

Keywords

- ◆ Endocrine system
- ◆ Endocrine glands
- ◆ Hormones
- ◆ Hormone imbalance
- ◆ Effects of drug abuse
- ◆ Effects of alcohol abuse
- ◆ Healthy mind

Hormones

What are the endocrine glands in the human body?

What is the importance of hormones?

What are the effects of drug and alcohol abuse on body coordination?

What is the importance of a healthy mind?



Science Digest

Hormone Treatment

Menopause is a condition when the ovaries stop producing ova (egg) and the woman stops menstruating. This condition usually happens to women aged 45 to 55 years.

During menopause, the hormone oestrogen in the body decreases thus producing symptoms such as difficulty in sleeping, muscle and joint pain and restlessness.

Hormone replacement therapy (HRT) treatment is believed to be able to overcome menopausal symptoms. HRT can be done in the form of Oestrogen-Progestin therapy (EPT) if the woman concerned still has a uterus, or Oestrogen therapy (OT) for those who have undergone uterus removal surgery. HRT is aimed at restoring the hormone levels of women to allow their bodies to function normally again by replacing the decreasing hormones during menopause.

Source: myMetro

You will learn about:

- human endocrine system
- disruptions to body coordination
- healthy mind

Endocrine System and Its Functions

The human body has a system known as the endocrine system. The **endocrine system** is one of the systems in the body that coordinates body functions that involve chemical substances.

How would you feel if you came across a snake while playing at the field? Would you run away? Why does this happen? The answer is simple. This is to save yourself from harm. Let us see the situation below.

When a snake is seen ...



The endocrine gland secretes hormones that cause an increase in:

- (a) heartbeat
- (b) rate of breathing
- (c) blood pressure
- (d) blood glucose level
- (e) rate of metabolism

Effects:

- The heart pumps more blood to provide more oxygen and glucose to the muscles
- The muscles obtain more energy
- More stored glycogen is converted into glucose

Run away

Figure 7.1 Example of a situation that involves the endocrine system

The endocrine system functions as a messenger to the whole body that uses hormones. Hormone is a type of chemical substance secreted by special glands known as the **endocrine glands**. These glands are ductless glands because the hormone is not carried through a duct but secreted directly into the blood circulatory system to be distributed to the whole body. A type of hormone can have more than one target organ (organ that responds to the hormone).

Figure 7.2 shows the way the hormone coordination acts.

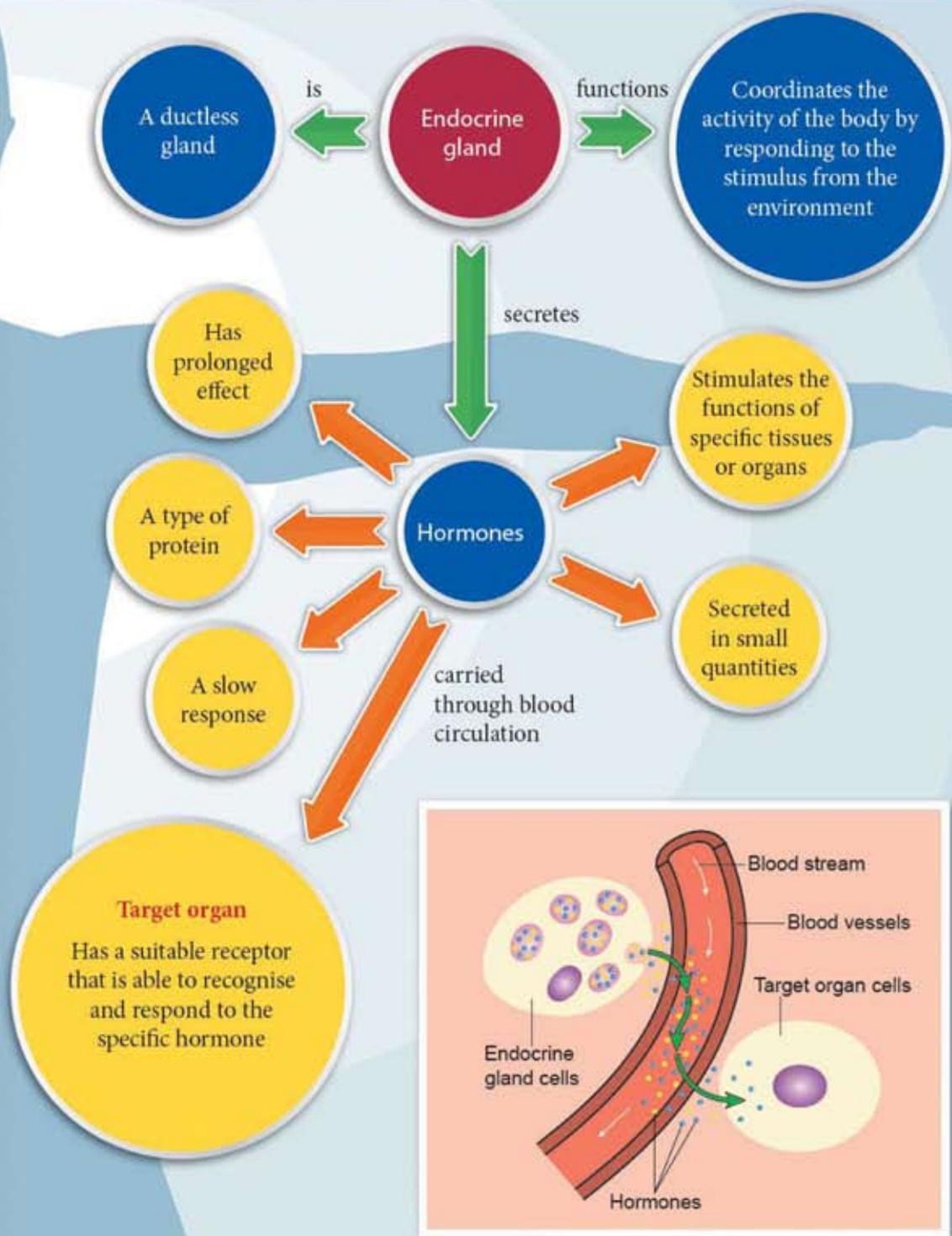
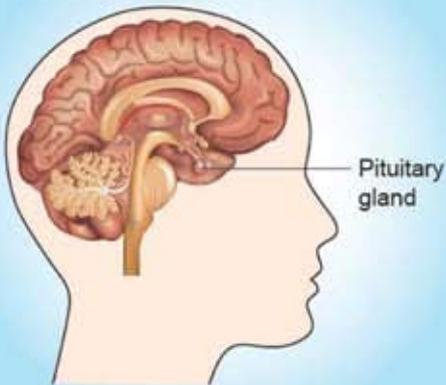


