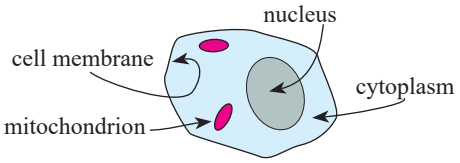
Answers Multi-cellular Organisms

Year 9 Science Chapter 2

p9

1 Draw and label a typical animal cell.



2 Describe the function of each of the following organelles found in animal cells:

a) cell membrane: a thin covering holding and protecting the cell. Lets oxygen and dissolved food into the cell. Lets carbon dioxide and wastes out of the cell.

b) nucleus: The dark spot in the cell. Has DNA which controls the action of the cell.

c) mitochondria: Tiny powerhouses in the cell. Converts glucose into energy (respiration).

O_2 + glucose → water + CO_2

d) cytoplasm: Jelly-like substance making up most of the cell. Where the important reactions take place.

3 More mitochondria would be expected to be found in a muscle cell than in a pancreas cell because a muscle cell requires more energy)mitochondria provide the energy).

4 List five vital nutrients needed by the cells of our body: Oxygen, Water, Carbohydrates, Fats, Minerals, Fibre, Proteins, Vitamins.

5 List four waste products that need to be excreted from the cells of our body: Carbon dioxide, Water, Sulphates, Nitrates, Lactic acid.

6 Write the following symbolic equation for respiration in words:

$C_6H_{12}O_6$ + $6O_2$ ➔ Energy + $6H_2O$ + $6CO_2$

glucose + oxygen ➔ Energy + water + carbon dioxide

p11

1 The human body has a number of organ systems that work together to keep us alive and functioning. **Organ systems** or **body systems** are made up of two or more organs working together to perform a function.

2 Give a brief description of the function of each of the following body systems:

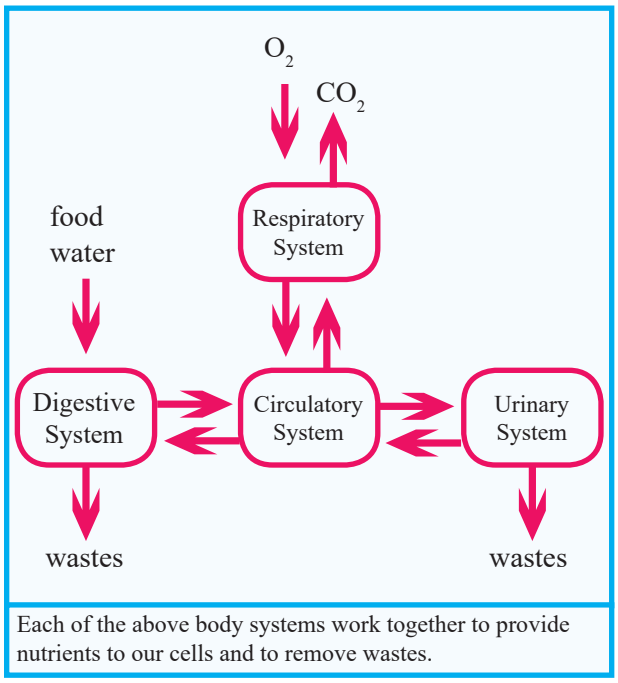
a. The **respiratory system** brings oxygen into the body and removes carbon dioxide.
b. The **digestive system** breaks food down to nutrients that are able to pass into the blood and removes wastes.
c. The **circulatory system** uses blood vessels to transport nutrients to cells of the body and to remove wastes.
d. The **excretory system** removes wastes from the body and includes the urinary system.
e. The **immune system** protects the body from pathogens and their toxins.
f. The bones of the **skeletal system** give support and movement to the body.
g. The **integumentary system** includes skin, hair, nails, exocrine gland.

3 Give a brief description of the function of each of the two control systems:

h. The **nervous system** uses nerves to help all parts of our body to communicate with each other.
i. The **endocrine system** uses chemicals called hormones to communicate with parts of the body.

p11

4 Use a labelled flow diagram to show how the respiratory system, digestive system, circulatory system, and the urinary system work together to provide nutrients to our body and to remove wastes.



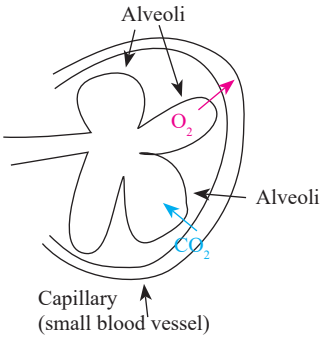
Each of the above body systems work together to provide nutrients to our cells and to remove wastes.

p13

1 The **respiratory system** is essentially responsible for getting oxygen (O_2) to our cells and getting rid of carbon dioxide (CO_2).

