G.C.E.(A.L.) Examination - 2013

Evaluation Report

09 - Biology

Research & Development Branch
National Evaluation & Testing Service
Department of Examinations

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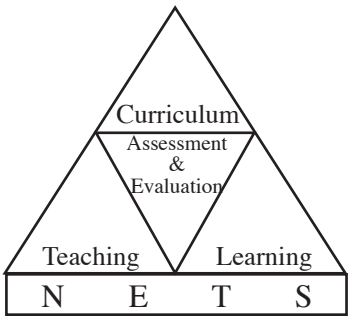

Research and Development Branch
National Evaluation and Testing Service
Department of Examinations, Sri Lanka

Biology

Evaluation Report - G.C.E.(A.L) Examination - 2013

Financial Aid

Transforming the School Education System as the Foundation of a Knowledge Hub Project (TSEP-WB)

INTRODUCTION

The General Certificate of Education (Advanced Level) Examination is the final certification examination of the Senior Secondary Education in Sri Lanka. Though certification of the students' achievement level at the end of Senior Secondary Education is the major aim of this examination, it bears a momentous position as an achievement test as well as a selection test because the eligible candidates for national universities and other higher education and vocational training institutes and also for the National Colleges of Education are selected on the results of this examination. This has also been accepted as an examination that certifies entry qualifications for the tertiary level employments. In the year 2013, 209906 school candidates and 31723 private candidates sat this examination.

Much pains are being taken by students to have a high achievement level at this examination and teachers and parents to fulfil their expectations. This evaluation report has been prepared by the Department of Examinations to assist the realization of their goals. It is certain that the information provided by this evaluation report is equally important for candidates, teachers, principals, in-service advisers, subject directors, parents and researchers in education. So it is appropriate to tender this report for wider reference.

This evaluation report comprises of three parts. I, II and III. Part I of this report consists of information related to aims and achievement of the subject Biology in G.C.E. (A.L) Examination. Presented under it are the statistical information on subject achievement, that is number of candidates sat for the subject, how they have obtained grades, how school candidates have obtained grades by district and distribution of marks according to class intervals and a comprehensive analysis of the subject achievement that reveals how candidates have selected questions in Papers I and II in Biology and how they have scored marks for the questions in them and the sub parts of each question. Part II of this report presents the questions in Paper I and Paper II of Biology in the G.C.E. (A.L) Examination 2013 and information about the candidates' responses to them. It encompasses expected answers for the questions of papers I and II, the mark scheme, observations on answers, conclusions and constructive suggestions.

This evaluation report prepared by the Research and Development Branch of the Department of Examinations is based on the information, observations, ideas and suggestions provided by chief examiners, additional chief examiners and assistant examiners involved in evaluating answer scripts and the information drawn through the analysis of candidates' responses using the Classical Test Theory and the Item Response Theory.

Part III of this report embodies the facts that should be taken into consideration by the candidates when answering each question and opinions and suggestions with regard to the learning teaching process. I think that this report is of immense value in the organization of the learning teaching process to achieve respective competencies and competency levels. You are kindly requested to direct your productive ideas and suggestions to us to improve the quality of our future evaluation reports.

I wish to extend my sincere thanks to the chief examiners, additional chief examiners and assistant examiners who provided information to prepare this report, the committee members who fervently and actively contributed to the task, the officers and the staff of the Department of Examinations who shouldered the responsibility, and the TSEP-WB that provided financial assistance for it.

W.M.N.J. Pushpakumara
Commissioner General of Examinations

19th January 2015
Research & Development Branch
National Evaluation & Testing Service
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Part I

1. Subject Objectives and information on subject achievement

1.1. Subject objectives

After completion of this course, the students will:

- Develop an interest and desire to acquire an extensive and deep knowledge in the field of Biology.
- Engage in cooperative learning (or group studies) to understand concepts, phenomena, fundamentals and processes in Biology.
- Determine the place we have in the nature by understanding the effect on natural and social environment with interactive processes among them.
- Develop the ability to plan research processes to solve the problems in the field of Biology,
- Develop the feeling that he/she is a part of the same environment while identifying natural habitats of the country with positive attitudes towards flora and fauna in order to take responsibility and to contribute for environmental conservation and protection of the environmental quality.
- Develop the sensitivity on the practical problems that encounter in day to day life.
- Develop the ability to acquire good habits that are essential for maintaining hygiene, health and quality of life.

1.2. Statistical information on subject achievement

1.2.1 Number of candidates sat for the subject

Medium	School	Private	Total
Sinhala	25849	6749	32598
Tamil	4144	659	4803
English	1667	314	1981
Total	**31660**	**7722**	**39382**

Table 1

1.2.2 Grades obtained by the candidates

Grade	School candidates		Private Candidates		Total	Percentage
	Number	Percentage	Number	Percentage		
A	919	2.90	310	4.01	1229	3.12
B	3633	11.48	1363	17.65	4996	12.69
C	8033	25.37	2364	30.61	10.397	26.40
S	9151	28.90	2191	28.37	11342	28.80
F	9924	31.35	1494	19.35	11418	28.99
Total	**31660**	**80.39**	**7722**	**19.61**	**39382**	**100.00**

Table 2

1.2.3 Grades obtained by school candidates who sat the examination for the first time - Districtwise

District	No. Sat	Distinction (A)		Very Good Pass (B)		Credit Pass (C)		Ordinary pass (S)		Pass (A+B+C+S)		Failed (F)	
		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1. Colombo	2562	147	5.74	379	14.79	635	24.79	685	26.74	1846	72.05	716	27.95
2. Gampaha	1663	28	1.68	132	7.94	384	23.09	481	28.92	1025	61.64	638	38.36
3. Kalutara	1075	21	1.95	84	7.81	255	23.72	307	28.56	667	62.05	408	37.95
4. Kandy	1662	30	1.81	124	7.46	328	19.74	492	29.60	974	58.60	688	41.40
5. Matale	448	3	0.67	17	3.79	76	16.96	126	28.13	222	49.55	226	50.45
6. Nuwara Eliya	526	1	0.19	24	4.56	79	15.02	162	30.80	266	50.57	260	49.43
7. Galle	1191	43	3.61	107	8.98	206	17.30	346	29.05	702	58.94	489	41.06
8. Matara	1079	32	2.97	122	11.31	242	22.43	291	26.97	687	63.67	392	36.33
9. Hambantota	863	10	1.16	48	5.56	154	17.84	252	29.20	464	53.77	399	46.23
10. Jaffna	572	16	2.80	59	10.31	170	29.72	151	26.40	396	69.23	176	30.77
11. Kilinochchi	94	0	0.00	2	2.13	17	18.09	31	32.98	50	53.19	44	46.81
12. Mannar	89	0	0.00	1	1.12	14	15.73	38	42.70	53	59.55	36	40.45
13. Vavuniya	121	4	3.31	8	6.61	34	28.10	43	35.54	89	73.55	32	26.45
14. Mullativu	79	1	1.27	5	6.33	16	20.25	16	20.25	38	48.10	41	51.90
15. Batticaloa	333	4	1.20	45	13.51	89	26.73	98	29.43	236	70.87	97	29.13
16. Ampara	618	8	1.29	58	9.39	105	16.99	213	34.47	384	62.14	234	37.86
17. Trincomalee	304	2	0.66	23	7.57	61	20.07	103	33.88	189	62.17	115	37.83
18. Kurunegala	1760	17	0.97	121	6.88	332	18.86	509	28.92	979	55.63	781	44.38
19. Puttalam	494	7	1.42	37	7.49	113	22.87	156	31.58	313	63.36	181	36.64
20. Anuradhapura	804	6	0.75	52	6.47	112	13.93	213	26.49	383	47.64	421	52.36
21. Polonnaruwa	331	1	0.30	17	5.14	67	20.24	85	25.68	170	51.36	161	48.64
22. Badulla	813	8	0.98	38	4.67	138	16.97	243	29.89	427	52.52	386	47.48
23. Monaragala	391	2	0.51	11	2.81	62	15.86	120	30.69	195	49.87	196	50.13
24. Ratnapura	1050	15	1.43	57	5.43	171	16.29	287	27.33	530	50.48	520	49.52
25. Kegalle	1009	8	0.79	39	3.87	222	22.00	335	33.20	604	59.86	405	40.14
All Island	**19931**	**414**	**2.08**	**1610**	**8.08**	**4082**	**20.48**	**5783**	**29.02**	**11889**	**59.65**	**8042**	**40.35**

Table 3

1.2.4 Marks obtained according to class intervals

Class Interval	Frequency	Frequency Percentage	Cumulative Frequency	Cumulative Frequency Percentage
91 - 100	0	0.00	39382	100
81 - 90	9	0.02	39382	100
71 - 80	555	1.41	39373	99.98
61 - 70	3791	9.63	38818	98.57
51 - 60	7157	18.17	35027	88.94
41 - 50	8624	21.90	27870	70.77
31 - 40	8625	21.90	19246	48.87
21 - 30	6969	17.70	10621	26.97
11 - 20	3513	8.92	3652	9.27
01 - 10	138	0.35	139	0.35
00 - 00	1	0.00	1	0.00

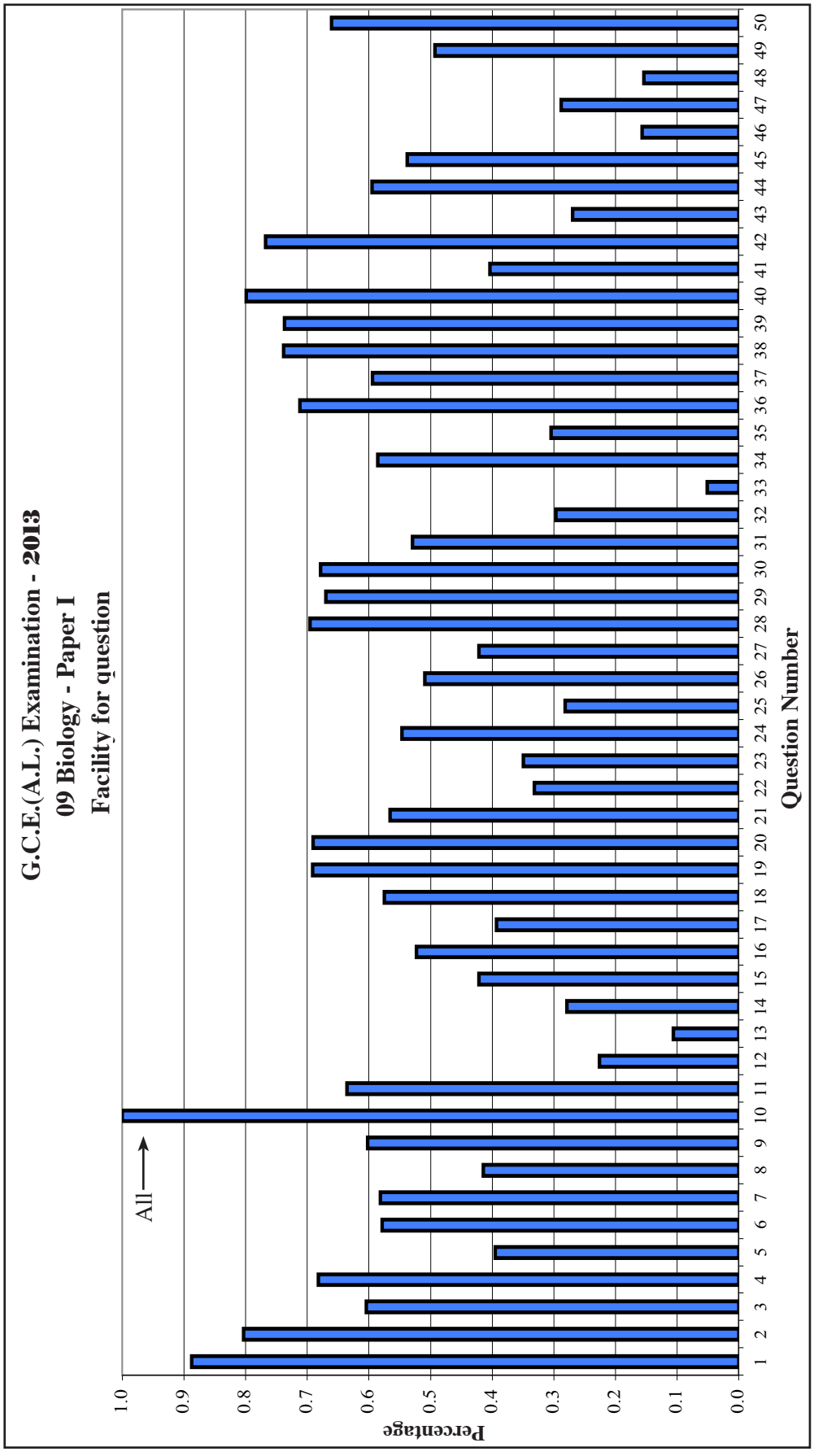
Table 4

The following example illustrates how information can be retrieved from the above table:
Example : (Taking the class interval 31 - 40 for instance)

The number of candidates scoring within 31 - 40 interval for this subject is 8625. As a percentage, it is 21.9%. The number of candidates scoring below marks is 19246 and as a percentage it is 48.87%.

