### Human Biological Science Stage 1

**Work Samples**

*The text reference refers to Newton and Joyce (2009) Human Perspectives 1A/1B. GWF stands for Get Work Folder located on the Curriculum network on school server.*

**WEBSITE FOR RESOURCES:** [https://sites.google.com/site/stage1hbs/](https://sites.google.com/site/stage1hbs/)

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<td>- Respiratory system</td>
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<td>Visit to Dental Nursing Australia OTLS activity Activity 19: Gunshot wound in the stomach STAWA lab manual Activity 20: Digestion STAWA lab manual</td>
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EYE DISSECTION: TASK 3

The eye is a very important sensory organ which relays images to the brain for interpretation in the occipital lobe of the cerebrum.

TASK: Your task is to carry out a successful dissection, locate important components of the eye and complete all questions.

1. Label the diagram below of the eye (6 marks)

   A__________
   E__________
   D__________
   C__________
   F__________
   B__________

   Sclera
   Ciliary Body
   Vitreous Humor

2. Place your eye on the dissecting tray. Look for the following features and get checked off with the teacher

   (2.5 marks total- teacher check)

   - Cornea
   - Sclera
   - Pupil
   - Optic nerve

www.odec.ca
3. Locate the Optic nerve. What is the function of this nerve?

____________________________________________________________________________

(1 mark)

4. What would happen if this nerve gets blocked or cut?

____________________________________________________________________________

(1 mark)

5. Take a scalpel and try to cut away some of the fat and excess tissue. Then try and cut the Sclera. What does it feel like?

____________________________________________________________________________

____________________________________________________________________________

(1 mark)

6. Why do you think the Sclera looks and feels like it does?

____________________________________________________________________________

(1 mark)

7. Use the scalpel- you are ready to make an incision in to the eyet. Start at the front of the eye and cut through the glassy exterior (the cornea) and try to remove the iris (the coloured part). The iris is considered to be a muscle? Why is it made of muscle? What is its function?

____________________________________________________________________________

(2)

8. What relationship does the iris have with the pupil?

____________________________________________________________________________

(1)

9. Cut lengthways along the eye towards the optic nerve. A lot of fluid should come out of the main chamber of the eye called the vitreous humour. What is this watery fluid for?

____________________________________________________________________________

(1)

10. Try and locate the lens- the hard, clear disc like shape at the front of the eye. What is the function of this structure?

____________________________________________________________________________

(2)

11. Place the lens over a piece of newspaper or text- and see what happens. What happens to the lens when we view distant objects?

____________________________________________________________________________

(1)
12. What happens to the lens when we view close objects?
__________________________________________________________________________(1)

13. The back of the eye is a thin, pink/ almost transparent film which is the retina. What kinds of cells are found in the retina?
___________________________________________________________________________ (2)

14. What would happen if the retina fell off/ detached itself from the back of the eye?
_________________________________________________________________________(1)

15. Locate the optic disc- a round nodule close to the retina. What is another name for the optic disc? ________________________________ (1)

-Tidy up your area and place all equipment back in the trays-

AT HOME RESEARCH:

16. Research one example of an eye disorder – What is it?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________ (2 marks)

17. What is the main cause of the disorder you have chosen?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________ (2 marks)

18. Describe one method of treatment for your disorder
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________ (2 marks)
NAME:____________________________

GO to:  http://learn.genetics.utah.edu/content/labs/extraction/

1. Why do you need to extract DNA?

2. Where is the DNA located?

3. How many metres are there of DNA in each nucleus?

4. Place the following words in order. Chromosome, cell, DNA, nucleus.

5. Why is it easy to take cells from the inside of your cheek?

6. What are the 4 steps in collecting DNA?

7. What does ‘lysis’ mean?

8. What does the detergent do?

9. What does a centrifuge do?
Look around you and list some of the features which vary in humans

Circle the features above that you have listed which can be changed or influenced by the environment eg: skin colour. Underline features which are a result of inheritance from parents and cannot be changed (don’t include surgeries)
# Human Biological Science Stage 2