2 Some of the **organs** in the respiratory system that work together are the nose, the bronchi, the lungs, and the alveoli.

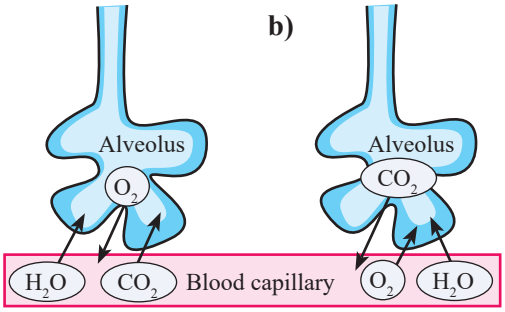
3 With a diagram, describe the function of the alveoli.



- The alveoli are sac-shaped bodies inside the lungs.
- The alveoli are covered in capillaries.
- Oxygen passes through the walls of the alveoli into the red blood cells of the capillaries.
- Carbon dioxide passes from the red blood cells through the walls of the alveoli into the lungs.

4 Which of the following best describes the flow of gases between the lungs and the blood?

a) **b)**



b) best describes the flow of gases

5 Three other body responses that happen without our being aware that they happen:

Sneezing, vomiting, breathing, heartbeat, swallowing, digestion, eye pupils,

p15

1 The **circulatory system** is a group of organs that transports oxygen, nutrients, and hormones to the cells of the body and transports wastes such as carbon dioxide, nitrates, sulphates, water, and lactic acid from the cells of the body to the lungs and kidneys.

2 Some of the **organs** in the circulatory system that work together are the heart, the blood vessels, and the blood.

3 **Arteries** carry blood **from** the heart (either O_2 rich blood and nutrients to cells of the body or CO_2 rich blood to the lungs). **Veins** carry blood **to** the heart (either CO_2 rich blood from the cells of the body or O_2 rich blood from the lungs). An **artery** takes blood **from** the heart. A **vein** takes blood **to** the heart.

4 Capillaries are tiny vessels that exchange nutrients and wastes among the cells of the body.

5 The **red blood cells** transport oxygen and carbon dioxide throughout the body.

6 There are four chambers are in the human heart.

7 The atrium collects blood from either the body or from the lungs?

8 The pulmonary artery carries blood from the heart to the lung. This blood would be oxygen poor?

9 Most diagrams of the circulatory system have red and blue coloured blood vessels. The red indicates a blood vessel rich in oxygen and the blue indicates a blood vessel rich in carbon dioxide

p17

1 The **urinary system** is a group of organs that filters wastes from the blood.

2 The **urinary system** is also known as the **renal system**.

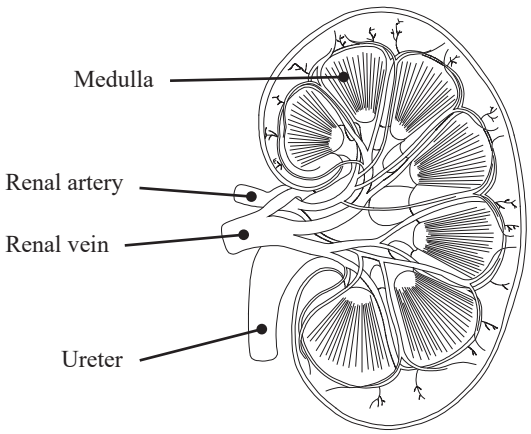
3 The kidneys filter the blood, removing wastes such as urea and ammonium. The kidneys also maintain the correct balance of substances such as water, amino acids, and electrolytes in the blood. The kidneys excrete the urine into the ureter.

4 The **ureter** is a muscular tube that propels urine from the kidney to the bladder. The ureter is about 25 cm to 30 cm long.

5 The **bladder** stores urine. Your brain gives the signal to empty the bladder. The bladder outlet muscles relax and the bladder squeezes to empty your bladder of urine.

6 Place each of the following urinary system organs in order of urinary flow:
kidney. ureter, bladder, urethra

7 Sketch and label a diagram of the urinary system.



8 For each of the following urine test strip results, indicate the test and whether the test is normal or abnormal.
a) Ketones - normal **b)** Protein - abnormal **c)** Blood cells - abnormal **d)** Glucose - normal

p19

1 The **digestive system** is a group of organs that absorb nutrients from foods.

2 The function of the mouth: The teeth chew the food into smaller pieces. Saliva from the salivary glands begins the breaking down of carbohydrates.

