

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව

ජාතික ඇගයීම් හා ජර්නලයන් සේවාව

இலங்கைப் பரீட்சைத் திணைக்களம்
தேசிய மதிப்பீட்டிற்கும் பரீட்சித்தலுக்குமான சேவை

අ.පො.ස.(උ.පෙළ) විභාගය - 2015

க.பொ.த (உயர் தர)ப் பரீட்சை - 2015

විෂය අංකය } 09 විෂය } Biology

ලකුණු දීමේ පටිපාටිය/ප්‍රශ්න ව්‍යුහයට දීමට - I පත්‍රය/පත්තිරය I

ප්‍රශ්න අංකය විභාග இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය විභාග இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය විභාග இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය විභාග இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය විභාග இல.	පිළිතුරු අංකය விடை இல.
01.	4	11.	2	21.	2	31.	1	41.	2
02.	4	12.	5	22.	2	32.	5	42.	5
03.	4	13.	3	23.	4	33.	2	43.	5
04.	4	14.	3	24.	3	34.	2	44.	4
05.	1	15.	1	25.	2,5	35.	3	45.	4
06.	2	16.	4	26.	1	36.	1	46.	4
07.	4	17.	4	27.	All	37.	4	47.	3
08.	5	18.	5	28.	3	38.	5	48.	2
09.	4	19.	1	29.	4	39.	1	49.	1
10.	3	20.	3	30.	4	40.	3	50.	5

විශේෂ උපදෙස්
விசேட அறிவுறுத்தல்

එක් පිළිතුරකට
ஒரு சரியான விடைக்கு

ලකුණු

02

මැතින් 50
புள்ள வீதம்

මුළු ලකුණු
மொத்தப் புள்ளிகள்

2×50 = 100

General Certificate of Education
(Advanced Level) Examination
August -2015
Biology - II
Part A - Structured essay

1. (A) (i) What is the most abundant group of biological molecules on earth?

Carbohydrates

1 x 2½

(ii) Name the nitrogen containing structural polymer found in exoskeleton of some animals.

Chitin

1 x 2½

(iii) (a) Name a reducing disaccharide.

Maltose / Lactose

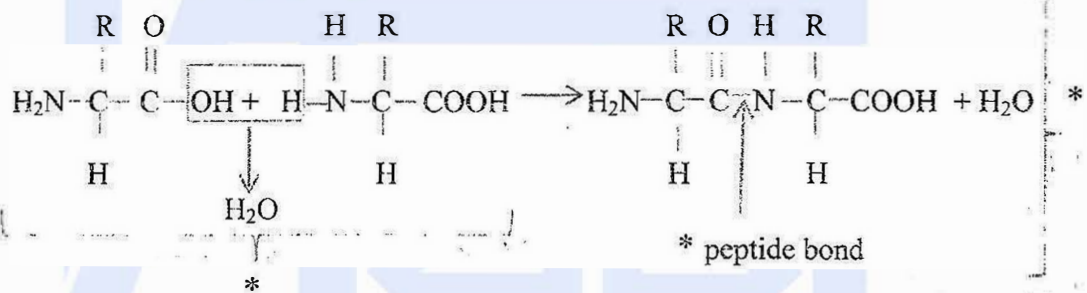
1 x 2½

(b) Name a non-reducing disaccharide.

Sucrose

1 x 2½

(iv) (a) In the space given below, show using suitable diagrams, how a peptide bond is formed between two amino acid molecules.



3 x 2½

(b) What is the test used to detect the presence of peptide bonds in proteins?

Biuret test

1 x 2½

(v) (a) What is a glycosidic bond?

The bond between two monosaccharides formed (by condensation)
 (normally) between carbon atoms (1 and 4 of neighboring monosaccharide

1 x 2½

(b) Name two biological compounds containing glycosidic bonds.

Sucrose / maltose / lactose / starch / cellulose / glycogen (any two)

2 x 2½

(vi) What are the three major chemical constituents of a nucleotide?

- Pentose sugar
- Nitrogenous base
- Phosphate group

1x2½

(vii) Name three nucleotides and state one function of each of them.

<u>Nucleotide</u>	<u>Function</u>	
• Ribonucleotide	- Component of RNA	
• Deoxyribonucleotide	- Component of DNA	
• ATP	- Store and release energy	
• NAD/NADP/FAD	- Behave as H ⁺ /electron carriers	
		(Any 3+3) 6 x 2½

(B) (i) State benefits of a systematic classification in the study of organisms.

