extra fluid and salts pass from the blood through the peritoneum into the dialysis solution. They then leave the body when the dialysis solution is drained. This used solution is thrown away. The process of draining and filling is called an exchange and takes about 30 to 40 minutes. The period that the dialysis solution is in your abdomen is called the dwell time. A typical schedule is four exchanges a day, each separated by a dwell time of four hours.

One form of PD, continuous ambulatory peritoneal dialysis (CAPD), does not require a machine and it is possible to walk around with the dialysis solution in your abdomen. Another form of PD, automated peritoneal dialysis (APD), requires a machine to fill and drain your abdomen. Three to five exchanges are performed during the night while you sleep. The whole process lasts a total of nine hours each night.

(a) Give one way that a person can change their diet to lower their risk of developing high cholesterol (lines 4 to 6).

(1)

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(b) One function of the kidney is excretion (line 9). Another function is osmoregulation.

Explain what is meant by the term **osmoregulation**.

(2)

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(b) Explain why a person with severe kidney disease will need dialysis to continue for life (lines 15 to 16).

(2)

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(d) The peritoneum acts as a partially permeable membrane.

(i) Explain what is meant by a partially permeable membrane (lines 23 to 24).

(2)

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(ii) Explain why the dialysis solution must contain purified water, glucose and mineral ions (lines 19 to 21).

(2)

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(e) Explain how the composition of the dialysis solution results in the waste products being removed from the blood (lines 21 to 22).

(2)

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(f) (i) A person is using APD.

Calculate the percentage of their time used for treatment in a week (lines 33 to 35).

(2)

percentage = ... %

(ii) Suggest why people may prefer to use CAPD instead of haemodialysis (lines 31 to 32).

(1)

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(g) Describe how the structures in a human kidney result in the correct substances being retained in the blood.

(3)

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(Total for question 1 = 17 marks)

Q2.

Fur colour in rats is controlled by a gene with two alleles.

One allele codes for black fur colour. The other allele codes for agouti fur colour.

Several female rats with agouti coloured fur are mated with several male rats with black coloured fur.

All of the offspring have agouti coloured fur.

(a) (i) Explain which allele is dominant.

(2)

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(ii) A male and female rat from these offspring are then mated together in a second cross.

Some of the offspring of this second cross have agouti coloured fur and some have black coloured fur.
Draw a genetic diagram to show this second cross. Include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring.

(4)

(iii) Calculate the probability of any one offspring from this second cross being male with agouti coloured fur.

(2)

probability = ...

(c) Scientists observed that genes that control fur colour in rats can affect rat behaviour, such as how tame they are.

Other genes that control the size of the adrenal glands and the production of neurotransmitters also affect rat behaviour.
Scientists also noticed that coat colour is associated with differences in anatomy and physiology, such as the size of the adrenal glands and the production of neurotransmitters.

(i) State the name of the type of genetic control where many genes control one phenotype.

(1)

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(ii) Explain why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour.

(3)

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(c) Some rats with white fur also have pink eyes.

These rats have pink eyes because they do not have pigment in their irises.
This means that their irises let light pass through, unlike the coloured irises found in other rats.
Explain how this difference in the iris affects vision in the rats with pink eyes.

(3)

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(Total for question 2 = 15 marks)

Q3.

Genetic modification is a process used to improve crop yield.

(a) Describe the role of a named vector in the process of genetic modification.

(2)

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(b) Weeds are plants that grow where they are not wanted.

Removing weeds reduces competition for mineral ions and improves crop yield.

(i) Name the mineral ion used to make chlorophyll.

(1)

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(ii) Two different methods can be used to remove weeds to improve crop yield.

- Method A pull weeds out of the ground by hand
- Method B spray weeds with a chemical that kills them

Design an investigation to find out which method produces the highest crop yield.
Include experimental details in your answer and write in full sentences.