1.3 Analysis of Subject Achievement

1.3.1 Achievement in Paper I

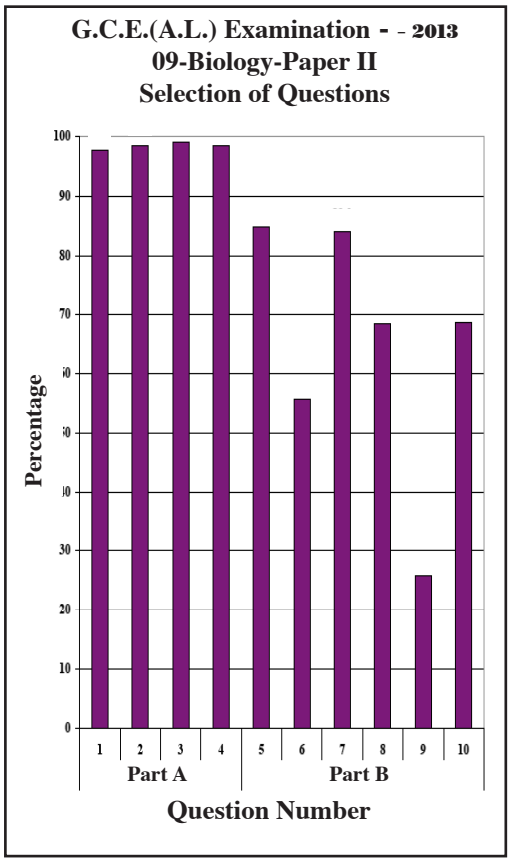


Graph 1 (Prepared using the information collected from the form RD/16/05/AL)

Retrieval of information from the above graph is illustrated by the example given below.

Ex: The highest number of candidates correctly responded to question number 1. Its percentage is 89%. The least number of candidates have correctly responded to question number 33. Its percentage is 0.05%.

1.3.2 Selection of questions in paper II



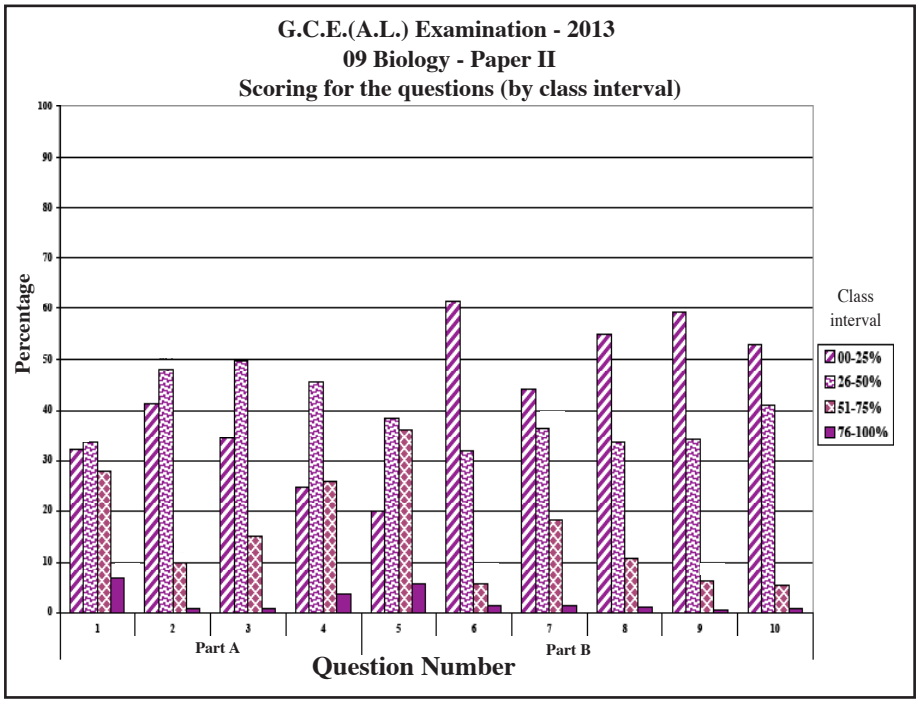
How information can be elicited from this graph is illustrated by the following example

Ex: Though the questions 1 – 4 in part A were compulsory a small number of candidates have not even answered compulsory questions. Only about 97.7% have answered question number 1.

Question number 5 of part B, has been selected by 84.6% of candidates. This is the question that has been selected by the highest number of candidates. The percentage of candidates who hare selected question number 9 is only 25.7% and this question has been selected by the lowest percentage of candidates.

Graph 2 (Prepared using the information collected from the form RD/16/02/AL)

1.3.3 Scoring for the questions in paper II

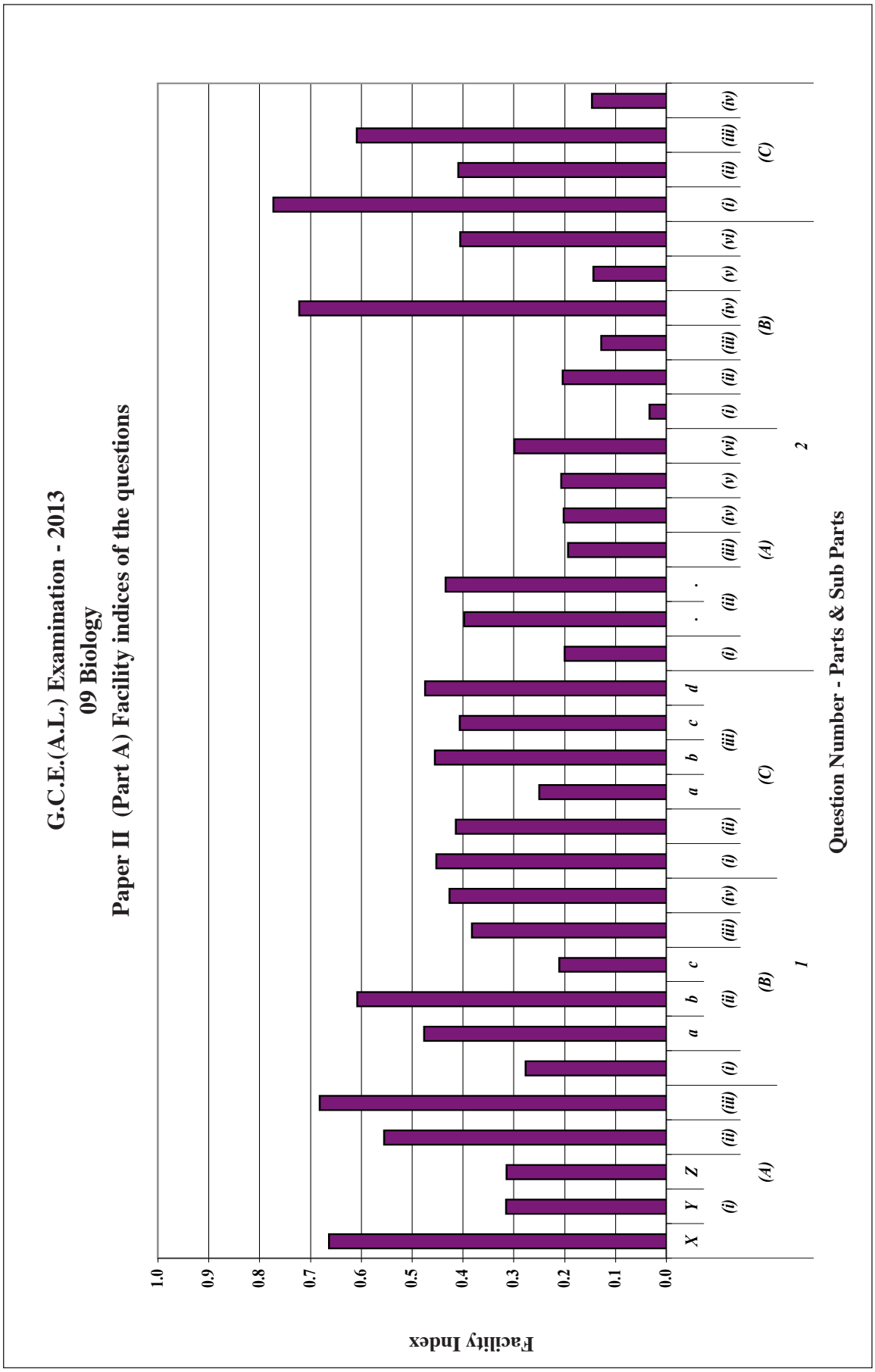


How information can be elicited from this graph is illustrated by the following example.

Ex: Marks allocated for question 1 is 100. The percentage scoring within the range of 76 - 100 is 5.3%. Moreover, the percentage obtaining marks betwee 00- 25 is about 32%. The highest percentage of candidates, that is 61.6% have obtained low marks for question number 6.