- Helps in remembering characters of organisms
- Improves predicting power/ can predict about characters
- Can know about evolutionary relationships of organisms
- Helps in providing unique names to organisms
- Easy to identify organisms

any 4 x 2½

(ii) What are the molecular level criteria used in the classification on organisms?

- Base sequence of DNA of important genes
- Mitochondrial DNA
- Base sequence of r-RNA
- Sequence of amino acids of common proteins
- Molecular structures of cellular components

5 x 2½

(iii) Arrange the major taxa used in the classification of organisms in the order of increasing number of common characteristics.

Domain , Kingdom, Phylum, Class, Order, Family, Genus, Species

1 x 2½

(C) (i) State the common characteristics of viruses.

- Acellular /no cellular organization
- Consists of either DNA or RNA
- No metabolism
- Obligatory parasites
- Structure is made of protein capsid/lipoprotein and nucleic acid core/Nucleic acid surrounded by protein/lipoprotein
- Capsid possesses a specific symmetry / icosahedral or helical
- Consist of some enzymes in the capsid eg; polymerases
- Electron microscopic / 20nm-300nm in size

any 6 x 2½

- (ii) Some characteristics of phylum Echinodermata are given in column 1 of the following table. Indicate the presence of these characters in each of the animals listed in columns 2-5 using a (✓) mark in the appropriate cage.

Character	Sand dollar	Sea cucumber	Sea lily	Brittle Star
Flat body	✓			✓
Presence of arms			✓	✓
Mouth and anus at opposite sides /of the body	✓	✓		

any 6 x 2½

Total 40 x 2½ = 100

02. (A) (i) State the type of asexual reproduction seen in the following organisms.

- (a) *Paramecium* : Binary fission
- (b) *Plasmodium* : Multiple fission
- (c) *Hydra* : Budding
- (d) *Spirogyra* : Fragmentation
- (e) *Agaricus* : Fragmentation/ mycelial fragmentation

5 x 2½

- (ii) State the advantages of asexual reproduction.

- One parent is required
- Genetically identical offspring is produced
- Rapid multiplication in number

3 x 2½

- (iii) Write in the correct column, the diploid cells seen during spermatogenesis of man.

- | Diploid | Haploid |
|-------------------------|-------------------------|
| • Primordial germ cells | Secondary spermatocytes |
| • Spermatogonia | Spermatids |
| • Primary spermatocytes | Sperms |

6 x 2½

- (iv) Name the hormones involved in spermatogenesis of man and state the endocrine glands that secrete of them.

- | Hormone | Gland |
|----------------|--------------------|
| • GnRH | Hypothalamus |
| • FSH | Anterior pituitary |
| • LH /ICSH | Anterior pituitary |
| • Testosterone | Testis |
| • Inhibin | Testis |

10 x 2½

(B) (i) What is menopause?

~~(Permanent)~~ Cessation of ovulation and menstrual cycle

1 x 2½

(ii) State the age range of normal healthy women at which menopause occurs.

Between 45 -55 years

1 x 2½

(iii) What is the reason for menopause?

Less responsiveness to FSH and LH

1 x 2½

(iv) What is the disorder of the skeletal system associated with menopause?

Osteoporosis

1 x 2½

(C) (i) Name three vegetative propagules of plants widely used in agriculture for asexual propagation. Give one crop as an example for each propagule.

Propagule

Name of crop

- | | |
|-----------------|---|
| • Rhizomes | <i>Zingiber /Musa / Curcuma</i> |
| • Corms | <i>Alocasia</i> / <i>Colocasia</i> |
| • Bulbs | <i>Allium</i> |
| • Bulbils | <i>Ananas</i> |
| • Tubers | <i>Solanum</i> |
| • Runners | <i>Centella</i> |
| • Stem cuttings | <i>Saccharum / Ipomea / Camelia/ Manihot</i> |

any 6 x 2½

(ii) (a) What is meant by totipotency in plants?

Ability of plant cells to generate a total plant when suitable conditions are supplied

1 x 2½

(b) State two uses of tissue culture other than micro-propagation of plants.

