

Name: _____

Responses to Stimuli	Learning objectives
3.5.3 Responses in the Human – Endocrine System	<ol style="list-style-type: none"> Say what an Endocrine system is Define the term "hormone". Say which biochemical many hormones are made of Give 4 differences between hormone action as compared with nerve action Distinguish between exocrine and endocrine glands, with examples Draw an outline of the body to show the location of the principal endocrine glands Name one hormone and give its function, for each of the glands For one hormone, describe its deficiency symptoms, excess symptoms, and corrective measures. Explain what is meant by hormone supplements Give 2 examples of the use of hormone supplements
3.5.6.H Animal Hormones	<ol style="list-style-type: none"> Distinguish between a sensor and an effector Explain the term feedback Explain the term negative feedback Give an everyday example of negative feedback Define the term "osmoregulation" Explain how the body regulates its water levels Use a simple diagram of the nephron to explain how it functions in osmoregulation Say what ADH stands for Say where ADH is made and where it acts OR Explain the term "metabolism" Explain the function of Thyroxine in the body Say what TSH stands for Say where TSH is made and where it acts OR Explain the function of Insulin in the body Say where insulin is made and where it acts 26. Explain what diabetes is and give some symptoms

Both the nervous system and the endocrine (hormonal) system are used to coordinate body responses.

Hormones are chemicals produced in endocrine glands, secreted into the bloodstream and carried to target organs where they cause specific effects.

Most hormones are made of protein (some are steroid-based e.g. male and female reproductive hormones)

	Hormonal response	Nervous response
Message	Chemical	Electrical
Carried by	Blood	Nerve fibres
Received by	Many targets	Specific target areas e.g. contraction of a muscle

Endocrine system

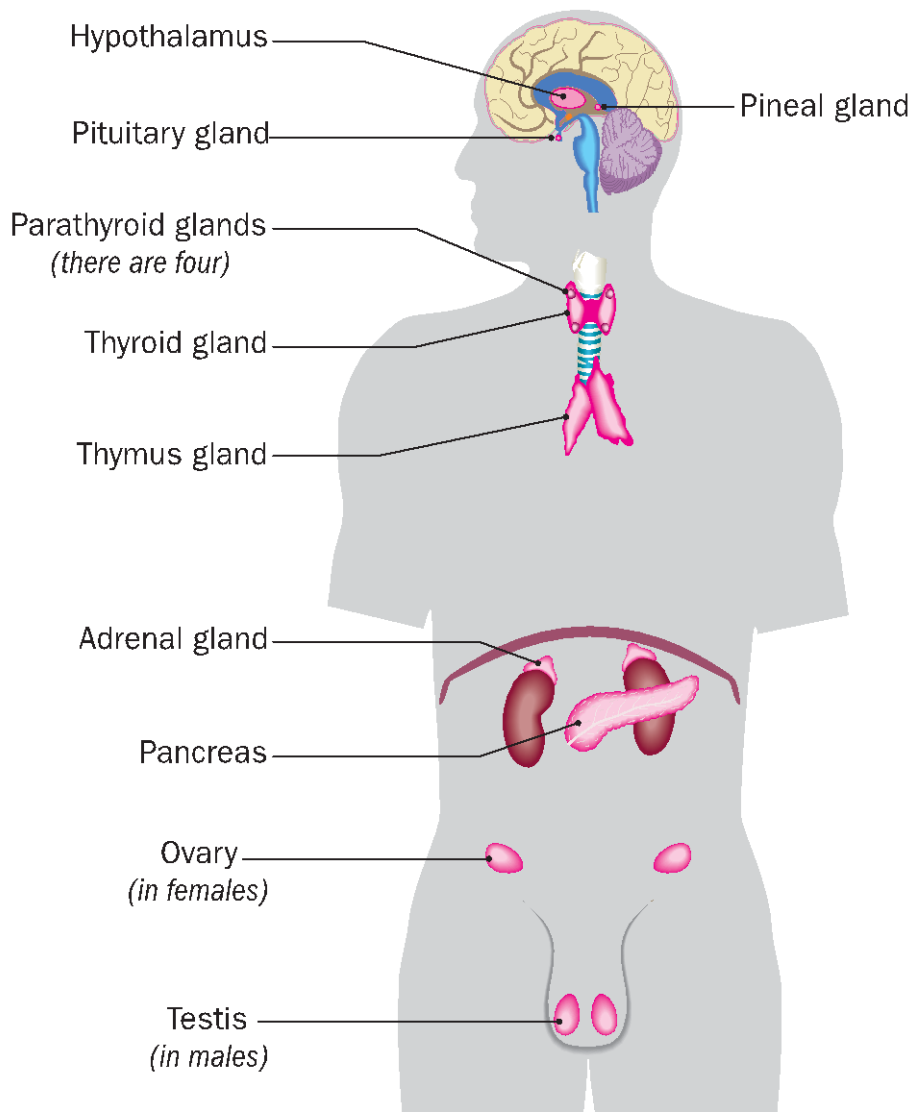
Duration	Long-lasting effect e.g. response to growth and metabolism	Short-lived e.g. contraction of a muscle
Response	Slow e.g. growth	Fast e.g. catching an object
Speed of transmission	Slow (bloodstream)	Fast (electrical)