(6)

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(Total for question 3 = 9 marks)

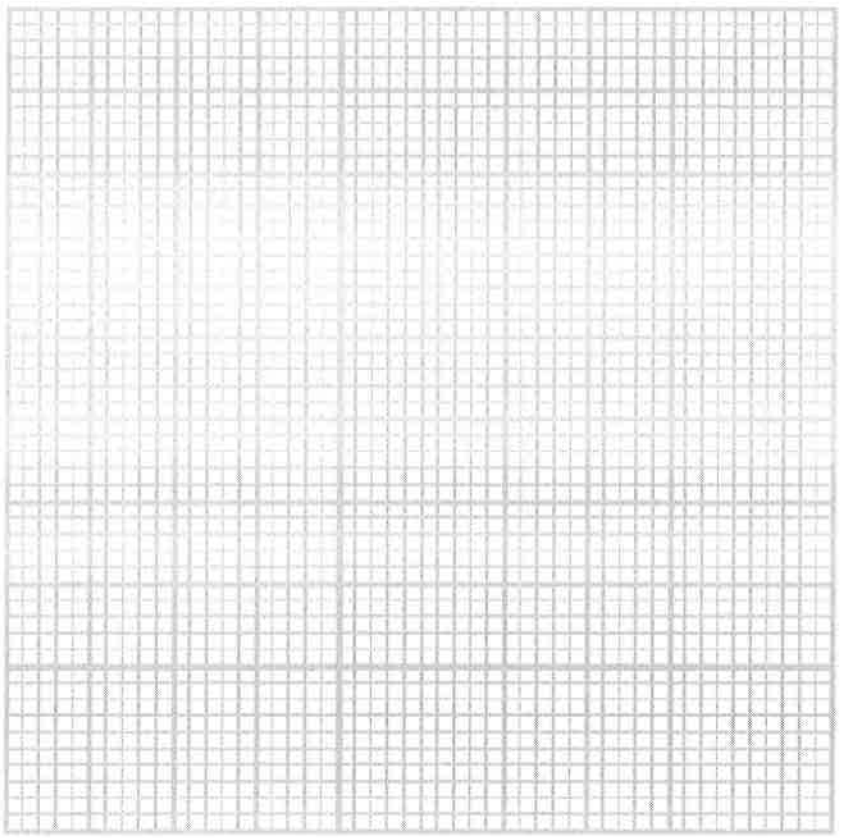
Q4.

The data in the table shows how the mean maximum lung volume changes with age for males and females.

Age / years	Mean maximum lung volume / dm^3	
	males	females
7	2.10	2.05
16	4.50	3.70
25	5.20	3.80
50	4.80	3.40
70	3.90	2.80

(a) (i) Plot a bar graph to show this data.

(5)



(ii) Calculate the increase in mean maximum lung volume for males between the ages of 7 and 25.

(1)

increase = ... dm^3

(iii) Explain why the mean maximum lung volume for males and females is similar at age 7 but is different at age 25.

(3)

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(b) The data shows the mean maximum lung volume at each age.

(i) Which of the following would improve the reliability of these mean values?

(1)

- ☐ **A** using a larger range of ages
- ☐ **B** measuring more people at each age
- ☐ **C** measuring lung volume in cm^3
- ☐ **D** measuring lung volumes in other mammals

(ii) Variation in maximum lung volume exists between males at each age.
Suggest **two** factors that could cause this variation.

(2)

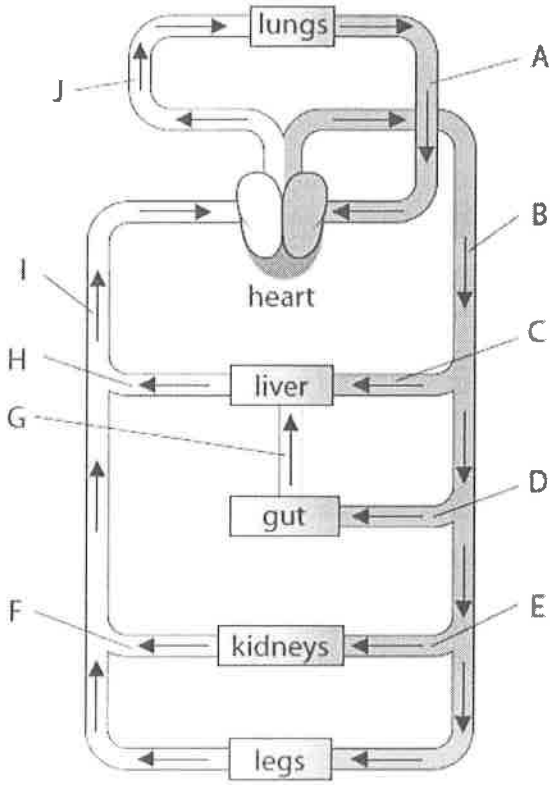
1.....