- Cryopreservation of germplasm
- Obtaining haploid plants
- Producing genetically modified plants
- Propagating of non- seed bearing plants
- Producing disease free plants

any 2 x 2½

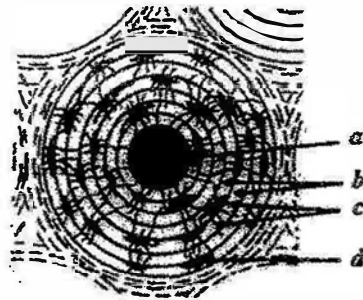
(iii) State major features seen in the life cycle of angiosperms which can be considered as evolutionary adaptations for land habitat.

- The dominant sporophyte with,
- highly differentiated (well developed) vascular and mechanical tissues
- Water is not required for the fertilization (of gametes).
- Production of a flower as sexual reproductive organ
- Production of seeds enclosed in a fruit (as the dispersal unit)
- Occurrence of double fertilization
- Presence of efficient pollinating and seed dispersal mechanisms
- Presence of highly reduced gametophyte (being surrounded by sporophyte tissues)
- Presence of a seed dormancy

any 3 x 2½

Total 40 x 2½ = 100

03. (A) Questions A (i) - A(iv) are based on the diagram given below.



(i) What is the structure shown in the above diagram?

Cross / transverse section of a compact bone / haversian system / osteon

1x 2½

(ii) Name the structures labelled as a - d in the above diagram.

- a. Haversian canal
- b. Lamellae
- c. Canaliculi
- d. Lacunae

4x 2½

(iii) Name the two main types of cells found in the structure shown in the above diagram and state the main function of each of them.

- | Type of cell | Main function |
|---------------------------|--|
| • Osteocytes / Osteoblast | - Secretion of bone matrix / formation of bone(tissue) |
| • Osteoclasts | - Reabsorb bone matrix / removing bone tissue |

4x 2½

(iv) What are the structures found in a?

- (A branch of) artery or vein/ blood vessel
- (A branch of) lymph vessel / lymphatic
- nerve

3x 2½

(B) (i) What is known as a fontanelle in humans?

(soft) membranous regions located in the cranium / skull (at the birth)

www.alevelapi.com

1x 2½

(ii) Name the main fontanelles found in humans?

- Anterior fontanelle
- Posterior fontanelle
- Sphenoidal fontanelle
- Mastoid fontanelle

4x 2½

(iii) State the main functions of fontanelles?

- Allows slight compression of skull at birth/ parturition
- Prevent damage / breaking of skull bones during parturition

2x 2½

(iv) What are known as the sinuses in the cranium?

- Air filled cavities
- lined with ciliated
- mucous membrane
- present in some skull bones

4x 2½

(v) Name the cranial bones that do not contain sinuses.

- Parietal bone
- Occipital bone
- Temporal bone

3x 2½

(C) (i) Give three examples for chlorinated hydrocarbon pesticides.

- DDT
- Aldrin
- Endrin

3x 2½

(ii) State the impacts of chlorinated hydrocarbon pesticides.

- Bioaccumulation / accumulation through food chains
- Toxicity / environment become toxic
- Kill useful insects
- Develop resistance in insects
- Reduces biodiversity
- Affects calcium metabolism of birds/ thinning egg shells/less survival of birds

6x 2½

(iii) What are the different types of national reserves found in Sri Lanka?

- Strict natural reserves
- National parks
- Nature reserves
- Jungle corridors
- Marine national parks

5x 2½

Total 40 x 2½ = 100

(4) (A) (i) What features of microorganism are beneficial in using them in microbial industries?

- High growth rate
- Metabolic versatility/ ability to use different substrates/ substrate versatility
- Ability to effect conversions / reactions under normal environmental conditions

3x 2½

(ii) Give one example each for microbial industries which use the following.

- | | |
|---|--|
| (a) Microbial cells | : production of food supplements/
production of vaccines/ active
immunization |
| (b) Microbial metabolic end-products | : production of alcoholic beverages/
vinegar/lactic acid / fermented milk/
enzymes / antibiotics |
| (c) Microbial processes | : composting/ biogas production/
extraction of metals(cu) from low grade
ores/ coir retting / bio- remediation |
| (d) Genetically modified microorganisms | : production of hormones (insulin)/vaccines/
therapeutic drugs/human growth hormone |

4x 2½

(iii) State three types of microbial associations of soil microorganisms and roots of higher plants.

- Root nodules
- Micorrhiza
- Rhizosphere

3x 2½

(iv) State three specific roles of soil microorganisms with reference to promoting plant growth.