## Work Samples

## Course Outline

**WEBSITE:** [https://sites.google.com/site/stage2hbs/](https://sites.google.com/site/stage2hbs/)

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| Week 9 Term 2 | Cells, metabolism and regulation DNA:  
  - structure of DNA including base pair model  
  - locations in the cell including nucleus and mitochondria  
  - role of DNA in the cell  
  - DNA replication—base pair model. | DNA: The Code for Life (Chapter 17)  
Review Questions Q1-9 page 238 | DNA Extraction activity.  
http://learn.genetics.utah.edu/  
http://learn.genetics.utah.edu/units/basics/buildDNA  
http://learn.genetics.utah.edu/content/begin/tour/ | Task 1: Extended Response (5%) |
| | Human Genome Project:  
  - information provided by the Human Genome Project  
  - range of possible uses for this information. | Newton and Joyce Pages 263-264 (reference only) | “The Human Genome Project”  
Exploring the genome  
http://www.dnai.org/c/index.html | |
| Week 10 term 2 | Monohybrid crosses:  
  - dominant, recessive, co-dominant, multiple alleles, autosomal and sex linked inheritance including Huntington's disease, PKU, ABO blood groups, sickle-cell anaemia, red-green colour blindness and haemophilia  
  - sex determination  
  - use of punnet squares and simple probabilities. | Principles of Inheritance (Chapter 18)  
Review Questions 1-11- page 253  
Apply Your Knowledge Q 1-10 | Genetics Web Lab  
http://www2.edc.org/weblabs/weblabdirectory1.html  
GENETICS PRACTICE PROBLEMS  
http://biology.clc.uc.edu/courses/bio105/geneprob.htm  
Practice Genetics Problems  
http://www.ksu.edu/biology/pob/genetics/intro.htm  
Genetics Problems Multi choice  
Field Trip- Blood Bank 6th August | |
Designing Experiments - Questions

1. Two groups of ten young rats were kept in a laboratory. One group, A, was fed on a solution which contained starch, sugar, purified amino acids, fats and mineral salts. The other group, B, was fed on the same diet, but in addition a small amount of milk was added to the daily diet.

The average body weight of each group of young rats was recorded at regular intervals. The following data was obtained:

<table>
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<th>TIME ELAPSED (DAYS)</th>
<th>AVERAGE BODY WEIGHT</th>
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<tr>
<td></td>
<td>GROUP A (g)</td>
</tr>
<tr>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
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<td>52</td>
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<td>47</td>
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<td>18</td>
<td>46</td>
</tr>
<tr>
<td>21</td>
<td>45</td>
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</table>

a. Plot the data for the two groups of rats on a single graph using graph paper provided.

b. What is the average body weight of each group of rats on Day 10?

______________________________________________________________________________

______________________________________________________________________________

c. State the hypothesis that you believe the investigators were trying to test.

______________________________________________________________________________

______________________________________________________________________________

d. Identify the
   i. Independent variable ____________________________
   ii. Dependent variable ____________________________

e. List any variables that need to be controlled

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

f. What is the advantage of using 10 rats instead of two?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

g. Give a conclusion to the experiment

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
2. A new cleaning fluid called ‘Steryl-Kleen’ has come onto the market. The following is printed on the label of the bottle.

‘Steryl-Kleen sterilises as it cleans. Just damp a cloth with Steryl-Kleen and wipe it over the surface you wish to sterilise. Do not rinse off but leave to dry and Steryl-Kleen’s deadly delayed action will kill any bacteria that fall onto the surface for the next 3 hours’

a. Outline a hypothesis you could use to test the claims made for Steryl-Kleen.

______________________________________________________________________________
______________________________________________________________________________

b. Outline the method you would use to test your hypothesis

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

3. A drug company has developed a new influenza vaccine that is squirted into the nasal passages. The vaccine has been approved for testing in people, to see if it prevents the symptoms of influenza in people at risk of infection. Consider how an experiment might be designed to test this vaccine, and answer the following questions.

a. State a suitable hypothesis for this experiment.

______________________________________________________________________________
______________________________________________________________________________

b. What would be the independent variable in the experiment?

______________________________________________________________________________

______________________________________________________________________________

c. What would the dependent variable be?

______________________________________________________________________________

______________________________________________________________________________

d. In this experiment, the subjects would be randomly assigned to 2 different groups. Using your understanding of scientific method, what name would you use to describe each group and what would you give the members of each group to test your hypothesis?

______________________________________________________________________________
______________________________________________________________________________
4. Background information

A researcher working for a pharmaceutical company had developed an adrenaline related compound ("Drug X") which showed promise as a bronchodilator in the treatment of asthma. Bronchodilators are substances which cause the muscular walls of the airways to relax during an asthma attack thus making breathing easier. Since one of the side effects of adrenaline can be to increase heartrate and blood pressure, it was decided to try out the new drug on a group of volunteers. Fifteen volunteers were selected from physical education students attending a local college.

On day 1, the volunteers assembled at the college and were asked to rest for half an hour. Their pulse was then measured. The average pulse rate for the group was 72 pulses per minute.

