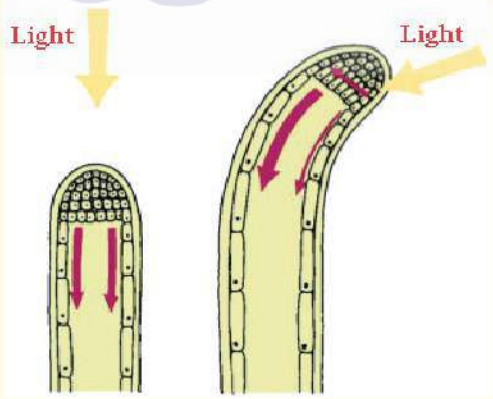
UNIT

16

Plant and Animal Hormones

POINTS TO REMEMBER

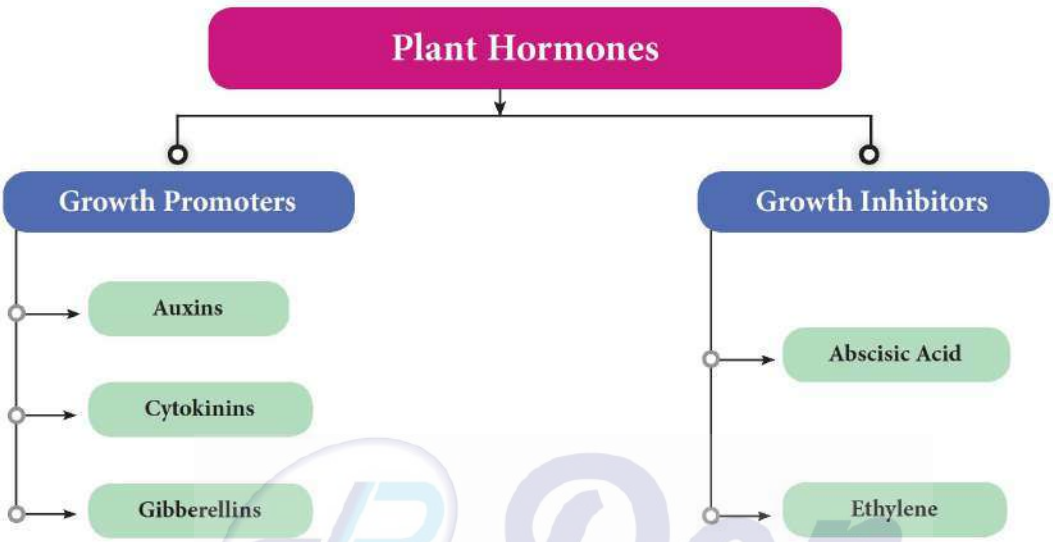
- The function of control and coordination in plants is performed by chemical substances produced by the plants called **plant hormones**.
- Plant hormones are Auxins, Cytokinins, Gibberellins, Abscisic Acid (ABA) and Ethylene .
- **Growth Promotors:** Hormones which promote plant growth are called growth promoters. Eg. auxins, cytokinins and gibberellins
- **Growth Inhibitors:** Hormones which inhibit plant growth are called growth Inhibitors. Eg. Abscisic acid and Ethylene.
- Frits Warmolt Went (1903– 1990), a Dutch biologist demonstrated the existence and effect of auxin in plants. He did a series of experiments in Avena coleoptiles.
- Auxins are produced at the tip of stems and roots.

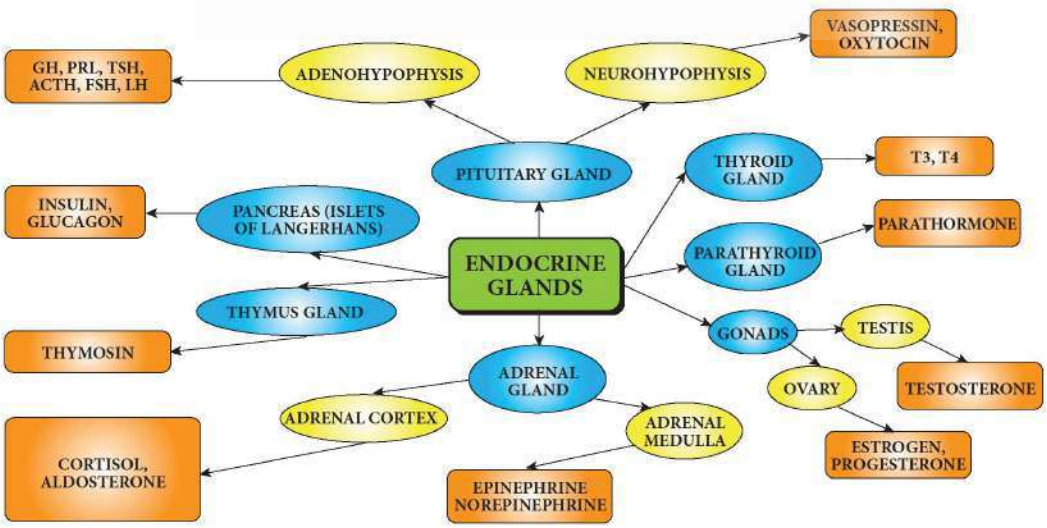


- Auxins are classified into two types, namely natural auxins and synthetic auxins.
- This internodal elongation in rice was caused by fungus *Gibberella fujikuroi*.
- The branch of biology which deals with the study of the endocrine glands and its physiology is known as '**Endocrinology**'.
- The pituitary gland forms the major endocrine gland in most vertebrates. It regulates and controls other endocrine glands and so is called as the "**Master gland**".
- **Dwarfism:** It is caused by decreased secretion of growth hormone in children.
- **Gigantism:** Oversecretion of growth hormone leads to gigantism in children.