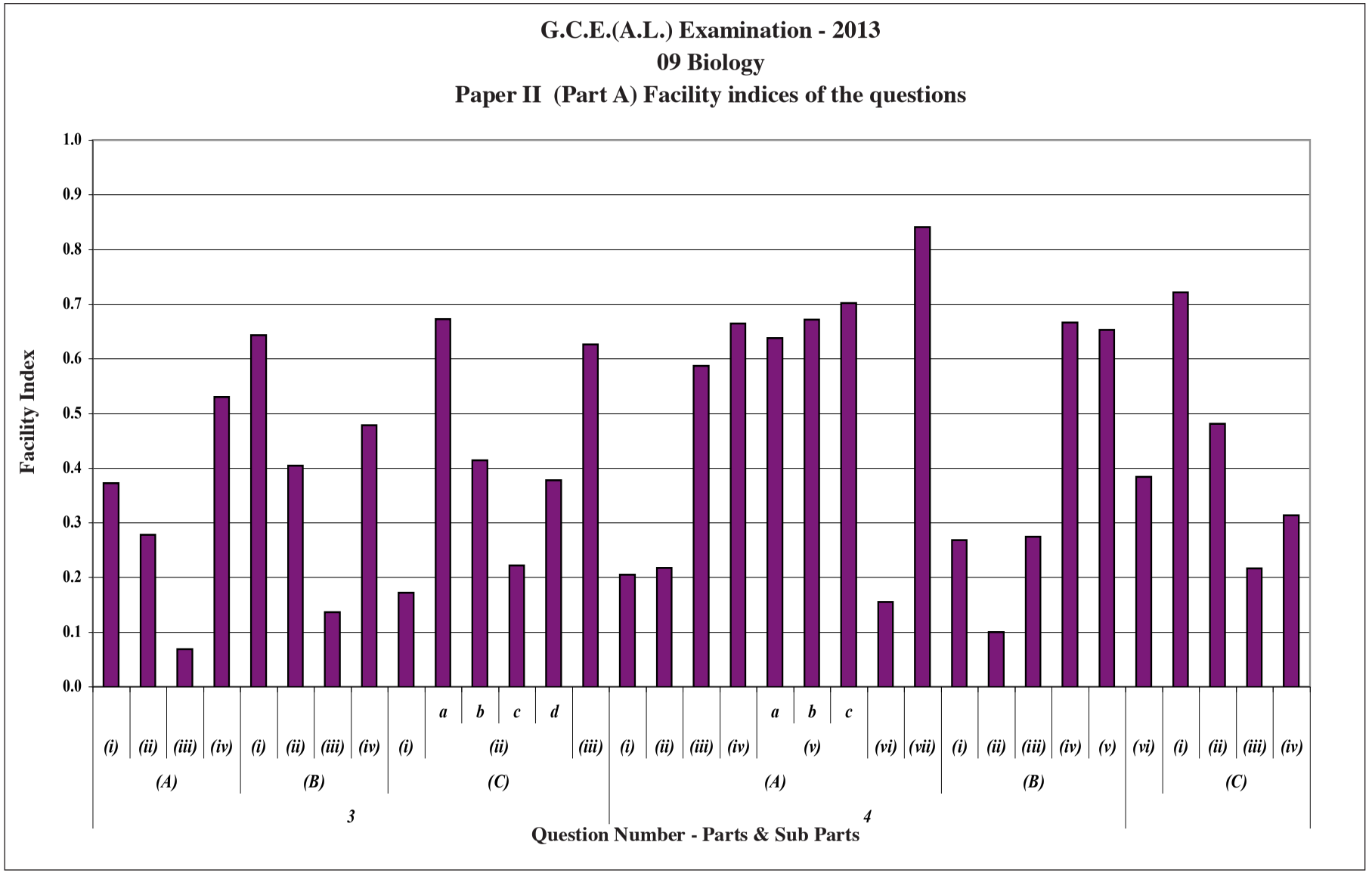
Graph 3 (Prepared using the information collected from the form RD/16/02/AL)

1.3.4 Achievement in Paper II

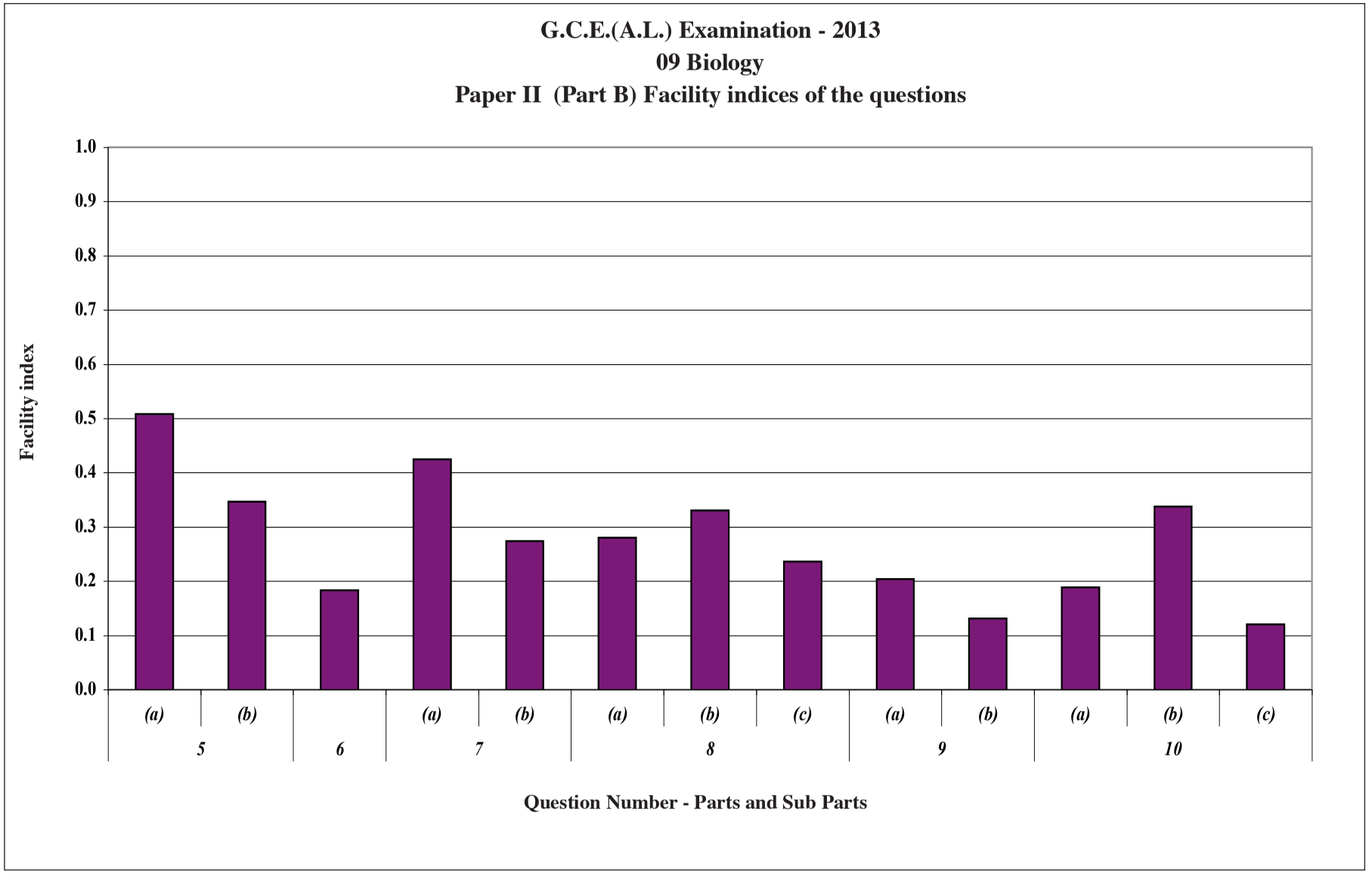


Graph 4.1 (Prepared using the information obtained from the form RD/16/04/AL)

How information can be elicited from the above graph is illustrated by the example stated below. Ex: The facility of Part (A) (iii) of question 1 is 68% while the facility of Part (C) (ii) (a) of the same question is 25%.



Graph 4.2 (Prepared using the information obtained from the form RD/16/04/AL)


G.C.E.(A.L.) Examination - 2013
09 Biology
Paper II (Part B) Facility indices of the questions
Facility index
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
(a)
(b)
5
6
(a)
(b)
7
(a)
(b)
(c)
8
(a)
(b)
9
(a)
(b)
(c)
10
Question Number - Parts and Sub Parts

Graph 4.3

Part II

2. Information on questions and answering

2.1 Question paper I and information on answers to paper I

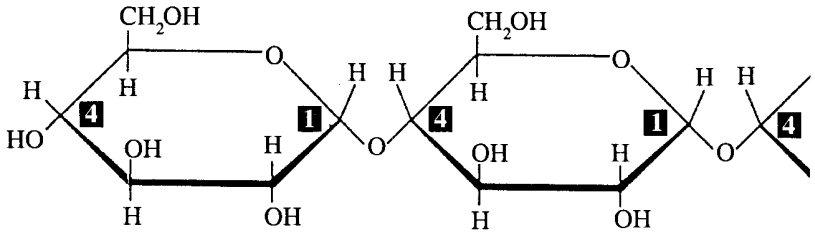
2.1.1 Structure of the question paper I

Time : 02 hours.

- ⋆ 50 multiple choice questions with 5 options form which correct or most approbate option should be selected.
- ⋆ All questions should be answered.
- ⋆ Each question carries 02 marks. Total marks : 100.

2.1.2 Paper I

1. Structure of a part of a polysaccharide molecule is shown in the diagram. What is the type of bond involved in joining the monosaccharide molecules?



(1) Peptide bonds (2) Hydrogen bonds (3) Disulphide bonds
(4) Glycosidic bonds (5) Ionic bonds

2. Which of the following are found only in plants?
(1) 80 S ribosomes (2) Endoplasmic reticulum (3) Plasmids
(4) Glyoxisomes (5) Golgi complex

3. Approximately what percentage of ATP is produced by the electron transport system in cellular aerobic respiration of glucose?
(1) 63% (2) 58% (3) 89% (4) 11% (5) 79%

4. Which of the following is **incorrect** regarding glycolysis?
(1) ATP is produced. (2) ATP is utilized.
(3) $NADH_2$ is produced. (4) CO_2 is released.
(5) Occurs in the cytosol.

5. Which of the following structures can be seen in Phylum Mollusca as well as in Phylum Platyhelminthes?
(1) Ganglia, gills, suckers (2) Nerve cords, excretory ducts, anus
(3) Nerve ring, eye spots, mucous glands (4) Chemoreceptors, tentacles, nephridia
(5) Statocysts, hooks, gonadal ducts

6. Which of the following statements regarding the characteristic features of vertebrate classes with homoiothermic animals is correct?
(1) All vertebrate classes with homoiothermic animals have viviparous animals.
(2) All vertebrate classes with ovoviviparous animals have homoiothermic animals.
(3) All vertebrate classes with animals having nictitating membranes have homoiothermic animals.
(4) All vertebrate classes with homoiothermic animals have animals with 12 pairs of cranial nerves.
(5) All vertebrate classes with animals showing internal fertilization have homoiothermic animals.

7. Members of the Domain Archaea
(1) have cell walls which lack peptidoglycans.
(2) are ubiquitous.
(3) have only one type of RNA polymerase.
(4) are sensitive to many antibiotics.
(5) have cell membranes which contain unbranched lipids.

8. Which of the following is correct regarding the members of Phylum Rhodophyta?
(1) They are either unicellular or multicellular.
(2) Contain chlorophylls, carotenes and xanthophylls.
(3) Reproductive cells do not have flagella.
(4) Cell walls contain cellulose and pectin.
(5) Mannitol is a stored food.

9. Function of which one of the following enzymes of man **cannot** be substituted by any other enzyme?
(1) Dipeptidase (2) Trypsin (3) Chymotrypsin
(4) Carboxypeptidase (5) Maltase

10. This question is based on the blood circulatory systems of the following animals.

a. Turtle b. Slug c. *Ichthyophis* d. Cockroach
e. Octopus f. Spider g. *Nereis*

Which of the above animals have an open blood circulatory system?

