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ASSIGNMENT BOOKLET

SCN2231 Biology 20

Module 8 Assignment

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Biology 20

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Module 8

CIRCULATION, IMMUNITY, AND EXCRETION

ASSIGNMENT BOOKLET

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment	18	
Lesson 2 Assignment	47	
Lesson 3 Assignment	48	
Lesson 4 Assignment	24	
Lesson 5 Assignment	38	
Lesson 6 Assignment	10	
Lesson 7 Assignment	15	
Lesson 8 Assignment	29	
Lesson 9 Assignment	32	

Teacher's Comments

Biology 20

Module 8: Circulation, Immunity, and Excretion

Assignment Booklet

ISBN 978-0-7741-3035-6

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Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other

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- Alberta Education, <http://www.education.gov.ab.ca>
- Learning Resources Centre, <http://www.lrc.education.gov.ab.ca>
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MODULE 8: LESSON 1 ASSIGNMENT

This Module 8: Lesson 1 Assignment is worth 18 marks. The value of each assignment and each question is stated in the left margin.

(18 marks) **Lesson 1 Assignment: Structures of the Circulatory System**

Lab: Investigation 8.A: Identifying Structures of the Circulatory System

The photographs of this lab question are copies of the full-colour images in the slide show “A Virtual Dissection” on the **Biology 20 Multimedia DVD**. Refer to the full colour images of the slide show as you complete this question. In the full colour images

- blue yarn represents deoxygenated blood
- red yarn represents oxygenated blood

For each photograph, chart the movement of blood. The following terminology will be used as you describe the pictures: right atrium, left atrium, right ventricle, left ventricle, superior vena cava, inferior vena cava, pulmonary arteries, pulmonary veins, aorta, tricuspid atrioventricular valve, bicuspid atrioventricular valve, semilunar valves, Purkinje fibres, sinoatrial node, atrioventricular node, deoxygenated blood, oxygenated blood, lungs.

To gain full marks, each term must be used correctly to describe the pictures. There will be two marks for each photo.

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

MODULE 8: LESSON 2 ASSIGNMENT

This Module 8: Lesson 2 Assignment is worth 47 marks. The value of each assignment and each question is stated in the left margin.

(47 marks) Lesson 2 Assignment: Investigating the Circulatory System

Lab: Virtual Blood Pressure

Background Information

Blood pressure is commonly measured using a sphygmomanometer. This is a blood-pressure cuff and is wrapped around the upper arm. Air is pumped into the cuff until circulation in the main artery of the arm is cut off. When a stethoscope is placed over the cuff, there is silence. Then, as the air is slowly let out of the cuff, blood begins to flow again and can be heard through the stethoscope. This is the point of greatest pressure (called systolic). It is usually expressed as how high the air pressure forces a column of mercury to rise in a tube.

The normal high pressure corresponds to a column of mercury of about 120 millimetres. At some point, as more and more air is let out of the cuff, the pressure exerted by the cuff is so little that the sound of the blood pulsing against the artery walls subsides and there is silence again. This is the point of lowest pressure (called diastolic), which normally corresponds to about 80 millimetres of mercury. The systolic and diastolic pressures also correspond to ventricular contraction and ventricular relaxation, respectively.

When average blood pressure is recorded, it is usually written as 120/80 with the units for pressure being given in millimetres of mercury or mmHg.

You will now perform the Virtual Blood Pressure Lab. In this lab you will look at the factors affecting hypertension or chronic high blood pressure. Continual high blood pressure may put an individual at greater risk for a heart attack or a stroke.

- (1 mark) Record the purpose and objective in the space provided this in the virtual lab. You are writing these down so you become familiar with presenting information in a proper lab format.

Purpose

Objective

(1 mark) Problem

State a problem about the relationship of age and gender to blood pressure.

(1 mark) Hypothesis

Use your knowledge about the heart and the circulatory system to make a hypothesis about how the average blood pressure for a group of people would be affected by manipulating the age and gender of the group members.

(4 marks) Procedure

You will proceed to follow the procedure as outlined in the virtual lab. You will be collecting information and recording it in charts. You will then graph the information from your data tables. Place the information under the Observations heading. Consider the following questions as you start your investigation:

- How will you use the investigation screen to test your hypothesis? What steps will you follow? What data will you record?

(6 marks) Observations

Place copies of your charts and graphs in the space provided.

(2 marks) Calculations

Write out one set of sample calculations that you used to complete the table of average blood pressures for age range and gender.