Three days later the group reassembled. Each member of the group received an intravenous injection of the drug. They then rested for half an hour before their pulse was checked. This time the average pulse rate for the group was 73.5 pulses per minute.

The researcher concluded that at this dosage Drug X produced no significant increase in heartrate.

When the pharmaceutical company finally marketed the drug in the form of an aerosol it was claimed in their advertising that it had been scientifically proven that the drug had no adverse affect on cardiac function.

a. What hypothesis was the researcher testing?

b. Identify the independent and dependent variables in this investigation

c. What was the control in this investigation?

d. Make a list of all the variables which might have interfered with this investigation. Against each one state whether it was adequately controlled and if not, suggest how it can be improved.

e. How justified was the researchers conclusion?

f. How justified was the pharmaceutical company’s advertising claim?
Stage 2AB and X Human Biological Science Text Human Perspectives

This requires a lot of **reading from a text book** and **self made notes** derived from the readings and the questions. It also requires **going thru the material at leasts 4 times**. Once via **reading**, then again in the **chapter questions**, this is all pre reading. The teacher then discusses the chapter concepts and more notes are completed via **worksheets or video**. More work is done for study by completing the Revision or making your own study book and finally a **revision sheet** should be made of the summary of the chapter and should be restricted to 1-2 pages or 2 A3 pages.

For example read the following and answer the questions below:

**Topic 1. Chapter 7 Digestion**
The small intestine

The small intestine is approximately 6 metres long, the longest part of the alimentary canal. It receives material pushed through the pyloric sphincter from the stomach. The first part of the small intestine is called the duodenum. It is about 25 cm long and extends from the bottom end of the stomach in a curve around the pancreas (see Fig. 7.8).

Digestion continues in the small intestine under the influence of intestinal juice, which is secreted by glands in the lining, pancreatic juice, which is secreted by the pancreas, and bile, which is secreted by the liver but stored in the gall bladder. Pancreatic juice enters the duodenum and helps to neutralise the acid that has come with the material from the stomach. Many of the enzymes involved in the digestion of food are contained in pancreatic juice. These include:

- pancreatic amylase, which breaks down starch
- trypsin (or pancreatic protease), which splits proteins into much smaller units
- ribonuclease and deoxyribonuclease, enzymes that digest RNA and DNA
- pancreatic lipases, enzymes that break down fats into fatty acids and glycerol.

Bile does not contain any digestive enzymes, but bile salts are very important in the digestion of fats. They act like a detergent and emulsify the fat, breaking it into tiny droplets. This is a form of mechanical digestion, increasing the surface area on which the lipases can act to bring about the chemical breakdown of fat.

Intestinal juice contains many enzymes that complete the digestion of carbohydrates, proteins and lipids (see chemical digestion in the small intestine in Table 7.2).

When chemical digestion is complete the complex carbohydrates will have been broken down to simple sugars, the proteins to amino acids and the lipids to fatty acids and glycerol. The products of digestion, along with substances such as vitamins, minerals and water, are then absorbed through the wall of the small intestine into the blood. Nutrients are absorbed through the internal surface of the small intestine, so efficient absorption requires a large surface area. A large internal surface area is achieved in a number of ways:

- the small intestine is very long—about 6 metres
- the inner lining, known as the mucosa, has folds that extend into the interior (Fig. 7.12a)
- the mucosa has small, finger-like projections called villi that extend from the folded surface (Fig. 7.12b)
- the cells covering the outside of the villi have tiny microscopic projections from their external surfaces. These are the microvilli (Fig. 7.13).

The structure of a villus is ideally suited to its function of nutrient absorption. Each villus is about 1 mm long and is covered by a single layer of cells. Inside the villus is a lymph capillary, called a lacteal, which is surrounded by a network of blood capillaries (Fig. 7.14). Absorption is further enhanced by a continual movement of the villi brought about by the muscular movements of the intestinal wall. This constantly brings the villi into contact with different parts of the intestinal contents. These contents are constantly changing as new material is emptied into the small intestine from the stomach.

Some absorption occurs through simple diffusion, as there is a higher concentration of nutrient materials in the interior of the small intestine than in the cells lining the villi. Absorption also occurs through active transport, which involves the cells of the villi using energy to take in nutrients against a concentration gradient—that is, taking in molecules from a lower concentration to a higher concentration. From the walls of the villi simple sugars, amino acids, water and water-soluble vitamins are absorbed into the blood capillaries. Fatty acids and glycerol recombine in the cells of the villi to form fats and, along with the fat-soluble vitamins, enter the lacteals. The substances that are absorbed into the blood capillaries are carried by the hepatic portal vein to the liver. Here they may be removed for further processing, or they may remain in the blood to be carried to other body cells. Substances that are absorbed into the lacteals are transported in the lymph system, which eventually empties into the blood through veins in the upper part of the chest (see Fig. 9.9, p. 123).
Questions to answer from Text

1. What are the basic activities that the digestive system must carry out?

2. Draw up a table with three columns. In the first column list the parts of the alimentary canal that are discussed in this chapter; in the second column describe the role of each part in digestion and absorption; and in the third column explain how the structure of the part is suited to its functions. Remember to put an appropriate heading on each of your columns.