Figure 7.2 Method of action of hormone coordination

Figure 7.3 shows the main endocrine glands and their position in the body.

Pituitary gland

Pituitary gland is located below the cerebrum. This gland is also known as the master gland because it produces hormones that control other endocrine glands.



Ovary

Women have a pair of ovaries in the pelvic space.

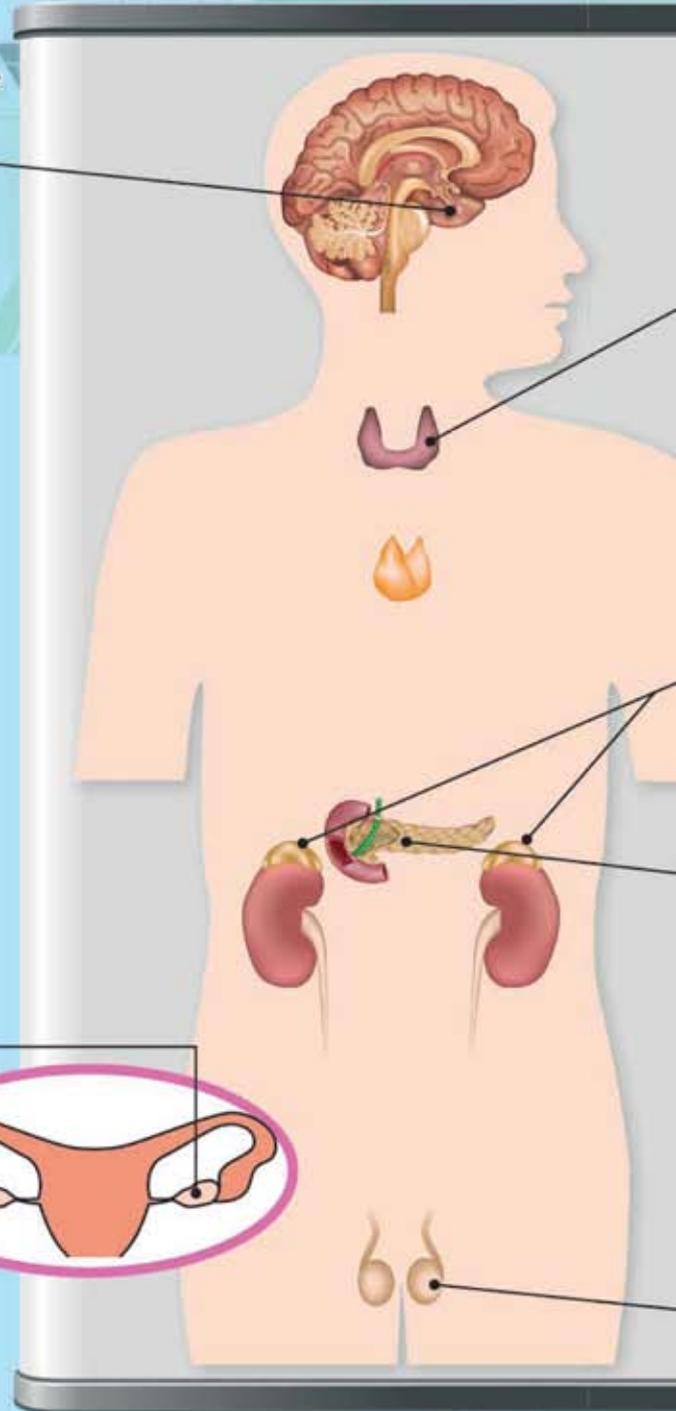
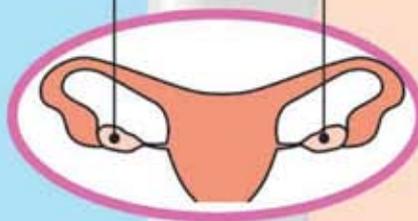
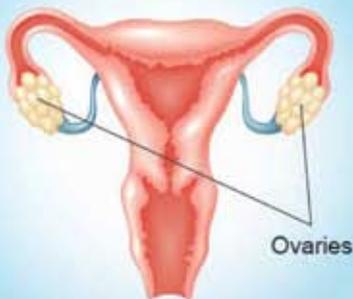
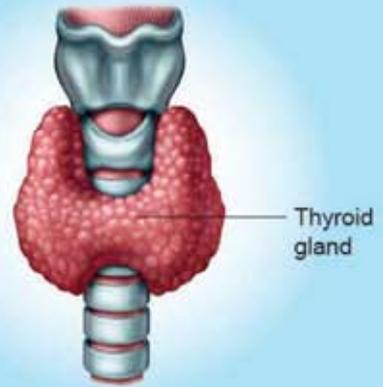