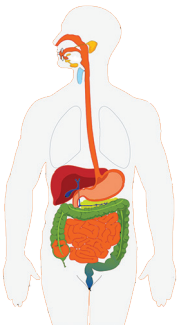
3 The function of the stomach: Gastric juices begin breaking down proteins. The acidic gastric juices also kill harmful organisms.

4 The function of the small intestine: 90% of the nutrients in our food are absorbed through the walls of the small intesting into the blood stream.

5 The function of the large intestine: Water is absorbed from the wastes. Vitamins are absorbed from the wastes. Waste material is passed from the body.

6 Where on the following diagram

a) is the oesophagus? A
b) is the stomach? C
c) is the pancreas? B
d) is the small intestine? E
e) is the large intestine? D
f) is most of the food absorbed into the bloodstream? Yes
g) is water absorbed from the wastes? Yes
h) do gastric juices begin breaking down proteins? Yes



p21

1 Describe the function of each of the following parts of the nervous system:

a) The **brain** is the control centre of our body. The brain receives messages, processes information, and sends messages to musces and glands throughout the body via nerves through the spinal cord.

b) The **cerebum** is the largest part and consists of two halves. The cerebum controls voluntary actions such as memory, conscious thought, behaviour, emotions such as happiness and sadness, speech, vision, smell, touch, and hearing.

c) The **cerebellum** is the small part at the lower back of the brain. The cerebellum controls the involuntary actions, such as balance and fine motor control (eg the complex coordination of muscles needed to pick up a coin).

d) The **brain stem** connects the brain to the spinal cord and controls other involuntary actions such as breathing, heart rate, swallowing, thirst, and body temperature.

e) The **spinal cord** extends from the base of the brain through the vertebra (spine) and is about 45 cm long. The vertebra protects the spinal cord. The spinal cord acts as a message conduit between the brain and the rest of the body. Nerves branch out from the spinal cord to other parts of our body.

f) A **ganglion** is a group of nerve cells that occur inside the brain, the spinal cord, and outside the brain and the spinal cord.

g) **Nerve cells**, neurons, are specialised cells that transmit electrical signals, very quickly, from one part of the body to another. Chemicals help conduct signals from the end of one nerve onto the next nerve.

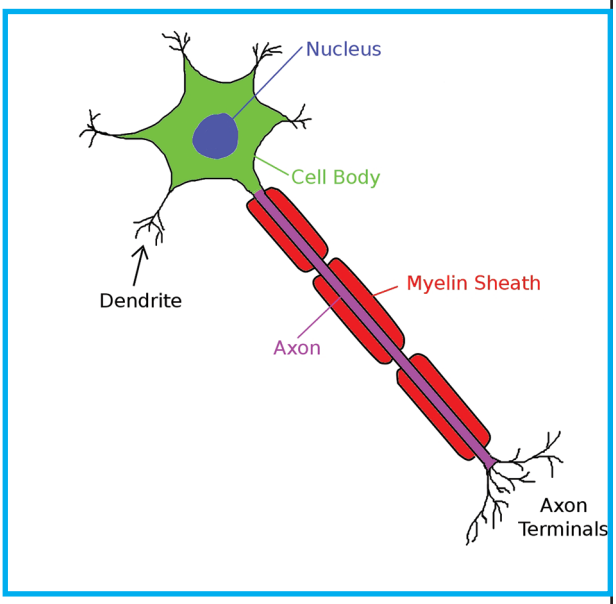
2 The nervous system controls voluntary actions, of which we are aware, such as turning off the TV or picking up litter. The nervous system also controls involuntary actions, of which we are not aware, such as our breathing, heartbeat, and blinking.

3 The cerebellum coordinates the rapid actions of a gymnast?

p23

1 Draw a sketch of a neuron and add the following labels:

a) Nucleus.
b) Cell body.
c) Dendrite.
d) Axon.
e) Myelin sheath.



2 What is a synapse? Electrical impulses transfer from one neuron to the next neuron over a small gap called a **synapse**. A chemical called a neurotransmitter transmits the electrical impulse across the synapse. It is believed that synapses form the basis of memory.

3 Which of the following statements are false?

a) The myelin sheath covers the axon. **True**
b) Sensory neurons carry messages from the spinal cord to the brain. **False** (Bit of a tricky question). Sensory neurons collect the information - they convert the stimulus such as touch into electrical signals. Connector neurons are more likely to be carrying messages from the spinal cord to the brain.
c) Motor neurons carry messages from the brain or spinal cord to muscles and glands. **True**
d) Electrical impulses can travel both ways along a neuron. **False**

p25

1 The **nervous** and **endocrine** (hormonal) systems transmit electrical and chemical signals to all parts of the body controlling thousands of activities.

