
Date _____

Name _____ Student No. _____

Teacher _____ School _____



Biology 12

~~Section Assignment 4.2~~ Unit 12

Remember to submit the following with this assignment:

| Title | From | Marks |
|--|------|-------|
| Part A: Case Studies in Renal Functions | 4.2 | 17 |
| Part B: Renal Artery vs. Renal Vein | 4.2 | 26 |
| Part C: Regulation of Water and the Kidney | 4.2 | 14 |



Section Assignment 4.2 Part A

Case Studies in Renal Functions

Here's your chance to exercise your knowledge! Imagine you are an intern doctor doing a rotation in the emergency ward of a hospital. What would you say is the cause of each patient's condition, based on the information provided? Use the *Inquiry Into Life* textbook to research your answers.

Case 1

Young adolescent boy dressed in soccer uniform. Complaining of pain in lower back. When examined he has a large bruise in the painful region of his back. His urine sample is tinged red. He has no fever, no other pain, and is otherwise quite healthy and normal. (3 marks)

Case 2

Older female patient dressed in nightclothes. Urine sample indicates abnormal levels of nutrients, salts, and urea. Patient is lethargic (seems tired and has difficulty moving) and complains of feeling unwell. Blood work indicates elevated levels of white blood cells. (5 marks)

Case 3

Middle aged overweight man. Complains of being thirsty and urinating frequently. Patient complains of being extremely weak and tired. Blood work shows elevated levels of glucose. Urine contains glucose and is very dilute. (5 marks)

Case 4

Patient has extremely low blood pressure caused by congestive heart failure; unable to provide a urine sample. Patient reports that they have not urinated for two days. Patient is extremely weak and feels terrible. Blood work shows elevated levels of urea and imbalance of electrolytes (ions in blood). (4 marks)

Marks

Section Assignment 4.2 Part B Renal Artery vs. Renal Vein

For this assignment you will play the role of a new lab assistant in a lab where a mistake with patient records has been made. Your job is to resolve the problem accurately. The office manager, who risks being fired if the problem isn't solved, has given you several documents and asked you to find a solution. Keep hard copies of these documents available while doing the assignment. Good luck!

Date: August 4

Subject: Welcome
From: Perry City, CEO
To: Aldo Duncan

Hi, Aldo! Welcome aboard!

It is great to have a qualified lab assistant join our team here at Perry City Partners (PP) labs. I hope your lab bench suits your needs. If you are missing a piece of equipment, ask Leslie, the lab manager and I'm sure she will fix you right up.

Perry City, CEO

MEMO

Pericity Partners Lab

Date: August 4

To: Leslie Liddy
From: Aldo Duncan
Subject: Welcome

Leslie:

I just received an email from Mr. City. He says if I need anything, I'm to ask you. I will need some gas spectrometer tubes as I am all out at my station. And could you please make sure I have access to the blood gas analyzer and urinalysis equipment in the main lab area?

Thanks, Aldo

Date: August 5

Subject: Re: Welcome
From: Leslie Liddy
To: Aldo Duncan

Aldo:

No problem, I'll make sure you have everything you need.

I hate to break you in this way, but there seems to have been a mix-up with records from the hospital lab and everyone here is too busy to spend time sorting it out. Since you're new, this will be a good opportunity for you to show what you can do.

Here is the problem. In transport from the lab, a file folder containing information about four blood samples slid off the rack as our driver swerved to miss a cat on the road. A container of alcohol spilled and obliterated much of the identification that went with the blood samples. It's a real mess, and the hospital staff will be upset if they have to resample these patients. Can you use a bit of detective work to sort out which sample is which?

I will send you the records and the blood samples. You can test the blood to determine which sample goes with which record. Let me know if you have difficulty. This has happened before, and I am afraid the driver (who is also my husband) may lose his job if this gets out. Please submit your report to me and be sure it has my name on it. It's important that we keep a low profile on this one.

Owe you one already.

Les

Hospital Records

Patient [redacted]
Profile: Male, aged [redacted]. Recently returned from the Himalayan mountains, where he successfully climbed K-2. Patient has very low heart rate and respiratory rate. Patient complained about low urine output, strongly coloured urine, but otherwise seems healthy.

Patient [redacted]
Profile: Female, aged 93. Patient weak, beyond what could be expected from her advanced age. Complains of frequent urination and thirst.

Patient [redacted]
Profile: Male, aged 54. High blood pressure, obese, office worker.

Patient [redacted]
Profile: Female, aged 27. Olympic athlete. Complains of unexplained nausea. Seems otherwise to be in good health.