Glands are structures that secrete substances.

Endocrine glands are ductless and secrete hormones directly into the blood.

Exocrine glands have ducts (tubes) e.g. pancreas, liver, salivary glands, sweat glands, tear glands, gastric glands, sebaceous glands and mammary glands.

Location of endocrine glands



Gland	Hormone	Function
Pituitary (master)	Growth hormone	Growth and repair

Endocrine system

<p>gland - controls other glands directly or indirectly) Located below cerebrum (peanut-sized)</p>	Follicle stimulating hormone (F.S.H.)	(bone elongation) Development of follicle and secretion of oestrogen in ovary. Growth of tubules in testes and stimulates production of sperm.
	Luteinising hormone (L.H.)	Ovulation and stimulates corpus luteum to secrete progesterone. Stimulates secretion of testosterone.
	Thyroid stimulating hormone (T.S.H.)	Causes thyroid to make thyroxine.
	Prolactin	Stimulates milk production in females.
	Oxytocin	Contracts uterus during birth.
<p>Hypothalamus (links nervous and endocrine systems) Located - Base of brain, above pituitary</p>	Anti-diuretic hormone (ADH) (stored in pituitary)	Causes nephron to reabsorb water and so produce less urine*
<p>Pineal body – Located in brain, near hypothalamus</p>	e.g. Melatonin – produced when asleep	May be involved in controlling biological rhythms e.g. ovulation, sleep, activity patterns, and sexual maturity.
<p>Parathyroids (4) Behind thyroid</p>	Parathyroid hormone	Stimulates release of calcium from bones into blood.
<p>Thyroid On trachea beside larynx (H-shaped)</p>	Thyroxine	Controls metabolism.
<p>Thymus Behind breast-bone</p>	Thymosin	Causes lymphocytes to mature.
<p>Adrenals (2) On top of kidneys</p>	Adrenaline (from adrenal medulla) - flight or fight hormone	It activates the body during stress – causes emergency responses.
<p>Pancreas (islets of Langerhans) In abdomen, below stomach</p>	Insulin Glucagon	Reduces blood sugar levels. Causes cells, especially muscle and fat cells to absorb glucose from the blood. Glucose is used in respiration or stored as glycogen – mostly in liver and muscles. Raises blood sugar levels (converts glycogen to glucose)
<p>Sex glands Ovaries</p>	Oestrogen (secreted by developing follicle) Progesterone (secreted by corpus	<ul style="list-style-type: none"> Repairs lining of uterus. Development of secondary sexual characteristics. Inhibits FSH. Stimulates pituitary to produce LH.

Testes	luteum (after ovulation)	<ul style="list-style-type: none"> • Causes proliferation of uterus wall. • Prevents contraction of muscles in wall of uterus. • Inhibits both FSH and LH.
	Testosterone	<ul style="list-style-type: none"> • Development of sex organs. • Enlargement of larynx - deepening of voice. • Growth of body hair. • Production of sperm. • Increased muscle. • Reduction of fat (fat converted to muscle).

*¹ Alcohol reduces secretion of ADH - causes dehydration

Learn one hormone re over- or under production

THYROXINE

Thyroxine controls metabolism Thyroxine stimulates production of enzymes involved in respiration. The higher the levels of thyroxine the faster the respiration rate. In children thyroxine helps control the rate of growth.

Excess thyroxine

Cause: may be caused by an enlarged thyroid (cancer) or a condition called goitre.

Symptoms: increased basal metabolic rate, hunger, loss in weight, heat production, irritability, bulging eyes, nervousness, and anxiety. Condition = Graves' disease.

Corrective measures: surgical removal of all/part of gland or by destroying some of gland using radioactive iodine.