2 The **endocrine system** consists of a number of glands that secrete hormones, chemical signals, directly into the **blood** stream. The circulatory system then transports the hormones to various cells and organs around the body. The targeted cells and organs then respond to the hormone.

3 Which of the following statements are false?

a) The pituitary gland is a master gland because it controls other glands. **True**

b) The adrenal glands produce the insulin that controls blood sugar levels. **False** (The pancreas produces insulin).

c) The endocrine system also controls our emotions. **True**

d) The ovaries and the testes are considered major endocrine glands. **True**

e) An endocrine gland secretes hormones directly into the blood stream. **True**

f) More than two hormones are never present in the blood at the same time. **False**

p27

1 **Homeostasis** is vital for survival. Homeostasis refers to our body's ability to keep our internal environment stable. For proper functioning, our body needs to maintain a constant temperature, a stable blood pressure, an appropriate level of iron in our blood, maintenance of salt and water levels, appropriate blood pH levels, avoid high carbon dioxide levels, and maintain thousands of other conditions. The systems of the body work together to maintain homeostasis.

2 **Body temperature** is maintained within a range of 37°C to 38°C. Our respiratory system, digestive system, and the circulatory system work together to provide nutrients for respiration within cells. This respiration produces the heat energy for our body. The hypothalamus detects when our our body is too hot or too cold and uses the endocrine system to bring the body temperature back to normal. Our endocrine system also influences our behaviour to alter our body temperature such as seeking cooler conditions when hot.

3 The **endocrine system** is involved in maintaining a constant body temperature. Name four other body systems that are involved in maintaining a constant body temperature. The respiratory system, the digestive system, the circulatory system, the nervous system, and the endocrine system work together to maintain a constant body temperature.

4 Normal **blood glucose** is about 4 to 6 mmol/L. Many cells and tissues, such as our brain and retina, will be damaged by abnormal glucose levels. The pancreas produces hormones depending on the blood glucose level. If the blood glucose level is high, the pancreas secretes insulin into the blood stream. The insulin stimulates muscle cells to use more glucose or store excess glucose as glycogen. If the blood sugar is too low, the pancreas secretes glucagon into the blood stream. Glucagon stimulates the liver to convert glycogen into glucose and to release the glucose into the blood stream. These two hormones, insulin and glucagon, work together to regulate the level of glucose.

p29

1 A pathogen is anything that can cause a disease. A pathogen is also known as a germ.

2 Name four different types of pathogens: A pathogen, or germ, is a micro-organism such as a virus, bacterium, protozoan, or fungus.

3 The **skin** provides an effective barrier against pathogens. If the skin is cut, our blood clots quickly to form a scab and prevent entry by pathogens. Our immune system also sends white blood cells to the cut to attack pathogens. The red inflammation at a cut or sore is an indication that white blood cells are trying to overcome an infection.

4 Our **digestive system** usually kills pathogens that enter through our food by churning gastric acid with the food in our stomach. Our digestive system will quickly expel identified pathogens through diarrhoea. Vomiting is also a way of expelling pathogens and their toxins.

5 Mucous secreted by our **respiratory system** (nose, trachea, bronchi, lungs) traps pathogens which are then expelled by sneezing and coughing.

6 Our **eyes** are protected by the flushing action of tears. The enzymes in our tears also provide a chemical barrier against pathogen invasion.

7 Hygiene is critical for the prevention of infection by pathogens.

p31

1 A leucocyte is a white blood cell that defends the body from pathogens.

2 **Neutrophils** make up about 50% of the white blood cells and are usually the first cells to arrive at the infection. Neutrophils kill bacteria by eating the bacteria. The neutrophils can themselves be killed by the toxin produced by an eaten bacteria. Yellow pus is an indication of dead neutrophils.

3 **Macrophages** act as scavengers eating dead cells, including dead neutrophils, pathogens and cancer cells. Macrophages are found in most tissues throughout the body waiting to spring into action.

4 **Natural killer cells** destroy cells that have been invaded by a virus. Natural killer cells are able to recognise a cell that has been invaded by a virus and then destroy the cell and the included virus.

5 The **lymphatic system** is a series of channels, or lymphatics, that drain off excess tissue fluid and returns it to the circulatory system. The lymphatic system is considered a part of the circulatory system. The main function of the lymphatic system is managing the fluid levels in the body, filtering pathogens, and producing various types of white blood cells. The lymph is a clear, colourless liquid consisting of plasma, white blood cells, old and damaged cells, and pathogens. The lymph fluid is filtered through the lymph nodes, spleen, and thymus before being returned to the blood.