MIND MAP

Mind Map





- **Acromegaly:** Excess secretion of growth hormone in adults may lead to abnormal enlargement of head, face, hands and feet.
- Gonadotropic hormones (GTH)

  The gonadotropic hormones are follicle stimulating hormone and luteinizing hormone which are essential for the normal development of gonads.
- Prolactin (PRL)

  PRL is also called lactogenic hormone.
- The hormones secreted by the posterior pituitary are:

  a. Vasopressin or Antidiuretic hormone

  b. Oxytocin
- **Hyperthyroidism**

  It is caused due to the excess secretion of the thyroid hormones which leads to Grave's disease.
- **Hypothyroidism**

  It is caused due to the decreased secretion of the thyroid hormones.
- **Cretinism**

  It is caused due to decreased secretion of the thyroid hormones in children.

  Goitre

  It is caused due to the inadequate supply of iodine in our diet.
- **Myxoedema**

  It is caused by deficiency of thyroid hormones in adults.

  Thymosin is the hormone secreted by thymus.

Scientists and inventions:

- The term auxin was introduced by **Kogl** and **Haagen- Smith** (1931).
- **Charles Darwin** (1880), observed unilateral growth and curvature of canary grass (Phalaris canariensis) coleoptiles.
- Frits **Warmolt Went** (1903– 1990), a Dutch biologist demonstrated the existence and effect of auxin in plants. He did a series of experiments in Avena coleoptiles.
- **Thomas Addison** is known as Father of Endocrinology.
- English physiologists **W. M. Bayliss** and **E. H. Starling** introduced the term hormone in 1909. They first discovered the hormone secretin.
- **Kurosawa** (1926) observed Bakanae disease or foolish seedling disease in rice crops.
- Human insulin was first discovered by Fredrick Banting, Charles Best and MacLeod in 1921.
- Edward C. Kendal in 1914 first crystallised thyroxine hormone.
- Application of cytokinin delays the process of ageing in plants. This is called **Richmond Lang effect**.

Textbook Evaluation

I. Choose the most suitable answer from the given four alternatives and write the option code and corresponding answer:

1. Gibberellins cause

a) Shortening of genetically tall plants
b) Elongation of dwarf plants
c) Promotion of rooting
d) Yellowing of young leaves

2. The hormone which has positive effect on apical dominance is ★★

a) Cytokinin
b) Auxin
c) Gibberellin
d) Ethylene

3. Which one of the following hormones is naturally not found in plants? ★

a) 2, 4-D
b) GA3
c) Gibberellin
d) IAA

4. Avena coleoptile test was conducted by

a) Darwin
b) N. Smit
c) Paal
d) F.W. Went

5. To increase the sugar production in sugarcanes they are sprayed with _____

a) Auxin
b) Cytokinin
c) Gibberellins
d) Ethylene

6. LH is secreted by

a) Adrenal gland
b) Thyroid gland
c) Anterior pituitary
d) Hypothalamus.

7. Identify the exocrine gland

a) Pituitary gland
b) Adrenal gland
c) Salivary gland
d) Thyroid gland

8. Which organ acts as both exocrine gland as well as endocrine gland ? ★★

a) Pancreas
b) Kidney
c) Liver
d) Lungs

9. Which one is referred as "Master Gland"? ★★

a) Pineal gland
b) Pituitary gland
c) Thyroid gland
d) Adrenal gland

Ans:

1)	b)	Elongation of dwarf plants	6)	c)	Anterior pituitary
2)	b)	Auxin	7)	c)	Salivary gland
3)	a)	2, 4-D	8)	a)	Pancreas
4)	d)	F.W. Went	9)	b)	Pituitary gland
5)	a)	Auxin			

II. Fill in the blanks

1. _____ causes cell elongation, apical dominance and prevents abscission. ★★
2. _____ is a gaseous hormone involved in abscission of organs and acceleration of fruit ripening.
3. _____ causes stomatal closure.
4. Gibberellins induce stem elongation in _____ plants.
5. The hormone which has negative effect on apical dominance is _____. ★★
6. Calcium metabolism of the body is controlled by _____.
7. In the islets of Langerhans, beta cells secrete _____. ★★
8. The growth and functions of thyroid gland is controlled by _____.
9. Decreased secretion of thyroid hormones in the children leads to _____.

Ans:

1.	Auxin	6.	Parathormone
2.	Ethylene	7.	Insulin
3.	Abscisic acid	8.	Thyroid stimulating hormone TSH
4.	Rice	9.	Cretinism
5.	Cytokinins		

III. Match the following:

1. a) Match Column I with Columns II and III

Column I	Column II	Column III
1. Auxin	a. *Gibberella fujikuroi*	(i) Abscission
2. Ethylene	b. Coconut milk	(ii) Internodal elongation
3. Abscisic acid	c. Coleoptile tip	(iii) Apical dominance
4. Cytokinin	d. Chloroplast	(iv) Ripening
5. Gibberellins	e. Fruits	(v) Cell division