(1) a, c and g only (2) a and c only (3) b and e only
(4) b, d, e and f only (5) d and f only

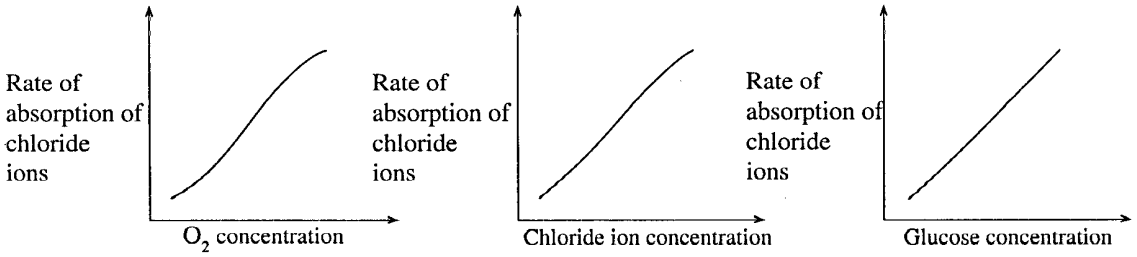
11. Which one of the following statements regarding SA node of man is correct?

(1) It is located in the wall of right auricle close to inter-auricular septum.
(2) Purkinje fibres originate from it.
(3) It is stimulated by the impulses received from the pacemaker of heart.
(4) Stimulus for heart beat originates from it.
(5) It consists of nervous tissue.

12. Which of the following is **not** transported by phloem tissue in plants?

(1) Potassium ions (2) Phosphate ions (3) Vitamins
(4) Nitrate ions (5) Herbicides

13. The graphs below show the effect of various factors on the rate of absorption of chloride ions by discs of carrot tissue from a solution in a flask.



(a) (b) (c)

Which of the above graphs support/supports the hypothesis that chloride ion absorption by carrot tissue involves active transport?

(1) a and b only (2) b and c only (3) a and c only
(4) a, b and c (5) c only

14. Which one of the following statements regarding the end products of nitrogenous excretion is correct?

(1) Urea is the least toxic nitrogenous waste product in vertebrates.
(2) Excretion of urea requires a large amount of water due to its high solubility.
(3) Due to excretion of urea, loss of carbon from body is high.
(4) Main nitrogenous excretory product of aquatic birds is uric acid.
(5) Creatine is a nitrogenous excretory product of mammals.

15. If proteins are present in the urine of a person, which of the following structures could have been damaged?

(1) Bowman's capsule (2) Proximal convoluted tubule
(3) Descending limb of loop of Henle (4) Ascending limb of loop of Henle
(5) Glomerulus

16. Which one of the following statements regarding human skeletal muscle contraction is **incorrect**?

(1) A motor nerve stimulation is essential for its initiation.
(2) Cross bridges are formed between myosin heads and actin binding sites.
(3) Actin filaments shorten.
(4) I-bands shorten.
(5) Calcium ions are essential for the formation of cross bridges.

17. Which of the following statements regarding human pelvis is **incorrect**?

(1) Pelvis is a basin-shaped structure formed by sacrum, coccyx and innominate bones.
(2) Ilium is the largest bone of pelvis.
(3) Acetabulum is a deep lateral depression in the pelvis.
(4) Pubis bears most of the body weight when we are seated.
(5) Compared to the male pelvis the female pelvis is more shallow and rounded.

18. Which of the following statements regarding nervous systems is correct?
(1) All multicellular animals possess a nervous system.
(2) Neurone is the functional unit of the human nervous system.
(3) Parasympathatic nervous system prepares a person for an emergency.
(4) Resting potential of a human motor neurone is about -40 mV.
(5) Larger the diameter of an axon, faster would be the speed of conduction of an impulse.

19. Which one of the following statements regarding the action potential of a neurone is **incorrect**?
(1) It is a transient reversal of polarity of axolemma.
(2) A threshold stimulus is required to produce it.
(3) Its depolarization phase is due to influx of Na^+.
(4) Na^+ K^+ pump is not essential for its completion.
(5) It is self propagating.

20. Which of the following statements regarding homoeostasis in man is **incorrect**?
(1) It is the maintenance of a constant internal environment.
(2) It is mediated via negative feedback mechanisms.
(3) Blood urea level is homoeostatically regulated.
(4) Liver plays an important role in homoeostasis.
(5) Homoeostatic mechanisms are mainly involuntary.

21. Some parts of human brain and their functions are given below. Which of the following "part of the brain - function" combination is **incorrect**?
(1) Hypothalamus - Regulation of hunger
(2) Medulla oblongata - Regulation of rate of heart beat
(3) Cerebellum - Regulation of posture
(4) Temporal lobe - Regulation of speech
(5) Thalamus - Integration of sensory information

22. Which of the following statements regarding human lactation is **incorrect**?
(1) It is the production and release of milk from mammary glands.
(2) Oxytocin is involved in the milk ejection reflex.
(3) Progesterone suppresses milk production.
(4) Baby's suckling is essential for maintenance of milk production.
(5) Human placental lactogen enhances milk production.

23. Which of the following statements regarding human male reproductive system is correct?
(1) Inhibin inhibits the secretion of LH.
(2) Vas deferens is the main site of sperm storage.
(3) Capacitation of sperms occurs in the epididymis.
(4) Bulk of the seminal fluid is produced by prostate gland.
(5) Seminal vesicle secretion is a rich source of prostaglandins.

24. Which of the following statements regarding human reproduction is correct?
(1) Acrosome reaction of sperms is necessary for penetration of corona radiata.
(2) Cortical reaction of ovum prevents polyspermy.
(3) During ovulation a primary oocyte is ejected from Graafian follicle.
(4) Fertilization should occur within 48 hours after ovulation.
(5) Oogenesis starts after puberty.

25. In angiosperms, meiosis occurs during the formation of
(1) pollen mother cells. (2) embryo sac. (3) megasporangium.
(4) megaspore mother cell. (5) nuclei in the pollen tube.

26. In *Selaginella,* meiosis occurs during the formation of
(1) spores. (2) gametophyte. (3) gametes.
(4) sporophyte. (5) embryo.

27. Which one of the following features distinguishes *Nephrolepis* from *Pogonatum*?
(1) Presence of well developed vascular system
(2) Absence of heterospory
(3) Presence of alternation of generation in the life cycle
(4) Requirement of external water for fertilization
(5) Nutritionally independent sporophyte

28. In mice, grey fur colour (G) is dominant to black fur colour (g). Expression of colour is determined by another gene with a pair of alleles where the dominant allele (C) expresses colour and recessive allele (c) indicates albinism. When a grey coloured mouse was bred with a black coloured mouse, the resultant progeny had a phenotypic ratio of 3 grey : 3 black : 2 albino. Which of the following indicates the genotypes of the parents?

(1) GGCc × ggCC (2) GGCC × ggCc (3) GGCc × ggCc
(4) GgCC × ggCc (5) GgCc × ggCc

29. A man of blood group A married a woman of blood group B. Their first child is of blood group O. The identical twin sister of this woman married a man of blood group AB and the possible blood groups of their children are

(1) B and AB only. (2) A and B only. (3) A and AB only.
(4) A, B and AB only. (5) A, B, AB and O.

30. If a DNA molecule contains 8000 nucleotides of which 20% are adenine, the number of guanine nucleotides present in this DNA molecule is

(1) 1600. (2) 2000. (3) 2400. (4) 3200. (5) 1000.

31. Which of the following is **not** a current application of genetic engineering in plants?

(1) Production of plants resistant to herbicides
(2) Production of plants which can fix nitrogen
(3) Production of plants with insecticidal proteins
(4) Production of plants resistant to viral diseases
(5) Production of nutrient rich plants

32. Which one of the following animals has the highest risk of becoming extinct in the near future?

(1) Leatherback turtle (2) Asian elephant (3) Giant tortoise
(4) Lamp shell (5) Blue magpie

33. Which of the following groups of organisms appeared on land first?

(1) Conifers (2) Insects (3) Amphibians
(4) Angiosperms (5) Spiders

34. Which of the following Acts and Conventions has helped most to protect the environment of Sri Lanka?

(1) National Environmental Act (2) Fauna and Flora Protection Act (3) CITES
(4) Ramsar Convention (5) Biodiversity Convention

35. Some air pollutants are given below.

a. Carbon monoxide b. Sulphur dioxide c. Oxides of nitrogen
d. Hydrocarbons e. Chlorofluorocarbons f. Ozone
g. Particulate matter

Which of the above pollutants aggravate asthma?

(1) a, b, c and g (2) b, c, d and f (3) c, d, e and f
(4) b, c, f and g (5) a, c d and g

36. Which of the following is normally used to demonstrate microscopically, the presence of live yeasts?

(1) Soil suspension (2) Toddy sample (3) Yoghurt
(4) Pond water (5) Piece of bread soaked in water

37. Which of the following genera contains facultatively anaerobic microorganisms?

(1) *Acetobacter* (2) *Azotobacter*
(3) *Clostridium* (4) *Saccharomyces*
(5) *Lactobacillus*

38. Which of the following sites in a healthy human body is **not** a natural habitat of microorganisms?

(1) Skin (2) Lungs
(3) Small intestine (4) Buccal cavity
(5) Genital organs

39. A person who had an infection of measles rarely develops the same infection again. This is an example of
(1) nonspecific immunity.
(2) artificially acquired passive immunity.
(3) artificially acquired active immunity.
(4) naturally acquired active immunity.
(5) naturally acquired passive immunity.

40. Viruses are different from bacteria because viruses
(1) cause diseases in plants and animals.
(2) have RNA and DNA.
(3) do not show a cellular organization.
(4) cannot be cultivated in the laboratory.
(5) are widely distributed in nature.

● **For each of the questions 41 to 50 one or more of the responses is/are correct. Decide which response/ responses is/are correct and then select the correct number.**

If only **A, B** and **D** are correct 1
If only **A, C** and **D** are correct 2
If only **A** and **B** are correct 3
If only **C** and **D** are correct 4
If any other response or combination of responses is correct.... 5

Directions summarised				
1	**2**	**3**	**4**	**5**
A, B, D correct.	**A, C, D** correct.	**A, B** correct.	**C, D** correct.	Any other response or combination of responses correct.

41. Phosphorous is a structural element in which of the following?
(A) Proteins
(B) Carbohydrates
(C) Lipids
(D) Nucleic acids
(E) Chlorophylls

42. Which of the following features is/are common to both DNA and RNA?
(A) Both are polymers of nucleotides.
(B) Both have identical sugar molecules.
(C) Both are genetic material.
(D) Both have pyrimidine and purine bases.
(E) Both are double stranded.

43. Which of the following statements regarding the human skeletal system is/are **incorrect?**
(A) Both parietal and frontal bones of the skull are paired.
(B) Cervical curvature of the vertebral column develops around 7-8 months after birth.
(C) It plays a role in homoeostasis.
(D) It produces both red and white blood cells.
(E) There are two longitudinal arches in the foot.

44. In which of the following plant movements the direction of the stimulus determines the direction of the response?
(A) Phototropism
(B) Geotropism
(C) Nyctinasty
(D) Thigmotropism
(E) Photonasty

45. Which of the following hormones of man act/acts on bones?
(A) Growth hormone
(B) Erythropoietin
(C) Parathormone
(D) Thyroxin
(E) Adrenaline

46. When stretch receptors of lungs are stimulated
(A) stimulation of apneustic area in Pons Varolii is inhibited.
(B) stimulation of inspiratory area of medulla oblongata stops.
(C) stimulation of pneuomotaxic area in Pons Varolii is inhibited.
(D) expiratory area of medulla oblongata is stimulated.
(E) stimulation of chemoreceptors in aorta stops.

47. Some categories of species, examples for these categories and the habitats of these examples are given in the following table.