6 The **lymph nodes** are scattered throughout the body. The lymph nodes filter the lymph fluid of foreign material such as bacteria and cancer cells. The lymph nodes also produce lymphocytes, a type of white blood cell, that attack the pathogens trapped in the lymph node.

7 The **spleen** filters the lymph fluid, removing pathogens and cleaning up old and damaged red blood cells.

8 The **thymus** produces specialised T-cells that develop specifically to attack a particular pathogen. This development of specifically targeted T-cells takes time but eventually means that our immune system will, in future, be able to quickly attack the invading pathogen - we are then said to be **immune** to the particular pathogen.

9 A difference between blood and lymph is:

- **a)** No white blood cells in blood: **False**
- **b)** No red blood cells in lymph: **True**
- **c)** No neutrophils in blood: **False**
- **d)** No neutrophils in lymph: **False**

p33

1 **Radiation** is energy that occurs naturally in sunlight.

2 **Non-ionising radiation** has less energy and poses less risk than ionising radiation. Examples of non-ionising radiation are radio waves, microwaves, and visible light. **Ionising radiation** has enough energy to push electrons out of the atoms in living things. Ionising radiation thus poses a health risk of damaging human cells and tissues.

3 List three sources of ionising radiation: **X-rays** are used extensively in medicine to produce detailed images of bones and soft tissue. **Radon** is a colourless, odourless, radioactive gas that is present in most rocks and soils. **Nuclear power reactors** contain significant sources of dangerous radiation. **Industrial radiation** has many uses including security screening at airports, killing pathogens in food products, and checking metal parts and welds.

4 Indicate four effects of a high radiation dose on the body: **Thyroid gland** High risk of cancer as thyroid absorbs radioactive iodine. **Lungs** Scarring and inflammation. **Stomach** Vomiting, internal bleeding, nausea. **Intestines** Diarrhea, internal bleeding, damaged lining. **Bone marrow** White blood cells destroyed, high risk of infection. **Skin cells** Peeling, sores.

5 Briefly describe the risks from each of the following radiation sources:

a) Exposure to medical radiation, **X-rays** etc, is necessary for diagnosis and treatment and is an important tool to help doctors save lives. Doctors are trusted with balancing the benefits of medical radiation with the risks.

b) Naturally occurring **radon gas** may accumulate in houses and other buildings. It is generally considered that radon gas poses little risk in most Australian homes. Radon gas monitors are inexpensive.

c) Some **smoke alarm** designs use a small amount of radioactive material. It is generally considered that the risk from 'ion chamber smoke alarms' is insignificant.

d) The **security screening** at airports may be based on a X-ray machine or a preferred radiofrequency machine. It is generally considered that the risk from a X-ray scanner is insignificant.

p34

1 Diabetes is the term for a group of diseases in which there are high blood sugar levels over a long period of time.

2 Type 1 diabetes, high blood sugar, can happen if the pancreas doesn't produce enough insulin.

3 Type 2 diabetes, high blood sugar, can happen if the cells of the body don't respond to the insulin.

4 Some symptoms of diabetes: The high blood sugar can cause increased hunger, thirst, and urination. Serious life-threatening complications will arise if the diabetes is untreated.

5 Your blood sugar level would be expected to be at its lowest in the morning before breakfast.

p35

1 An antibiotic is a product that either kills or restricts the growth of a pathogen.

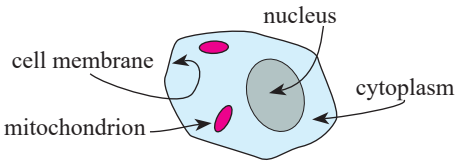
2 Antibiotics such as penicillin work by preventing the bacteria from developing a strong cell wall. The cell wall then fails, killing the bacteria. Other antibiotics work by stopping the growth of the bacteria.