Ans : 1-c-iii, 2-e-iv, 3-d-i, 4-b-v, 5-a-ii

2. b) Match the following hormones with their deficiency states

Hormones		Disorders	
1. Thyroxine	-	a. Acromegaly	(c)
2. Insulin	-	b. Tetany	(e)
3. Parathormone	-	c. Simple goitre	(b)
4. Growth hormone	-	d. Diabetes insipidus	(a)
5. ADH	-	e. Diabetes mellitus	(d)

IV. State whether True or false If false write the correct statement

1. **A plant hormone concerned with stimulation of cell division and promotion of nutrient mobilization is cytokinin.** **True**
2. **Gibberellins cause parthenocarpy in tomato.** **True**
3. **Ethylene retards senescence of leaves, flowers and fruits.** ✶✶ **False**
   Ethylene hastens the senescence of leaves, flowers and fruits.
4. **Exopthalmic goitre is due to the over secretion of thyroxine.** **True**
5. **Pituitary gland is divided into four lobes.** **False**
   Pituitary gland is divided into two lobes.
6. **Estrogen is secreted by corpus luteum.** ✶✶ **False**
   Progesterone is secreted by corpus luteum.

V. Assertion and Reasoning

Direction: In each of the following questions a statement of assertion (A) is given and a corresponding statement of reason (R) is given just below it. Mark the correct statement as.

a) If both A and R are true and R is correct explanation of A

b) If both A and R are true but R is not the correct explanation of A

c) A is true but R is false

d) Both A and R are false

1. **Assertion:** Application of cytokinin to marketed vegetables can keep them fresh for several days.

   Reason: Cytokinins delay senescence of leaves and other organs by mobilisation of nutrients.

   Ans: a) If both A and R are true and R is correct explanation of A

2. **Assertion (A):** Pituitary gland is referred as "Master gland".
   Reason (R): It controls the functioning of other endocrine glands.
   Ans: a) If both A and R are true and R is correct explanation of A

3. **Assertion (A):** Diabetes mellitus is increased blood sugar level.
   Reason (R): Insulin decreases the blood sugar levels.
   Ans: b) If both A and R are true but R is not the correct explanation of A

VI. Answer in a word or sentence

1. **Which hormone promotes the production of male flowers in Cucurbits?**
   Gibberellins promote the production of male flowers in Cucurbits.
2. **Write the name of a synthetic auxin.** ✶✶
   2,4 Dichlorophenoxy Acetic Acid (2,4 D)
3. **Which hormone induces parthenocarpy in tomatoes?**
   Gibberellins induces parthenocarpy in tomatoes.

4. What is the hormone responsible for the secretion of milk in female after child birth?

Prolactin (PRL) is also called lactogenic hormone, initiates development of mammary glands during pregnancy and stimulates the production of milk after child birth. ★★

5. Name the hormones which regulates water and mineral metabolism in man.

Growth hormone, Thyroid hormone, Parathormone and Glucocorticoids.

6. Which hormone is secreted during emergency situation in man? ★

- Epinephrine (Adrenaline)
- Norepinephrine (Noradrenaline)
- They are together called as "Emergency hormones" secreted during emergency situation in man.

7. Which gland secretes digestive enzymes and hormones?

Pancreas

8. Name the endocrine glands associated with kidneys.

Posterior lobe (Neurohypophysis) of pituitary gland.

VII. Short answer questions

1. What are synthetic auxins? Give examples.

- **Artificially synthesized** auxins that have properties like auxins are called as synthetic auxins.
- eg. 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).

2. What is bolting? How can it be induced artificially? ★★★

- **Bolting** is production of a flowering stem in plants.
- Treatment of rosette plants with gibberellin induces **sudden shoot elongation** followed by flowering. This is called bolting.

3. Bring out any two physiological activities of abscisic acid.

- Abscisic acid promotes the process of **abscission** (separation of leaves, flowers and fruits from the branch).
- During water stress and drought conditions, Abscisic acid causes **stomatal closure.**

4. What will you do to prevent leaf fall and fruit drop in plants? Support your answer with reason.

Application of **auxin** on plants will prevent leaf fall and fruit drop in plants because **Auxins** prevent the formation of abscission layer.

5. What are chemical messengers?

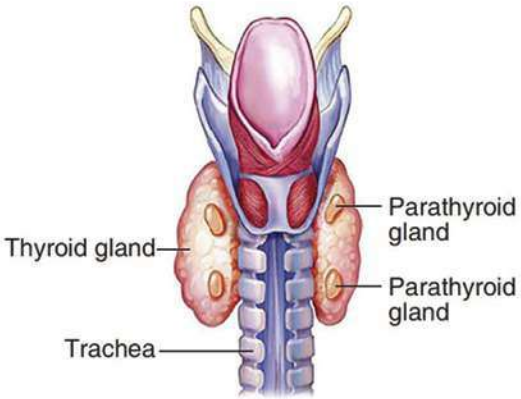
- A chemical messenger is any compound that serves to transmit a **message**.
- **Hormones** act as chemical messengers which are produced by specialized glands.

6. Write the differences between endocrine and exocrine gland. ★★

S.No	Endocrine gland	Exocrine gland
1.	These are **ductless** glands.	These glands are with **specific ducts.**
2.	Secretions are **directly** diffused into the **blood stream.**	Secretions are passed through the specific dusts.
3.	Secreate **hormones**.	Secreate **saliva, sweat,** etc.
4.	**E.g:** Pituitary gland, thyroid gland.	**E.g:** Salivary glands, sweat glands.