Thyroxine deficiency

Cause: underproduction of thyroxine.

Symptoms:

Children - Cretinism - mental and physical retardation (often deaf-mute)

Adults - Underactive, tired, slow heart beat, weight gain (due to build-up of fluid under skin), decreased BMR.

May cause goitre –swelling of thyroid due to TSH being stored in thyroid.aa

Corrective measures:

Newborn babies – ‘heel prick’ test for low thyroxine levels. Given thyroxine, if needed, to prevent cretenism

Adults - thyroxine tablets or iodine give to prevent myxoedema.

HORMONE SUPPLEMENTS

learn two hormones

Insulin

Causes: Low insulin production, or inability of cells to take up insulin, results in diabetes. In young people this is normally caused by the failure of the Islets of Langerhans to produce insulin.

Symptoms: high glucose conc. in blood and urine, production of large amounts of urine, severe thirst, loss of weight, and tiredness.

Treatment: Controlling intake of carbohydrate and/or insulin injections.

Normal blood sugar level = 95 mg/100cm³ blood (0.08-0.12%)

If sugar level drops adrenaline secreted which converts glycogen into glucose.

If sugar level rises insulin secreted which converts glucose into glycogen.

Generally diabetics

- Must eat small amounts of food regularly to keep sugar levels up.
- Cannot 'open' the cell membranes to get any excess sugar in, so the excess is removed by kidneys and appears in urine.
- Have a blood sugar level that goes up and down much more than normal.

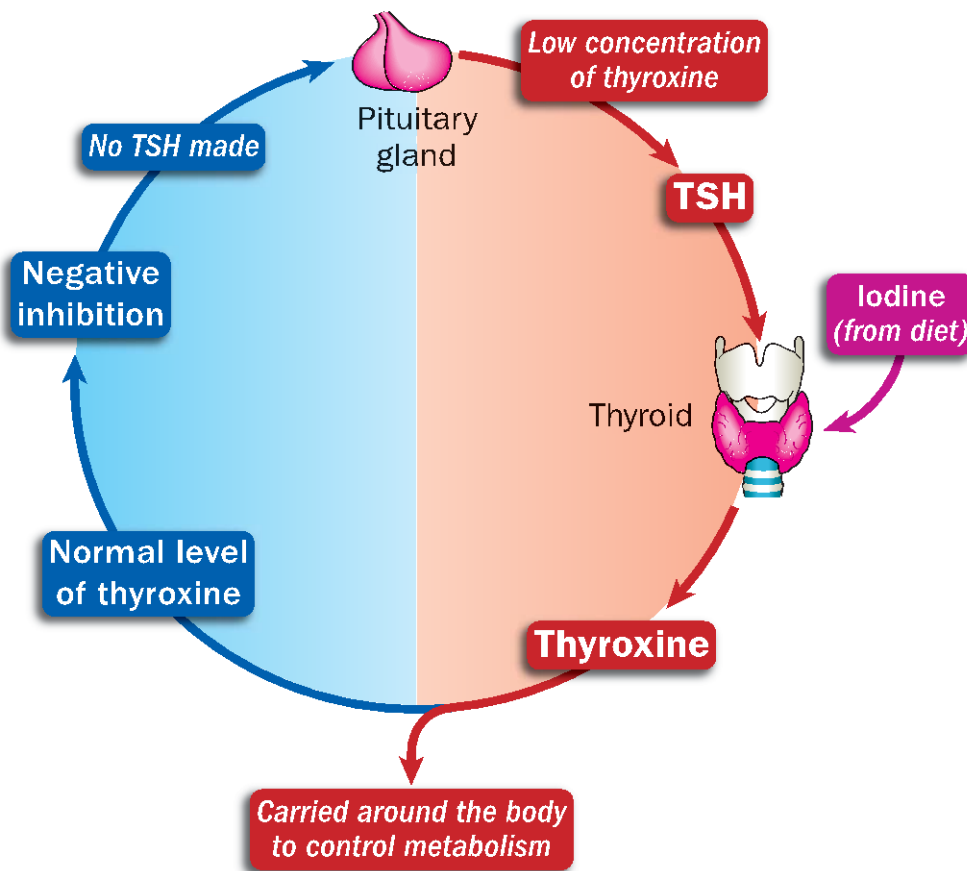
Anabolic steroids

Drugs that build up protein(muscle), speed up muscle recovery after injury, help to strengthen bones.

Risks – liver and adrenal gland damage, infertility, impotence (failure of males to achieve erections) and the production of male traits in female abusers.