Figure 7.3 Endocrine glands in humans

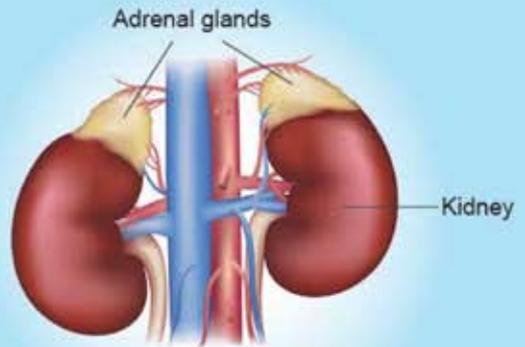
Thyroid gland

The thyroid gland is located in front of the trachea.



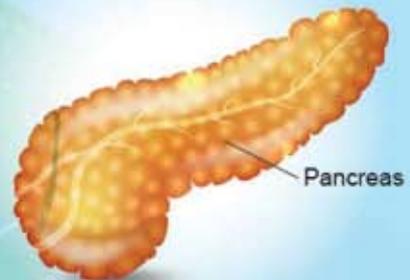
Adrenal glands

Adrenal glands are located above the kidneys.



Pancreas

The pancreas is located at the back of the stomach.



Testis

Men have a pair of testes protected by a scrotum.

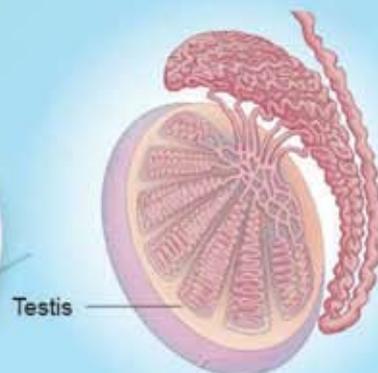


Table 7.1 shows the function of hormones released by the endocrine glands.

Table 7.1 Functions of hormones released by the endocrine glands

Endocrine gland	Hormone	Function
Pituitary gland	Antidiuretic hormone (ADH)	<ul style="list-style-type: none"> Controls the quantity of water reabsorbed by the kidneys
	Growth hormone (GH)	<ul style="list-style-type: none"> Stimulates growth in children Maintains healthy body composition in adults Maintains the muscle and bone mass of adults
Thyroid gland	Thyroxine	<ul style="list-style-type: none"> Controls the rate of metabolism Controls the physical and mental development in children
Adrenal gland	Adrenaline	<ul style="list-style-type: none"> Prepares your body to act in an emergency situation by: <ul style="list-style-type: none"> – increasing the rate of metabolism – increasing the rate of heartbeat – increasing the glucose level in the blood – dilating the size of the pupil
Pancreas	Insulin	<ul style="list-style-type: none"> Controls the glucose level in the blood by converting excess glucose into glycogen to be stored in the liver
Ovary	Oestrogen	<ul style="list-style-type: none"> Controls the female secondary sexual characteristics such as development of breasts and broadening of the hip Stimulates the production of ova Prepares the uterus for implantation of embryo
	Progesterone	<ul style="list-style-type: none"> Maintains the thickness of the wall of the uterus for the implantation of embryo
Testis	Testosterone	<ul style="list-style-type: none"> Controls the development of male secondary sexual characteristics such as a deep voice and the growth of moustache Stimulates sperm production