7. What is the role of parathormone?

- The parathormone regulates **calcium** and **phosphorus** metabolism in the body.
- They act on bone, kidney and intestine to maintain **blood calcium levels**.



Parathyroid Gland

8. What are the hormones secreted by posterior lobe of the pituitary gland? Mention the tissues on which they exert their effect. ✶✶

The hormones secreted by the posterior pituitary are:

- **Vasopressin or Antidiuretic hormone (ADH)**
  In kidney tubules it increases reabsorption of water.
- **Oxytocin**
  It helps in the contraction of the smooth muscles of uterus.

9. Why are thyroid hormones referred as personality hormone?

- Thyroid hormone is essential for **normal physical, mental** and **personality** development.
- Hence it is called as the personality hormone.

10. Which hormone requires iodine for its formation? What will happen if intake of iodine in our diet is low?

- Iodine is involved in the formation of **thyroid hormone.**
- Goitre is caused due to the inadequate supply of iodine in our diet.

VIII. Long answer questions

1. (a) Name the gaseous plant hormone. Describe its three different actions in plants. (b) Which hormone is known as stress hormone in plants ? Why?

(a) Ethylene is a gaseous plant hormone.

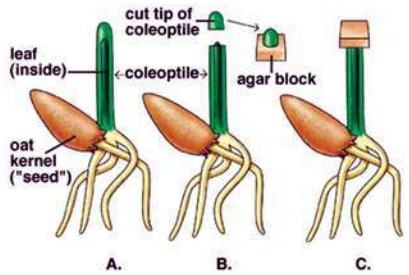
- It is mainly concerned with maturation and ripening of fruits.
- Ethylene inhibits the elongation of stem and root in dicots.
- Ethylene hastens the senescence of leaves and flowers.

(b)

Abscisic Acid is also called as stress hormone in plants because it increases tolerance of plants to various kinds of stress.

2. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile. ★★★

- **Warmolt Went** (1903– 1990), a Dutch biologist demonstrated the existence and effect of **auxin** in plants. He did a series of experiments in **Avena coleoptiles.**
- He did a series of experiments in **Avena coleoptiles.**



A. Germination of an oat seed
B. Decapitate tip of coleoptile and place on agar block.
C. Agar block is placed on top of the decapitated tip of the seedling.

Went's Experiment

First Experiment:

- In his first experiment he **removed the tips of** Avena coleoptiles.
- The cut tips **did not grow** indicating that the tips produced something essential for growth.

Second Experiment:

- In his second experiment he placed the **agar blocks** on the decapitated coleoptile tips.
- The coleoptile tips **did not show any response.**

Third Experiment:

- In his next experiment he placed the detached coleoptile **tips on agar blocks.**
- After an hour, he discarded the **tips** and placed this **agar block** on the decapitated coleoptile.
- It **grew** straight up indicating that some **chemical** had diffused from the cut coleoptile tips into the agar block which stimulated the growth.

Conclusion:

- He concluded that a chemical diffusing from the tip of coleoptiles was responsible for growth.
- He named it as **"Auxin"** meaning **"to grow".**

3. Write the physiological effects of gibberellins. ★

- Application of gibberellins on plants stimulate extraordinary **elongation** of **internode**. e.g. Corn and Pea.
- Treatment of rosette plants with gibberellin induces sudden **shoot elongation** followed by flowering. This is called bolting
- Gibberellins promote the production of male flowers in monoecious plants (Cucurbits).
- Gibberellins **break dormancy** of potato tubers.
- Gibberellins are efficient than auxins in inducing the formation of **seedless fruit** - Parthenocarpic fruits (Development of fruits without fertilization) e.g. Tomato

4. Where are estrogens produced? What is the role of estrogens in the human body?

- Estrogen is produced by the **Graafian follicles** of the ovary. ✶✶

Role of estrogen in the human body:

- It brings about the changes that occur during **puberty.**
- It initiates the process of **oogenesis.**
- It stimulates the **maturation of ovarian follicles** in the ovary.
- It promotes the development of **secondary sexual characters** (breast development, high pitched voice etc).

5. What are the conditions which occur due to lack of ADH and insulin? How are the conditions different from one another?

- ADH deficiency causes Diabetes insipidus.
- Insulin deficiency causes Diabetes mellitus.
- Deficiency of Vasopressin or Antidiuretic hormone (ADH) reduces reabsorption of water in kidney and causes an increase in urine output (polyurea).
- Deficiency of insulin causes excretion of excess glucose in the urine (Glycosurea).

IX. Higher Order Thinking Skills (HOTS)

1. What would be expected to happen if

a. Gibberellin is applied to rice seedlings.

b. A rotten fruit gets mixed with unripe fruits.

c. When cytokinin is not added to culture medium

a. When **Gibberllin** is applied to **rice seedlings,** it would induce bolting. It is a natural attempt to boost seed production.

b. When a rotten fruit gets mixed with unripe fruits, the **ethylene** produced from the rotten fruits will hasten the **ripening** of the unripe fruits.

c. When cytokinin is not added to culture medium, then cell division, growth and differentiation will not be observed.

2. A plant hormone was first discovered in Japan when rice plants were suffering from Bakanae disease caused by *Gibberella fujikuroi*. Based on this information answer the following questions:

a. Identify the hormone involved in this process.

b. Which property of this hormone causes the disease?

c. Give two functions of this hormone.

a. Gibberellins

b. The active substance was identified as Gibberellic acid, which caused this disease.

c. Application of gibberellins on plants stimulate **extraordinary elongation** of internode. e.g. Corn and Pea.