3 The danger of overusing antibiotics is that the overuse can support the growth of antibiotic resistant bacteria.

4 Have antibiotics saved your life? Yes. Early in my life I had osteomyelitis, infection of the bone following a sporting injury, which was treated with antibiotics. Before antibiotics, Infections were very difficult to deal with and severe infections were life threatening.

p38

1 Draw and label a typical animal cell.



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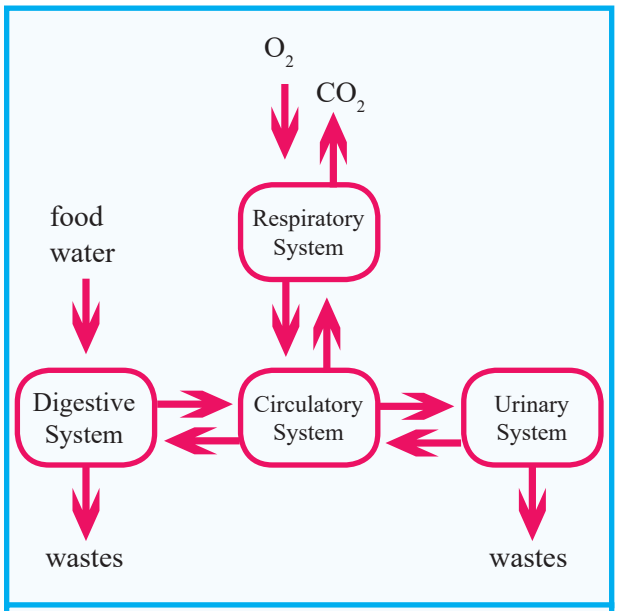

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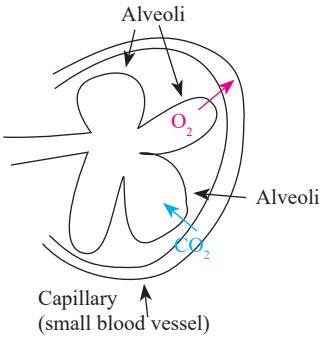

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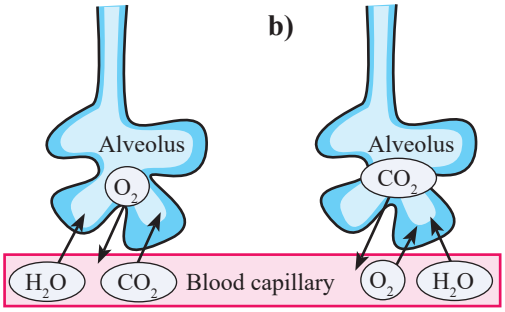

b) best describes the flow of gases

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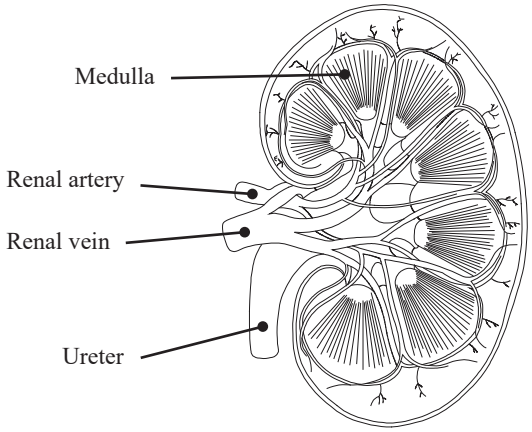

p40

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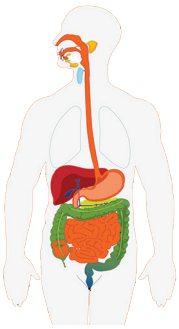

p41

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e) The **spinal cord** extends from the base of the brain through the vertebra (spine) and is about 45 cm long. The vertebra protects the spinal cord. The spinal cord acts as a message conduit between the brain and the rest of the body. Nerves branch out from the spinal cord to other parts of our body.

f) A **ganglion** is a group of nerve cells that occur inside the brain, the spinal cord, and outside the brain and the spinal cord.

g) **Nerve cells**, neurons, are specialised cells that transmit electrical signals, very quickly, from one part of the body to another. Chemicals help conduct signals from the end of one nerve onto the next nerve.

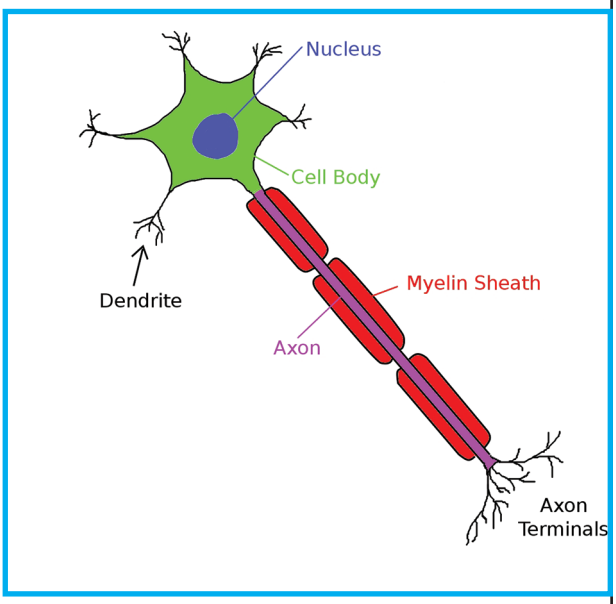
2 The nervous system controls voluntary actions, of which we are aware, such as turning off the TV or picking up litter. The nervous system also controls involuntary actions, of which we are not aware, such as our breathing, heartbeat, and blinking.