REQUISITION

Date: August 6

From: Aldo D.
To: Blood Analyst

Please provide an analysis for these four blood samples. Please note there are two samples for each patient, one from the renal artery and one from the renal vein. Please provide the following information:

- % dissolved oxygen
- glucose
- urea
- renin
- ADH
- aldosterone

Please identify the patient blood analysis by patient numbers 1 to 4. Can I have these by tomorrow morning?

Date: August 9

Subject: Blood Analysis Lab Report, August 8
From: Aldo Duncan
To: Frank Stein

Thanks, Frank.

That's just what I needed. Could you do one more test for me, just to confirm something I am a bit unsure of? Please test patient 4 for elevated levels of erythropoietin.

Aldo

BLOOD ANALYSIS LAB REPORT

Date: August 8

Aldo:

Here are the blood analyses as requested. Sorry I couldn't get to it sooner, but we are stacked up here. Blood everywhere. Ha, ha, old lab joke!

Get back to me if the results are not what you need. I numbered the samples as you requested and have also put normal blood levels into the table for your reference.

Frank N. Stein, Junior Analyst

| | % O ₂ | Glucose | Urea | Renin | ADH | Aldosterone |
|---------------------------|------------------|---------|---------|-----------|--------------|-------------|
| Renal Artery (RA)(Normal) | 10 % | 6 g/L | 20 ppm | 2 pg/ml | .4 pg/ml | 8 pg/ml |
| Renal Vein (RV)(Normal) | 5 % | 5 g/L | 2 ppm | 2.5 pg/ml | .3 pg/ml | 7 pg/ml |
| RA 1 | 8 % | 46 g/L | 33 ppm | 1 pg/ml | 5 pg/ml | 8 pg/ml |
| RV 1 | 6 % | 42 g/L | 5 ppm | 1.2 pg/ml | 4.8 pg/ml | 7 pg/ml |
| RA 2 | 12 % | 6 g/L | 20 ppm | 2 pg/ml | .4 pg/ml | 8 pg/ml |
| RV 2 | 6 % | 5 g/L | 1.8 ppm | 2.5 pg/ml | .3 pg/ml | 7 pg/ml |
| RA 3 | 8 % | 10 g/L | 20 ppm | 0.2 pg/ml | .4 pg/ml | 1 pg/ml |
| RV 3 | 4 % | 6 g/L | 1 ppm | 0.2 pg/ml | .3 pg/ml | .8 pg/ml |
| RA 4 | 25% | 6 g/L | 32 ppm | 4 pg/ml | 6 pg/ml | 12 pg/ml |
| RV 4 | 22% | 5 g/L | 30 ppm | 2.5 pg/ml | 1 pg/ml | 7 pg/ml |

Date: August 9

Subject: Re: Blood Analysis Lab Report, August 8
From: Frank Stein
To: Aldo Duncan

Aldo:

Patient 4's circulating erythropoietin is four times lower than normal. Hope this helps.

Frank

Part 1

Write the final report on your findings. Indicate which patient (by number) is which. Give a brief explanation of why you made the identification. It doesn't need to be long, just identify one characteristic of each pair of samples that led you to believe in their particular identification.

Remember, your job depends on getting it right. If you are correct, Les owes you one, big time!

Part 2

As a second part of the task, write a memo to Perry City explaining the request made to do the lab tests. When you first read Les' memo, did it make you uneasy? Point out the ethical problems you have with the request made by Les, and identify as many breaches in ethical behaviour as you can.



If you have access to the Internet you can find information about business ethics on the *Biology 12 Web site* Lesson 4.2C Renal Artery vs. Renal Vein.

Do you feel that Aldo handled the request appropriately? Explain your answer in a few sentences.

Marks

26

Section Assignment 4.2 Part C

Regulation of Water and the Kidney

In this assignment you will assess two scenarios and determine how each situation will affect kidney function. In your explanation, describe the cause of the symptoms, and then describe how regulatory hormones counteract the imbalance created in each situation.

Case 1: Sports Player

A male, 16 years old, is playing soccer. He refuses to drink water during break times. The temperature is 30 degrees Celsius. After the game, he is extremely thirsty. When he attempts to urinate he can only manage a small volume, which is dark yellow in colour. (6 marks)

Case 2: Motorcycle Accident Victim

A middle-aged man is struck from the side while riding his motorcycle. His leg is severely injured, including a laceration of the femoral artery. He has lost approximately 2 litres of blood. When taken to the hospital, his urine output is nil, and he has very low blood pressure and a weak heart rate. (8 marks)

Marks

14