nor the testers know who is in the control group and who is in the experimental group. It is conducted by an independent administrator. Subjects are randomly allocated to each group and the results are passed on after proper statistical analysis.

(b) Because the test subject is unaware of which treatment group they belong to, the "placebo effect" may be exposed and can be taken into account when the results are analysed. The idea behind a double-blind test is to reduce the possibility of bias being introduced into the results by the subjects, who, by knowing the details of the treatment, could respond to psychosomatic inputs, or by the unintentional influence of the tester through suggestive comments or undue interest in the subject's welfare.

(c) Used to test the effect of new drugs in humans.

2: ENDOCRINE SYSTEM

Terminology

(i) endocrine gland – a ductless gland whose products (called hormones), are released directly into the blood, e.g. thyroid gland. As they are carried in the blood, hormones can potentially reach every cell in the body – but not all cells respond to every hormone.

(ii) exocrine gland – a gland with a duct through which secretions are transported to the site of activity, e.g. salivary gland, sebaceous gland.

(iii) gland – an organ that secretes substances that are used in the body.

(iv) hormone – chemical produced from an endocrine gland which affects the functioning of the body in some way.

(v) intercellular – occurs or found between cells.

(vi) intracellular – occurs or found in cells.

(vii) lipid-soluble – substances that will dissolve in lipids (fats and oils), not water.

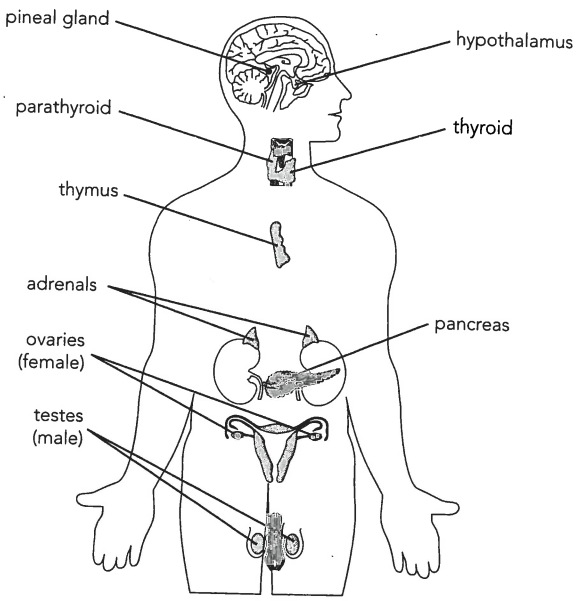
(viii) receptor sites – areas on the cell membrane of a target cell which can combine with a hormone (or proteins). Some hormones (steroids) which are lipid based easily pass through the cell membrane and their receptor sites are on the nucleus.

(ix) target cell (or organ) – the cells or organs that are responsive to a particular hormone.

(x) water-soluble – substances that will dissolve in water.

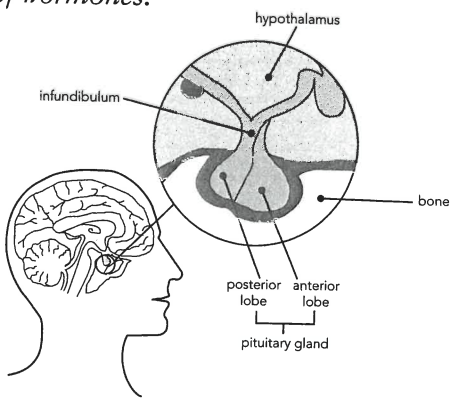
Review Questions

1.



2. The hypothalamus is a small area of the brain located on the underside of the brain. It receives information from other parts of the brain including the sensory information. It controls the autonomic nervous system and regulates a variety of body functions such as body temperature, thirst, hunger, sexual behaviour, fear and rage.

3. The pituitary gland is a pea-sized gland found in the head centrally located between the ears. It is attached to the hypothalamus by a thin stalk-like structure called the infundibulum. The pituitary is divided into two lobes, each of which produces a number of hormones.



4. The hypothalamus links the nervous and endocrine systems. It produces 'releasing factors' that stimulate the production and release of hormones and 'inhibiting factors' (which suppress the release of hormones), from the anterior pituitary gland. These substances pass down to the pituitary gland via capillaries in the infundibulum and result in major effects on the functioning of the body. The hypothalamus produces oxytocin and antidiuretic hormone, both of which are stored and released from the posterior lobe of the pituitary gland.