Analysis

- (4 marks) 1. Analyze the result of your experiment. Explain any patterns you observed.
- (4 marks) 2. During the course of your experiment, did you obtain any blood pressure readings that were outside of the average range for the group being tested? What did you notice on the medical charts for these individuals that might explain their high readings?
- (4 marks) 3. List four risk factors associated with hypertension. Based on your observations, what risk factor do you think is most closely associated with hypertension?
- (1 mark) 4. a. What effect might obesity have on blood pressure?

(2 marks)

- b. Does obesity alone cause a person to be at risk for high blood pressure? Explain.

(3 marks)

- c. What other factors, in combination with obesity, might increase a person's risk for high blood pressure?

(4 marks)

Conclusion

Did the result of your experiment support your hypothesis? Why or why not? Based on your experiment, what conclusion can you draw about the relationship of age and gender to group blood pressure averages?

TR 1. Heart Rate Recovery

- (5 marks)** 1. After recording your heart rate recovery from either exercise or extreme relaxation, place your graph in the space provided.
- (2 marks)** 2. How would this graph compare to the graph of an elite athlete?
- (3 marks)** 3. What do you think this graph indicates about your cardiovascular health? Why?

MODULE 8: LESSON 3 ASSIGNMENT

This Module 8: Lesson 3 Assignment is worth 48 marks. The value of each assignment and each question is stated in the left margin.

(48 marks) Lesson 3 Assignment: Blood

Lab: Identifying Blood Cells

View the photographs of the fields of view from prepared slides of human blood. Make sure you go through all ten fields. You will be making sketches and filling in a chart.

(10 marks) Observations

Visual Field Number	# of Neutrophils	# of Basophils	# of Eosinophils	# of Monocytes	# of Lymphocytes	Approximate # of Red Blood Cells
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Totals						
Average #'s						

(18 marks) Remember to use the standards appropriate for biological drawings.

Formed Element	Approximate Size (micrometres)	Appearance	Sketch
Neutrophil			
Basophil			
Eosinophil			
Monocyte			
Lymphocyte			
Red Blood Cell			

Questions and Analysis

Answer the Analysis and Conclusions questions from page 285 of the textbook.

(2 marks) 1.

(2 marks) 2.

(2 marks) 3.

(2 marks) 4. a.

(2 marks) b.

(10 marks) **TR 1. The Body’s Response to Temperature Change**

Place your response to this activity below. You will be marked according to your explanation of the body’s response to the two given situations. You must include references to vasoconstriction, vasodilation, countercurrent heat exchange, and peripheral heat loss.

Thermoregulation is the term used when biological systems attempt to maintain temperature. After watching the previous animations and reading the textbook, prepare a summary table. Outline the body’s thermoregulatory response to

- an increase in internal temperature due to exertion
- a colder external temperature than body temperature

Explain how peripheral heat loss, selective vasoconstriction, vasodilation, and countercurrent heat exchange are involved in each circumstance.

	Increased temperature (body) due to exertion	T (body) > T (environment)
Peripheral heat loss		
Vasoconstriction/vasodilation		

Countercurrent exchange		
--------------------------------	--	--

MODULE 8: LESSON 4 ASSIGNMENT

This Module 8: Lesson 4 Assignment is worth 24 marks. The value of each assignment and each question is stated in the left margin.

(24 marks) Lesson 4 Assignment: Circulation

TR 1. Capillary Fluid Exchange

There are three different situations outlined below that demonstrate how your body reacts to maintain homeostasis using capillary fluid exchange. For each situation you will create a diagram or sketched summary that illustrates the net movement of water—either outward or inward.

For each of the following three situations, begin your illustration at the capillary level, with the hydrostatic pressures, osmotic pressures, and net movement of water represented by arrows. There are also questions for each situation that require a response that describes the physiological changes that would occur in an individual suffering from the condition described.

Situation 1: Starvation

hydrostatic pressure = normal
osmotic pressure = low

- (4 marks)** 1. Place your diagram in the space provided, or attach it and submit it with your Module 8: Lesson 4 Assignment.

- (4 marks) 2. Why would the osmotic pressure be low in someone who is starving?

Situation 2: Bleeding

hydrostatic pressure = low
osmotic pressure = normal

- (4 marks) 1. Place your diagram in the space provided, or attach it and submit it with your Module 8: Lesson 4 Assignment.

- (4 marks) 2. Why is hydrostatic pressure low in someone who is bleeding?

Situation 3: Allergic Reaction

hydrostatic pressure = low

osmotic pressure = normal

- (4 marks)** 1. Place your diagram in the space provided, or attach it and submit it with your Module 8: Lesson 4 Assignment.