- Mineralization/ recycling of minerals / decomposition
- Production of growth substances
- Forming soil aggregations /improving soil texture
- Facilitating absorption of soluble nutrients through micorrhizal association
- Producing chemicals that inhibit (plant) pathogenic bacteria (rhizosphere)

any 3x 2½

(v) Name the three major step in water treatment in an urban water treatment plant and state one function of each step.

Step	Function
• Sedimentation	sedimentation of suspended matter
• Filtration	remove 99% of bacteria
• Disinfection	destroy micro-organisms

3x 2½

(B) (i) What is meant by the following terms used in protein synthesis?

(a) Transcription : copying of genetic information of DNA/ gene into base sequence of m-RNA

1x 2½

(b) Translation : conversion of genetic information contained in m RNA into amino acid sequence / polypeptide chain

1x 2½

(ii) What is the role of r RNA in protein synthesis?

Provide the sites for the synthesis of polypeptide chain/ assemble amino acids into polypeptide chain

1x 2½

(iii) (a) What is a codon?

Three adjoining/ triplet of nucleotides of DNA or RNA

1x 2½

(b) How many codons are present in the genetic code?

64

1x 2½

(iv) Which of the molecules involved in protein synthesis contain each of the following?

(a) Anticodon: t RNA

(b) Codon : DNA / m RNA

2x 2½

- (v) Name the two major enzymes used in recombinants DNA technology and state the main function of each of them.

Enzyme	Main Function
• Restriction endonuclease	- cleaving / cut DNA at specific sites
• DNA ligase	- binding DNA fragments

4x 2½

- (vi) What are the two events unique to meiosis that contribute to the production of genetic variation in daughter cells?

- Independent assortment
- Crossing over

2x 2½

- (vii) At what stage of cell division does each of the following occur?

(a) Replication of chromosomes	- Interphase
(b) Division of centromere	- Anaphase
(c) Arrangement of chromosomes on the equatorial plate	- Metaphase
(d) Re-formation of nuclear membrane	- Telophase

4x 2½

- (C) (i) What is the gas released in light reactions in photosynthesis?

- Oxygen /O₂

1x 2½

- (ii) What is the source of this gas?

- Water /H₂O

1x 2½

- (iii) State the two major factors that affect photosynthesis.

- Light
- Carbon dioxide

2x 2½

- (iv) Name the two products of light reactions that are used for the synthesis of carbohydrates in dark reactions of photosynthesis.

- NADPH,
- ATP

2x 2½

- (v) (a) What is the function of RuBP carboxylase in photosynthesis?

- Catalyze carboxylation /CO₂ fixation

1x 2½

- (b) Where is this enzyme located?

- Stroma of chloroplast

1x 2½

Total 41 x 2½ = 102½ Maximum 100

PART B – ESSAY

5.a) Describe the fine structure of a mitochondrion using a fully labeled diagram

1. Double membrane structure/ is bounded by two membranes/ envelopes.
2. Rod/sausage/tubular shaped.
3. Outer membrane is smooth,
4. Inner membrane is folded inwards
5. forming a number of cristae.
6. Stalked particles are
7. attached on cristae/ are found on the matrix side of the inner membrane
8. The cristae of the inner membrane effectively increase its surface area/ and
9. contain enzymes of electron transport system.
10. Inter membranal space is present (between membrane).
11. Internal area is called matrix
12. which contains circular DNA,
13. 70s ribosomes and
14. Enzymes of the Krebs cycle.

