G.C.E.(A.L.) Support Seminar - 2015
Biology - Paper I
Answer Guide

Question No.	Answer	Question No.	Answer
(1)	2	(26)	5
(2)	2	(27)	2
(3)	4	(28)	4
(4)	2	(29)	2
(5)	3	(30)	5
(6)	1	(31)	5
(7)	4	(32)	4
(8)	5	(33)	4
(9)	4	(34)	1
(10)	4	(35)	5
(11)	1	(36)	1
(12)	1	(37)	3
(13)	4	(38)	3
(14)	2	(39)	5
(15)	3	(40)	4
(16)	2	(41)	4
(17)	3	(42)	3
(18)	3	(43)	1
(19)	1	(44)	4
(20)	2	(45)	5
(21)	3	(46)	3
(22)	3	(47)	4
(23)	1	(48)	3
(24)	3	(49)	1
(25)	5	(50)	2

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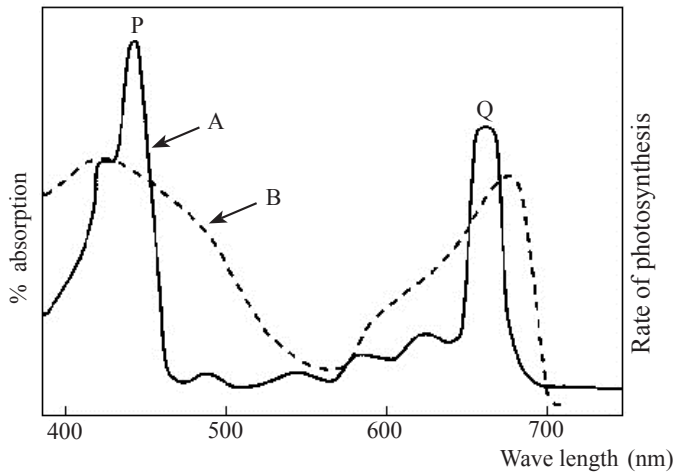
Answer Guide

Part A - Structured Essay

1. (A) Following two graphs are related to the process of photosynthesis.



(i) Name graphs denoted by A and B

A - Absorption spectrum of chlorophills B - Action spectum of photosynthesis

(2 × 2)

(ii) What are the colours of visual region of spectrum which are compatible to peaks P and Q of graphs A ?

P - Bule Q - Red **(2 × 2)**

(iii) What are the important conclusions can be obtained regarding the process of photosynthesis by above graphs ?

- ⋆ photosynthetic pigments absorb light rays in wave length of blue and red range of visual spectrum
- ⋆ The rate of photosynthesis is maximum in blue and red wave lengths
- ⋆ Therefore, the light energy, absorbed by photosynthetic pigments directly participate in the photosynthesis **(3 × 2)**

(iv) Name the primary electron donar and final electron acceptor of non-cyclie photophosphorylation

Primary electron donar - H_2O / water

Final electron acceptor - NADP / $NADP^+$ **(2 × 2)**

(v) Complete the table given below based on C_3 and C_4 photosynthesis

		C_3	C_4
(a)	**Initial CO_2 acceptor**	RUBP / Ribulose bis phosphate	PEP / Phospho Enol Pyruvate
(b)	**Site / sites of CO_2 fixation**	Stroma of chloroplast	• In the cytoplasm of leaf mesophill cell • In the stroma of bundle sheath chloroplasts
(c)	**First stable product**	PGA / Phspho giycerate / phospho Glyceric Acid	Oxaio acetate / Oxalo Acetic Acid

(7 × 2)

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(B) (i) What is an enzyme ?

Glolbular proteins, which catalyze bio chemical reactions, being synthesized naturally in living cells **(1 × 2)**

(ii) (a) What is meant by enzyme co-factors ?

Non proteinous components, required to enhance the catalytic ability of some enzymatic reaction **(1 × 2)**

(b) Name three enzyme co-factors and state an example for each.

Type of enzyme co-factor	Example
coenzymes	ATP / NAD / NADP / Coenzyme A / FAD
prosthetic group	Haem / biotin
inorganic ions	Cl^- / Mg^{+2} / Zn^{+2} / Mn^{+2} / Cu^{+2} **(6 × 2)**

(iii) Which property of an enzyme is shown by the Lock and Key mechanism of enzyme reaction ?

The substrate specificity of the enzyme **(1 × 2)**

(iv) State the functions of following enzymes.

Enzyme		Function
a) **Lysozyme**	-	destroying bacterial cell walls / cells
b) **Phospholipase**	-	destroying animal cell membranes / destroy the lipid component of cell membrane
c) **Cholin-esterase**	-	hydrolysing acetylcholine **(3 × 2)**

(v) State a species of micro organism used in commercial production of following enzymes.

Enzyme	Species of micro organism
a) **Amylase**	*Aspergillus niger / A. oryzae / Bacillus subtilis*
b) **Protease**	*Aspergillus oryzae*
c) **Invertase**	*Saccharomyces cerevisiae* **(3 × 2)**

(C) (i) (a) What is binomial nomenclature ?

Naming a species by two terms as generic name and specific epithet **(1 × 2)**

(b) State three important rules in binomial nomenclature.