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(Total for question 4 = 12 marks)

Q5.

The diagram shows the human circulation system with some blood vessels labelled A to J. The arrows show the direction of blood flow.



(a) The table gives some statements about the content of blood vessels in this circulation system. Complete the table by giving the letter of the blood vessel that matches each statement.

(5)

Statement	Letter
contains the least carbon dioxide	
contains the most glucose after a meal	
contains the least oxygen	
contains the least urea	
contains blood at the highest pressure	

(b) State two ways in which the structure of blood vessel A differs from the structure of blood vessel J.

(2)

1.....

2.....

(Total for question 5 = 7 marks)

Total for paper = 60 marks

Q1.

Question Number	Answer	Additional guidance	Mark
(a)	An answer that makes reference to one of the following points: • balanced diet / eq (1) • less lipid / fat / oil / eq (1) • less foods that contain cholesterol eg eat fewer eggs that contain cholesterol /eq (1)	oily / fatty not just eat less cholesterol/ eat fewer eggs	1

Question Number	Answer	Additional guidance	Mark
(b)	An answer that includes : • maintains water level/ water of body / body fluids / plasma / blood / cells / eq (1) • maintains **salt and water levels / salt and water balance / concentration / water potential** in body / body fluids / blood/ plasma cells / eq (2)	controls water / water levels in body = 1 mark controls water and dissolved materials / solutes in body = 2 marks	2

Question Number	Answer	Additional guidance	Mark
(c)	An explanation that makes reference to two of the following points: • (body produces) urea / salt / toxins / water / metabolic waste / eq • need to be excreted / removed / prevent build up / prevent poisoning / become toxic eq (1) • kidneys cannot recover / no cure / incurable / (until) transplant /eq (1)	Not urine cannot excrete / remove Remove excrete urea = 2 remove toxins = 2	2

Question Number	Answer	Additional guidance	Mark
(d)(i)	An explanation that makes reference to the following points: • (only) lets / allows some molecules / substances / water pass through (stops others) eq (1) • does not let large ones / charged ones / pass through / eq (1)	allow converse	2

Question Number	Answer	Additional guidance	Mark
(d)(ii)	An explanation that makes reference to two of the following points: • so that substances do not leave blood / so they can return to blood / eq (1) • by diffusion / down concentration gradient / eq (1) • as cells require water for water balance / ions for water balance / water for metabolic reactions / eq (1) • glucose for respiration / energy / allow named mineral ion for correct function / (1)	kidney normally reabsorbs these	2

Question Number	Answer	Mark
(e)	An explanation that makes reference to two of the following points: • lower concentration of / no urea / salts / waste products in dialysis fluid (1) • by diffusion / (from blood / into solution) (1)	2

Question Number	Answer	additional guidance	Mark
(f)(i)	9 ÷ 24 = 0.375 or 63÷168 0.375 × 100 = 38 % 37.5 or 38 % (2)	9÷24 or 63÷168 For one mark	2

Question Number	Answer	Mark
(f)(ii)	• you can walk around / can be done at home / when travelling / does not require machine/ eq (1)	1

Question Number	Answer	Additional guidance	Mark
(g)	A description that makes reference to three of the following points: • proteins / large molecules can't leave glomerulus / can't go into Bowman's capsule / eq (1) • reabsorption of glucose / amino acids / glucose absorbed (back) into blood eq (1) • by proximal convoluted tubule / eq (1) • water reabsorbed from collecting duct / eq (1)	must refer to large molecules / proteins **and** glomerulus or Bowman's capsule Allow from PCT and Loop of Henle	3

Q2.