3 The cerebellum coordinates the rapid actions of a gymnast?

p41

4 Draw a sketch of a neuron and add the following labels:

a) Nucleus.
b) Cell body.
c) Dendrite.
d) Axon.
e) Myelin sheath.



5 What is a synapse? Electrical impulses transfer from one neuron to the next neuron over a small gap called a **synapse**. A chemical called a neurotransmitter transmits the electrical impulse across the synapse. It is believed that synapses form the basis of memory.

6 Which of the following statements are false?

a) The myelin sheath covers the axon. **True**
b) Sensory neurons carry messages from the spinal cord to the brain. **False** (Bit of a tricky question). Sensory neurons collect the information - they convert the stimulus such as touch into electrical signals. Connector neurons are more likely to be carrying messages from the spinal cord to the brain.
c) Motor neurons carry messages from the brain or spinal cord to muscles and glands. **True**
d) Electrical impulses can travel both ways along a neuron. **False**

p42

1 The **nervous** and **endocrine** (hormonal) systems transmit electrical and chemical signals to all parts of the body controlling thousands of activities.

2 The **endocrine system** consists of a number of glands that secrete hormones, chemical signals, directly into the **blood** stream. The circulatory system then transports the hormones to various cells and organs around the body. The targeted cells and organs then respond to the hormone.

3 **Homeostasis** is vital for survival. Homeostasis refers to our body's ability to keep our internal environment stable. For proper functioning, our body needs to maintain a constant temperature, a stable blood pressure, an appropriate level of iron in our blood, maintenance of salt and water levels, appropriate blood pH levels, avoid high carbon dioxide levels, and maintain thousands of other conditions. The systems of the body work together to maintain homeostasis.

4 **Body temperature** is maintained within a range of 37°C to 38°C. Our respiratory system, digestive system, and the circulatory system work together to provide nutrients for respiration within cells. This respiration produces the heat energy for our body. The hypothalamus detects when our our body is too hot or too cold and uses the endocrine system to bring the body temperature back to normal. Our endocrine system also influences our behaviour to alter our body temperature such as seeking cooler conditions when hot.

5 The **endocrine system** is involved in maintaining a constant body temperature. Name four other body systems that are involved in maintaining a constant body temperature. The respiratory system, the digestive system, the circulatory system, the nervous system, and the endocrine system work together to maintain a constant body temperature.

6 Normal **blood glucose** is about 4 to 6 mmol/L. Many cells and tissues, such as our brain and retina, will be damaged by abnormal glucose levels. The pancreas produces hormones depending on the blood glucose level. If the blood glucose level is high, the pancreas secretes insulin into the blood stream. The insulin stimulates muscle cells to use more glucose or store excess glucose as glycogen. If the blood sugar is too low, the pancreas secretes glucagon into the blood stream. Glucagon stimulates the liver to convert glycogen into glucose and to release the glucose into the blood stream. These two hormones, insulin and glucagon, work together to regulate the level of glucose.

7 Which of the following statements are false?

a) The pituitary gland is a master gland because it controls other glands. **True**

b) The adrenal glands produce the insulin that controls blood sugar levels. **False** (The pancreas produces insulin).

c) The endocrine system also controls our emotions. **True**

d) The ovaries and the testes are considered major endocrine glands. **True**

e) An endocrine gland secretes hormones directly into the blood stream. **True**

f) More than two hormones are never present in the blood at the same time. **False**

g) Homeostasis, keeping our internal environment stable, is controlled by the thyroid gland. **False**

p43

1 Green = 2 Purple = 3 Yellow = 4

2 Water will fall.

3

p44

1 A pathogen is anything that can cause a disease. A pathogen is also known as a germ.

2 Name four different types of pathogens: A pathogen, or germ, is a micro-organism such as a virus, bacterium, protozoan, or fungus.

3 The **skin** provides an effective barrier against pathogens. If the skin is cut, our blood clots quickly to form a scab and prevent entry by pathogens. Our immune system also sends white blood cells to the cut to attack pathogens. The red inflammation at a cut or sore is an indication that white blood cells are trying to overcome an infection.