- ⋆ Should be written in English / Roman letters
- ⋆ Generic name should be written initiating by a capital letter and the remaining part in simple letters
- ⋆ Should be underlined when hand written and italicized while printing
- ⋆ The same name should not be given for two species **(any 3 × 2)**

(ii) Name the sexual spore type of following fungi.

Fungi		Type of sexual spore
a) *Allomyces*	-	zoospores
b) *Agaricus*	-	Basidiospores
c) *Aspergillus*	-	Ascospores **(3 × 2)**

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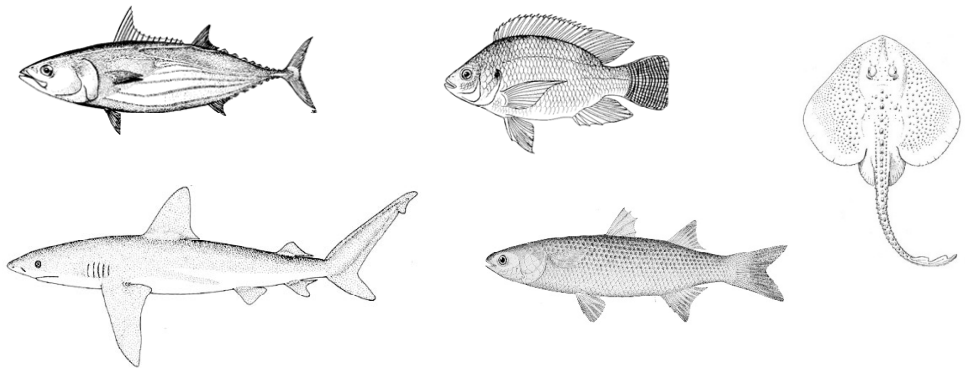
(iii) Following pictures represent fishes, Shark, Tuna, Tilapia, Ray and Grey mullet. Complete the given dichotomous key to identity those fish.



1.	Heterocercal caudal fin is present	2
	Heterocercal caudal fin is absent	3
2.	Body is dorsoventrally flattened	skate
	Body is not dorsoventrally flattened	shark
3.	Continuous dorsal fin is present	Thilapia
	Continuous dorsal fin is absent	4
4.	Longitudinal bands are present in belly region	Tuna
	Longitudinal bands are absent in belly region	Grey mullet

(8 × 2)

(iv) State the phylums of kingdom protista in which multicellular organisms are included.

Phaeophyta, Rhodophyta, Chlorophyta **(3 × 2)**

(v) State three unique external characteristic features of animals in phylum Echinodermata, which help to identify them ?

- ⋆ Pentaradial symmetry
- ⋆ tube feet
- ⋆ Pedicellaria
- ⋆ Ambulacral groves
- ⋆ madreporite

(any 3 × 2)

(any 50 × 2 = 100 marks)

2. (A) (i) What are the essential characteristic features of a respiratory surface for efficient gaseous exchange ?

- ⋆ Should be moist
- ⋆ should be permeable to respiratory gases
- ⋆ should be thin surface
- ⋆ should possess a high surface area
- ⋆ should possess a good blood supply (should be highly vascularized)

(5 × 2)

(ii) What is the respiratory structure of millipedes and centipedes ?

Trachea **(1 × 2)**

(iii) Millipedes and Centipedes lack respiratory pigment in their blood. What is the reason ?

Oxygen can be obtained by simple diffusion directly, because of tracheal system is extended up to the cells of internal tissues **(1 × 2)**

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(iv) Name two major types of cells which line wall of respiratory tract of man.

- ⋆ Ciliated columnar epithelial cells
- ⋆ goblet cells **(2 × 2)**

(v) Name two major unfavorable components in cigarette smoke and state an effect of each.

	Components	**Effect**
a)	Carbon monoxide	Oxygen transportation in blood is affected / reduced
b)	Nicotine	Temporary increase of rate of heart beat / temporary increase rise of blood pressure

(4 × 2)

(vi) Respiratory disorders may cause due to some industries other than smoking. Name two such disorders.

- ⋆ Asbestosis
- ⋆ Silicosis
- ⋆ Asthma (Wheezing) / bronchitis **(any 2 × 2)**

(B) (i) What is the significance of co-ordination in animals ?

- ⋆ To maintain a constant internal environment in animal's body / homeostatis
- ⋆ To confirm the exixtance of animals by responding to stimuli **(2 × 2)**

(ii) What are the two systems important in co-ordination of animals.

- ⋆ Nervous system
- ⋆ Endocrine system **(2 × 2)**

(iii) State three major differences between co-ordination of those two systems.

Nervous	Endocrine
⋆ rapid conduction	slow conduction
⋆ electrical and chemical transmission	chemical transmission only
⋆ localized response	diffused response
⋆ instant response	prolonged response
⋆ possess a specific conduction path	no specific conduction path

(any 3 × 2)

(iv) What is the contribution of blood circulatory system in co-ordination of animals ?

Hormones in chemical coordination are transported from endocrine glands to target organs through blood / Keeping physiological relationship between organs maintain an optimum chemical environment in nervous system to proper nerve conduction. **(1 × 2)**

(v) (a) What is meant by resting potential of a neuron ?

The potential difference between either sides of the membranes of a neuron / axon when an impulse is not transmitted **(1 × 2)**

(b) What are the factors on which resting potential is based ?