**Activity 7.1**

Result Showcase

21st Century Skills

Aim: To prepare a multimedia presentation that shows the main endocrine glands (pituitary gland, thyroid gland, adrenal gland, pancreas, ovary and testis) and their functions.

Instructions:

1. Carry out this activity in groups.
2. Gather information from the Internet, reference books, magazines and articles on:
 - (a) position of the endocrine glands
 - (b) type of hormones secreted
 - (c) function of each hormone
3. Present the outcome of your group discussion in class in the form of a multimedia presentation.

Causes and Effects of Hormonal Imbalance

Hormone is an organic chemical substance that has an important role in every function of the body. Hence, the rate of hormone secretion must be balanced with its functions. Over secretion and under secretion of hormone by the endocrine glands will cause hormonal imbalance that leads to diseases. These could be due to an unhealthy lifestyle or exposure to dangerous rays.

**Activity 7.2**

Hot Seat

21st Century Skills

Aim: To carry out a study on endocrine gland disorder.

Instructions:

1. Carry out this activity in groups.
2. Gather information from the Internet, reference books, magazines and articles on the causes and effects of the following:
 - (a) Diabetes insipidus
 - (b) Diabetes mellitus
 - (c) Acromegaly
 - (d) Low rate of metabolism
3. Appoint a student to role play as a 'doctor'.
4. The 'doctor' will answer all the questions asked by other students.



Photograph 7.1 Goitre

Thyroxine deficiency will cause:

- low rate of metabolism
- inability to tolerate cold
- stunted physical and mental development in children (cretinism).
- less energy in adults (myxedema)
- tendency to become fat
- goitre

Excessive thyroxine hormone will cause:

- high rate of metabolism
- sweating and always feeling hot
- sleeping difficulties and a very good appetite
- tendency to become thin
- thyroid gland enlargement, protruding eyeballs and swollen neck

Hormonal Imbalance

Testosterone hormone deficiency will cause:

- delay in reaching puberty
- low sperm count

Excessive testosterone hormone will cause:

- male characteristics in women

Oestrogen deficiency will cause:

- development of female secondary sexual characteristics to be disrupted.

Excessive oestrogen will cause:

- female characteristics in men

Progesterone deficiency will cause:

- menstrual problems
- headache
- constipation
- miscarriage



How Can I Balance My Hormones

<http://bukutekskssm.my/Science/E4/Pg150>

INFORMATION

Growth hormone deficiency will cause:

- dwarfism

Excessive growth hormone will cause:

- uncontrolled growth
- acromegaly (gigantism)



Photograph 7.2
*Acromegaly man (right)
and normal man (left)*

Antidiuretic hormone (ADH) deficiency will cause:

- poor reabsorption of water at the collecting duct in the kidney
- excessive production of urine
- excessive thirst
- diabetes insipidus

Excessive antidiuretic hormone (ADH) will cause:

- headache
- dizziness

Insulin hormone deficiency will cause:

- failure of excessive glucose to be converted to glycogen
- increase in blood glucose level
- diabetes mellitus

Excessive insulin will cause:

- low glucose levels
- hypoglycaemia
- excessive thirst



FORMATIVE PRACTICE

7.1

1. State the meaning of hormone.
2. State the main endocrine glands in the human body.
3. Name the hormones secreted by the following glands:
(a) Adrenal gland (b) Pancreas (c) Testis (d) Thyroid gland
4. What is the function of the hormones produced by the following glands?
(a) Thyroid gland (b) Ovary (c) Pancreas

7.2

Disruptions to Body Coordination

Body coordination can be disrupted due to various factors. One of the main factors is the uncontrolled consumption of drugs. Drugs are chemical substances that can disrupt the neuron function by delaying the impulse transmission in the neuron. The drugs that are taken without control disrupts body coordination, and causes addiction.



Photograph 7.3 *Types of drugs used as medicine*

Types of Drugs

Drugs may cause good or bad effects on the body depending on its use. Drugs can be used to treat a disease. Morphine and steroid need to be taken under a doctor's supervision. Figure 7.4 shows the types of drugs and their effects.



