**Topic 6.6: Hormones, Homeostasis and Reproduction**

**Essential Idea: Hormones are used when signals need to be widely distributed.**

**Statements & Objectives:**

**6.6.U1 Insulin and glucagon are secreted by beta and alpha cells of the pancreas respectively to control blood glucose concentrations.**

Explain the control of blood glucose concentration, including the roles of glucagon, insulin and the alpha and beta cells in the pancreatic islets.

(**Explain**: Give a detailed account including reasons or causes)

**6.6.U2 Thyroxin is secreted by the thyroid gland to regulate the metabolic rate and help control body temperature.**

Describe the structure and function of thyroxin.

**(Describe**: Give a detailed account)

Outline thyroxin’s role in body temperature regulation.

(**Outline** Give a brief account or summary.)

List symptoms of thyroxin deficiency.

(**List** Give a sequence of brief answers with no explanation.)

**6.6.U3 Leptin is secreted by cells in adipose tissue and acts on the hypothalamus of the brain to inhibit appetite.**

State that leptin is a protein hormone.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the mechanism of action of leptin.

(**Outline** Give a brief account or summary.)

Describe the role and discovery of the ob allele in obese mice.

**(Describe**: Give a detailed account)

**6.6.U4 Melatonin is secreted by the pineal gland to control circadian rhythms.**

Define circadian rhythm.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Describe the secretion and action of melatonin.

**(Describe**: Give a detailed account)

Outline the mechanism that regulates melatonin secretion in response to the day-night cycle.

(**Outline** Give a brief account or summary.)

**6.6.U5 A gene on the Y chromosomes causes embryonic gonads to develop as testes and secretes testosterone.**

Describe the mechanism by which the SRY gene regulates embryonic gonad development.​​ ​

**(Describe**: Give a detailed account)

**6.6.U6 Testosterone causes pre-natal development of male genitalia and both sperm production and development of male secondary sexual characteristics during puberty.**

Outline role of testosterone in prenatal development of male genitalia

(**Outline** Give a brief account or summary.)

State testosterone's role in stimulating the primary sexual characteristic of males.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

List secondary sexual characteristics triggered by testosterone at puberty.

(**List** Give a sequence of brief answers with no explanation.)

**6.6.U7 Estrogen and progesterone cause pre-natal development of female reproductive organs and female secondary sexual characteristics during puberty**.

State the sources of estrogen and progesterone used in embryonic development.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Describe prenatal development of female reproductive organs.

**(Describe**: Give a detailed account)

List secondary sexual characteristics triggered by estrogen and progesterone at puberty.

(**List** Give a sequence of brief answers with no explanation.)

**6.6.U8 The menstrual cycle is controlled by negative and positive feedback mechanisms involving ovarian and pituitary hormones.**

Outline events occurring during the follicular and luteal phases of the menstrual cycle.

(**Outline** Give a brief account or summary.)

State the source and location of action of hormones in the menstrual cycle, including FSH (follicle stimulating hormone), LH (luteinising hormone), estrogen and progesterone.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the role of hormones in the menstrual cycle, including FSH (follicle stimulating hormone), LH (luteinising hormone), estrogen and progesterone.

(**Outline** Give a brief account or summary.)

Describe the negative feedback loop that regulates secretion of FSH.

**(Describe**: Give a detailed account)

Describe the positive feedback loop that regulates secretion of estrogen.

**(Describe**: Give a detailed account)

Annotate a graph showing hormone levels in the menstrual cycle, illustrating the relationship between changes in hormone levels and follicular development, ovulation, changes to the corpus luteum, menstruation and the thickening of the endometrium.

**(Annotate** Add brief notes to a diagram or graph)

**6.6.A1 Causes and treatment of Type I and Type II diabetes.**

Distinguish between causes of type I and type II diabetes.

(**Distinguish** Make clear the differences between two or more concepts or items.)

Distinguish between treatments of type I and type II diabetes.​

(**Distinguish** Make clear the differences between two or more concepts or items.)

**6.6.A2 Testing of leptin on patients with clinical obesity and reasons for the failure to control the disease.**

Explain the double blind study that tested the effect of leptin treatment on human obesity.

(**Explain**: Give a detailed account including reasons or causes)

Outline role of leptin resistance in human obesity.

(**Outline** Give a brief account or summary.)

**6.6.A3 Causes of jet lag and use of melatonin to alleviate it.**

State symptoms of jet lag.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the biological cause of jet lag.

(**Outline** Give a brief account or summary.)

Describe use of melatonin in treatment for jet lag.​

**(Describe**: Give a detailed account)

**6.6.A4 The use of IVF of drugs to suspend the normal secretion of hormones, followed by the use of artificial doses of hormones to induce superovulation and establish a pregnancy.**

Define in vitro fertilization.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Outline the process of in vitro fertilization including down-regulation, superovulation, harvesting, fertilization and implantation.

(**Outline** Give a brief account or summary.)

**6.6.A5 William Harvey’s investigation of sexual reproduction in deer.**

Outline Harvey's methods of studying reproduction.

(**Outline** Give a brief account or summary.)

State Harvey's discovery about reproduction.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

**6.6.S1 Annotate diagrams of the male and female reproductive system to show names of structures and their functions.**

Label a diagram of the male reproductive system, including the bladder, sperm duct, penis (with foreskin and erectile tissue), urethra, testis, scrotum, epididymis, prostate gland and seminal vesicle.

(**Label** Add title, labels or brief explanation(s) to a diagram or graph.)

Outline the function of the following male reproductive structures: testis, scrotum, epididymis, sperm duct, seminal vesicle, prostate gland, urethra and penis.

(**Outline** Give a brief account or summary.)

Label a diagram of the female reproductive system, including the ovary, uterus, bladder, urethra, vulva, vagina, cervix and oviduct.

(**Label** Add title, labels or brief explanation(s) to a diagram or graph.)

Outline the function of the following female reproductive structures: ovary, oviduct, uterus, cervix, vagina, and vulva.​

(**Outline** Give a brief account or summary.)

**6.6.NOS Developments in scientific research follow improvements in apparatus- William Harvey was hampered in his observational research into reproduction by lack of equipment. The microscope was invented 17 years after his death.**

Describe what Harvey was and was not able to observe in his reproduction research given the tools available at the time.​

**(Describe**: Give a detailed account)

**Key Terms**

Hypothalamus

negative feedback

​positive feedback

insulin

alpha cells

beta cells

glucagon

glycogen

endocrine

superovulation​

uterus

​endometrium

​menstrual cycle

​IVF

​pancreatic islets

​embryonic gonad

​erectile tissue

propagation

pancrease

pineal gland

pituitary

thyroid

pancreas

ovaries

testes

fertilization

​cervix

​Leydig cells

​FSH

​ovulation

hormone therapy

​pre-natal

​prostate gland

​oviduct

hypothalamus

seminal vesicle

exocrine

thyroxin

leptin

​melatonin

​​endometrium

​follicles

​LH

oestrogen

implantation

​adipose tissue

puberty

follicular phase

luteal phases

​sperm duct

​vagina

​ovarian

endocrine

gland

penis

testis

epididymis

scrotum

vas deferens

​scrotum

XX

corpus luteum

​oocyte

​progesterone

inhibit appetite

​circadian rhythms

​genitalia

​urethra

​vulva

​ovulation

hormone

target

blood glucose

thermoregulation

diabetes

vasodilation

vasoconstriction

​XY

​puberty

​William Harvey

gonadotropin

ob allele ​

​testosterone

obesity

​jet lag

​cervix