- ⋆ The concentration difference of specific ions in cells relatively to extra cellular fluid
- ⋆ The selective permeability of plasma membranes for Na^+, K^+
- ⋆ Na^+, K^+ Pump **(3 × 2)**

(c) Name the ion which is responsible for deporlarization stage during action potential.

Na^+ **(1 × 2)**

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(d) State two functions of cerebellum of man.

- ⋆ Coordination of voluntary muscle movements / muscle tone
- ⋆ Maintaining the body posture and balance **(2 × 2)**

(C) (i) What is a receptor ?

a specific body organ/ structure used in perception of stimuli **(1 × 2)**

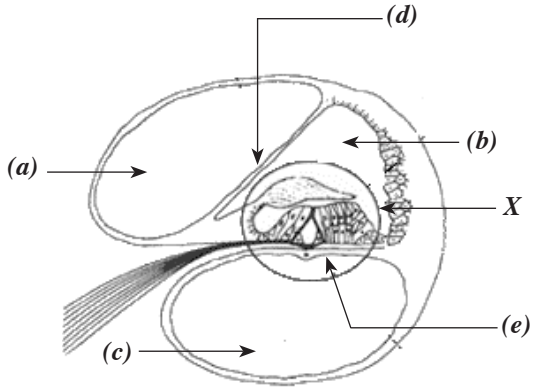
(ii) What are the features of receptors ?

- ⋆ Structure which is designed to receive specific stimuli
- ⋆ Act as transducers
- ⋆ Consist of special types of cells
- ⋆ always connected with the nervous systems
- ⋆ contain sensory receptor cells which respond to minimum threshold level
- ⋆ able to adapt when act continuously **(6 × 2)**

(iii) Name the types of receptor / receptors in human skin which are sensitive to following stimuli.

Heat	-	Ruffini bodies
		Krause end bulbs
		free nerve endings
Touch	-	Meissners corpuscles
		Merkel' discs
		free nerve endings
Pressure	-	Pacinian corpuscles **(7 × 2)**

(iv) Name following structure and label the parts (a) - (e) in the diagram given below.



(a) - Vestibular canal

(b) - cochlear canal

(c) - tympanic canal

(d) - Reisner's membrane/ vestibular membrance

(e) - basillar membrane **(5 × 2)**

Name above diagram - Transverse section of human cochlear **(1 × 2)**

(v) What is the part named as ' X ' in the above diagram ?

organ of corti **(1 × 2)**

(any 50 × 2 = 100 marks)

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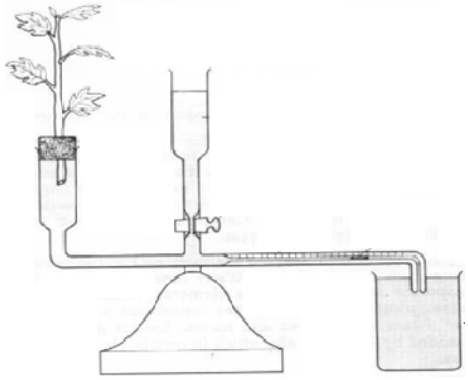
3. (A) Diagram given below is an apparatus used in laboratory.



(a) (i) What is this apparatus ?

potometer (ganong) **(1 × 2)**

(ii) What are the precautions which should be considered when this apparatus is set up ?

- ⋆ Cutting the twig under water
- ⋆ fixing the twig to potometer in water
- ⋆ making the water filled apparatus air tight **(3 × 2)**

(iii) State an important assumption you make when measure the rate of transpiration using above apparatus

amount of water absorbed by the twig is equal to the water evolved by transpiration **(1 × 2)**

(iv) How to supply different conditions to above apparatus in the laboratory, when examining the variations of transpiration rate according to the changes of environmental factors like wind and humidity.

Wind - keeping the apparatus in still air and exposing it to wind / keeping under the rotating fan

Humidity - Keeping the apparatus in normal environment and covering the twig with air tighten polythene bag **(2 × 2)**

(v) State how the rate of transpiration change under following conditions.

Increase of temperature - increase the rate of transpiration

Increase of humidity - decrease the rate of transpiration **(2 × 2)**

(vi) Explain is the reason for change of transpiration rate with the increase of wind ?

- The diffusion shells are removed rapidly under increased wind and
- leads to increase of transpiration **(2 × 2)**

(b) (i) Guttation and transpiration are two methods of water loss from plants. Mention two differences of water, excluded in above two methods.

- ⋆ water emits in liquid state in guttation but in vapour state in transpiration
- ⋆ water exit with salts in guttation but salt free water is emitted in transpiration

(2 × 2)

(ii) Why guttation can be seen only in some plants ?

- ⋆ In herbaceous plants with hydathodes
- ⋆ guttation takes place by not pressure **(2 × 2)**

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(B) (i) (a) What is meant by nitrogenous excretion in animals ?

Removal of nitrogenous metabolic wastes from the body **(1 × 2)**

(b) State the ascending order of different nitrogenous excretory products according to the loss of water, during the excretion of animals.

uric acid, urea, amonia **(1 × 2)**

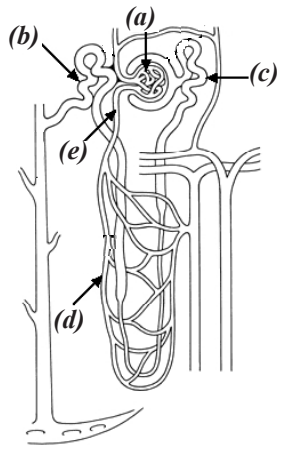
(ii) State the major excretory structures of man.

kidneys, lungs, skin **(3 × 2)**

(iii) Name primary excretory products synthesized in human body.