Species category	Example	Habitat
I. Invasive species	i. *Chitala ornata*	a. Fresh water bodies
II. Migratory species	ii. *Eichhornia crassipes*	b. Marine water
III. Indigenous species	iii. *Caretta caretta*	c. Rain forests
IV. Endemic species	iv. *Caryota urens*	

Which of the following combinations is/are correct?

(A) III, iv, c (B) IV, iii, b (C) I, ii, a (D) I, i, a (E) II, iii, a

48. Which of the following microorganisms cause/causes diseases when contaminated water and food are consumed?

(A) *Mycobacterium tuberculosis* (B) *Leptospira interrogans*
(C) Polio virus (D) *Salmonella typhi*
(E) *Clostridium tetani*

49. Which of the following microorganisms use/uses organic chemical compounds as sources of both energy and carbon for growth?

(A) *Nitrobacter* (B) *Nostoc* (C) *Saccharomyces*
(D) *Pseudomonas* (E) *Nitrosomonas*

50. Which of the following is/are **not** surrounded by a membrane?

(A) Nucleus
(B) Lysosome
(C) Ribosome
(D) Plasmid
(E) Peroxisome

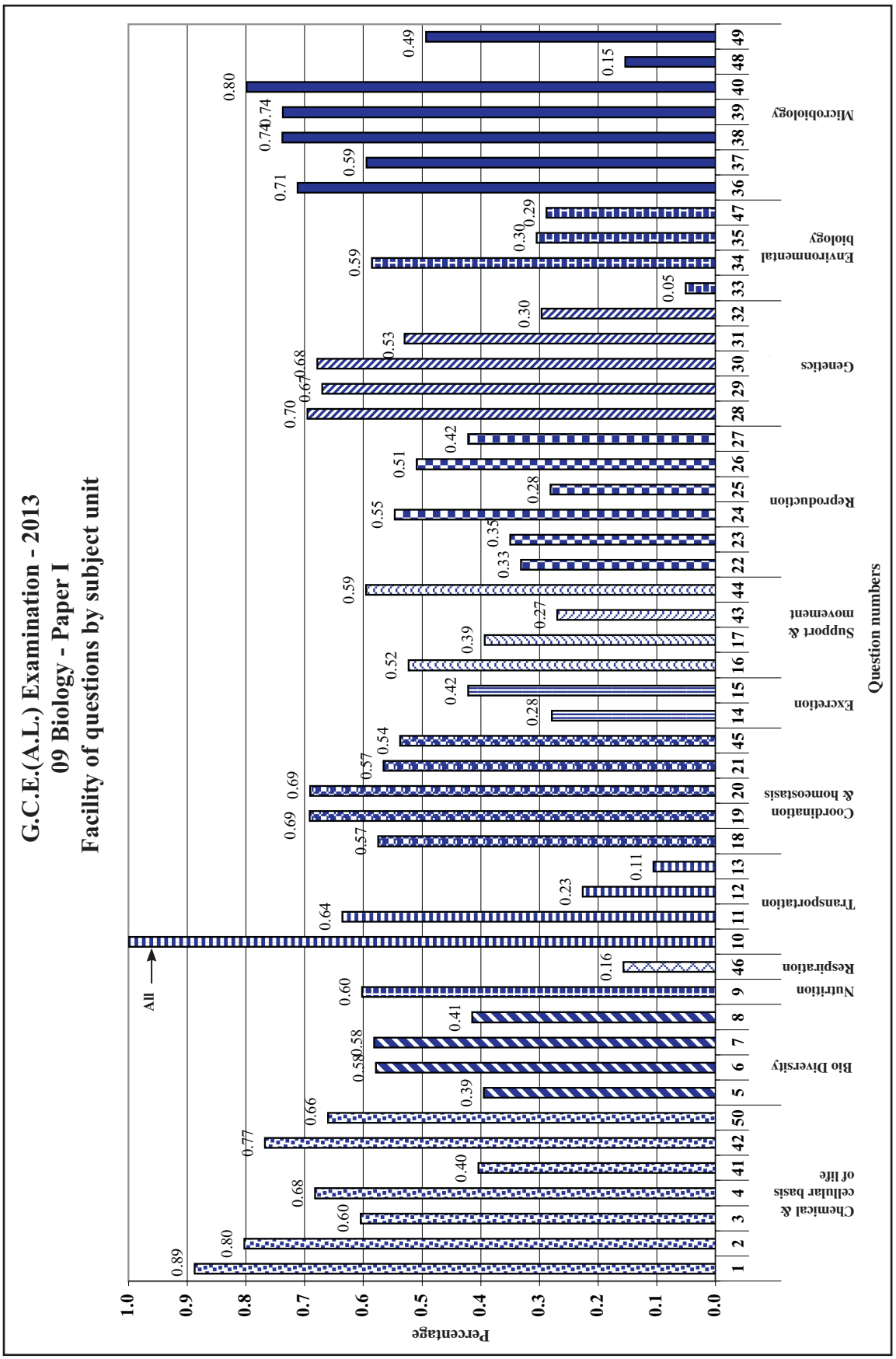
* * *

2.1.3 Expected answers and the scheme of marking for paper I

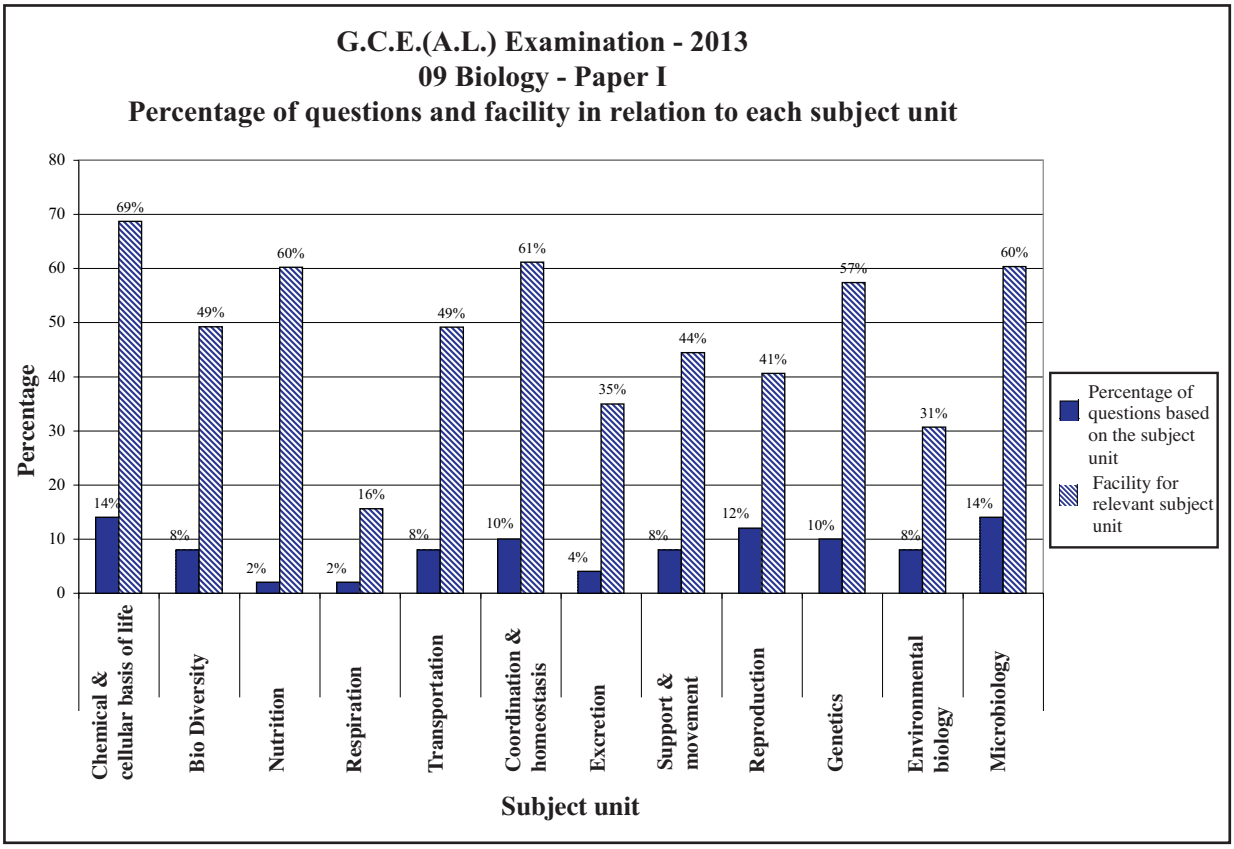
Question No	Answer	Question No	Answer
01	4	26	1
02	4	27	5
03	3	28	5
04	4	29	4
05	3	30	3
06	4	31	2
07	1	32	3
08	3	33	5
09	5	34	1
10	All	35	4
11	4	36	2
12	4	37	4
13	4	38	2
14	4	39	4
15	5	40	3
16	3	41	4
17	4	42	2
18	5	43	3
19	4	44	1
20	3	45	5
21	4	46	3
22	5	47	2
23	5	48	4
24	2	49	4
25	2	50	4

Each correct answer carries 02 marks, amounting the total to 100.

2.1.4 Observations on the responses to paper I



Subject unit	No. of multiple choice questions	Highest facility		Lowest facility	
		Question	Facility	Question	Facility
Chemical & cellular basis of life	7	1	89%	41	40%
Bio Diversity	4	6,7	58%	5	39%
Nutrition	1	9	60%	-	-
Respiration	1	-	-	46	16%
Transportation	4	11	64%	13	11%
Coordination & homeostasis	5	19,20	69%	45	54%
Excretion	2	15	42%	14	28%
Support & movement	4	44	59%	43	27%
Reproduction	6	24	55%	25	28%
Genetics	5	28	70%	32	30%
Environmental biology	4	34	59%	33	05%
Microbiology	7	40	80%	48	15%



Percentages of questions asked from each subject unit for Paper 1 and the facility shown by students for questions from those subject units are illustrated in the above graph.

The highest facility, that is 69% was displayed for the unit, Chemical & Cellular Basis of Life. Facility shown for units, Coordination and Homeostasis and Microbiology was also above 60%.

Students have displayed a facility of 49% 49% and 57% for the 3 units, Bio diversity, Transportation and Genetics (49%, 49% and 57% respectively) Facility of answering the questions under the two units, Support & ovement and Reproduction was comparatively low (44% and 41% respectively).

Students have displayed a low facility, that is 31% for questions from Environmental biology unit. It seems that learning - teaching process on this unit should be carried out giving a greater emphasis.

