Marking Key

Question	Answer	Explanation
1	D	Progesterone stimulates mammary glands and regulates the menstrual cycle in preparation for/during pregnancy.
2	A	Adrenal cortex secretes cortisol and aldosterone.
3	C	Testosterone is a major androgen.
4	A	Bone resorption (breaking down bone) occurs.
5	A	Hormones are only released by endocrine glands and are secreted into the blood.
6	B	Posterior pituitary releases ADH and oxytocin.
7	D	Exocrine glands do not produce hormones. Alimentary glands (exocrine) and ovaries (endocrine).
8	D	Anterior hormones: LH, FSH, GH, TSH, ACTH, PRL.
9	A	Hormones are chemical messengers.
10	A	Posterior lobe makes 0 hormones but releases 2.
11	C	Amines and proteins are water-soluble; steroids are lipid-soluble.
12	B	Posterior pituitary makes 0 hormones and releases 2; anterior lobe makes and releases 6 hormones.
13	A	Releasing factors are only sent from the hypothalamus to the anterior pituitary.
14	A	GnRH is produced in the hypothalamus and travels through capillaries in the hypothalamic-pituitary axis to the anterior lobe.
15	D	ADH is produced in the hypothalamus, sent via nerve endings to the posterior pituitary, and secreted into systemic blood.
16	C	Hypothalamic releasing factors are secreted into the portal circulation and are specific for an anterior hormone.
17	C	LH causes the production of androgens (testosterone).
18	D	Progesterone is released by the ovaries to promote pregnancy.
19	C	The hormone is a steroid since it enters the cell, binding to intracellular receptors.

Question 20.

20a) Amines, proteins and steroids. (1)

20b) Aldosterone (1), released from the adrenal cortex, affects Na^+/K^+ ion concentrations.

20c) Thymosins. (1)

20d) i)

- Kidneys. (1)
- Liver. (1)

20d) ii) Hormone clearance. (1)

Question 21.

21a)

Any two marks:

- All are specific, chemical messengers, operating on the 'lock and key' hypothesis. (1)
- All hormones target specific cells only. (1)
- Secreted by endocrine cells only. (1)
- All bind to receptors on target organ(s). (1)

21b)

- Steroids. (1)

Any two marks:

- Lipid-soluble hormone. (1)
- Bilayer is also lipid-soluble. (1)
- Hormone penetrates membrane since like dissolves like. (1)

21c)

- A – exocrine gland (1) contains a duct.
- B – endocrine gland (1) note blood supply.

21d)

For full marks, the student must compare endocrine and exocrine glands:

- Endocrine glands secrete chemical messengers known as hormones AND exocrine glands do not secrete hormones. (1)
- Endocrine glands secrete hormones into bloodstream AND exocrine glands secrete their products into a duct. (1)
- Endocrine glands can be far away from their target cells AND exocrine glands are located close to where secretion is required. (1)

Question 22.

22a)

- Vasopressin/ADH (antidiuretic hormone). (1)
- Oxytocin. (1)

22b)

Any 3 marks, but one mark must be dedicated to an example:

- Releasing factors are hypothalamic hormones/specific chemical messengers made and released from the hypothalamus. (1)
- Allow hypothalamus to communicate with anterior pituitary/'tell' anterior lobe to release a specific hormone. (1)
- Releasing factors travel through the internal hypothalamic-pituitary portal circulation, from the hypothalamus to the anterior pituitary gland. (1)
- E.g. TSH releasing factor from the hypothalamus will inform the anterior lobe upon binding to specific anterior receptors that TSH needs to be released, thus causing TSH release from anterior lobe. (1)

22c)

Essential marks:

- Cortisol targets most cells of the body (1) in response to circadian rhythms and stress.
- Cortisol is a steroid hormone and is lipid-soluble. (1)
- Cortisol when binding to DNA will cause stress-relief and healing by turning on anti-inflammatory genes and turning off pro-inflammatory genes. (1)

Any three marks:

- Bilayer is lipid-soluble and cortisol can permeate through the membrane. (1)
- Steroid binds to specific intracellular receptors to form hormone/receptor complex. (1)
- Hormone/receptor complex can move into the nucleus and bind directly to the DNA. (1)
- Changes in cell function include altering the rate of protein synthesis, changing the shape of enzymes to activate/inactivate them, or turning genes on or off. (1)

Question 23.