CO_2, H_2O, NH_3 **(3 × 2)**

(iv) (a) The diagram below is the structure of uriniferous tubule of man. Name the parts (a) - (e) in the diagram.



(a) - glomerulus
(b) - distal convoluted tubule
(c) - proximal convoluted tubule
(d) - peritubular capillary net
(e) - efferent arteriole **(5 × 2)**

(b) State one major difference between *(a)* and *(d)* in above diagram.

(a)	*(d)*
⋆ is located in between two arterioles	⋆ is located in between an arteriole and venule
⋆ originated and terminated by arterioles	⋆ originated by an arteriole and terminated by a venule

(1 × 2)

(c) What is the part in human nephron which is always impermeable to water ?

the ascending limb of loop of Henle **(1 × 2)**

(d) What is the part in nephron which becomes permeable to water in the presence of ADH ?

distal convoluted tubule **(1 × 2)**

(v) Name three components contained in glomerular filterate of healthy man which are not found in urine

Glucose
amino acid
HCO_3^- ions **(3 × 2)**

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(C) (i) What is the overall role of the circulatory system of animals ?

Transportation **(1 × 2)**

(ii) Why development of a circulatory system was required in animals during evolution ?

- ⋆ The size and complexcity of animals increased during evolution
- ⋆ energy requirements increased in animals
- ⋆ amount of transportive materials increased
- ⋆ transportive distance increased
- ⋆ because of transportation by diffusion was not sufficient circulatory system was developed. **(5 × 2)**

(iii) State two major differences between close circulation and open circulation.

Close circulation	Open circulation
⋆ blood is circulated within vessels	⋆ blood is circulated through a hacmocoel
⋆ materials are exchanged via capillary walls	⋆ materials are exchanged directly because organs are bathing in blood

(2 × 2)

(iv) (a) State four adaptations of human erythrocyte related to oxygen transportation.

- ⋆ biconcave disc shape / presence of a high surface area
- ⋆ absence of nucleus
- ⋆ presence of hemoglobin in the cytoplasm
- ⋆ absence of mitochondria **(4 × 2)**

(b) What is the most abundant enzyme in human erythrocyte ?

Carbonic anhydrase **(1 × 2)**

(c) What is the hormone which stimulates the production of erythrocytes in man ?

Erythropoietin **(1 × 2)**

(v) Mention how to differentiate human neutrophill and monocyte.

neutrophills	monocytes
⋆ nucleus with 3-5 lobes	⋆ kidney shaped nucleus
⋆ granular cytoplasm	⋆ agranular cytoplasm **(2 × 2)**

(50 × 2 = 100 marks)

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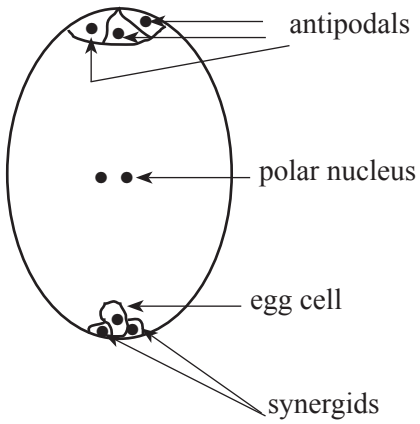
4. (A) (i) What is meant by cross-pollination ?

Deposition of the pollen of a flower on the stigma of a different flower of the same plant or a different plant of the same species. **(1 × 2)**

(ii) What is the advantage of cross-pollination ?

- ⋆ shuffling of genes
- ⋆ increasing new genetic variations **(2 × 2)**

(iii) Draw a labelled diagram of female gametophyte / embryo sac of Anthophyte.



(labelling 4 × 1 = 4)

(iv) Describe the process of double fertilization takes place in the reproductive process of Anthophytes.

- ⋆ within the embryo sac of Anthopytes
- ⋆ one male gamate of male gametophyte fuses with egg cell and
- ⋆ other male gamate fuses with the secondary nucleus at the same time **(3 × 2)**

(v) State four post-fertilization changes occur in Anthopyte ovule.

- ⋆ egg cell ⟶ zygote / embryo
- ⋆ secondary nucleus ⟶ primary endosperm nucleus / endosperm
- ⋆ integument of ovule ⟶ seed coat
- ⋆ ovule ⟶ seed **(4 × 2)**

(vi) What is seed dormancy ?

even when water, oxygen and suitable temperatures are provided / required factors are supplied to a live seed, the germination of it doesn't occur **(1 × 2)**

(vii) What is the importance of seed dormancy ?

- ⋆ can avoid unfavorable environmental conditions
- ⋆ preventing germination of seed within the fruit **(2 × 2)**

(B) (i) Explain following terms.

Pure line - maintaining the qualitative genetic factors unchanged, when propagated repeatedly by self pollination **(1 × 2)**

Homologous chromosomes - morphologically similar chromosomes in a diploid nucleus which pair up during meiosis **(1 × 2)**

Codon - three consequetive bases of DNA / mRNA strand, which symbolize specific amino acid in protein synthesis **(1 × 2)**

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(ii) State two similarities seen in genetic factors which mentioned by Mendal and behavior of chromosomes during reproduction and cell division.