Figure 7.4 Types of drugs and their effects

Drug abuse causes addiction and addicts will experience withdrawal symptoms if they cease to take drugs. The symptoms include shivering, nausea, anxiety and depression. Figure 7.5 shows the effects of drug abuse on body coordination.

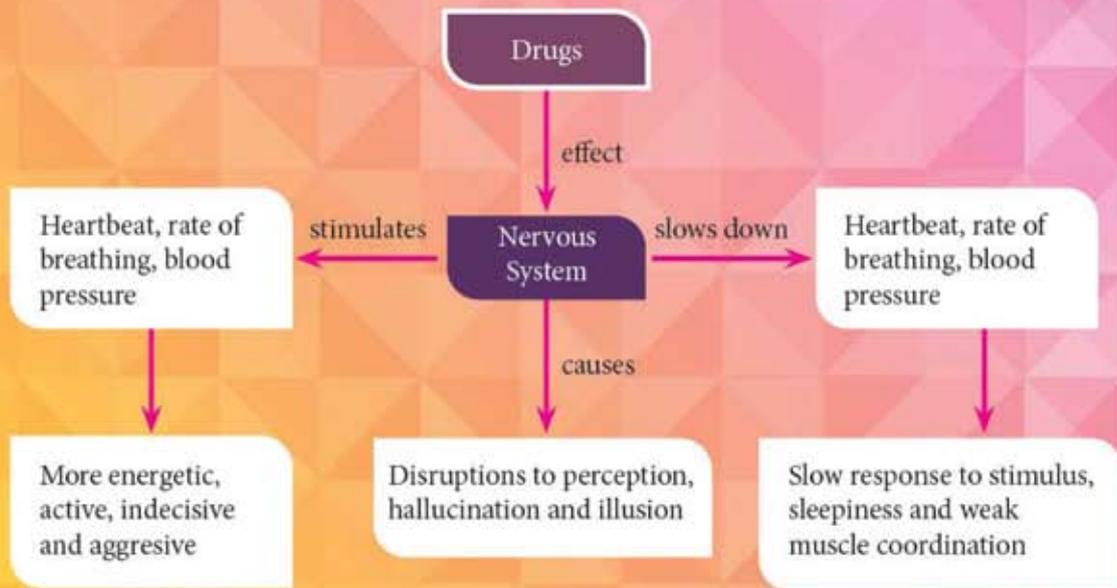


Figure 7.5 Effects of drug abuse

The factors that cause drug abuse are curiosity, peer influence, seeking pleasure and the desire to overcome sadness or to forget a problem.



Activity 7.3

Gallery Walk

Aim: To prepare a review on drug abuse.

21st Century Skills

Instructions:

1. Carry out this activity in groups.
2. Listen and record important information on drug abuse such as:
 - (a) drug categories
 - (b) types of drugs and examples of each type of drug
 - (c) effects of drug abuse
 - (d) characteristics of drug addicts
3. Gather information obtained and prepare a review.
4. Display your group's review to the class.
5. Write comments about the work of other groups.

Effects of Drug and Alcohol Abuse on Body Coordination



Most drugs influence the body coordination by causing an effect on the nervous system. Alcohol also affects the nerves by slowing the flow of nerve impulses. Hence, affecting the brain function. Let us look further at the effects of drug and alcohol abuse on our body coordination.

Hormonal imbalance

- The body will experience coordination disruption. The body will be exposed to danger and injury. The body will either experience extreme growth or no development if damage to the pituitary gland happens. Secondary sexual development will be stunted if oestrogen and testosterone hormones fail to function normally.
- Symptoms of hormonal imbalance can be observed through physical and mental changes of the person such as excessive height and size, weight loss, depression and poor memory.

Unclear speech

- Consuming alcohol will cause negative effects on parts of cerebrum in the brain.
- Excessive alcohol consumption causes unclear speech.

Slow reflex action

- Psychoactive chemical substances in drugs and ethanol in the alcohol will slow down the response of the nervous system. These chemical substances will be present between the afferent neurons and interneurons. The impulse transmission will be blocked and the process of impulse transmission to the brain will slow down.
- This can be observed in drug addicts and in those who consume alcoholic drinks excessively.

Loss of balance

- Consuming drugs and alcoholic drinks will cause weak muscle coordination resulting in staggering and loss of balance.

Effects of Drug and Alcohol Abuse on Physical and Mental Health

Besides influencing the nervous system, drug abuse also causes many physical and mental health problems such as liver damage, weak immune system, brain damage and serious mental problems. Excessive consumption of alcoholic drinks can also damage most organs of the human body. Let us look at the effects of drug and alcohol abuse on human health.



Liver cirrhosis

- Continuous consumption of large amounts of alcoholic drinks, and drug abuse can cause toxic effects on the liver resulting in liver cirrhosis.
- Liver cirrhosis is the condition of the liver that undergoes chronic damage, scarring, hardening and failure to function normally. This scar will spread slowly until the liver functions are lost completely.