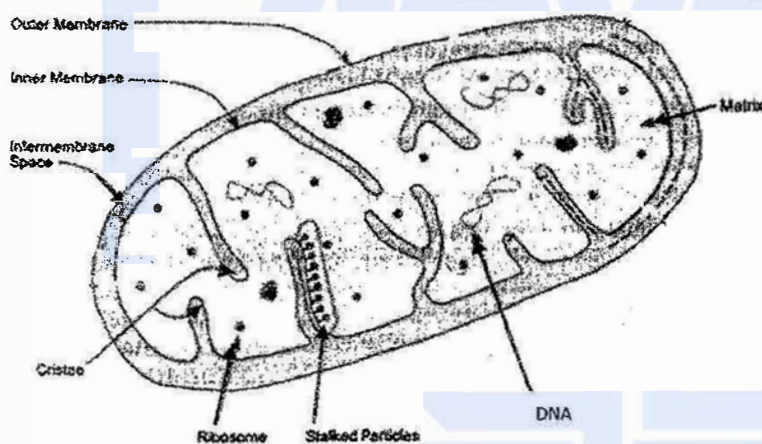


Diagram 1 x 8 = 08

b) Explain the role of mitochondria in cellular respiration

15. Mitochondria is the major organelle in which generation of cellular energy and
16. where Krebs cycle reactions and
17. electron transport chain take place.
18. Krebs cycle takes place in matrix (of mitochondria) and
19. electron transport chain takes place in inner membrane/ cristae (of mitochondria)
20. Pyruvate/pyruvic acid
21. which is the end product of oxidation of glucose
22. in glycolysis
23. enters to mitochondrial matrix.
24. In the presence of oxygen
25. it is converted to acetyl co-enzyme A
26. by enzymes in the matrix
27. producing two NADH molecules and
28. two CO₂ molecules.
29. Acetyl Co-A reacts with Oxaloacetic acid
30. which is a 4C compound
31. to form Citric acid
32. which is a 6C compound

33. by a series of enzymes.
34. Most of the Kreb cycle enzymes are located in the matrix.
35. Citric acid regenerates to oxalo acetic acid
36. producing H^+ /electrons.
37. Those H^+ /electrons are accepted by NAD and
38. FAD
39. to produce 6NADH and
40. 2FADH₂ molecules respectively.
41. Two ATP molecules are produced
42. by substrate level phosphorylation in the matrix of mitochondria.
43. Reduced co-enzymes/ NADH and
44. FADH₂ are oxidized
45. to release ATP by electron transport chain.
46. 34 ATP molecules are produced(in electron transport chain)
47. by (a process known as) oxidative phosphorylation.
48. H^+ /electrons in reduced co-enzymes/ NADH and FADH₂ are finally accepted by molecular oxygen
49. to form water