Question Number	Answer	additional guidance	Mark
(a)(i)	• agouti (1) • all offspring are agouti / no offspring are black / as allele always expressed / shown / visible in all phenotype / expressed in heterozygous / black allele not expressed / /eq (1)	allow ignore passed on as black allele also passed on otherwise, all the black parents would need to be heterozygous and even then only 0.5 probability that each is black / eq (1)	2

Question Number	Answer	additional guidance	Mark
(a)(ii)	An answer that makes reference to two the following: • parent genotypes Aa and Aa (1) • parent gametes (1) A or a A or a • offspring genotypes AA Aa aa (1) • offspring phenotypes labelled or ratio 3 : 1 (1)	allow from Punnett square allow other letters allow A and b eg Ab x Ab A or b A or b AA Ab bb ignore X and Y ECF max 2 for mp 2 gametes and mp 3 genotypes of offspring	4

Question Number	Answer	additional guidance	Mark
(a)(iii)	• probability of agouti / probability of male • multiplied ⅜ or 0.375 or 37.5% (2)	allow full marks for correct answer no working 1 mark for 0.5 or ½ or 50% or 0.75 or ¾ or 75%	2

Question Number	Answer	Mark
(b)(i)	polygenic (1)	1

Question Number	Answer	additional guidance	Mark
(b)(ii)	An explanation that makes reference to three of the following: • more adrenaline produced / affects amount of adrenaline produced / eq (1) • affects heart rate / fear response / fight or flight idea /eq (1) • neurotransmitter levels affects synapses / eq (1) • quicker reflex / reaction time / quicker response / more responsive / eq (1)	allow converse for smaller adrenal and less neurotransmitter	3

Question Number	Answer	additional guidance	Mark
(c)	An explanation that makes reference to three of the following: • iris does not block / blocks less light / eq (1) • so pupil change / dilate / constrict has little / no effect / (iris) cannot regulate / control amount of light entering eye / eq (1) • too much light / more light enters eye / falls on retina / eq (1) • poor vision / damages retina / (goes) blind / eq (1)	not just iris lets light through	3
			total 15 marks

Q3.

Question Number	Answer	Additional guidance	Mark
(a)	An explanation that makes reference to two of the following points: • plasmid / virus / bacteriophage / phage / gene gun / eq (1) • transfer (recombinant) / DNA / gene / into organism) eq (1)	 allow carry DNA /gene introduce / insert DNA / gene	2

Question Number	Answer	additional guidance	Mark
(b)(i)	Magnesium / Mg Iron / Fe Nitrate / NO_3	Mg^{2+} Fe^{2+} / Fe^{3+} NO_3^-	1

Question Number	Answer	additional guidance	Mark
(b)(ii)	An answer that makes reference to six of the following points: • C use pulling / method A and weedicide / method B /eq (1) • O uses same species of crop / same crop / plant (1) • R repeat investigation / uses more than one field (1) • M1 measure crop mass / weigh /eq (1) • M2 use quadrats / use sampling / per m^2 / per unit area / per tray / eq (1) • S1 after **stated** time period / one growing season / eq • S2 (control) temperature / light / carbon dioxide / soil / water / fertiliser / minerals /eq (1)	not amount not yield allow idea of in same region / climate for S2	6
			Total 9 marks

Q4.

Question number	Answer	Mark
(a)(i)	A graph showing: • y-axis scale half grid and linear (1) • bars drawn with lines (1) • x-axis labelled age and y-axis labelled mean maximum, and x-axis units as years and y-axis units as dm^3 (1) • bars plotted correctly (1) • key males/females (1)	5

Question number	Answer	Mark
(a)(ii)	Subtraction 5.2 − 2.1 = 3.1 (1)	1

Question number	Answer	Mark
(a)(iii)	An explanation that makes reference to three of the following points: • mean maximum lung volume for males is greater than females for 16 and 25 (1) • males grow more than females (1) • greater difference from puberty/equivalent (1) • males continue to grow from 16 to 25 (1)	3

Question number	Answer	Mark
(b)(i)	B	1

Question number	Answer	Mark
(b)(ii)	An explanation that makes reference to two of the following points: • different body mass/size (1) • taking more exercise/equivalent (1) • smoking (1) • asthma/lung disease/equivalent (1) • genetics/inheritance (1)	2

(Total for question = 12 marks)

Q5.

Question Number	Answer	Mark
(a)(i)		5

statement	letter
contains the least carbon dioxide	A
contains the most glucose after a meal	G
contains the least oxygen	J
contains the least urea	F
contains blood at the highest pressure	B

Question Number	Answer	additional guidance	Mark
(a)(ii)	An answer that makes reference to two of the following points: A / pV has • thin(ner) wall (1) • less muscle (1) • less elastic tissue (1) • wide(r) / big(er) / lumen (1)	allow converse for J allow thin allow wide ignore ref to valves	2

(Total for question = 7 marks)