Feedback mechanism of hormone control e.g. thyroxine

Negative feedback means the correct level of one item has a negative effect on a previous step in the cycle.



Hypothalamus monitors blood. When thyroxine is needed hypothalamus releases thyroid releasing hormone. This hormone travels to the pituitary and causes the release of thyroid stimulating hormone. TSH causes the

thyroid gland to release thyroxine. An increased level of thyroxine has the effect of reducing the production of TRH, and thus TSH, so the thyroxine level does not get too high.

Endocrine System

Section A

2005 HL

3. Indicate whether the following are true (T) or false (F) by drawing a circle around T or F.

(c) Endocrine glands secrete hormones. T F

2013 HL

1. In the case of any **five** of the following pairs of terms, clearly distinguish between the first term and second term by writing a brief sentence about each.

(d)

Hormones. _____

2004 OL

1.

(d) Hormones are secreted by glands.

Section C

2005 HL

14. Answer any two of (a), (b), (c). (30,30)

(c) Answer the following questions in relation to systems of response to stimuli in the human body.

(i) The pancreas is both an exocrine gland and an endocrine gland. Explain the underlined terms.

(ii) Name a product of the endocrine portion of the pancreas and state one of its functions.

2007 HL

15. Answer any two of (a), (b) and (c). (30, 30)

(b) (i) Other than the secretion of hormones, how does an endocrine gland differ from an exocrine gland?

(ii) State two ways in which hormone action differs from nerve action.

(iii) Copy the following table into your answer book and fill each of the empty boxes.

Endocrine Gland	Location	Hormone	Role of Hormone
	Pancreas	Insulin	

Endocrine system

Thyroid Gland			
			“fighr or flight”

(iv) In the case of a named hormone give:

1. a deficiency symptom,
2. a corrective measure.

2010 HL

11.

(c) (i) What term is used to describe the glands that secrete hormones in the human body?

- (ii)
1. Name a hormone-producing gland in the human body.
 2. Where in the body is the gland located?
 3. Name a hormone that this gland secretes.
 4. State a role of this hormone.
 5. Describe what happens if the body experiences a deficiency of this hormone.

(iii) Give **two** examples of the use of hormone supplements.

(24)

2011 HL

11.

- (c) (i) What is a hormone?
- (ii) State **two** ways in which hormones are similar to the group of substances referred to in (b)(i).
- (iii)
1. What is meant by *feedback* in relation to hormone action?
 2. Give a brief account of the feedback mechanism for a **named** hormone.
- (iv) Describe **one** deficiency symptom of a **named** hormone.

(24)

2013 HL

10. (a) (i) What term is used for glands that secrete hormones?

(ii) How do these glands differ from those that do not secrete hormones?

(iii) Explain why the pancreas may be described as a *dual-function* gland.

(b) Answer the following by reference to hormones, other than sex hormones, which you have encountered in the course of your studies.

(i) What is the chemical nature of many hormones?

(ii) In the case of **each** of **two named** hormones secreted in the human body state:

1. The precise location of the gland that secretes it.
2. A function of the hormone.

- (iii) In the case of **one** of the hormones referred to in part (b) (ii):
1. Give a deficiency symptom.
 2. Give a symptom of excess secretion.
 3. Give a corrective measure for **either** its deficiency **or** its excess, clearly stating which you have chosen.
- (iv) Explain why hormonal responses are slower than nervous responses.

2013 HL

12. (c) (i) Distinguish clearly between *antibodies* and *antibiotics* by writing a note about each.
- (ii) In relation to antibodies, distinguish between active and passive immunity.

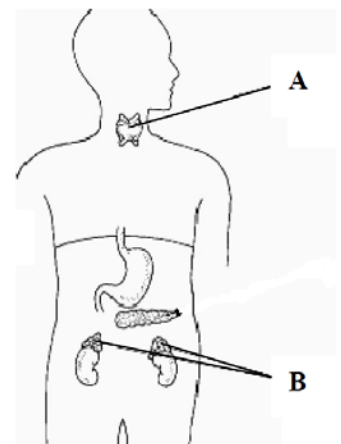
2004 OL

15. (b) (i) What is a hormone?
- (ii) Draw an outline diagram of the human body and indicate on it the location of the following hormone-producing glands by using the following letters:
- W Pituitary
X Thyroid
Y Pancreas (Islets of Langerhans)
Z Adrenals
- (iii) In the case of one of the hormone-producing glands that you have located in your diagram, state:
1. the gland and a hormone that it produces.
 2. a function of this hormone.
 3. a deficiency symptom of this hormone.
- (iv) State one way in which hormone action differs from nerve action.