Treatment of rosette plants with gibberellin induces sudden **shoot elongation** followed by flowering. This is called bolting.

3. Senthil has high blood pressure, protruded eyeball and an increased body temperature. Name the endocrine gland involved and hormone secretion responsible for this condition.

- Hyperthyroidism is caused due to the excess secretion of the thyroid hormones which leads to Grave's disease.
- This hormone is secreted by the thyroid gland.

4. Sanjay is sitting in the exam hall. Before the start of the exam, he sweats a lot, with increased rate of heart beat. Why does this condition occur?

Adrenaline is known to cause physical symptoms that accompany test anxiety, such as increased heart rate, sweating, and rapid breathing.

5. Susan's father feels very tired and frequently urinates. After clinical diagnosis he was advised to take an injection daily to maintain his blood glucose level. What would be the possible cause for this? Suggest preventive measures.

- Polyurea occurs in people diagnosed with Diabetes mellitus, if blood glucose levels have risen too high.
- Regular exercise, along with a good diet, can reduce the risk of diabetes.

Additional Questions

I. Choose the most suitable answer from the given four alternatives and write the option code and corresponding answer:

1. _____ promote the elongation of stems and coleoptiles. ★

a) Cytokinins b) Gibberellins c) Ethylene d) Auxin

2. _____ promote the growth of lateral buds in the presence of apical bud

a) Cytokinins b) Gibberellins c) Ethylene d) Auxin

3. _____ inhibits the elongation of stem.

a) Cytokinins b) Gibberellins c) Ethylene d) Auxin

4. _____ breaks the dormancy of buds, seeds and storage organs.

a) Cytokinins b) Gibberellins c) Ethylene d) Auxin

5. An amino acid _____ and iodine are involved in the formation of thyroid hormone. ★

a) Alanine b) Tyrosine c) Valine d) Glycine

6. The alpha cells of pancreas secrete _____ .

a) Glucagon b) Insulin c) Valine d) Glycogen

7. Beta cells of pancreas secrete _____ . ★★

a) Glucagon b) Insulin c) Valine d) Glycogen

8. _____ prepares the uterus for the implantation of the embryo .

a) Estrogens b) Thymosin
c) Progesterone d) Testosterone

9. _____ initiates the process of oogenesis.

a) Estrogens b) Thymosin
c) Progesterone d) Testosterone

10. It stimulates protein synthesis and controls muscular growth. ★

a) Estrogens b) Thymosin
c) Progesterone d) Testosterone

11. **It is essential for the formation of placenta.**
    a) Estrogens b) Thymosin
    c) Progesterone d) Testosterone

12. **It is also known as life-saving hormone.**
    a) Thymosin b) Cortisol c) Adrenaline d) Epinephrine

13. **It is also known as emergency hormone.**
    a) Thymosin b) Cortisol c) Adrenaline d) Insulin

14. **Muscle spasm known as _____.** ★
    a) Thymus b) Tetany c) Thymosin d) Thyroid

15. **It controls the growth of thyroid gland**
    a) TSH b) ACTH c) GTH d) FSH

16. **It helps in the contraction of the smooth muscles of uterus at the time of child birth** ★
    a) Prolactin b) Vasopressin c) Estrogen d) Oxytocin

17. **'Influence' that was observed by Charles Darwin is _____.**
    a) Gibberellins b) 2 – 4 D c) Auxin d) Cytokinins

18. **_____ observed Bakanae disease in rice crops.**
    a) Darwin b) Kurosawa c) F.W.Went d) Koal

19. **_____ is a growth inhibitor hormone.**
    a) Auxin b) Cytokinin c) Gibberellins d) Ethylene

20. **The hormone responsible for the production of female sex hormones is _____.** ★
    a) G.T.H b) FSH c) LH d) TSH

21. **The gland, composed of two distinct lobes lying one on either side of the trache is _____.**
    a) Pineal b) Thyroid c) Pituitary d) Pancreas

Ans:

1)	d)	Auxin	12)	b)	Cortisol
2)	a)	Cytokinins	13)	c)	Adrenaline
3)	c)	Ethylene	14)	b)	Tetany
4)	c)	Ethylene	15)	a)	TSH
5)	b)	Tyrosine	16)	d)	Oxytocin
6)	a)	Glucagon	17)	c)	Auxin
7)	b)	Insulin	18)	b)	Kurosawa
8)	c)	Progesterone	19)	d)	Ethylene
9)	a)	Estrogens	20)	c)	LH
10)	d)	Testosterone	21)	b)	Thyroid
11)	c)	Progesterone			

II. Fill in the blanks

1. _____ was the first plant hormone to be discovered.
2. _____ are the plant hormones that promote cell division in plant cells.
3. _____ promotes senescence in leaves by causing loss of chlorophyll.
4. _____ is a gaseous plant hormone.
5. Melatonin is a hormone produced by the _____ gland.
6. Thyroid is composed of glandular follicles which are filled with colloid material called _____.
7. The branch of biology that deals with the study of the endocrine glands and its physiology is known as _____. ✶
8. _____ gland attached to the hypothalamus by a pituitary stalk.
9. _____ and _____ identified the molecular structure of thyroxine in 1927.
10. A balance between _____ and _____ production is necessary to maintain blood glucose concentration.
11. Insulin helps in the conversion of glucose into _____.
12. Glucagon helps in the breakdown of glycogen to _____ in the liver.
13. Adrenal glands are also called as _____.
14. The adrenal medulla is composed of _____. ✶
15. _____ cells form the endocrine part of the testes.
16. _____ is the hormone secreted by thymus.
17. _____ influences the process of spermatogenesis.
18. _____ is responsible for the development of secondary sexual characters in men.
19. _____ is responsible for the premenstrual changes of the uterus. ✶ ✶
20. _____ promotes the development of secondary sexual characters in women.
21. _____ stimulates the production and differentiation of lymphocytes.
22. _____ is partly an endocrine gland and partly a lymphoid gland.
23. An amino acid _____ and _____ are involved in the formation of thyroid hormone.