- (4 marks)** 2. Why is osmotic pressure low in someone who is having an allergic reaction?

MODULE 8: LESSON 5 ASSIGNMENT

This Module 8: Lesson 5 Assignment is worth 38 marks. The value of each assignment and each question is stated in the left margin.

(38 marks) Lesson 5 Assignment: The Lymphatic System and Immunity

TR 1. An Immune Response

- (4 marks)**
1. Barriers are the first line of defence, and they are designed to prevent pathogens from entering the body. Draw or list the 4 barriers.
- (3 marks)**
2. Once a pathogen has entered the body, there is a second non-specific line of defence that involves white blood cells.
 - a. Draw or list the white blood cell types involved in the second line of defence.

(3 marks)

- b. By what process do these white blood cells destroy pathogens? Describe this process or provide a sketch.

Use the graph to answer the following questions.

(2 marks)

3. Explain what is happening in the graph.

(4 marks) 4. a. Compare how long the body took to produce antibodies after the first exposure to how long it took after the second exposure. Compare the number of antibodies as well.

(2 marks) b. How does this information explain the likelihood of a more violent response in someone who has already had food poisoning caused by salmonella bacteria?

(20 marks) **Reflect and Connect: A Creative Representation of the Immune System**

Scientists often create simulations or models to illustrate how something works. Models and simulations are useful tools in visualizing biological processes. A model is a logical representation of a phenomena or process. The following graphic is an example of such a model.

Any of the animations you have viewed in this course can be used as an example of a simulation.

Based on your current knowledge and further research of the lymphatic system and immunity, you will design a model or simulation of the functioning of the main components of the human immune system. You will model the body's immune response from the first line of defence to the third line of defence. Identify all cells and components involved in an immune response.

Your presentation may be in any format suitable such as illustrations, animations, video, or a slide show. If the format for your assignment involves work on sheets of paper, you may include these sheets within this assignment.

In order to create your model or simulation, you will be required to conduct some research. You may choose to work with a partner or on your own.

Procedure

- Conduct research in a library or on the Internet on the immune system from the first line of defence to the third line of defense. You may find models or simulations that you would like to incorporate into your design.
- Your design must identify the primary elements of the human immune system including initial barriers, as well as the components involved in cell-mediated and antibody-mediated responses.
- Include all of the sequential steps of the immune response.
- Make sure that all parts of your representation are properly labelled or identified. A legend may be helpful, depending on your chosen design.
- Include a brief description of the steps involved in creating your presentation, and indicate what information you learned that was surprising or that you would like to learn more about.

You will be marked according to the following rubric. You can achieve up to four marks for each bullet.

Score	Score Criteria The student ...
4	<ul style="list-style-type: none">• presents evidence of research by properly citing sources used• includes a detailed response that outlines the body's immune response from the first line of defence to the third line of defence• clearly labels or identifies all cells and components involved in an immune response• presents the model/simulation in a way that an audience of peers would be able to clearly understand the order of an immune response• includes a brief, organized description of the process the student used to create the immune system representation and make comments on the information they learned

3	<ul style="list-style-type: none">• presents evidence of research. Students may or may not properly cite sources used.• includes a response that outlines the body's immune response from the first line of defence to the third line of defence• labels or identifies all cells and components involved in an immune response. One or two may be missing.• present the model/simulation in a way that an audience of peers would be able to clearly understand the order of an immune response• includes a brief description of the process the student used to create the immune system representation and they may or may not make comment on the information they learned
2	<ul style="list-style-type: none">• may or may not provide evidence of research. Research is not cited.• includes a brief response that outlines the body's immune response from the first line of defence to the third line of defence• labels or identifies some cells and components involved in an immune response• doesn't present the model/simulation in a way that an audience of peers would be able to clearly understand the order of an immune response• may include a brief description of the process the student used to create the immune system representation and they may or may not make comment on the information they learned
1	<ul style="list-style-type: none">• completes one or two bullets at a 3 or 2 scoring level
INS	<ul style="list-style-type: none">• work is not identifiable according to the criteria

MODULE 8: LESSON 6 ASSIGNMENT

This Module 8: Lesson 6 Assignment is worth 10 marks. The value of each assignment and each question is stated in the left margin.

(10 marks) Lesson 6 Assignment: Blood Types and Rh Factors

TR 1. Identifying an Unknown Blood Type

The following case study has a student working with blood samples to identify their blood types. Consider the situation and answer the questions.

A student is given eight red blood cell suspensions, which contain only red blood cells, and the serum from each sample. Serum is blood plasma in which fibrinogen has been removed.