(a) Healthy liver

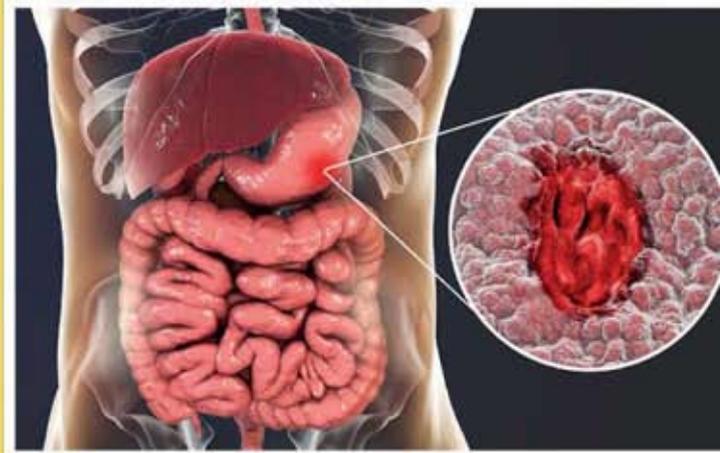


(b) Liver cirrhosis

Photograph 7.4 Difference between a healthy liver and liver cirrhosis

Stomach ulcer

- Alcohol can cause stomach ulcer.
- Stomach ulcer or peptic ulcer is a condition in which the lining of the stomach is injured.
- This is because alcohol causes the stomach to produce more acid than normal which will cause irritation and inflammation of the stomach lining.
- The patient will complain of heartburn or pain at the upper liver region, bloatedness, nausea and vomiting.
- A patient with stomach ulcer can also experience more serious symptoms such as vomiting blood and passing out black stools.



Photograph 7.5 Ulcer in the stomach

Violent behaviour

- Consuming drugs such as amphetamine will activate brain cells and increase the rate of metabolism. The user will become more active, be unable to sleep, violent and aggressive.
- A person who consumes alcohol excessively can become drunk and lose his senses, laugh alone, act out of control and become violent.

Hallucination

- Drugs such as marijuana disrupts the brain function. This drug will change a person's perception.
- This causes the person to experience hallucination, paranoia or suspicious feeling and fear of others. Hallucination may also cause aggressive behaviour towards other people.



FORMATIVE PRACTICE

7.2

1. What is the effect of drug abuse on body coordination?
2. How do the chemical substances in the drugs and alcoholic drinks affect the neurons?
3. How do drugs and alcohol influence hormone secretion?

In the world of advancement in science and technology, we are often shocked by society's neglect in keeping a healthy mind. The mind is the brain function that relates to our consciousness, personality, thinking, memory, judgement, intellect and emotion. A healthy mind has the ability to reason and think as well as to make logical judgements before an action is taken. A healthy mind also refers to positive behaviour, independence, ability to care for others and being responsible.

Characteristics of individuals who have healthy minds:

Can think and
make judgements

Able to detect
stimulus
and respond
accordingly

Can recall past
events that are sad
or happy

Dare to accept
challenges

Able to differentiate
between right and
wrong

Responsible

Live in peace
and have a
positive view
on life

Free from
prejudice

Open-minded and
not emotional

Able to reason

There are several factors that can influence the mind and mental health. Figure 7.6 shows factors that influence the mental health.