2.1.5 Responses to the options of each question in Paper 1 – as a percentage

Question No.	Correct answer	Percentage of students selecting each option					
		1	2	3	4	5	Missing
1	4	5%	4%	1%	**89%**	1%	-
2	4	7%	2%	8%	**80%**	2%	-
3	3	9%	11%	**60%**	8%	12%	-
4	4	4%	6%	8%	**68%**	14%	-
5	3	14%	23%	**39%**	11%	12%	-
6	4	5%	10%	13%	**58%**	14%	-
7	1	**58%**	9%	11%	13%	10%	-
8	3	13%	16%	**41%**	12%	17%	-
9	5	7%	9%	14%	9%	**60%**	-
10	all	**3%**	**2%**	**8%**	**56%**	**31%**	-
11	4	18%	5%	11%	**64%**	3%	-
12	4	15%	8%	16%	**23%**	38%	-
13	4	15%	19%	38%	**11%**	18%	-
14	4	9%	12%	35%	**28%**	17%	-
15	5	25%	25%	5%	3%	**42%**	-
16	3	12%	7%	**52%**	16%	12%	-
17	**4**	25%	7%	7%	**39%**	21%	-
18	5	9%	15%	9%	10%	**57%**	-
19	4	8%	4%	8%	**69%**	10%	-
20	3	3%	15%	**69%**	7%	6%	-
21	4	10%	13%	9%	**57%**	11%	-
22	5	4%	10%	28%	26%	**33%**	-
23	5	16%	7%	22%	19%	**35%**	-
24	2	18%	**55%**	10%	11%	7%	-
25	2	14%	**28%**	17%	21%	20%	-
26	1	**51%**	11%	26%	8%	5%	-
27	5	34%	10%	5%	9%	**42%**	-
28	5	3%	7%	12%	8%	**70%**	1%
29	4	7%	4%	5%	**67%**	17%	-
30	3	19%	3%	**68%**	9%	1%	-
31	2	10%	**53%**	18%	13%	5%	1%
32	3	35%	17%	**30%**	13%	4%	1%
33	5	31%	14%	40%	10%	**5%**	1%
34	1	**59%**	9%	5%	10%	17%	1%
35	4	29%	8%	2%	**30%**	29%	1%
36	2	1%	**71%**	8%	2%	17%	1%
37	4	6%	10%	13%	**59%**	10%	1%
38	2	3%	**74%**	9%	5%	8%	1%
39	4	3%	4%	7%	**74%**	12%	1%
40	3	1%	11%	**80%**	6%	2%	1%
41	4	3%	15%	3%	**40%**	38%	-
42	2	5%	**77%**	2%	4%	12%	-
43	3	23%	11%	27%	9%	30%	-
44	1	**59%**	4%	18%	3%	16%	-
45	5	7%	18%	17%	5%	**54%**	-
46	3	46%	9%	**16%**	12%	17%	-
47	2	11%	**29%**	16%	16%	28%	1%
48	4	21%	9%	5%	**15%**	50%	-
49	4	3%	5%	5%	**49%**	36%	1%
50	4	1%	1%	2%	**66%**	29%	-

Under each question, the student percentage selecting the correct option is shaded.

2.1.6 Overall observation, conclusions and suggestions regarding the answers to paper 1

70% of the candidates had responded correctly for question no. 01, 02, 28, 36, 38, 39, 40 and 42 of Paper I (multiple choice question paper). These questions were asked on knowledge based specific facts of the subject Biology that the students are supposed to keep in the memory.

Facility of 26 multiple choice questions of this paper ranged between 40% and 69%. Those questions were no: 03, 04, 06, 07, 08, 09, 11, 15, 16, 18, 19, 20, 21, 24, 26, 27, 29, 30, 31, 34, 37, 41, 44, 45, 49 and 50. The facility of those 26 questions was at a median level. Among those questions, question no. 03, 04, 06, 07, 08, 11, 15, and 19 were prepared using specifically the subject content of the teachers' guide. In such questions, subject knowledge of students and the degree of use of teachers guide for teaching - learning process decide the level of proficiency of students and it is the normal situation to have a median level of facility for such questions.

Question no. 07 was asked on the characteristics of Domain Archaea and the facility shown be the candidates more 58%. Question no. 08 was on the characteristics of Phylum Rhodophyta which is a group of algae belongs to the Kingdom Protista and its facility was 41%. The facts stated in teachers' guide only had been considered in deciding the answers for those questions and therefore the facility of the questions were high.

Questions that the students had scored below 30% were 12, 13, 14, 25, 32, 33, 35, 43, 46, 47 and 48. Question 13 was on absorption of ions by a tissue, an active process which spends ATP. When the oxygen and glucose concentration increases, the rate of absorption of ions also increases as concentration of oxygen and glucose has a direct effect on production of ATP.

Only 28% of the candidates had selected the correct answer to question 14, which was based on the main excretory products of vertebrates. Main excretory products of vertebrates are NH_3, urea and uric acid. Among these 3 compounds, as NH_3 is highly soluble in water and as it is toxic on nervous system also it is NH_3 requires the greatest volume of water for excretion too. Main excretory product of bird is uric acid. Excretory product of birds does not change with the environment they live. Among the nitrogenous excretory products, the highest loss of carbon from body occurs when the uric acid is excreted. For 4 nitrogen atoms in one molecule of uric acid, 5 carbon atoms are lost. Excretory product of Aves and Reptiles is uric acid. The resulting nitrogenous product by breaking down of creatine in skeletal muscles is creatinine. Accordingly, the correct answer for question no.14 is option 4, however, 34.66% of the candidates had selected option 3 as the correct answer which was wrong.

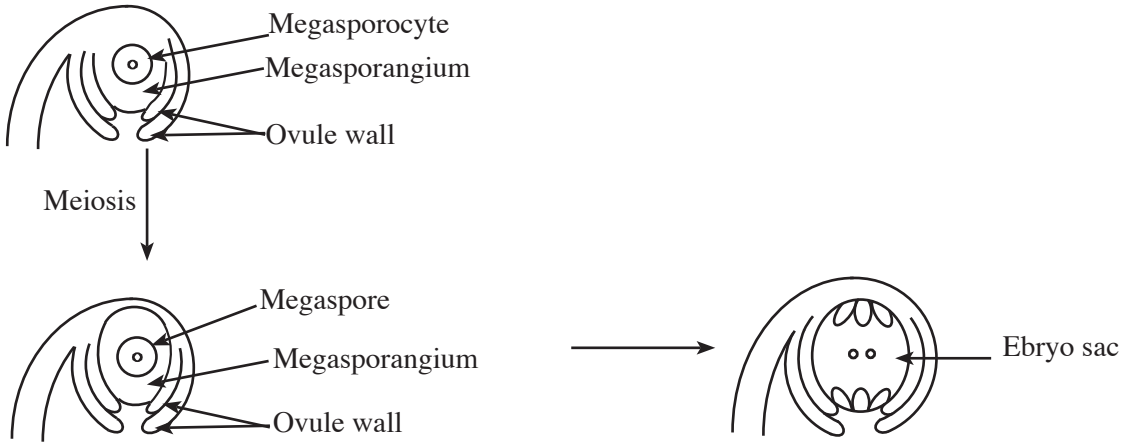
Question no. 15 of this question paper was on ultra-filtration in relation to the process of human urine production and the facility of the question was 42%. During the ultra-filtration of urine production, all the other components of blood filter into the cavity of Bowman's capsule except, plasma protein, blood cells and platelets. However, when the glomeruler structure is damaged, those things that do not filter under normal conditions could filter and go out with urine. As inner wall of Bowman's capsule consists of podocytes with perforations, filtration or non filtration of above things are not decided by Bowman's capsule.

30% to 40% of the candidates had selected the correct option. for question no 5, 17, 22, 23 and 30 Question no. 05 and 17 were knowledge based questions; they were asked on specific facts that should be kept in memory and if the student had forgotten relevant facts, it could have been difficult to select the correct answer. In question no. 17, incorrect statement is the 4th answer as it is the ischium in pelvic girdle that bears the most of the body weight when we are seated. Ischiopodite which is flattened to have an increased surface area helps to bear the weight.

Question no. 22 was asked on human lactation. Production of milk is stimulated by prolactin hormone. At birth, prolactin secretion is not inhibited by progesterone further more. As the placenta is separated at birth, anterior pituitary secretes prolactin which hormone stimulatie milk production. At birth mixing of placental lactogen with blood ceases, Therefore the effect of placental lactogen on milk production is removed.

Percentage of students who selected correct answer for question no. 25 was 28%. It was a question connected to sexual reproduction of angiosperms. In angiosperms, megasporangium is located in the ovary, surrounded by ovule walls. Megasporocyte in megasporangium undergoes meosis producing 4 cells and out of those, 3 cells degenerate while one cell becomes megaspore. Megaspore germinates developing embryo sac which is the female gametophyte.

Angiosperm ovary



Among the other options given for this question, pollen mother cells, megaspore mother cell and megasporangium are diploid and therefore, they are not the structures formed after meiosis. Haploid pollen grain undergoes mitosis producing nuclei of pollen and nuclei in the pollen tube. Therefore, options 1, 3, 4 and 5 cannot be the result of meiosis and the option 2, embryo sac had been accepted as the correct answer.

Students who gave the correct answer to question no. 32 were 30%. Animals at higher levels of threat in IUCN red data book have the highest risk of becoming extinct in the near future. Among the answers given to this question, giant tortoise which is extinct in the wild comes under the group that has the highest threat. Leatherback turtle comes under 'critically endangered ' group while Asian elephant, *Elephas maximus* is included under the group of vulnerable (VU) animals.

Question no. 33 was asked on evolution time periods of bio-diversity. It was depicted by the answers given be candidates to this question that the knowledge of students, on the time periods that different groups of plants and animals were evolved and time period that they inhabited terrestrial habitats during the evolution of bio diversity on earth, was poor. Correct answer had been selected by 5.07% which was the lowest choice of students. Option 1 had been selected by 30.54% while option 3 had been chosen by 39.66%; both were wrong answers for the question. This indicates that the subject contents, on which this question was based, have been very complicated for the students. Another possible reason for this situation could be the non-inclusion of relevant subject matter to the teachers guide.

Question no. 35 was on air pollutants and their effect on human health. Correct answer for this question had been selected by 30% of students. It is a question that tests the memory on specific facts. It is essential to have a clear memory on definite subject contents that are given in teachers guide to answer questions like this. As this field of subject contains a large number of specific facts, students seemed to have faced difficulties in memorizing them in order to select the correct answer. Students should know that ozone aggravates asthma.

Question no. 43 had been asked on human skeletal system. Frontal and occipital bones of the skull are single bones while parietal and temporal bones are paired. Cervical curvature, stated in response B of this question, develops after about 3 months from birth while the second curvature, lumber curvature develops in about 7-8 months from birth. Students had got these facts mixed up and selected a wrong answer. As stated in response C, skeletal system plays an important role in homeostasis of Calcium and Phosphorous. By selecting D response, students had displayed that they were not aware of the fact that red bone marrows of skeletal system produces red blood cells as well as white blood cells. In the foot of man, there are three arches, 2 longitudinal arches and one horizontal arch. Students had chosen the answer without paying attention to the term longitudinal. It is a compulsory requirement to pay attention to such specific adjectives in answering multiple choice questions.

Question no. 41 had been asked on chemical basis of life. In the correct answer, it was stated that phosphorous is a structural element in lipid and nucleic acid. It had been selected by 40.34% students. However, 37.97% students had selected 5th answer as the correct answer. In the teachers guide, it is stated that sometimes, lipids contain Nitrogen and Phosphorous. In lipids, the major elements are CHO and therefore, the response (C) had not been accepted as correct.

Question no. 46 was based on how ventilation of lungs occurs by nervous control. As a result of inspiration, when the lungs inflate too much, stretch receptors in the walls of alveoli are stimulated and the nerve impulse generated from that inhibits the stimulation of apneustic area in Pons Varolii facilitating expiration. At that time pneumotoxic area in Pons Varolii is stimulated and stimulation of inspiration area of medulla oblongata stops facilitating expiration. The response D, "expiratory area of medulla oblongata is stimulated" had been considered as a correct answer by the students leading them to select a wrong answer. Students should have understood that the stimulation of stretch receptors does not stimulate expiratory area of medulla oblongata but leads to stop inspiration facilitating expiration.

Question no. 47 expected the knowledge on scientific names of organisms belong to the groups such as invasive species, endemic species. As students had not kept those names correctly in their memory, they were unable to select the correct answer easily. Therefore, most of the students had chosen 5th answer. Though the teachers guide had stated on *Chitala chitala* no information was provided on *Chitala ornata* which might have caused for the poor answers.