5.

(a) *Steroid hormones (e.g. sex hormones) are lipid (fat) soluble and easily pass through the cell membrane. Inside the cell, they can bind to the nucleus and can affect the production of particular genes which will affect how the cell functions. For example, if different proteins are produced such as enzymes.*

(b) *Water soluble hormones (proteins) bind to receptor sites on the outside of the cell membrane. This causes a second substance (messenger) on the inside of the cell membrane to be released into the cell. In most cases, a substance called cyclic AMP forms which alters cell functioning in specific ways. Functions that are affected in this way include regulation of enzymes, secretion and protein synthesis.*

6. *Stomach, small intestine, kidney and placenta.*

7. *See next page.*

8. *Aldosterone and sex hormones such as testosterone and oestrogen.*

9. *Insulin, glucagon, oxytocin, antidiuretic hormone, thyroid-stimulating hormone, calcitonin.*

10.

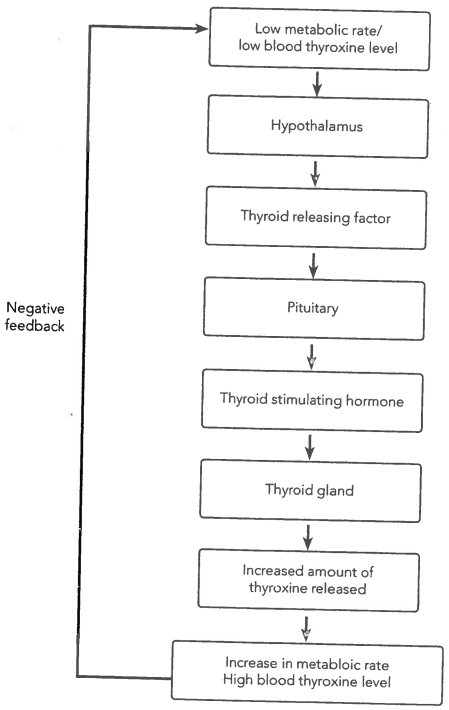
(a) *A feedback system is a homeostatic mechanism that controls an aspect of the internal environment.*

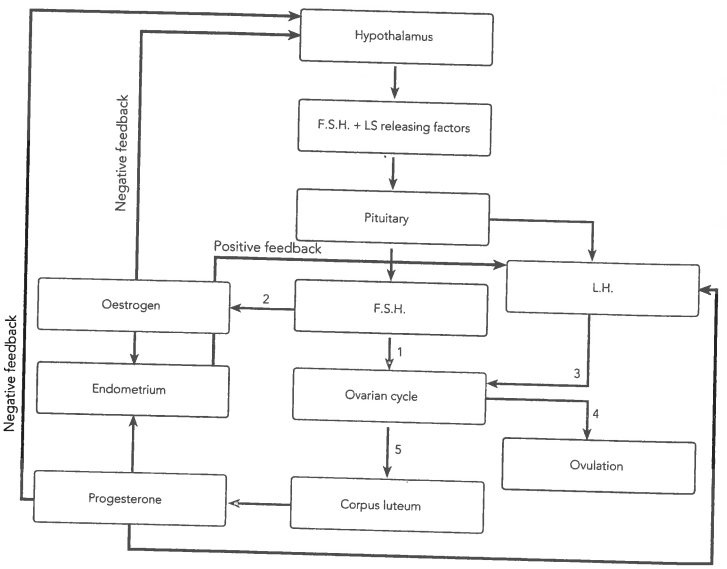
(b) *Positive feedback enhances the stimulus and the effect it is having, e.g. contractions in childbirth, which increase until the chil is born. Negative feedback is the mo common and refers to the situation in whic a response reverses the original stimulus, e.g temperature control.*

11. *See diagram below.*

12. *Under the influence of releasing factor from the hypothalamus, follicle stimulatin hormone (F.S.H.) is released from the anterio pituitary. (1) F.S.H. stimulates an ovaria follicle containing an ovum to mature. (2) A the same time, the follicle produces and release oestrogen which prepares the endometriun for implantation. As the oestrogen level increase this inhibits the production of F.S.H (negative feedback). (3) The high level o oestrogen triggers the release of luteinising hormone (L.H.). (4) L.H causes the follicl to rupture, releasing the ovum (ovulation) (5) The follicle under the influence of L.H then changes into a corpus luteum which secretes progesterone. Progesterone further enhances the endometrium for implantation. The presence of high levels of progesterone inhibits secretion of both F.S.H. and L.H. If pregnancy does not occur, the corpus luteum degenerates, the levels of oestrogen and progesterone fall and another menstrual cycle begins, i.e. more F.S.H. is released and so on.*

11.