Ans:

1.	Auxins	13.	Supra renal glands
2.	Cytokinins	14.	Chromaffin cells
3.	Abscisic acid	15.	Leydig
4.	Ethylene	16.	Thymosin
5.	Pineal	17.	Testosterone
6.	Thyroglobulin	18.	Testosterone
7.	Endocrinology	19.	Progesterone
8.	Pituitary	20.	Estrogen
9.	Charles Harrington and George Barger	21.	Thymosin
10.	Insulin, glucagon	22.	Thymus
11.	Glycogen	23.	Tyrosine, iodine
12.	Glucose		

III. Match the following:

1) Thyroid	– a) Child birth	(d)
2) Prolactin	– b) Graves disease	(e)
3) Oxytocin	– c) Antidiuretic hormone	(a)
4) Parathyroid	– d) Personality hormone	(f)
5) Vasopressin	– e) Milk production	(c)
6) Hyperthyroidism	– f) Tetany	(b)

IV. State whether True or false If false write the correct statement

1. **Gibberellins are produced at the tip of stems and roots.** **False**
   Auxins are produced at the tip of stems and roots.
2. **Cytokinin causes cell enlargement.** **True**
3. **Kurosawa (1926) observed Bakanae disease or foolish seedling disease in wheat.** **False**
   Kurosawa (1926) observed Bakanae disease or foolish seedling disease in rice. ✶
4. **Cytokinin induces bolting plants.** **False**
   Gibberellin induces bolting.
5. **Gibberellin is also called as stress hormone.** ✶ **False**
   Abscisic acid is also called as stress hormone.
6. **Ethylene promotes the ripening of fruits.** **True**
7. **Endocrine glands are ductless glands.** **True**
8. **Suppression of serotonin has been implicated in sleep disturbances.** **False**
   Suppression of melatonin has been implicated in sleep disturbances.
9. **Progesterone prepares the uterus for the implantation of the embryo.** **True**

10. **Progesterone brings about the changes that occur during puberty.** **False**
Estrogen brings about the changes that occur during puberty.

V. Assertion and Reasoning

Direction: In each of the following questions a statement of assertion (A) is given and a corresponding statement of reason (R) is given just below it. Mark the correct statement as.

a) If both A and R are true and R is correct explanation of A

b) If both A and R are true but R is not the correct explanation of A

c) A is true but R is false

d) Both A and R are false

1. **Assertion:** Auxins produced by the plants are called natural auxins
Reason: Auxins bring about a variety of physiological effects in different parts of the plant body.
Ans: a) If both A and R are true and R is correct explanation of A

2. **Assertion:** TSH controls the growth of thyroid gland. ★
Reason: The gonadotropic hormones are follicle stimulating hormone.
Ans: b) If both A and R are true but R is not the correct explanation of A

3. **Assertion:** Melatonin is a hormone produced by the pineal gland. It is known as a 'time messenger'.
Reason: It signals night time information throughout the body.
Ans: a) If both A and R are true and R is correct explanation of A

VI. Answer in a word or sentence

1. **Name the five classes of plant hormones.**
Auxins, Cytokinins, Gibberellins, Abscisic Acid (ABA), Ethylene

2. **Parthenocarpy is induced by the external application of cytokinin.**
False, Parthenocarpy is induced by the external application of auxins

3. **Which prevents the formation of abscission layer?** ★
Auxins prevent the formation of abscission layer.

4. **Give two examples of natural auxins.**
Phenyl Acetic Acid (PAA) and Indole 3 Acetonitrite (IAN) are natural auxins.

5. **Name the plant hormone which promotes cell division in plant cells.**
Cytokinins are the plant hormones that promote cell division or cytokinesis in plant cells.

6. **What is Richmond Lang effect?** ★
Application of cytokinin **delays** the process of ageing in plants. This is called Richmond Lang effect.

7. **Name the fungus which is responsible for intermodal elongation.**
Internodal elongation in rice is caused by the fungus ***Gibberella fujikuroi.***

8. **Which hormone hastens the senescence of leaves?**
Ethylene hastens the senescence of leaves.

9. **Which hormone causes the stomatal closure during drought conditions?**
During water stress and drought conditions **Abscisic acid** (ABA) causes stomatal closure.

10. **Which hormone is known as a time messenger?** ★
Melatonin hormone is known as a 'time messenger'.

11. **What is thyroid dysfunction?**
When the **thyroid gland fails** to secrete the normal level of hormones, the condition is called thyroid dysfunction.

12. **Who is the father of endocrinology?**
Thomas Addison is known as Father of Endocrinology.

13. **Who introduced the term 'hormone'?**
English physiologists **W. M. Bayliss** and **E. H. Starling** introduced the term hormone in 1909.

14. **Who first crystallised thyroxine hormone?**
Edward C. Kendal in 1914 first crystallised thyroxine hormone.