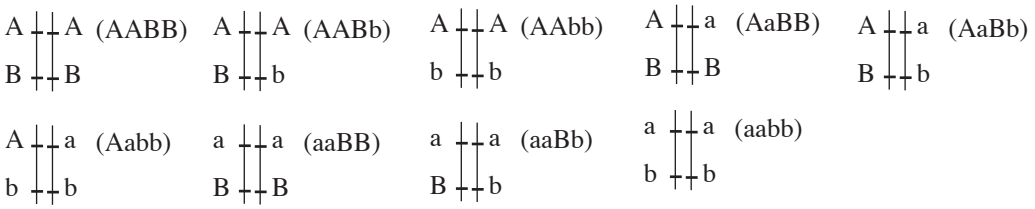
- ⋆ genetic factors in organisms exist as pairs. In a diploid nucleus chromosomes exist as homologous pairs.
- ⋆ pairs of factors segregate during reproduction while pairs of homologous chromosomes segregate in meiosis
- ⋆ each gamete contains only one genetic factor of a pair as well as it contains only one chromosome of a pair
- ⋆ In the fusion of gamates, the zygote is given with two factors as well as a pair of homologous chromosomes **(any 2 × 2)**

(iii) Name the following non-mendalian patterns of inheritance and state the F_2 phenotype ratio result in relevant crosses.

	Pattern of genetics	F_2 phenotype ration
a) **An allele of a gene is not completely dominant over the other**	Incomplete dominance	1 : 2: 1
b) **Suppress the action of dominant gene in both loci by double recessive alles of another gene.**	recessive epistasis	9 : 7
c) **Suppress the action of a dominant gene by another dominant gene.**	dominant epistasis	13 : 3

(6 × 2)

(iv) Assume A and B are linked genes in a sexually reproducing population. They became a and b respectively being mutated in a certain ratio. What are the genotypes would be expected in next population ?



(9 × 1)

(v) State how the genetic variations occur according to the following theories.

(a) Lamark's theory - organisms acquire adaptations during their life time according to the needs of the environment **(1 × 2)**

(b) Darwin's theory - randomly / spontaneously **(1 × 2)**

(vi) State three factors which disturb the Hardy-Weinberg equlibrium in most populations.

- ⋆ non-random mating
- ⋆ occurrence of mutations
- ⋆ occurrence of selection
- ⋆ occurrence of migration / immigration and emigration
- ⋆ being a small population **(any 3 × 2)**

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(C) (i) The measured amount of energy of an ecosystem is given in Kilo Jules, per square meter, per year as following.

Total solar energy = 4.71×10^8

Net primary productivity = 4.95×10^6

Respiration of primary producers = 0.88×10^6

(a) State two major functional features of an ecosystem

- ⋆ recycling of matter
- ⋆ unidirectional flow of energy **(2 × 2)**

(b) What is meant by net primary production of an ecosystem ?

The amount of biomass produced by primary producers by a unit area within a unit time **(1 × 1)**

(c) Theoretically, what is the amount of total energy gained by heterotrophs of above mentioned ecosystem ?

4.95×10^6 $KJm^{-2}yr^{-1}$ **(1 × 2)**

(d) Calculate the precentage of fixed the energy out of incident energy of above ecosystem

Total energy fixed $= 4.95 \times 10^6 + 0.88 \times 10^6$ $= 5.83 \times 10^6$ $KJm^{-2}yr^{-1}$

Amount of energy fixed $= \frac{5.83 \times 10^6}{4.71 \times 10^8} \times 100$ $= 1\%$

(2 × 2)

(ii) What is meant by "bio diversity hotspot" ?

The areas with high concentrations of endemic species (with high bio diversity) exceptional levels of threats. **(1 × 2)**

(iii) What are the expected objectives of " bio diversity convention" ?

- ⋆ conservation of bio diversity
- ⋆ sustainable use of its components
- ⋆ fair and equitable sharing of benefits arising from the use of genetic resources. **(3 × 2)**

(iv) (a) What is meant by the term "extinction of species" ?

elimination of the last member of a species from the earth **(1 × 2)**

(b) What is the evolutionary importance of the process of extinction ?

it makes room for new species **(1 × 2)**

(c) State the period of last catastrophic mass extinction occurred in bio diversity hitory and name two groups of organism that have been extincted in that period.

Period of extinction	**Group of organism**
Cretaceous	Ammonites
	Dinosaurs

(3 × 2)

(44 × 2 = 88)

(4 + 9 = 13)

(88 + 13 = 101)

(maximum 100)

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Part B - Essay

5. "Water is an essential component for life". Discuss the importance of water to living organisms relating the physical and chemical properties.