She is asked to identify each of the four blood types present. To test these samples, the only materials she has at her disposal are a sample of type B red cell suspension and the serum from type B blood.

- (9 marks)**
1. Describe the step-by-step procedure that she must use to identify the four blood types present. In each step, interpret the results. In each step, interpret what it means if the cells in the sample clump together, or if they do not clump together.

- (1 mark) 2. Explain why serum was used instead of plasma.

MODULE 8: LESSON 7 ASSIGNMENT

This Module 8: Lesson 7 Assignment is worth 15 marks. The value of each assignment and each question is stated in the left margin.

(15 marks) **Lesson 7 Assignment: Structures and Functions of the Excretory System**

TR 1. Investigation 9.A: Identifying Structures of the Excretory System

You may have performed a real dissection of a sheep's kidney or you may have chosen to observe a virtual dissection of a sheep's kidney.

Based on your observations of either a real dissection or the virtual dissection, complete the following two questions. You will receive 6 marks for correct labelling and 9 marks for creating a biological drawing that follows the indicated rules.

Check the following information to review rules for biological drawings.

Rules for a Biological Drawing

Following these rules makes biological drawings neat and easy to read.

1. Use unlined paper.
2. Always use a pencil.
3. Print all words.
4. Have a 1" margin on all four sides.
5. Never cross labelling lines. Write all labels horizontally.
6. Centre the title at the top of the page and print in all capital letters.
7. The title should be the common name of the organism. (Example: Wolf)
8. Do very little erasing. No erasing is better.
9. If you use a scientific name, write it under the picture.

Protozoa

Amebaproteus

*note: Pencil was not used in this drawing for graphic purposes.

Analysis

- (6 marks)** 1. Draw a labelled sketch of the kidney that includes the following structures.
- a. renal capsule
 - b. renal cortex
 - c. renal medulla
 - d. renal pelvis
 - e. renal vein
 - f. renal artery

- (9 marks)** 2. Refer to “Figure 9.2” and “Figure 9.3” on pages 307 and 308 of the textbook. Add labels for the areas where you would expect to find the following nephron structures: glomerulus, proximal tubule, loop of Henle, distal tubule, and collecting duct.

MODULE 8: LESSON 8 ASSIGNMENT

This Module 8: Lesson 8 Assignment is worth 29 marks. The value of each assignment and each question is stated in the left margin.

(29 marks) Lesson 8 Assignment: Urine Formation in the Nephron

TR 1. Glomerular Filtration

Urine formation occurs as blood pressure forces filtrate from the glomerulus into Bowman's capsule. This bulk flow of fluids into the Bowman's capsules of the nephrons in both kidneys creates about 180 L of filtrate per day. All but about 1 L will be actively reabsorbed back into the blood, with a great expenditure of ATP.

Inquiry into Biology (Whitby, ON: McGraw-Hill Ryerson, 2007), 311, fig. 9.4. Reproduced by permission.

- (2 marks) 1. How does the bulk flow of filtrate into the capsule differ from diffusion?

- (2 marks) 2. In what ways is nephric filtration similar to the formation of interstitial fluid (lymph) in other tissues in the body?
- (3 marks) 3. One of the effects of a drug overdose is a serious decrease in blood pressure. How might this affect kidney function?
- (1 mark) 4. Explain why blood cells and proteins are not usually found in the filtrate.
- (2 marks) 5. Why are useful molecules like glucose and other nutrients found in the filtrate along with urea and other wastes?
- (2 marks) 6. Sometimes bacterial infection causes nephritis—an inflammation of membranes in the glomerulus and capsule. Large pores are created where blood cells enter the nephron. What symptom would indicate this problem?

TR 2. Tubular Reabsorption

Reabsorption of substances and ions in the proximal tubule.

Transport mechanism

- active transport (Na^+ , glucose)
- passive transport
- osmosis

Inquiry into Biology (Whitby, ON: McGraw-Hill Ryerson, 2007), 312, fig. 9.5. Reproduced by permission.

- (4 marks) 1. In terms of energy costs to the cells in the proximal tubule, the reabsorption of salt (Na^+ and Cl^-) and water has been called a deal where we get "3 for the price of 1." Explain.

- (2 marks) 2. What other useful substances, in addition to Na^+ , Cl^- , and water, are reabsorbed in the proximal tubule?

Adapted from Inquiry into Biology (Whitby, ON: McGraw-Hill Ryerson, 2007), BLM 9.2.2. Reproduced by permission.