15. **How much iodine is needed in everyday life for thyroxine secretion?**
Thyroid gland requires "**120 µg**" of iodine everyday for the production of thyroxine.

16. **Where does the breakdown of glycogen to glucose take place?**
Breakdown of **glycogen to glucose** takes place in the liver.

17. **What is Polydipsia?**
Increased thirst is Polydipsia.

18. **What is Glycosuria?** ★ ★
Excretion of excess glucose in the urine is Glycosuria.

19. **Who first discovered human insulin?**
Human insulin was first discovered by **Fredrick Banting, Charles Best** and **MacLeod** in 1921.

20. **Which hormone maintains pregnancy?**
Progesterone

21. **In which plant did Charles Darwin do the experiments?**
Canary grass (Phalaris canariensis)

22. **What is the term used to denote the fruit formation without fertilization?**
The fruit formation without fertilization is called as **parthenocarpy**.

23. **From where was cytokinine isolated at first?**
It was first isolated from **Herring fish sperm.**

24. **Name the hormone that breaks dormancy of Potato tubers.**
Gibberellins.

25. **What are the diseases caused by the decreased secretion of Parat hormone?**
Tetany, painfull cramp of the limb muscles.

26. Give any two symptoms of Diabetes mellitus, Give any 2

Polyurea, Polyphagia.

VII. Short answer questions

1. Write short notes on the types of Auxins.

Types of auxins:

- Auxins are classified into **two** types, namely natural auxins and synthetic auxins.

Natural Auxins:

- Auxins produced by the **plants** are called **natural auxins.**
- **Example:** IAA (Indole – 3 - Acetic Acid)

Synthetic Auxins:

- **Artificially synthesized** auxins that have properties like auxins are called as **synthetic auxins.**
- **Example:** 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).

2. Mention the causes and symptoms of cretinism. ★

- It is caused due to **decreased secretion** of the thyroid hormones in children.
- The conditions are stunted growth, mental defect, lack of skeletal development and deformed bones.
- They are called as **cretins.**

3. Mention the causes and symptoms of myxoedema.

- It is caused by deficiency of **thyroid hormones** in adults.
- They are mentally sluggish, increase in body weight, puffiness of the face and hand, oedematous appearance.

4. Mention the causes and symptoms of Dwarfism:

Dwarfism:

- It is caused by **decreased secretion of growth hormone** in children.
- The characteristic features are stunted growth, delayed skeletal formation and mental disability.

5. Mention the causes and symptoms of Acromegaly.

Acromegaly:

- **Excess secretion of growth hormone** in adults may lead to abnormal enlargement of head, face, hands and feet.

6. What is the function of TSH?

Thyroid Stimulating Hormone (TSH) **controls** the growth of thyroid gland, **coordinates** its activities and hormone secretion.

7. What is the function of ACTH? ★

- Adrenocorticotropic hormone (ACTH) **stimulates adrenal cortex** of the adrenal gland for the production of its hormones.
- It also **influences** protein synthesis in the adrenal cortex.

8. What is the function of GTH?

Gonadotropic hormones (GTH) are follicle stimulating hormone and luteinizing hormone which are essential for the normal **development of gonads.**

9. What is the function of Pancreatic hormone?

A balance between insulin and glucagon production is necessary to **maintain** blood glucose concentration.

10. What is the function of insulin? ✶ ✶

- Insulin helps in the conversion of **glucose into glycogen** which is stored in liver and skeletal muscles.
- It promotes the **transport of glucose** into the cells.
- It decreases the **concentration of glucose** in blood

11. What is the function of glucagon?

- Glucagon helps in the breakdown of **glycogen** to glucose in the liver.
- It **increases** blood glucose levels
- ue to the **excess secretion** of the **thyroid hormones** which leads to Grave's disease.

VIII. Long answer questions

1. Write the physiological effects of auxin. ✶

- Auxins promote the **elongation of stems** and coleoptiles which makes them to grow
- Auxins induce **root formation** at low concentration and inhibit it at higher concentration.
- The auxins produced by the apical buds **suppress growth** of lateral buds. This is called apical dominance.
- Seedless fruits without fertilization are induced by the external application of auxins. (Parthenocarpy). **Examples:** Watermelon, Grapes, Lime, etc.
- Auxins **prevent** the formation of abscission layer.

2. Write the physiological effects of cytokinin.

- Cytokinin induces **cell division** in the presence of auxins.
- Cytokinin also causes **cell enlargement.**
- Both auxins and cytokinins are essential for the **formation** of **new organs** from the callus in tissue culture.
- Promote the **growth of lateral buds** even in the presence of apical bud.
- Application of cytokinin **delays** the process of **ageing in plants.** This is called Richmond Lang effect.

3. Write the physiological effects of Abscissic acid.

- ABA **promotes** the process of abscission (separation of leaves, flowers and fruits from the branch).
- During water stress and drought conditions ABA causes **stomatal closure.**
- ABA promotes **senescence** in leaves by causing loss of chlorophyll.
- ABA induces **bud dormancy** towards the approach of winter in trees like birch.
- ABA is a powerful inhibitor of **lateral bud growth** in tomato.

4. Write the Physiological effects of ethylene. ✶

- Ethylene promotes the **ripening of fruits.** e.g. Tomato, Apple, Mango, Banana, etc.
- Ethylene inhibits the **elongation** of stem and root in dicots.
- Ethylene hastens the **senescence** of leaves and flowers.