Any 48 x 3 = 144

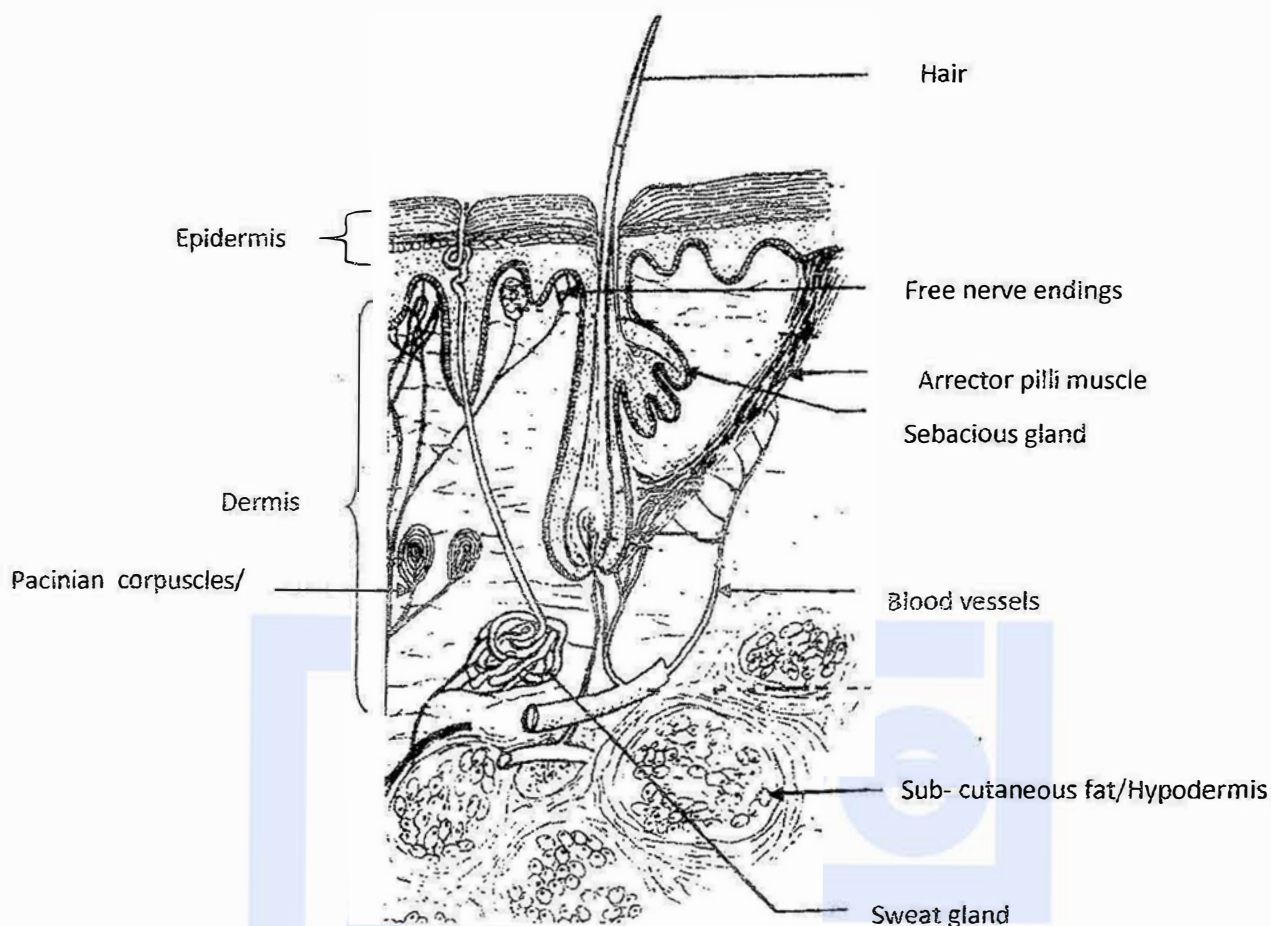
Diagram= 08

Total = 152

Maximum = 150

6. a) Describe the structure of human skin

1. Consists of two main layers /parts.
2. The outer layer is epidermis and
3. the inner layer is dermis.
4. Epidermis consists of stratified squamous epithelium.
5. Cells towards outer region are flattened.
6. Epidermal cells are keratinized/ cornified/ contain keratin.
7. (Some epidermal cells) contain melanin/melanocytes.
8. Lower most layer of epidermis is malpighian layer.
9. Dermis is formed from loose connective tissue/areolar tissue.
10. Dermis contains blood capillaries/ vessels,
11. lymph vessels,
12. nerves,
13. sensory receptors (any named receptor accepted),
14. sweat glands,
15. hair,
16. hair follicles,
17. arrector pilli muscles/hair erector muscles,
18. sebaceous glands and
19. pigmented cells/ melanocytes.
20. Hypodermis/ subcutaneous fat
21. lies below the dermis and
22. consists of areolar tissue and
23. adipose tissue.



Fully labeled correct diagram 1 X 10

(1 mark for each correct labeling)

b) Explain the role of skin in homeostasis

24. When the temperature increases Ruffini corpuscles and
25. free nerve endings are stimulated,
26. Information/ nerve impulses are passed to thermoregulation center of hypothalamus.
27. Heat loss center (in hypothalamus) is stimulated and
28. sweat glands are stimulated (due to impulses from this center)
29. resulting in increased sweating/ increased production of sweat.
30. Evaporation of sweat absorb heat from the skin.
31. Dermal blood vessels/ blood vessels in the skin dilates and
32. enhances blood supply/ flow to skin,
33. and heat loss(from body) increases due to radiation.
34. When temperature reduces Krause's end bulbs and
35. free nerve endings are stimulated and
36. nerve impulses/ information are passed to the heat gain center of hypothalamus.
37. Heat gain center (in hypothalamus) is stimulated (and due to impulses from heat gain center)
38. sweat glands are inhibited
39. production of sweat/ sweating is reduced.
40. This reduces heat loss by evaporation.
41. Blood vessels in the skin constrict and
42. blood supply to the skin is reduced.
43. It reduces the loss of heat by radiation.

44. Contraction of arrector pilli muscles/ hair erector muscles causes some heat production.
45. Excretion of some ions /salts and
46. organic substances
47. contributes to maintain constant internal environment/homeostasis.

$$47 \times 3 = 141$$

Diagram 10

Total = 150

7. a) What are the major materials generally transported in vascular plants?