- (1 mark) 3. Why are the two parts of the nephron loop called *descending* and *ascending*?

(2 marks) 4. Explain the process of reabsorption from the descending loop.

(1 mark) 5. Where is the highest concentration of Na^+ found?

(2 marks) 6. Explain the process of reabsorption from the ascending loop.

(2 marks) 7. Explain how the reabsorption of ions and water occurs from the distal tubule.

Use this additional information to answer the next question.

Excess ions and other substances are added to the filtrate from the surrounding capillaries in a process called tubular secretion. This has been called *reabsorption in reverse*.

- (3 marks)** 8. List three examples of substances that are actively secreted into the filtrate.

MODULE 8: LESSON 9 ASSIGNMENT

This Module 8: Lesson 9 Assignment is worth 32 marks. The value of each assignment and each question is stated in the left margin.

(32 marks) Lesson 9 Assignment: Maintaining the Excretory System

(8 marks) TR 1. Maintaining Homeostasis

Choose two of the following situations. Perform some research and create a flow chart for each situation to describe how humans maintain homeostasis with respect to water and ions.

- a) an increase of water consumption
- b) a decrease of water consumption
- c) when coffee is consumed
- d) when excessive sodium is ingested after periods of intense exercise

You will be marked according to the following rubric.

Score	The student	Score Criteria
4	<ul style="list-style-type: none"> clearly describes the action of water and ions with respect to hormones creates a flow chart that clearly describes how the actions of the kidney maintain homeostasis 	
3	<ul style="list-style-type: none"> describes the action of water and ions with respect to hormones creates a flow chart that describes how the actions of the kidney maintain homeostasis 	
2	<ul style="list-style-type: none"> describes the action of water and ions but may not make the connection with respect to hormones creates a flow chart that describes how the actions of the kidney maintain homeostasis that is sometimes confusing to follow 	
1	<ul style="list-style-type: none"> provides a superficial explanation of water and ion regulation of kidney, which is not clearly presented in a flow chart 	
INS	<ul style="list-style-type: none"> submits a response that cannot be marked according to the criteria 	

Lab: Urinalysis

Urinalysis is the physical, chemical, and sometimes microscopic examination of urine. Many diseases with no obvious symptoms can be revealed during urinalysis. Historically, appearance, odour, and even taste have been used to make inferences about a person's health. In this investigation you will interpret urinalysis results from four different tests. You will record your results from the urine analysis outlined in Lesson 9.

(6 marks)

Test	Control Tests	Crime Scene	Suspect 1	Suspect 2	Suspect 3	Suspect 4
Colour/Odour/Clarity						
Protein						
pH						
Glucose						

Analysis

(3 marks)

1. Who is the thief? Explain how you arrived at your conclusion.

(4 marks)

2. Based on your urinalysis, identify the disease that Suspect 4 might have. Explain.

- (3 marks) 3. List at least three other characteristics of urine that you would expect to observe (or not) in a healthy urine sample.
- (4 marks) 4. In what ways were the data that you collected in this urinalysis limited? What additional data would provide a more comprehensive picture of a urine sample?
- (4 marks) 5. Explain why you would not expect to find evidence of glucose or protein in a urine sample from someone whose kidneys are healthy. (Use details of nephron anatomy in your answer.)

(8 marks) TR 2. Hemodialysis and Peritoneal Dialysis

Use the table below, which shows the composition of the dialysate compared to normal plasma and uremic plasma, to answer the questions that follow.

COMPOSITION OF PLASMA AND DIALYSING FLUID (VARIOUS UNITS)

Component	Normal Plasma	Uremic Plasma	Dialysate
Potassium (K^+)	5	8	5
Bicarbonate (HCO_3^-)	27	14	27
Glucose	100	100	125
Urea	26	200	0

The kidney machine is used when a person's kidneys shut down. The patient's blood is passed through very fine tubes made of semi-permeable dialysis membrane. The outside of the tubes is bathed with dialysis fluid.

Some of the materials in the dialysis fluid are compared to normal blood plasma and uremic plasma (urine) in the previous table. Uremic plasma has abnormally high levels of urea and other substances in abnormal concentrations due to kidney failure. Explain the reason for each solute concentration of the dialysate.

Once you have completed all of the questions, submit your work to your teacher.

The following information is provided for the purpose of the following information:

COMPARISON OF THE TWO DATA SETS

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	34.5	12.5	20	50
Gender	0.5	0.5	0	1
Marital Status	0.5	0.5	0	1
Education	12.5	2.5	10	15
Income	35000	10000	20000	50000

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