- Ethylene **stimulates** formation of abscission zone in leaves, flowers and fruits. This leads to premature shedding.
- Ethylene **breaks the dormancy** of buds, seeds and storage organs.

5. What are the hormones secreted by the anterior lobe of the pituitary gland? Write their functions.

The hormones secreted by anterior pituitary are:

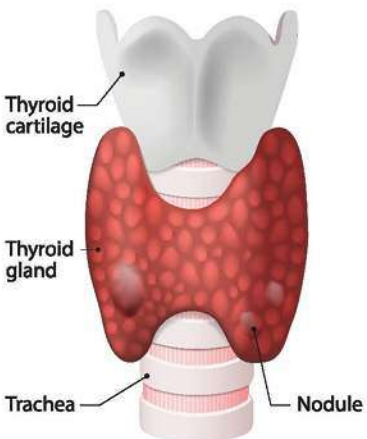
- Growth Hormone – GH **promotes** the development and enlargement of all tissues of the body.
- Thyroid stimulating Hormone – TSH **controls** the growth of thyroid gland, coordinates its activities and hormone secretion.
- Adrenocorticotropic Hormone – ACTH stimulates adrenal cortex of the adrenal gland for the **production** of its hormones. It also **influences protein** synthesis in the adrenal cortex.
- Gonadotropic Hormone which comprises the Follicle Stimulating Hormone and Luteinizing Hormone – which are essential for the normal **development of gonads.**
- Prolactin – PRL is also called **lactogenic** hormone. This hormone initiates **development** of **mammary glands** during pregnancy and stimulates the production of milk after child birth.

6. What are the functions of thyroid hormones? ✶ ✶

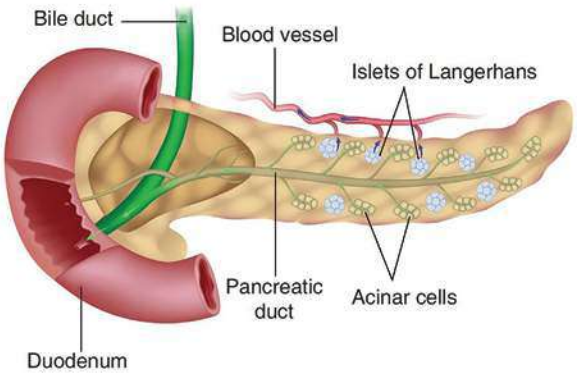
- Production of energy by maintaining the Basal Metabolic Rate (BMR) of the body.
- Helps to **maintain** normal body temperature.
- **Influences** the activity of central nervous system.
- **Controls** growth of the body and bone formation.
- Essential for normal physical, mental and personality development .
- It is also known as **personality hormone.**
- **Regulates** cell metabolism.

7. Draw and label of the following:

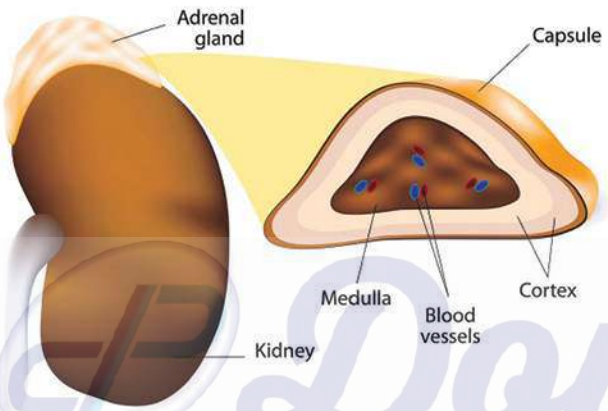
i) Thyroid gland ii) Pancreas iii) Adrenal gland



Thyroid Gland



Pancreas



Adrenal Gland

IX. Higher Order Thinking Skills (HOTS)

1. Exposure to light at night can interrupt sleep. How?

- Exposure to light at night, especially short-wavelength light, can decrease melatonin production interrupting sleep.
- Suppression of melatonin has been implicated in sleep disturbances and related metabolic disorders.

Unit Test - 16

Plant and Animal Hormones

Time : 1 hr | Marks : 30

I. Choose the most suitable answer and write the code with the corresponding answer. 5 × 1 = 5

1. Which one of the following hormones is naturally not found in plants?
   a) 2, 4-D b) GA3 c) Gibberellin d) IAA
2. Avena coleoptile test was conducted by
   a) Darwin b) N. Smit c) Paal d) F.W. Went
3. Identify the exocrine gland
   a) Pituitary gland b) Adrenal gland c) Salivary gland d) Thyroid gland
4. Muscle spasm known as _____
   a) Thymus b) Tetany c) Thymosin d) Thyroid
5. It helps in the contraction of the smooth muscles of uterus at the time of child birth
   a) Prolactin b) Vasopressin c) Estrogen d) Oxytocin

II. Answer the following questions in one or two lines. 5 × 2 = 10

1. What are chemical messengers?
2. Write the differences between endocrine and exocrine gland.
3. Why are thyroid hormones referred as personality hormone?
4. Mention the causes and symptoms of myxoedema.
5. Mention the causes and symptoms of Acromegaly.

III. Answer the following questions in brief. 2 × 4 = 8

1. Write the physiological effects of auxin.
2. What are the functions of thyroid hormones?

IV. Answer the following questions in detail. 1 × 7 = 7

1. i) Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile.
   ii) How are the diseases caused due to thyroid dysfunction?