Question number 48 was based on few diseases of human caused by microorganisms. *Leptospira interrogans* causes leptospirosis and it infects human body through wounds, from polluted water. Polio virus causes polio infection when contaminated water and food with the virus are consumed. *Salmonella typhi* causes typhoid fever when contaminated water and food with the bacteria are consumed. *Clostridium tetani* causes tetanus and the bacteria infects blood through wounds on skin. Therefore, as asked in question no. 48, microorganisms that cause diseases with the consumption of contaminated water and food, are only Polio virus and *Salmonella typhi* bacteria.

2.2 Paper II and information on answers

2.2.1 Structure of the paper II

Allotted time is 03 hours.

This question paper consists of two parts, Structured Essay and Essay.

Part **A** – This contains four structured essay questions. **All** the questions should be answered. Each question carries 100 marks, so the total mark is 400.

Part **B** – This contains **six** essay type questions from which four should be answered. Marks allocated for each question is 150. The total mark is 600.

Total mark for Paper II is 1000 ÷ 10 = 100

2.2.2. Expected answers, marking scheme and observations, conclusions and suggestions related to answers for Paper II.

The observations related to the answers for Paper II have been presented by the graphs 2, 3, **4.1, 4.2 and 4.3.** The relevant portion of the graph is displayed with observations and conclusions for each question.

Part A – Structured Essay

Question 1.

1. (A) (i) Indicate in the table given below the five major biochemical processes involved in the natural decomposition and dycling of nitrogenous compounds in column **X**, corresponding biochemial transformation of each of them **Y** and one microorganism responsible for each of the transformations in column **Z**.

	X	Y	Z
(a)	Proteolysis	Protein $\longrightarrow$ amino acid	Fungi / Bacteria
(b)	Amino acid degradation / Ammonification	Amino acid $\rightarrow$ Ammonia	Fungi / Bacteria
(c)	Nitrification	$NH_4^+ \longrightarrow NO_2^- \longrightarrow NO_3^-$	*Nitrosomonas* / *Nitrobacter*
(d)	Denitrification	$NO_3^- \longrightarrow N_2$	*Pseudomonas*/ *Thiobacillus*
(e)	Nitrogen fixation	$N_2 \longrightarrow$ Protein / NH_4^+	*Azotobacter* / *Rhizobium* / *Nostoc* / *Anabaena*/ *Clostridium*

(15 x 2 marks)

(ii) In what chemical form do plants generally obtain nitrogen from soil ?
Nitrate / NO_3^-

(01 x 2 marks)

(iii) What is the major compound which supplies nitrogen to humans ?
Protein

(01 x 2 marks)

(B) (i) What are the adverse effects of discharging large amounts of waste into natural water bodies?
Dissemination of pathogenic microorganisms
Water pollution.
Increase in BOD / anaerobic / anoxic condition.
Anaerobic decomposition leading to bad smell

(04 x 2 marks)

(ii) Many industrial waste water treatment plants use **two** stages of treatment, primary treatment and secondary treatment to purify waste water.

(a) What happens during the primary treatment stage ?

Large floating materials removed

Sand removed

Oil and grease removed

No biological activity

Removes 25 - 35 % organic matter

Settling of solid matter

any 3
(03 x 2marks)

(b) Name the methods generally employed in the secondary treatment stage.

Activated Sludge

Trickling Filter

(02 x 2 marks)

(c) What is the major functions of the secondary treatment stage ?

Microbial oxidation of organic matter

(01 x 2 marks)

(iii) Some industrial waste treatment plants employ an anaerobic sludge digestion system.

Production of biogas (methane + CO_2)

Use of digested sludge as fertilizer

(02 x 2 marks)

(iv) Name the three major techniques currently used in the management of solid waste.

Separation and Recycling

Composting

Production of Biogas

Sanitary land fills

any 03
(03 x 2marks)

(C) (i) What are the major portals of pathogenic microorganisms in to human body ?

Gastrointestinal tract

Respiratory tract

Genito - urinary tract

Wounds on skin

(04 x 2 marks)

(ii) Name the four major nonspecific defence mechanisms seen in the human body.

Skin and mucous membrane

Antimicrobial substances in body fluids

Phagocytosis

Inflammatory responses

(04 x 2 marks)

(iii) Occurrence of infectious diseases in human depend on invasiveness and toxigenicity of pathogens.

(a) What is invasiveness?

Ability of pathogens to invade human cells / tissues and multiply within the tissue.

(01 × 2 marks)

(b) Name **two** enzymes that contribute to invasiveness and indicate the role of each of these.

Enzyme	**Role**
Phospholipase	destroy lipid component of cell membrane
Lecithinase	destroy lecithin of cell membrane
Hyaluronidase	destroy hyaluronic acid / cementing substance between cell

any 2 + 2
(04 x 2 marks)

(c) State **two** differences between exotoxins and endotoxins.

Exotoxins are heat - labile, Endotoxins are heat stable.

Extoxins are proteins, Endotoxins are lipopolisaccharides.

(02 x 2 marks)

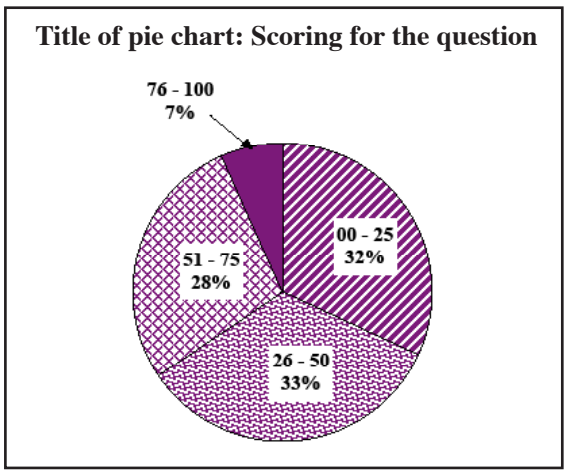
(d) State two major exotoxins contributing to pathogenicity and a pathogen producing each of them

Exotoxin	**Pathogen**
Neurotoxin	*Clostridium tetani*
Enterotoxin	*Vibrio cholerae*
Cytotoxin	*Corynebacterium diphtheriae*

any 2 + 2
(04 x 2 marks)

51 Points
(any 50 x 2 = 100 marks)

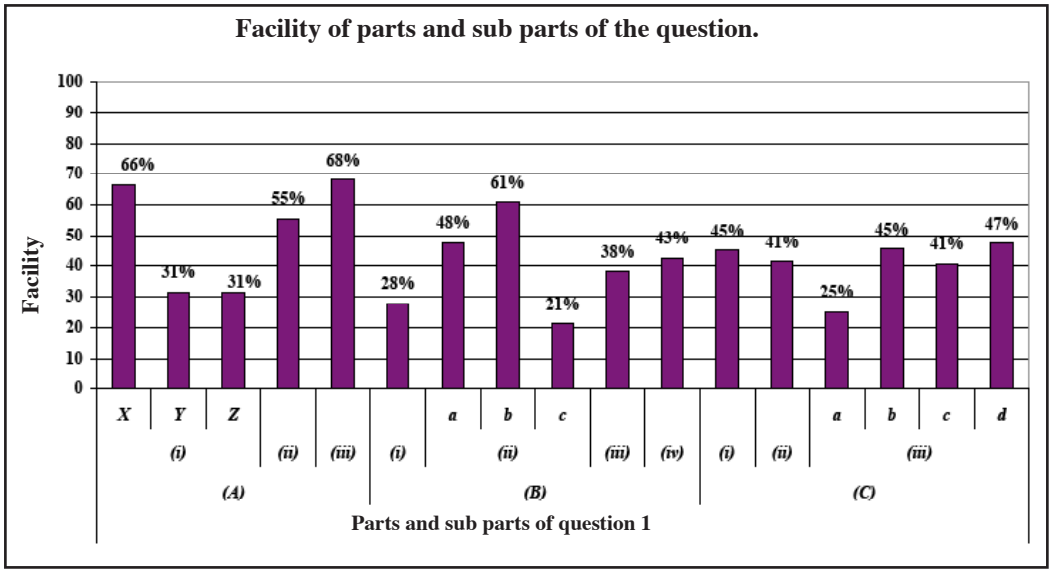
Overall observations, conclusions and suggestions regarding the answers to question 1:



Although question 1 is compulsory, only 97.7% of candidates have answered it. Marks allocated for this question is 100. The percentages of candidates scoring within following four intervals are:

00 – 25 ⟶ 32%
26 – 50 ⟶ 33%
51 – 75 ⟶ 28%
76 – 100 ⟶ 7%

The percentage scored 75 or above was 7% while those who scored 25 or below was 32%. Out of the candidates 33% have scored 26 – 50.



This question had 17 sub parts and the facility of 3 sub parts was above 60%. The highest facility was for sub part A (iii) and it was 68%. The lowest facility was for sub part B (ii) c and it was 21%.

Facility of obtaining marks for the answers to sub part 1. A. (i) X was 66%. This concludes that most of the students had sufficient understanding on biochemical processes of nitrogen cycle.

Facility of answering sub parts Y and Z each was 31%. It indicates that though the students had some knowledge on biochemical processes, their knowledge and understanding on related biochemical conversions were not sufficient. Relevant subject matter is included under Ecology and Microbiology units of the teachers guide. It seemed that students had not given attention to write both steps involved in biochemical process of nitrification and therefore they could not obtain allocated total marks. Further, students were unable to present the answer by analyzing the subject contents included in several units. Students should be trained to answer questions that measure higher level of higher mental skills like this utilizing term tests and school based assessments.

In sub part Z, it was questioned on scientific names of microbial species that involve in biochemical conversions. Most of the students did not write correct scientific names of microorganisms. Students should be trained to write correct scientific names following standard method of nomenclature with correct spellings.

Facility of B. (i) sub part was 28% which was a low value. It seemed that answers were given without understanding the question clearly. Students lost the opportunity to score marks as they could not present completely the adverse effects of discharging waste water into natural water bodies. It was not sufficient to write dissemination of microorganisms while it should be corrected as pathogenic microorganisms. Instead of writing producing gases with bad smell, it was essential to write gases with bad smell are produced by anaerobic decomposition.

B. (ii) c was a sub part that candidates had displayed a low facility. Its facility was 21%. During the secondary treatment stage, polluted water is aerated which increases the activities of aerobic bacteria increasing the rate of microbial oxidation of organic matter. The cause of students getting low marks could be due to poor understanding of these facts.

Facility displayed by candidates was low for the sub part B. (iii). Its facility was 38%. Answers were expected based on specific subject matter included in teachers guide. Remaining sludge of primary and secondary treatment is sent to sludge digestion system for anaerobic decomposition of its organic matter. The resulting mixture of methane and carbon dioxide gases is identified as biogas. Decomposed sludge is used as fertilizer. Students got low marks due to presentation of incomplete answer.

Facility of the sub part C. (iii) (a) was 25%. Students were unable to get the allocated marks due to the deficiency in defining invasiveness. Ability of a pathogen to invade human cells and tissues and multiply within the tissues is described as invasiveness. Instead of invading tissues, most of the students had stated entering tissues which resulted no marks.

When considered this question as a whole, understanding and memory of subject matter included into the last unit of teachers guide had been tested. It is a practical difficulty of learning teaching process that the students are unable to spend sufficient time to study the subject matter in the last unit of the syllabus. Therefore, teachers should guide students to plan their studies allocating sufficient time for the last unit of the syllabus too.