EXAM Question 3.

Use the diagram below to answer the following questions

Label and state the function of the following in the picture above [8 marks]

A._______________________________________________________________

B._______________________________________________________________

C._______________________________________________________________

D._______________________________________________________________
(b)

A section of Part 3 is shown below but this time it is highly magnified.

(i) Name the structures labeled A. (1 mark)

(ii) Explain how these structures help in the absorption of substances. (3 marks)

Extended Response

The small intestine, liver and bile are three vital components of the digestive system. Describe the role played by each of these parts and any interactions they have with each other. (10 marks)
Human Biological Science Stage 3
Work Samples

This requires a lot of reading from a textbook and self-made notes derived from the readings and questions. It also requires going thru the material at least 4 times. Once via reading, then again in the chapter questions, this is all pre-reading. The teacher then discusses the chapter concepts and more notes are completed via worksheets or video. More work is done for study by completing the DOT Point book and finally a revision sheet should be made of the summary of the chapter and should be restricted to 1-2 pages or 2 A3 pages.

For example read the following and answer the questions below:

**Topic 1. Types of immunity**

Immunity is resistance to infection by invading micro-organisms. Using the processes just described, the body is able to respond quickly enough to deal with any invasion by pathogenic micro-organisms before symptoms of disease occur. Such an ability to respond rapidly may be natural or artificial. Natural immunity occurs without any human intervention; artificial immunity results from giving people an antibody or an antigen.

Both natural and artificial immunity can be either passive or active. Passive immunity is when a person is given antibodies produced by someone else. The individual’s body plays no part in the production of antibodies. This can occur naturally when antibodies from the mother pass across the placenta to a developing foetus or when the mother’s antibodies are passed to the baby in breast milk. It can also be gained artificially when a person is injected with antibodies to combat a particular infection. This is often done when a person is exposed to pathogens that cause serious diseases, such as tetanus, diphtheria and rabies. Antibodies are given so that immunity is established immediately. Passive immunity is short-lived; it lasts only until the antibodies are broken down and excreted.

Active immunity results when the body is exposed to a foreign antigen and manufactures antibodies in response to that antigen. This type of immunity is prolonged because, although the amount of the antibody produced gradually decreases, the ‘memory’ of that antigen persists through the memory cells once the antigen has been dealt with. Should a subsequent infection involving the same antigen occur, the appropriate antibodies can be produced very quickly before the infection can produce any disease symptoms (see Fig. 11.7). Such immunity lasts for many years, often for life. Active immunity to a disease can result from an actual attack of the disease (natural active immunity) or from an injection of the antigens associated with the disease (artificial active immunity). Table 11.2 summarises the types of immunity.

<table>
<thead>
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<th>Table 11.2 Types of immunity</th>
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</thead>
<tbody>
<tr>
<td><strong>Natural</strong></td>
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<tr>
<td>Passive</td>
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<tr>
<td>Active</td>
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</tbody>
</table>
The body’s immune system does not normally react against its own antigens—the body is said to have tolerance for its own antigens. However, sometimes this tolerance breaks down.

Find out:
• what are autoimmune diseases
• what causes these diseases
• how autoimmune diseases are treated.

Questions to answer

1. What is the difference between:
   (a) natural and artificial immunity?
   (b) active and passive immunity?

2. (a) How could passive immunity be gained artificially?
   (b) How could active immunity be acquired naturally?

3. A new mother was concerned about the risk of infection when her 4 month old baby cut his finger. Her friend told her not to worry as she was still breastfeeding the baby boy. Explain whether this rationale is correct.

(4 marks)

Topic 2. ENDOCRINE SYSTEM

The hypothalamus produces many different hormones. Some of them are carried by the blood to the anterior lobe of the pituitary where they stimulate or inhibit the release of hormones made in the anterior lobe. Other hormones pass along the nerve fibres from the hypothalamus to the posterior lobe of the pituitary where they are then secreted.

Many pituitary hormones regulate the activity of other endocrine glands. For this reason the pituitary is sometimes referred to as the ‘master gland’.