7.

Endocrine gland	Hormone	Target organ	Function
Pituitary - anterior lobe	Growth Hormone	Most cells e.g. bone, muscle, liver, adipose, etc.	Stimulates general body growth and regulates aspects of metabolism such as protein synthesis and lipolysis.
	Follicle stimulating hormone	Ovaries and testes	Stimulates maturation of ova in follicles, secretion of oestrogen by ovaries and production of sperm in testes.
	Luteinising hormone	Ovaries and testes	Ovulation in females, formation of corpus luteum, and secretion of testosterone in males.
	Thyroid stimulating hormone	Thyroid gland	Stimulates the thyroid to produce and release thyroxine.
	Adrenocorti-cotropic hormone	Adrenal cortex	Stimulates the adrenal cortex to secrete hormones, mainly cortisol.
	Prolactin	Breasts	Breast development and milk production in females.
- posterior lobe	Antidiuretic hormone. Produced by vasopressin in the hypothalamus, stored in pituitary	Kidney	Increases the permeability of the collecting duct so that water is reabsorbed back into blood from nephron and urine production decreases.
	Oxytocin produced by the hypothalamus, stored in pituitary	Breasts, uterus	Causes contraction of smooth muscles of the uterus during childbirth and release of milk from breasts.
Hypothalamus	Releasing and inhibiting factors	Anterior pituitary	Controls the release of various hormones from the anterior pituitary.

Pineal gland	Melatonin (released into the cerebrospinal fluid and then into the blood)	The part of the brain that operates as a biological clock (the suprachiasmatic nucleus, SCN).	Biological rhythms related to reproduction, skin pigmentation. Light/dark cycles.
Thyroid gland	Thyroxine	Most cells	Stimulates metabolism (BMR), protein synthesis, lipolysis (triglyceride breakdown), use of glucose for ATP production, increases cholesterol excretion in bile (which reduces blood cholesterol level) and increases body growth especially of nervous tissue.
	Calcitonin	Bones	Lowers the levels of calcium and phosphates in the blood by increasing uptake by the bones (inhibits the activity of the osteoclasts).
	Parathormone (parathyroid hormone)	Bone and kidney	Affects the number and activity of osteoclasts (bone-destroying cells) causing an increase in the amount of calcium and magnesium ions in the blood and a decrease of phosphate ions in the blood.
Thymus	Thymosin	Stimulates T cells	Development of the immune system.
Pancreas – (beta cells in the Islets of Langerhans)	Insulin (released if concentration of glucose is high)	Most cells	Decreases blood sugar level by increasing sugar uptake by cells, changes sugar (glucose) into glycogen (glycogenesis), increases protein synthesis, and lipogenesis, decreases glycogenolysis and gluconeogenesis.
Pancreas – (alpha cells in the islets of Langerhans)	Glucagon (released if concentration of glucose is low)	Liver	Increases blood sugar level, decreases sugar uptake by cells, changes glycogen into glucose (glycogenolysis), forms glucose from amino acids and lipids (gluconeogenesis), and increases the release of sugar into the blood.
Adrenal cortex	Aldosterone	Kidney tubules	Increases reabsorption of sodium ions in kidney and increases excretion of potassium and hydrogen ions in filtrate (raises pH of blood).
	Cortisol	Mainly muscle cells, blood vessels and cells involved in the inflammatory response.	Helps to regulate metabolism and increases resistance to stress.
Adrenal medulla	Adrenalin (epinephrine) and noradrenalin (norepinephrine)	Mainly heart, lungs, digestive system and muscle cells.	Fight or flight response, i.e. increases heart rate, blood pressure and respiration rate etc.
Ovaries	Oestrogen	Ovaries, breasts, uterus, bones, hair follicles.	Develop and maintain female sexual organs and secondary sexual characteristics, development of breasts.
	Progesterone	Uterus, breasts, bone	Prepares endometrium for pregnancy and breasts for lactation.
Testes	Testosterone	Testes, penis, hair follicles, skeleton, muscles.	Develop and maintain male sexual characteristics, sperm production.