2011 OL

14. Answer any **two** of (a), (b), (c)
(30,30)

- (b) (i) The diagram shows some parts of the human endocrine system. Name the glands labelled A and B.
- (ii) Name any **one** hormone produced by the body.
- (iii) Give a deficiency symptom of the hormone named in (ii) above.
- (iv) Give **one** example of the use of hormone supplements.
- (v) The central nervous system is made up of **two** main parts. Name **each** part.
- (vi) Name a disorder of the nervous system.
Give **one** cause of the disorder **and** suggest a means of treating the disorder.



Marking scheme - Hormones

Section A

2005 HL Q3

3.			5(1)+5(3)
	(c)	True	

2013 HL Q1

1.	5(4, 2, 0) i.e. best five answers from (a) – (f)		
	(d)	Enzyme	– a catalyst (or explained)
		Hormone	– a (chemical) messenger (or explained)

2004 OL Q1

1.	any four		2(8)+2(2)
	(d)	endocrine or ductless glands or name of gland	

Section C

2005 HL Q14(c)			
	(c)	(i)	Exocrine: ducted or explained Endocrine – ductless or hormone producing
			3 3
		(ii)	Insulin or glucagon Regulates blood sugar or regulates sugar (level) or correct explanation
			3 3

2007 HL Q15(b)								
	(b)	(i)	ductless or secretes into blood stream					3
		(ii)	chemical transmission / slower action / longer lasting effect / many target organs					2(3)
		(iii)	Endocrine Gland	Location	Hormone	Role of Hormone	8(2)	
			Islets of Langerhans			regulates blood sugar or explained		
				neck or described	thyroxine	growth in young or (rate of) metabolism		
			adrenal	on kidney	adrenalin(e)			
		(iv)	Named hormone: 1. deficiency symptom: 2. corrective measure:					1 2 2

2010 HL Q11

11	(c)	(i)	*Endocrine (or ductless)	3
		(ii)	1. Name of a hormone-producing gland	3
			2. Location of named gland	3
			3. Hormone secreted by named gland	3
			4. Role of hormone	3
			5. Description of deficiency symptom [<i>Accept named condition</i>]	3
		(iii)	e.g. 1. Treatment of diabetes 2. Contraception	2(3)

2011 HL Q11

11	(c)	(i)	A chemical messenger or product of endocrine (or ductless) gland	3
		(ii)	Produced in one location / acts in different location / prolonged effect <i>Any 2</i>	2(3)
		(iii)	1. When the level of a hormone (in the blood) controls (the production) of another (or itself)	3
			2. Named hormone	3
			inhibits (or causes production of) a named hormone	3
		(iv)	One deficiency symptom of a named hormone	3

2013 HL Q10

10.	(a)	(i)	*Endocrine	3
		(ii)	Ductless	3

Endocrine system

		(iii)	Hormone (or insulin) secretion & non-hormone (enzyme) secretions or has endocrine and exocrine function (or described)		3
	(b)	(i)	Protein		3
		(ii)	Hormone name		2(2)
			1.	Gland location	2(2)
			2.	Hormone function	2(2)
		(iii)	1.	Deficiency symptom	2
			2.	Excess symptom	2
			3.	Corrective measure	2
		(iv)	Hormones travel in blood or are chemical electrical transmission in nerves		3 3

2004 OL Q15(b)

15.	(b)	(i)	a chemical / messenger / secreted by a ductless gland / transported in the blood / to a target area / causing a response <u>any two</u>	2(3)
		(ii)	diagram with correctly positioned labels (word or letter)	4(3)
		(iii)	1. Name or letter of gland repeated Hormone name 2. function 3. deficiency symptom	0 3 3 3
		(iv)	hormone vs nerve slower to act or more sustained or chemical (cf. ionic or electrical) (comments taken to refer to hormone) <u>any one</u>	3

2011 OL Q14(b)

14.	(b)	(i)	A = Thyroid (allow parathyroid) B = Adrenals	2(7) + 8(2) 2(Pts)
		(ii)	Any human hormone	
		(iii)	Deficiency symptom must match Hormone	
		(iv)	Any one use	
		(v)	Brain/spinal cord	(2 Pts)

Endocrine system

		(vi)	Named disorder/cause/treatment	(3 Pts)
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