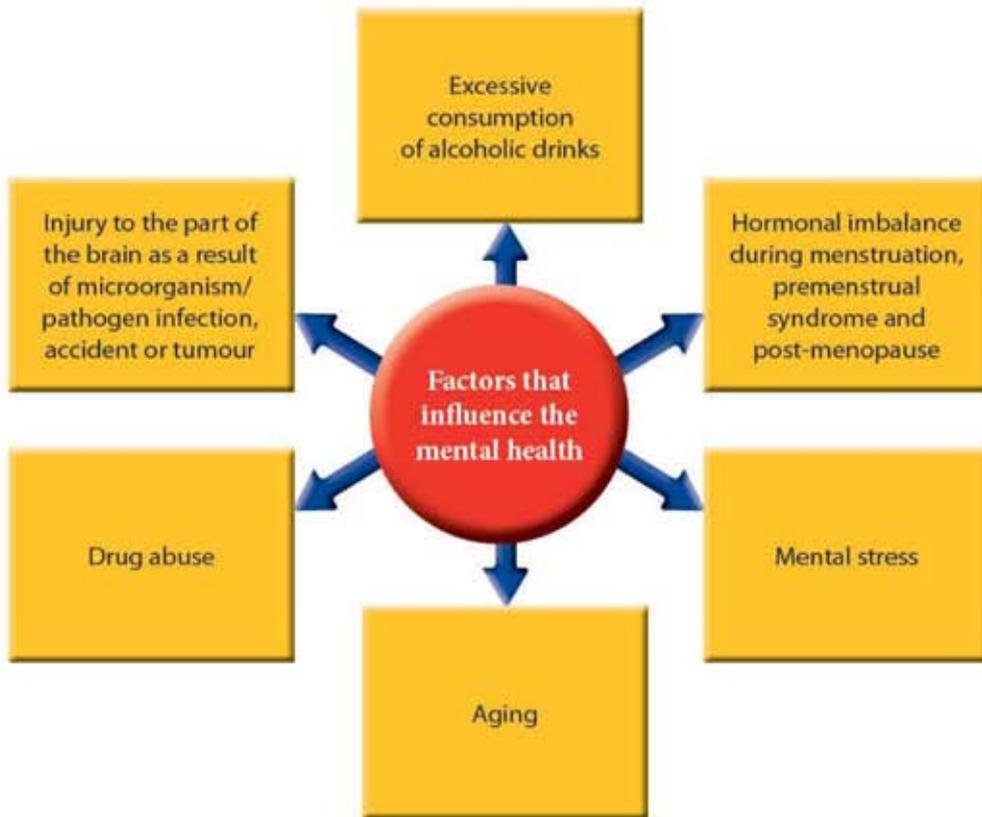


Figure 7.6 Factors that influence mental health

- Normally, hormonal imbalance happens before or during the menstrual cycle and also during menopause. Usually, a person will experience headache, depression and is easily irritated.
- Excessive consumption of alcoholic drinks will disrupt a person's ability to think, detect stimulus, reason and control emotions. A person who is drunk can become aggressive and endanger himself or other people.
- Drug abuse has negative effects such as the failure to fulfil responsibilities towards the family, work or studies and others. Drug abuse can also cause serious mental problems.
- Mental stress can affect a healthy mind. Hence, we need to be able to manage stress so that it does not affect the mind.
- Brain injury can cause a person to lose his memory or intellectual ability. Brain injury can also cause a person to be easily influenced by emotions.

Each individual must have a healthy mind. This is because each individual has a responsibility towards his family, place of work, society and country.



Photograph 7.6 Importance of having a healthy mind



Activity 7.4

Result Showcase

Aim: To gather information on a healthy mind and its importance.

Instructions:

1. Carry out this activity in groups.
2. Gather information from magazines, books, newspapers or the Internet on the following:
 - (a) factors that influence a healthy mind
 - (b) how these factors influence the mind
 - (c) the importance of having a healthy mind
3. Present the outcome of your group discussion in the class in the form of a multimedia presentation.



Activity 7.5

Draw a Poster

Aim: To evaluate the importance of having a healthy mind in the family, workplace, society and country.