1. Water
2. Inorganic ions/mineral ions/salts
3. Sucrose/organic food substances
4. Plant growth substances
5. CO₂
6. O₂

b) State the sources of those materials

7. Water from soil solution.
8. Inorganic ions/mineral salts from soil solution.
9. Sucrose/ Organic substances from where they are produced / leaf mesophyll cells/photosynthetic tissues or cells
10. storage organs /tissues.
11. Plant growth substances from synthesizing organs/roots apex/shoot apex /germinating seeds/ young leaves.
12. CO₂ from atmosphere.
13. O₂ from atmosphere or
14. (as a byproduct of) photosynthesis

c) Briefly describe the processes and mechanisms involved in the transport of those materials in vascular plants

15. Water (is absorbed) through root hair cells from soil solution
16. according to the water potential gradient
17. by osmosis
18. by diffusion.
19. Water moves from root hair cells to root xylem
20. through cortical cells, endodermis and pericycle
21. through Apoplast by mass flow
22. and by diffusion
23. through symplast by osmosis
24. and diffusion
25. through vacuolar path by osmosis.
26. From root xylem to upper parts of the plant body water moves through xylem tissue/xylem vessels
27. according to water potential gradient from soil solution to atmosphere through the plant.
28. Adhesive and cohesive forces of water molecules and
29. transpiration pull, facilitates this movement.
30. Water evaporates from aerial parts of the plant body
31. mainly through stomata by diffusion.
32. Inorganic ions/mineral ions are absorbed from the soil solution by root hair cells
33. through active absorption.
34. Dissolved mineral ions move through cortical cells up to the endodermis by
35. symplast, apoplast and vacuolar path.
36. casparian strips of endodermis block the apoplast pathway
37. thereby allowing mineral ions to pass through the symplast

38. where selective absorption occur / only ions that are needed by the plant is allowed to pass through endodermis.
39. Sucrose and
40. other organic substances (produced in mesophyll cells as a result of photosynthesis)
41. are transported through sieve tubes of phloem
42. under hydrostatic pressure gradient
43. passively.
44. by massflow
45. Those substances are actively
46. Loaded to sieve tubes and unloaded from sieve tubes
47. CO₂ from atmosphere enter mainly through stomata
48. O₂ from atmosphere also entered mainly through stomata and
49. as a byproduct of photosynthesis
50. and diffuse into intercellular spaces in leaf mesophyll cells.
51. Those gases diffuse through lenticels / root epidermis

Any 50 x 3 = 150

8. Describe the different non-Mendelian patterns of inheritance with suitable examples

Non-Mendelian patterns of inheritance include

1. Incomplete dominance
2. Co-dominance
3. Gene interactions/Epistasis
4. Polyallelism
5. Polygenic inheritance
6. Gene linkage
7. Sex linkage/ sex linked inheritance

Incomplete dominance

8. Dominance of alleles of a gene is incomplete / partial.
9. Heterozygous F₁ has a different/intermediate phenotype to homozygous parents (with contrasting characters).
10. (Monohybrid) F₂ phenotypic ratio is 1: 2: 1
11. Eg. *Mirabilis* flower colour

Correct diagrammatic representation (points 9 & 10)

Parents	RR (red)	X	rr (white)	
				} (point 9)
F₁			Rr (pink / light red)	
F₂	RR (red)		Rr (pink)	} (point 10)
Phenotypic ratio	1 :		2 : 1	

Gene linkage

40. Genes on the same chromosome are linked
41. Linked genes assort together / do not assort independently.
42. Test crosses are used to determine linkage.
43. Phenotypic ratio of a dihybrid test cross is not equal to 1: 1: 1: 1
44. In test cross progenies, parental types are more common and recombinant types are less frequent.
45. Eg: inheritance of body colour and wing length of *Drosophila*
correct diagrammatic representation (instead of 43)

Testcross parents	GgIi	X	ggii
		↓	
Progeny	GgIi	ggii	Ggii
	Large no. (parentals)		small no. (recombinants)

Sex linkage

46. Shown by genes carried on X chromosome
 47. Character / disease expressed (mostly) in males because they have only one X chromosome
 48. (mostly) due to recessive alleles on the X chromosome.
 49. Character / disease expressed in females when they are homozygous recessive.
 50. Heterozygous females are carriers / inherited from mother to son
 51. Eg human colour-blindness / haemophilia
- Correct diagrammatic representation (points 48,49, &50)

Parents	$X^H X^h$	X	$X^h Y$
		↓	
Progeny	$X^H X^h$ carrier (50)	$X^H Y$ Normal	$X^h X^h$ affected female (49)
			$X^h Y$ affected male (48)