1. Because of water is a liquid at room temperature;
2. it is a major component in protoplasm
3. and it is the medium of protoplasm
4. Because of water is a polar molecule
5. It is a powerful solvent
6. Therefore most of the materials get dissolved in protoplasm and cell sap
7. and metabolic reactions of the cell also take place is an aqueous medium
8. water is a reactant in some biochemical reactions
9. eg: in photosynthesis

   $6\,CO_2 + 6\,H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
10. in hydrolytic reactions

    starch $+ H_2O \longrightarrow$ maltose
11. Due to high cohesive and adhesive forces of water
12. Contribute in maintaining the turgidity of cells
13. In enlargement of cells
14. in the mechanical support of herbaeceous plants
15. in turgor movements
16. in the movements of guard cells
17. in blooming of flowers, this property is important
18. in translocation and
19. ascent of sap
20. in the absorption of minerals and water from soil solution.
21. Due to high specific heat capacity of water
22. it resists to change its temperature when a considerable amount of heat is absorbed or lost
23. therefore, it helps to maintain the body temperature of poikilotherms within a narrow range
24. Due to high surface tension of water
25. water skaters
26. like aquatic insects are provided with a habitat on the water surface.
27. Due to high latent heat of vaporization.
28. in sweating and
29. transpiration of plants
30. Cooling of body surfaces take place
31. Due to high latent heat of fusion,
32. a large amount of heat should be dissipated to the environment for water bodies to freeze.
33. Therefore water will not freeze easily within the cells and in water bodies
34. Due to anomalous expansion of water in freezing,

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35. water bodies will not freeze completely, ice formed on top and liquid water remains at the bottom and it floats on water
36. therefore aquatic organisms are capable of surviving during winter in polar region
37. Due to transparency of water
38. light is allowed to penetrate easily through it
39. Therefore algae and aquatic plants are able to grow in a considerable depth of water bodies

(any 38 points 38 x 4 = 152)
(maximum 150)

6. (a) Describe the location, gross structure and tissue organization of human stomach.

1. Just below the diaphragm
2. In abdominal cavity
3. Located in upper left and middle part
4. J shaped
5. muscular sac like structure
6. median lesser curvature and lateral greature curvature can be seen
7. At proximal end, oesophagous opens to it.
8. Cardiac orifix / Cardiac spincter is located at there
9. Stomach opens to duodenum at distal end.
10. Pyloric spincter/ Pyloric orifix is located at there

Stomach consists of four major parts.

11. Cardia
12. Fundus
13. Body
14. Pylorus
15. Outer surface of stomach is smooth
16. When stomach is empty, ruge are formed on the inner surface
17. Which are longitudinal and
18. temporary foldings
19. gastric pits are present in between them
20. stomach is covered by peritoneum
21. there are four major tissue layers in the wall
22. outer most layer is serosa
23. consists of fibrous connective tissue
24. inner to serosa is the musularis externa
25. it consists of three layers of smooth muscles
26. outer longitudinal muscle layer
27. middle circular muscle layer
28. Inner oblique muscle layer
29. In between longitudinal and circular muscle layers Auerbach's nerve plexus is present
30. Inner to musclaris externa is sub mucosa

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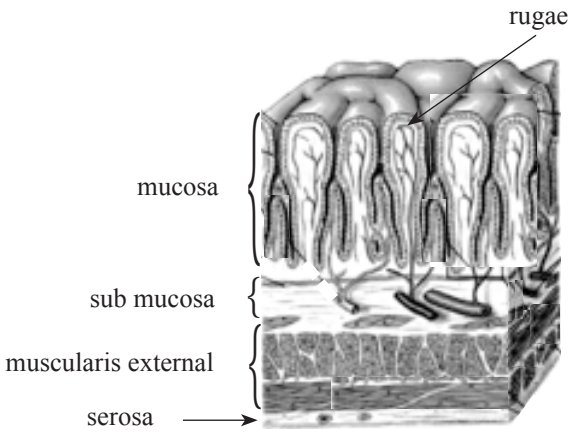
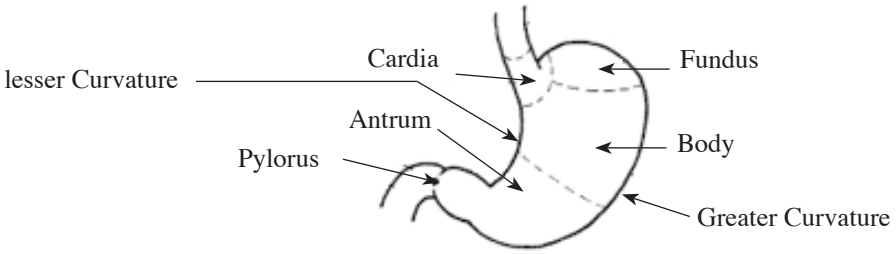
31. It consists of blood vessels, lymph vessels and nerve fibers
32. it is a loose connective tissue
33. In between muscularis externa and sub mucosa, Meissner's nerve plexus is present
34. Inner to sub mucosa is mucosa
35. mucosa consists of muscularis mucosa,lamina propria and epithelium
36. Muscularis mucosa consists of smooth muscles
37. Lamina propria, which consists of blood vessels, lymph vessels, nerves, collagen and elastin fibers and ect.
38. Lamina propria is a loose connective tissue
39. Lumen of the stomach is lined by simple columnar epithelium
40. Gastric glands are located in the lamina propria



(Diagram 05 marks)



(Diagram 05 marks)

(b) Explain the functions of human stomach.