23a)

- A – infundibulum (note stalk)
- B – posterior pituitary (note nerves)
- C – anterior pituitary (note blood)

23b)

Name of hormone	Stimulus	Function	Target organs
Glucagon	Low blood glucose. (1)	Increase blood glucose via gluconeogenesis and glycogenolysis. (1)	Liver, adipose tissue and muscle cells. (1)
Adrenocorticotrophic hormone	Low adrenal cortex hormones or stress or ACTH releasing factor. (1)	Stimulate secretion of adrenal cortex hormones (aldosterone and cortisol). (1)	Adrenal cortex of adrenal gland. (1)
Parathyroid hormone. (1)	Low blood calcium	To increase blood calcium via increased calcium absorption and bone resorption. (1)	Bone and kidneys. (1)
Oxytocin. (1)	Infant suckling on nipple or baby's head making contact with uterus wall (uterine contractions in childbirth). (1)	Uterus contractions and milk secretion (lactation).	Muscles of nipple and uterus. (1)
Thyroid-stimulating hormone (TSH). (1)	Low thyroid hormones (low T3 or T4) or TSH releasing factor or cold or low metabolism. (1)	To stimulate the thyroid to release thyroid hormones. (1)	Thyroid gland

Question 24.

24a)

- Are secreted by specialised cells known as endocrine glands. (1)
- Function as specific chemical messengers. (1)
- Released into the bloodstream. (1)
- Bind to receptors on target organ to produce their effects. (1)

24b)

Any two marks:

- Bind to receptors on the cell membrane of target organ (amine or protein) to trigger downstream signalling/activation of secondary messengers/cyclic AMP/indirect changes in cellular function. (1)
- Bind to intracellular receptors within target cell (steroid hormone), which bind to DNA along specific sequences/hormone response elements. (1)
- Activate certain genes to turn them on or off. (1)
- Change the shape of enzymes to active or inactivate them. (1)
- Alter the rates of protein synthesis by affecting transcription and/or translation. (1)

24c)

Any six marks:

- Hormones are proteins, steroids or amines. (1)
- Hormones can be hydrophilic (water-loving) amines or proteins. (1)
- Hormones can be hydrophobic/lipophilic (lipid-loving) steroids. (1)
- Bind to target organ's cell membrane receptors (amine or protein), forming hormone/receptor complex. (1)
- Protein/amine binding to receptor triggers activation of a secondary messenger. (1)
- Example: cAMP – acting internally to cause downstream signalling and cellular changes. (1)
- Or enters the cell and binds to intracellular receptors in the case of steroids (1) forming hormone/receptor complex, which migrates through cell and into nucleus, attaching to DNA. (1)

24d)

- Stimulus is low thyroid hormone or low metabolic rate or cold body temperature. (1)
- Stimulus detected by receptors and TSH releasing factor (thyrotropin-releasing hormone) is produced and released by hypothalamus. (1)
- TSH releasing factor is transmitted to anterior pituitary via internal portal circulation within hypothalamic-pituitary axis. (1)
- TSH releasing factor 'tells' TSH to be released from anterior pituitary and into systemic blood circulation. (1)
- TSH travels to thyroid and binds to receptors on thyroid. (1)
- Downstream cascade of signalling occurs and the thyroid manufactures and releases thyroxine (T4) using iodine and thyroglobulin. (1)
- T4 released into blood, with T3 being the active hormone. (1)
- Thyroid hormones act on most cells to increase metabolic rate and oxygen consumption and heat production. (1)