Any 50 x 3= 150

9. a) Describe the nature of normal microbiota of the human body

1. Microorganisms inhabiting in various parts of the body of a normal healthy person is called normal microbiota.
2. In healthy humans the internal tissues/ blood, brain, muscles, liver, lungs are normally free of microorganisms
3. A healthy foetus in uterus is free of microorganisms.
4. During birth the infant is exposed to vaginal microorganisms.
5. Within few hours of birth the infant starts developing the normal microbiota.
6. Healthy human body is inhabited by a large number of microorganisms,
7. which includes bacteria,
8. yeasts and
9. filamentous fungi.
10. Normal microbiota is found on skin,
11. nose/ nasopharynx,
12. mouth,
13. upper respiratory tract,
14. gastrointestinal tract,
15. genitourinary tract.
16. Most of these organisms are generally harmless and

17. are commensals,
18. and they prevent/ suppresses establishment/entry of pathogens/ help to maintain health of human body.
19. Normal flora induces antibody production raising the immune status of host against pathogens,
20. synthesize vit.K/ several B groups of vitamins.
21. They become pathogens when immunity is lowered.

b) Explain the properties of pathogenic bacteria that contribute to their disease causing ability

22. Invasiveness
23. Ability to invade human cells/tissues
24. Ability to enter at the appropriate portal of entry
25. Ability to colonize
26. Several extracellular enzymes produced by the pathogens contribute to invasiveness.
27. Phospholipase
28. destroys animal cell membranes.
29. Lecithinase
30. hydrolyses lecithin component of cell membrane.
31. Hyaluronidase
32. destroys body tissues by attacking hyaluronic acids cementing substance between cells
33. Toxicogenicity;
34. ability to produce toxins
35. that destroys normal functions of cells.
36. Endotoxins
37. are thermostable
38. lipopolysaccharides.
39. Ex; *Salmonella typhi*
40. Exotoxins
41. are thermolabile
42. Proteins
43. Neurotoxins
44. interfere with normal transmission of nerve impulses
45. Ex: *Clostridium tetani*
46. Enterotoxins
47. affects gastrointestinal functions
48. Ex: *Vibrio cholerae*
49. Cytotoxins
50. kills host cells by enzymatic attack
51. Ex: *Corynebacterium diphtheriae*

Any 50 x 3= 150

10. Write short notes on the following

a) DNA fingerprinting and its applications

1. Identifying individuals based on DNA/nucleotide sequence variation
2. at mini satellite/ microsatellite loci.
3. These are short (tandem) repeat sequences/ units (found throughout genome).
4. The number of repeat sequences / units vary between individuals.
5. Therefore DNA profile/fingerprint is unique to an individual
6. except in identical twins.

The main steps in DNA fingerprinting

7. Isolate sample DNA
8. Digest / cut the DNA with restriction endonuclease enzymes
9. Separate DNA fragments by
10. gel electrophoresis
11. Transfer / blot DNA to nitrocellulose membrane/ Southern blot,
12. Hybridize with labeled probe,
13. Visualize DNA profile/ finger print (after staining/ autoradiography)

Applications of DNA fingerprinting

14. Forensic work/ identifying criminals
15. Parentage testing / relatives identifying

b) Implantation of human embryo

1. Zygote passes down fallopian tube,
2. divides mitotically,
3. forms a mass of cells/ morula.
4. Cells of morula rearrange
5. to form a hollow ball of cells
6. called blastocyst,
7. with a fluid filled cavity
8. called blastocoel
9. which is lined with a single layer of cells
10. called tropoblast.
11. Tropoblast villi develop and
12. attach to endometrium.
13. Implantation commences by 7th day after fertilization and
14. lasts for 8 days/ completes by 14th day.

c) Modes of heterotrophic nutrition

Three types of heterotrophic nutrition

1. Saprotrophic
2. Holozoic
3. Symbiotic

Saprotrophic

4. Dead/ decaying organic matter is used,
5. by extracellular digestion/secrete enzyme on to the food
6. Ex: Fungi / Bacteria

Holozoic

7. Food is ingested into their alimentary canal
- consists of
8. Ingestion,
9. Digestion,
10. Absorption,
11. Assimilation,
12. Ejection.

Symbiotic

13. Association of organisms of two species

three types of symbiotic nutrition

14. Mutualism, which is
15. beneficial to both partners.
16. Ex: legume root nodule and *Rhizobium*
17. Commensalism, which is
18. beneficial to one and does not affect the other.
19. Ex: Sea anemone and hermit crab/ Ephyphytes/ orchids and plants
20. Parasitism, which is
21. beneficial to one and harmful to other.
22. Ex: *Plasmodium* and man/ *Necator americanus* and man / *Cuscuta* and host

$$15+14+22 = 51$$

$$\text{Any } 50 \times 3 = 150$$