41. Stores food temporary
42. Secrete gastric juice which initiate the digestion of proteins
43. Mechanical digestion/ Further breakdown of food by the movements due to contraction of muscle layers in muscularis externa
44. Formation of chyme/ liquifies the food by proper mixing it with gastric juice
45. Control the releasing chyme to the duodenum
46. Absorption of some drugs, alcohol & water
47. Synthesis of hormone gastrin/ endorcrine function

(47 × 3 = 141)
(Diagrams 2 × 5 = 10)
151
(maximum = 150)

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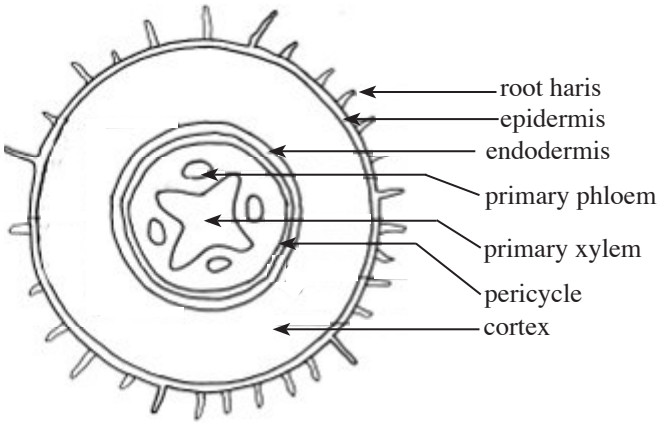
7. (a) Describe the tissue structure of a primary dicot root



The cross section of the dicot root.

(completely labeled diagram 10 marks)
(partially labeled diagram 05 marks)
(unlabeled diagram 03 marks)

1. The outermost single cell layer of root is the epidermis
2. root hairs are present on the epidermis
3. cortex is located inner to epidermis
4. cortex consists of several layers of parenchyma cells
5. Endodermis is the innermost boundry of cortex
6. Endodermis is single layered
7. radial and tangential / lateral walls of endodermal cells are suberinized / possess casparian stripes.
8. When matured inner tangential walls also become suberinized
9. cells in which inner tangential walls aren't thickened
10. are knows as passage cells
11. Pericycle is located inner to endodermis
12. Pericycle is made of parenchyma cells
13. Vascular bundles of roots are radial
14. xylem is exarch
15. there are 4-5 bundles of xylem and phloem
16. the pith is reduced / absent in the dicot root

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(b) Explain the transportion of soil water up to root xylem with underline principles.

17. Due to dissolved substances in the cell sap of root hair cells.
18. the water potential is low in root hair cells.
19. water potential in soil solution is relatively higher.
20. water enters to root hair cell from soil solution,
21. along water potential gradient
22. by osmosis
23. water move across cortex up to endodermis via three pathways
24. **appolast pathway**
25. across the system of intercellular spaces and
26. interconnected cell walls
27. water moves by diffusion and
28. mass flow from cell to cell
29. **symplast pathway**
30. the interconnected network of cytoplasm of the whole plant
31. consists of plasmadesmata, connects the cytoplasms of adjacent cells which pass through the pits in cell walls.
32. water enter by osmosis
33. and pass by diffusion
34. from one cytoplasm to the next.
35. **vacuolar pathway**
36. water moves from vacuole to vacuole between cells.
37. by osmosis
38. through tonoplast, cytoplasm
39. cell membrance, cell wall
40. casparian stripes in endodermis
41. obstruct the apoplast path
42. therefore water moves to pericycle across endodermis
43. by symplast and
44. vacuolar pathway
45. water cross the pericycle through all three pathways
46. and enter in to the xylem through apoplast
47. water moves from root hair cells/ epidermal cells to the xylem along water potential gradient

(47 × 3 = 141)
(Diagram 10 + 141 = 151)
(maximum 150)

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8. State the hormones released by the pituitary gland of man and describe the role of each.

1. Anterior pituitory produces and release hormones such as secreted by anterior pituitary of man are Such as
2. Growth hormone / GH
3. Thyroid Stimulating Hormone / TSH
4. Adreno Cortico Tropic Hormone / ACTH
5. Follicle Stimulating Hormone / FSH
6. Luteinizing Hormone / LH
7. Prolactin Hormone

Growth Hormone / GH

8. Promote Protein Synthesis
9. there by stimulate the growth of body tissues (mainly muscles and bones)
10. Secretion of growth hormone in large quantities cause gigantism in young stages
11. and small quantities cause dwarfism

Thyroid stimulating Hormone / TSH

12. Stimulate the growth and activity of thyroid gland
13. Stimulate the production and release of Thyroid Hormones / Thyroxin (T_3/ Tri iodothyronin ,T4)

Adreno Cortico Tropic Hormone / ACTH

14. Stimulate the synthesis and release of adreno cortical hormones / glucocorticoides

Follicle Stimulating Hormone / FSH

15. Stimulate the Spermatogenesis in seminiferous tubules in males
16. Stimulate growth and maturation of follicles in females
17. Stimulate the secretion of oestrogen by ovaries in females

Luteinizing Hormone / LH

18. Stimulate leydig / Interstitial cells of males
19. to secrete testosterone
20. Stimulate / triggers ovulation in females
21. by maintaining corpus luteum
22. Stimulate the secretion of oestrogen and
23. Progesteron

Prolactin

24. Stimulate the production of milk in milk glands
25. Secretion of prolactin in pregnant women is inhibited by high concentration of progesterone in blood
26. TSH, ACTH, FSH and LH are tropic hormones
27. Secretion of hormones by anterior pituitary is regulated by hypothalamous
28. Posterior Pituitary releases two hormones which are produced by hypothalamous
29. Antidiuretic hormone / ADH
30. Oxytocin

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ADH / Antidiuretic Hormone

31. Secretion is stimulated by increase of blood osmotic pressure
32. ADH increases the permeability of the walls of distal convoluted tuble of nephron and
33. wall of collecting duct to water
34. increases the resorption of water from glomerular filterate there by produce hypertonic / concentrated urine

Oxytocin

35. Stimulate the smooth muscles in uterus in parturition
36. by the stimulation of stretch receptors in uterine wall
37. Secretion of oxytocin is stimulated
38. oxytocin stimulate the contraction of smooth muscles in milk glands
39. there by stimulate the release of milk during suckling

(any 38 × 4 = 152)
(maximum 150)

9. *(a)* What are solid waste ?