4 Our **digestive system** usually kills pathogens that enter through our food by churning gastric acid with the food in our stomach. Our digestive system will quickly expel identified pathogens through diarrhoea. Vomiting is also a way of expelling pathogens and their toxins.

5 Mucous secreted by our **respiratory system** (nose, trachea, bronchi, lungs) traps pathogens which are then expelled by sneezing and coughing.

6 Our **eyes** are protected by the flushing action of tears. The enzymes in our tears also provide a chemical barrier against pathogen invasion.

7 Hygiene is critical for the prevention of infection by pathogens.

8 A **leucocyte** is a white blood cell that defends the body from pathogens.

9 **Neutrophils** make up about 50% of the white blood cells and are usually the first cells to arrive at the infection. Neutrophils kill bacteria by eating the bacteria. The neutrophils can themselves be killed by the toxin produced by an eaten bacteria. Yellow pus is an indication of dead neutrophils.

10 **Macrophages** act as scavengers eating dead cells, including dead neutrophils, pathogens and cancer cells. Macrophages are found in most tissues throughout the body waiting to spring into action.

11 **Natural killer cells** destroy cells that have been invaded by a virus. Natural killer cells are able to recognise a cell that has been invaded by a virus and then destroy the cell and the included virus.

12 The **lymphatic system** is a series of channels, or lymphatics, that drain off excess tissue fluid and returns it to the circulatory system. The lymphatic system is considered a part of the circulatory system. The main function of the lymphatic system is managing the fluid levels in the body, filtering pathogens, and producing various types of white blood cells. The lymph is a clear, colourless liquid consisting of plasma, white blood cells, old and damaged cells, and pathogens. The lymph fluid is filtered through the lymph nodes, spleen, and thymus before being returned to the blood.

13 The **lymph nodes** are scattered throughout the body. The lymph nodes filter the lymph fluid of foreign material such as bacteria and cancer cells. The lymph nodes also produce lymphocytes, a type of white blood cell, that attack the pathogens trapped in the lymph node.

14 The **spleen** filters the lymph fluid, removing pathogens and cleaning up old and damaged red blood cells.

15 The **thymus** produces specialised T-cells that develop specifically to attack a particular pathogen. This development of specifically targeted T-cells takes time but eventually means that our immune system will, in future, be able to quickly attack the invading pathogen - we are then said to be **immune** to the particular pathogen.

16 **Radiation** is energy that occurs naturally in sunlight.

17 **Non-ionising radiation** has less energy and poses less risk than ionising radiation. Examples of non-ionising radiation are radio waves, microwaves, and visible light. **Ionising radiation** has enough energy to push electrons out of the atoms in living things. Ionising radiation thus poses a health risk of damaging human cells and tissues.

18 List three sources of ionising radiation: **X-rays** are used extensively in medicine to produce detailed images of bones and soft tissue. **Radon** is a colourless, odourless, radioactive gas that is present in most rocks and soils. **Nuclear power reactors** contain significant sources of dangerous radiation. **Industrial radiation** has many uses including security screening at airports, killing pathogens in food products, and checking metal parts and welds.

19 Indicate four effects of a high radiation dose on the body: **Thyroid gland** High risk of cancer as thyroid absorbs radioactive iodine. **Lungs** Scarring and inflammation. **Stomach** Vomiting, internal bleeding, nausea. **Intestines** Diarrhea, internal bleeding, damaged lining. **Bone marrow** White blood cells destroyed, high risk of infection. **Skin cells** Peeling, sores.

p45	**1** c) **2** c) **3** d) **4** b)
p46	**1** a) No reflex kick because the motor neuron doesn't receive the message from the sensory neuron because of the cut spinal cord. b) The person doesn't feel the tap on their knee because the brain doesn't receive the message from the sensory neuron because of the cut spinal cord. c) The person won't be able to walk because the brain is unable to get messages to walking muscles because of the cut spinal cord. **2** **a)** Increased heart rate - sympathetic system, decreased heart rate - parasympathetic system. **b)** Muscles relax - parasympathetic system, muscles contract - sympathetic system. **c)** Pupils dilate - parasympathetic system, pupils constrict - sympathetic system. **d)** Stomach secretions decrease - sympathetic system, stomach secretions increase - parasympathetic system. **e)** Use shorter neuron pathways - sympathetic system, use longer neuron pathways - parasympathetic system. **3** a) A = artery, B = vein, C = artery, D = vein b) A = pulmonary artery, B = pulmonary vein c) A = poor oxygen , B = rich oxygen, C = rich oxygen, D = poor oxygen d) A = rich carbon dioxide, B = poor carbon dioxide, C = poor carbon dioxide, D = rich carbon dioxide