Anterior lobe of the pituitary

The anterior lobe of the pituitary (the adenohypophysis) releases a number of hormones that regulate a great range of bodily activities. Secretions of the anterior lobe are in turn controlled by releasing and inhibiting factors secreted by the hypothalamus. These factors are themselves hormones since they are secreted into the extracellular fluid around the cells of the hypothalamus and are carried by the blood to the anterior lobe of the pituitary.

Hormones released by the anterior lobe of the pituitary include the following:
• Gonadotropins, which are hormones that affect the gonads, the ovaries and testes. Follicle stimulating hormone (FSH) in the ovary of the female stimulates development of the follicles that contain eggs. In the male, FSH stimulates the production and maturation of sperm in the testes.

Luteinising hormone (LH), which is another gonadotropin that works with FSH in the female to bring about ovulation and to form a structure called the corpus luteum after ovulation. In the male, LH stimulates interstitial cells in the testes to secrete male sex hormones.

• Growth hormone (GH), or somatotropin, which stimulates body growth, particularly growth of the skeleton. It increases the rate at which amino acids are taken up by cells and built into proteins. GH is secreted throughout life as it helps to maintain the size of organs once maturity is reached.
• **Thyroid stimulating hormone (TSH)**, or thyrotropin, which stimulates production and release of hormones from the thyroid gland.

• **Adrenocorticotropic hormone (ACTH)**, or adrenocorticotropin, which controls production and release of some of the hormones from the cortex of the adrenal glands.

• **Prolactin**, or lactogenic hormone, which works with other hormones to initiate and maintain milk secretion in females.

**Posterior lobe of the pituitary**

The posterior lobe of the pituitary (the neurohypophysis) releases the hormones oxytocin and antidiuretic hormone, but neither is manufactured in the posterior lobe. Both hormones are produced in special nerve cells in the hypothalamus of the brain. These cells have long extensions that pass through the infundibulum to the posterior lobe. Hormones manufactured in the cells move down the extensions and are stored ready for release into the bloodstream. The release of the hormones is triggered by nerve impulses initiated in the hypothalamus and conducted along the cell extensions (Fig. 4.6).

**Figure 4.6** Hormones made in the hypothalamus are transported to the posterior lobe of the pituitary and can then be released into the bloodstream

**Oxytocin** is a hormone that stimulates contraction of the muscles of the uterus. It is released in large quantities during labour. Oxytocin also stimulates contraction of cells in the mammary glands, resulting in release of milk during breastfeeding.

**Antidiuretic hormone (ADH)**, or vasopressin, causes the kidneys to remove water from urine that is forming. This water is returned to the bloodstream. In this way, ADH helps to retain fluid within the body. At higher concentrations, ADH can also cause constriction of small arteries, the arterioles (giving rise to the alternative name, vasopressin).
Questions to answer

1. The pituitary gland is sometimes described as the ‘master gland’ because it secretes hormones that regulate the activity of other endocrine glands. Describe the pituitary hormones that are involved in the control of other endocrine glands.

2. Hormones secreted by the posterior lobe of the pituitary are not actually made in the posterior lobe. Describe the origin of these hormones and explain how they get to the posterior lobe of the pituitary gland.

3. (a) What is a target organ? (b) How do hormones get from their source to the target organ? (c) Describe target organ/cells and the role of the following hormones:
   - oxytocin
   - antidiuretic hormone
   - adrenaline
   - parathyroid hormone
   - insulin
   - glucagon
   - thyroxine.

4. The hypothalamus is an important control centre in the brain. The pituitary gland is often referred to as the ‘master gland’ and is essential to the functioning of the endocrine system. Describe the relationship between the hypothalamus and the anterior and posterior lobes of the pituitary gland. (6 marks)

Two weeks in HBS on one chapter would look like

Week 12 & 13  N&J Chapter 11 Complete all Review Questions N&J Chapter 11 Q 1-14
    Look at http://biology.clc.uc.edu/Courses/bio105/immunbe.htm

P&I: Antibody mediated defence
   - antigens in body fluids and extracellular pathogens
   - site of production and maturation of B cells
   - activated B cells reproduce to form plasma cells and memory cells
   - plasma cells synthesise and secrete antibodies
   - antigen-antibody complex
   - inactivation of antigen.

Cell mediated defence
   - autoimmune disease and intracellular pathogens
   - site of production and maturation of T cells
   - types of T cells—killer T’s, helper T’s and memory cells.
   - actions of T cells.

Complete past paper Q’s, Complete STAWA lab, 26., DOT Point Revision pg 123 Vaccines

TASK 4 Assignment 2.