1. organic wastes degrade rapidly such as,
2. plant materials
3. food wastes
4. and wastes which do not degrade rapidly such as
5. polythene
6. glass
7. paper
8. plastic are considered as solid wastes

***(b)* What are the environmental problems created by open dumping of solid waste ?**

9. it develops mosquito breeding grounds
10. produce bad smell due to anaerobic decomposition of waste,
11. methane is the major product of anaerobic decomposition of waste
12. methane is hazardous because it is explosive
13. spreading out of insects/provide breeding grounds for insects
14. spreading out of rodents / provide breeding grounds for rodents
15. ground water can be polluted / Contaminated water mixed with ground water

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(c) **Describe the current methods used in managing solid waste.**

16. **Separation and recycling**
17. household organic wastes / kitchen scrapes, plant cuttings, plastic, glass and papers are collected in separate containers
18. paper products and
19. glass are recycled for further use
20. **Decomposition of organic matter**
21. biological composting is done
22. using digestion processes
23. of plant matter
24. and food scrapes
25. resulting organic material is then used in
26. agriculture and
27. landscaping purposes
28. waste gas from above process / methane is captured
29. and used for generating electricity
30. **Sanitary land fills**
31. More than four fifth of municipal solid wastes is disposed of in land fills
32. this is based on engineered techniques
33. usually on to marginal or
34. sub marginal lands
35. waste is spread in layers
36. then compact them tightly
37. greatly reducing the volume of waste
38. then covered by soil
39. this waste decompose through biological
40. and chemical processes
41. producing solid, liquid and gaseous products. **(any 38 × 4 = 152)**

(maximum 150)

10. Write shorts notes on following.

(a) **Glycolysis**

1. first stage in cellular respiration
2. oxygen is not used
3. common to both aerobic and anaerobic respiration
4. a series of enzyne catalytic reactions
5. occur in cytoplasm
6. from 6 C glucose molecule
7. 3 C
8. two pyruvate / pyruvic acid molecules are formed

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9. two ATP molecules are required per one molecule of glucose initially
10. four ATP molecules and
11. two NADH molecules are produced for one glucose molecule
12. net ATP gained for one glucose molecules is two
13. Synthesis of ATP occur by substrate phosphorylation

(b) **Seminal fluid of man**

1. Alkaline fluid with mucous
2. It contains fructose
3. prostaglandin
4. vitamin C
5. Epididymis
6. Seminal vesicles
7. prostrate glands and
8. cowper's glands secrete seminal fluid

Functions :

9. Neutralize the vaginal acidity
10. lubrication
11. supply energy source for sperms
12. provide / supply medium for sperms to swim
13. neutralize the acidity of any remaining urine in urethra

(c) **Sex linked inheritance of man**

1. there are some other genes linked on sex chromosomes of man which do not involve in sex determination
2. This is the inheritance of characteristics determined by such genes linked on X Chromosome
3. Haemophilia / red-green clour blindness are such sex linked genetic disorders
4. This is caused by a recessive allelle linked on X Chromosome
5. Because of males possess only one X chromosome
6. when the recessive allele is located on X chromosome
7. it expresses the complete phenotype
8. there fore he becomes a hemophiliac / gets colour blindness
9. to be a haemophelic / colour blind female
10. she should possess the recessive alleles on both x chromosomes
11. because of this allele is found occasionally in human population homozygous recessive condition in females is rare
12. but when the females become heterozygous
13. she transmits the recessive allele to the next generation
14. though she is healthy
15. behaves as a carrier

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16. eg : from the marriage between a carrier female and healthy male they may have haemophilic / colour blind sons

17. non- hamphiliac allele H
hamphilliac allele h

18. carrier female × normal male

19. **P** $X^H X^h$ × $X^H y$

20. **G** X^H, X^h, X^H, y

21. **F** $X^H X^H$ $X^H y$ $X^H X^h$ $X^h y$

22. normal female, normal male, carrier female, hemophiliac male

23. **P** normal female × hemophiliac male
$X^H X^H$ × $X^h y$

24. **G** X^H, X^h, y
F $X^H X^h$ $X^H y$

25. carrier female : normal male

normal allele for colour vision C
colour blind allele c

carrier female × normal male

P $X^C X^c$ × $X^C y$

G X^C, X^c, X^C, y

F $X^C X^C$ $X^C y$ $X^C X^c$ $X^c y$

normal female, normal male, carrier female, colour blind male

P normal female × colour blind male
$X^C X^C$ × $X^c y$

G X^C, X^c, y

F $X^C X^c$ $X^C y$

carrier female : normal male

(any 24 points)

(13 + 13 + 24 = 50)

(50 × 3 = 150 marks)

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