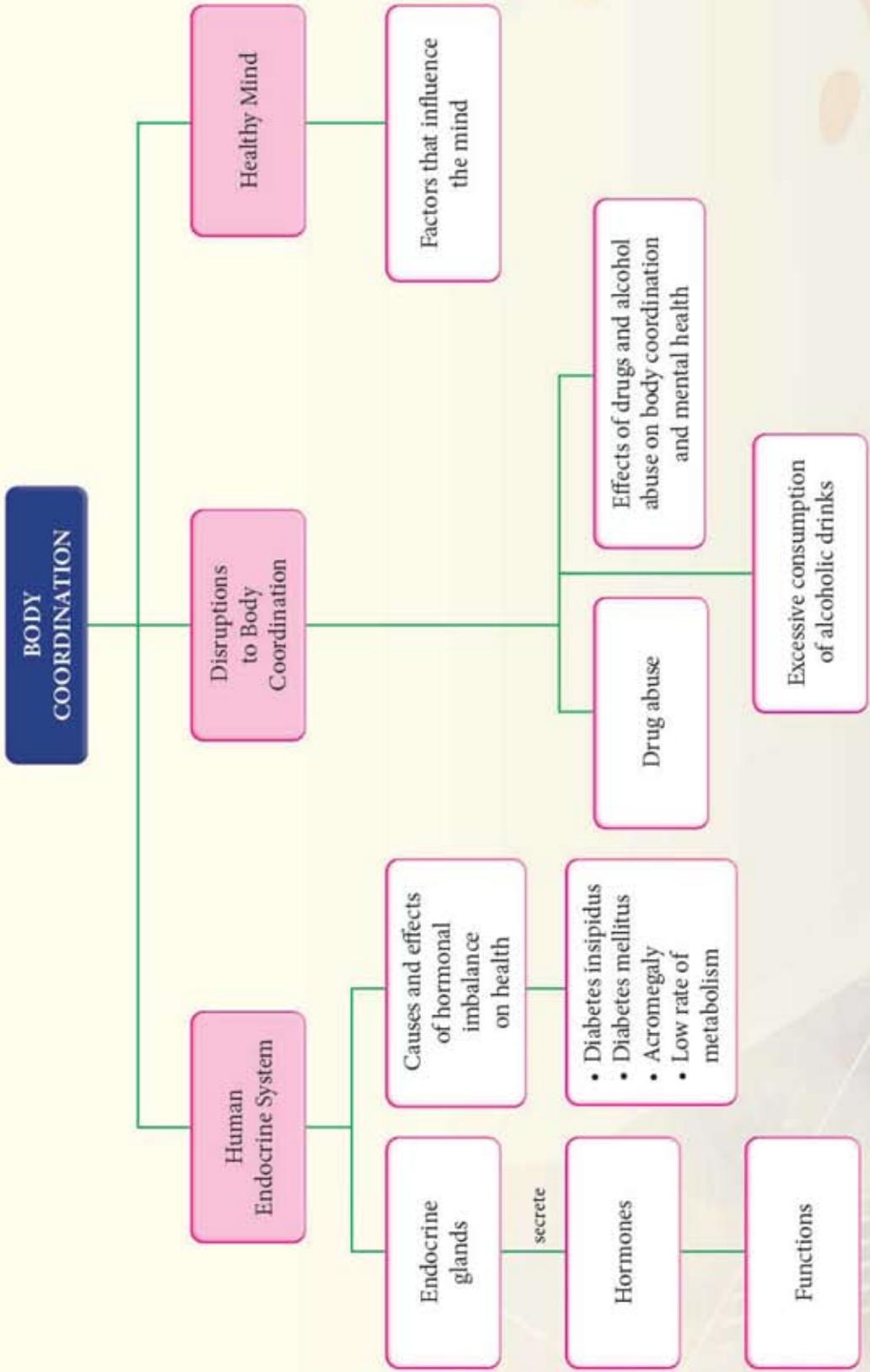
Instructions:

1. Carry out this activity in groups.
2. Prepare a poster to explain the importance of a healthy mind to other students in the school.
3. Display the poster in the exhibition corner of the class.



FORMATIVE PRACTICE 7.3

1. What is meant by the mind?
2. List five characteristics of a healthy mind.
3. Explain how hormonal imbalance can affect the mind.
4. State three factors that influence mental health.



Self-reflection

After studying this chapter, you are able to:

7.1 Human Endocrine System

- Explain the endocrine system and its functions.
- Explain with examples the causes and effects of hormonal imbalance on health.

7.2 Disruptions to Body Coordination

- Explain with examples the types of drugs.
- To understand and draw conclusions on the effects of drugs and alcohol abuse on body coordination and mental health.

7.3 Healthy Mind

- Justify the importance of having a healthy mind in a community.

Summative Practice 7



Objective Questions
<http://bukutekskssm.my/Science/F4/Q7>

1. Figure 1 shows the human endocrine system.

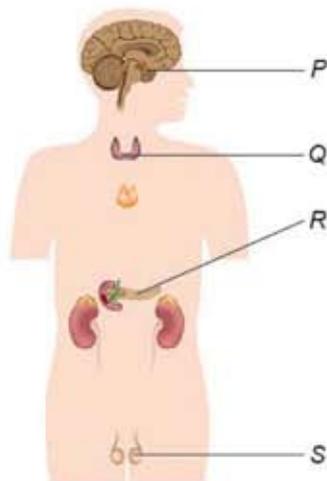


Figure 1

- (a) State the gland that is the master gland in the human endocrine system.
- (b) (i) Name the hormone secreted by gland Q.
- (ii) State the effect on humans if the hormone in question 1(b)(i) is not adequately secreted into the body. 🧠

- (c) (i) Name gland R.
 (ii) State the hormone secreted by gland R.
 (iii) How can the failure of gland R cause a person to have diabetes mellitus? 🧠
- (d) Name the hormone secreted by gland S.

2. Figure 2 shows a part of the endocrine system of a woman.



Figure 2

- (a) (i) Name the hormones produced by gland Y.
 (ii) State one function for each hormone that is stated in question 2(a)(i).
- (b) Although gland Y exists since birth, the gland is inactive. When will gland Y become active? 🧠
- (c) (i) Name the endocrine gland for man that is also inactive during birth.
 (ii) Explain the function of the hormone that is secreted by the gland that you have stated in question 2(c)(i). 🧠

Mind Challenge

3. Drinking coffee excessively is not good for health. Explain the reason. 🧠
4.

A woman who is pregnant is found to be an alcoholic.

 What will happen to the foetus in the uterus? 🧠
5.

Your friend told you that she feels stressed because of family problems.

 As a friend, what can you do to help her? 🧠