Question 2

2 (A) (i) Presence of flower is a major distinguishing characteristic of angiosperms, Indicate five other major distinguishing characteristics of angiosperms.

Presence of vessel elements in xylem

Presence of sieve tube elements and companion cells in phloem.

Formation of a pollen tube to transport male nuclei to embryo sac./ ovum / ovule

Double fertilization.

Production of seeds within a fruit.

(05 x 2 marks)

(ii) The following are reproductive structures seen in gymnosperms. Name the corresponding structure for each of them in the angiosperm flower.

Megasporophyll - Carpel

Microporophyll - Stamen

(02 x 2 marks)

(iii) State the major characteristic features seen in the life cycle of *Selaginella*

Exhibit heteromorphic alternation of generations.

Dominant sporophyte.

Sporophyte produces strobilus.

Heterosporous / produce microspores and megaspores.

Unisexual gametophytes / Dioecious gametophytes

Flagellated male gametes are produced / motile male gametes are produced.

Gametes fuse to form a zygote which develops in to the embryo.

(07 x 2 marks)

(iv) State the difference between cross-pollination and self-pollination.

In self-pollination deposition of pollen of a flower on the stigma of the sameflower,

In cross pollination deposition of a pollen on the stigma of a different flower of the same plant or a different plant of the same species.

(02 x 2 marks)

(v) What is the significance of cross-pollination?

Producing new genetic combinations / Increase genetic variation within the species.

(01 x 2 marks)

(vi) What are the adaptations seen in plants for cross-pollination?

Heterostyly / Stigma and stamens at different levels.

Dichogamy / Male and female organs mature at different times .

Unisexuality / Dioecious plants / Produce only male or female flowers.

Self-sterility / Self-incompatibility / Pollen grains do not grow when deposited on the stigma of the same flower.

(04 x 2 marks)

(B) (i) What is a seed

The dispersal unit of seed plants which contains the embryo and stored food, surrounded by the seed coat

(01 x 2 marks)

(03 x 2 marks)

(ii) What features of seed have enabled seed plants to colonize land?

Presence of a seed coat

Presence of stored food, in the endosperm / cotyledons

Presence of a dormancy period.

Presence of efficient dispersal mechanisms.

(05 x2 marks)

(iii) What is parthenocarpy?

Development of a fruit from the ovary without fertilization .

Parthenocarpic fruits do not have viable seeds.

(02 x 2 marks)

(iv) Name a crop where parthenocarpy occurs naturally.

Banana / Pineapples

(01 x 2 marks)

(v) What is parthenogenesis?

Development of infertile seeds without fertilization.

(01 x 2 marks)

(vi) State how parthenocarpy is induced in horticulture and give an example of a crop where it is practised.

By applying / using / spraying plant growth substances.

Example - Grapes / oranges.

(02 x 2 marks)

(C) (i) The mojor events/ processes that take place in a nucleus of an eukaryotic cell during mitosis are given below. Put a mark in the appropriate column in the table to indicate in which phase of mitosis each of the following events/ processes occur.

	Interphase	Prophase	Metaphase	Anaphase	Telophase
• Chromosome condensation -	.....	..×..	.....	.....	.....
• DNA replication -	..×..	.....	.....	.....	.....
• Attachment of chromosomes to the spindle -	.....	.....	..×..	.....	.....
• Movement of chromosomes to wards the spindle poles -	.....	.....	.....	..×..	.....
• Breakdown of nuclear membrane -	.....	..×..	.....	.....	.....
• Alignment of chromosomes at the centre of the cell -	.....	.....	..×..	.....	.....
• Centromere separation -	.....	.....	.....	..×..	.....
• Reformation of nuclear membrane -	.....	.....	.....	.....	..×..

(08 x 2 marks)

(ii) Name the enzyme that participates in the synthesis of m-RNA molecule from a DNA molecule during protein synthesis.

RNA Polymerase .....

(01 x 2 marks)

(iii) What is the sequence of nitrogenous bases in the m-RNA strand that would be synthesized from a strand of DNA with the sequence of nitrogenous bases TGAGCGCCTAAAATT

ACUCGCGGAUUUUAA .....

(01 x 2 marks)

(iv) What is the natural role of the following enzymes?

DNA polymerase — Synthesis of new DNA Strand . .....

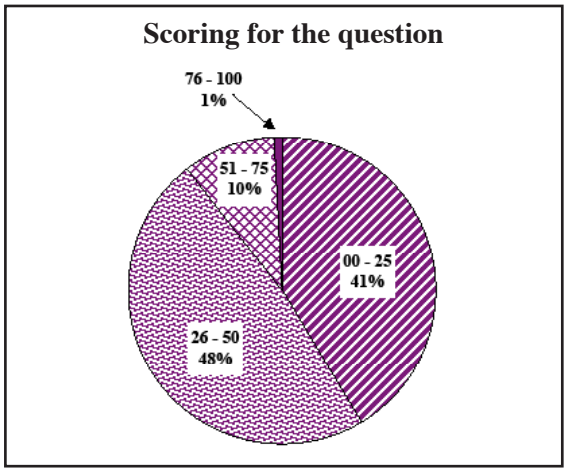
DNA helicase — Breaking of hydrogen bonds between two ands. .....

Restriction endonuclease — Cleaving DNA at specific sites. .....

Ligase — Joining of DNA fragments. .....

(04 x 2 marks)

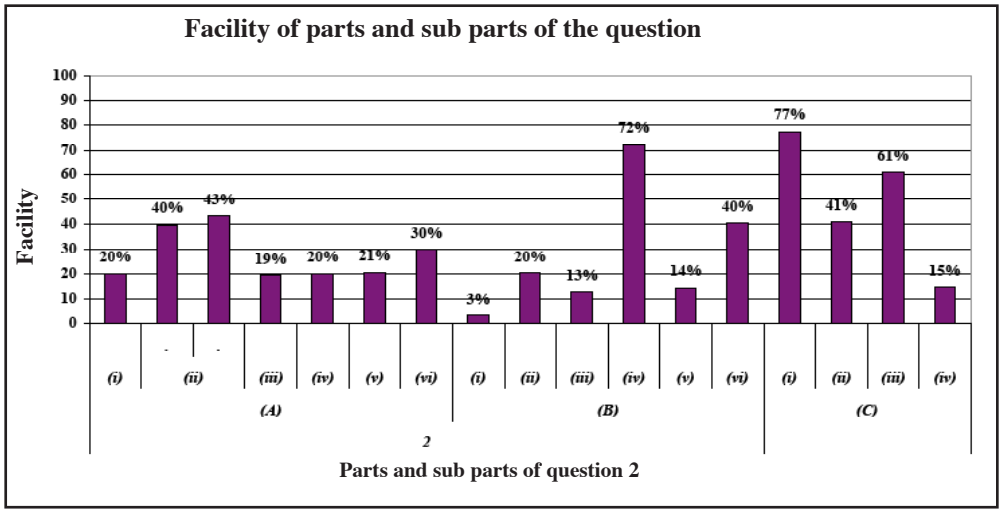
Overall observations, conclusions and suggestions regarding the answers to question 2



Although question 2 is compulsory, only 98.5% of the candidates had answered it. Marks allocated for this questionis 100. The percentages of candidates scoring within the following four intervals are:

00 – 25 ⟶ 41%
26 – 50 ⟶ 48%
51 – 75 ⟶ 10%
76 – 100 ⟶ 1%

The percentage scored 51 or above was 11% while those who scored 50 or below 50 was 87%.



This question had 17 sub parts and the facility of 3 sub parts was above 60%. The highest facility was for sub part C (i) and its facility was 77%. The sub part B. (i) had the lowest facility. Its facility was 03%.

2. A. (i) Facility of answering this sub part was 20%. Here, incomplete answers were presented such as presence of vessels or presence of vessels in xylem instead of "presence of vessel elements in xylem". Presence of pollen tube was written without stating the formation of pollen tube to transport male nuclei to embryo sac/ovum and students could not get marks. Students had written "the presence of sieve tube elements" but did not state the presence of companion cells and they lost the marks for that point. Further, though the students had stated "bearing seeds" they have not written "bearing seeds within a fruit" and could not get marks for that point also. In teaching the subject matter, it is important to explain that structures are made to do specific functions while students should acquire a proper understanding. When answering Biology structured essay questions like this, it is essential to present specific facts following the standard procedure.

2 A. (ii). Facility index for this sub part was 40% - 43%. As stated in the teachers guide it is not necessary for the students to remember diagrams with descriptive facts of developmental and reproductive structures representing different stages of life cycles of plants of non Anthophytic plants . Though it is stated that structures of life cycle of Anthophyta should be studied, answers of students showed that they have not had that understanding. It is essential to understand the parts of an angiosperm flower and the corresponding parts of the reproductive structures of gymnosperms for each part of the flower.

(iii). Answers of students to this sub part had a very low facility of 19%. Answers were given without having a proper understanding on major characteristics of the life cycle of Seleginella. Though detailed descriptions were not expected, the students should have known what the different stages of life cycle are viz. reproductive structures of saprophytic generation and gametophytic generation.

(iv). Students displayed a low facility index of 20% for this sub part. The difference between cross-pollination and self-pollination was asked in the question and if facts relevant to either cross-pollination or self-pollination were stated, marks were not allocated according to the marking scheme. It is important to emphasize the fact that when a comparison is done students must compare the structure or the function by giving attention to the concomitant difference of the same feature of two things that are to be compared.

(v). Students have shown a low facility that is 21% for this sub part. According to the marking scheme, there were no marks for incomplete answers. Marks were not given for 'producing genetic combinations", it should have been stated as "producing new genetic combinations". Marks were not given for "genetic variation within a species" but marks were allocated if it was stated as increase of genetic variation within a species. It has to be stressed that cross-pollination could add more genetic variation, in addition to the prevailing genetic variation of a species.

(vi). Facility was low for this sub part, that was 30% Though most of the candidates seemed to understand the question, they could not present glossary terms correctly and lost the opportunity of getting marks. Insufficient understanding of students on the sexual reproduction of Anthophyta plants had contributed for low facility in answering this question.

B. (i) Facility of answering this sub part was 3%. Here, stating the first point was made compulsory to get marks for the remaining 3 points out of the 4 points expected in the complete answer and that was the major reason for this very low facility. In the answer where 'the dispersal unit of seed plants" was not stated first, marks were not given for the remaining 3 facts of the answer. In defining the seed of a plant, it is essential to emphasize the fact that the seed was developed as a dispersal unit. It must be taught that the seed contains the embryo, and has stored food for provision of nutrition for the embryo after the seed is dispersed from the mother plant. Students should know that the mechanism of dispersal is decided by the adaptations of seed coat to the medium/vector of dispersal and the seed coat protects the seed from most of the physical damages that could occur in the environment.

2 B (II) Question in this sub part had been asked to find out the features of seed that have enabled seed plants to colonize land and the facility shown by students was 20%. Students seemed not to have a clear understanding on those features of seed.

(iii) Facility of this sub part was, 13% which is a low facility. According to teachers guide, students should have understood that parthenocarpic fruits do not have viable seeds. Students did not get marks mostly due to not stating that "parthenocarpic fruits do not have viable seeds".

(iv) Expected answer for this sub part was an example for a crop where pathenocarpy occurs naturally. Most of the students were able to answer successfully with a facility of 72%.

(v) Students could not provide the definition of parthenogenesis and therefore, the facility for this sub part was, 14% which is low.

(vi) Facility recorded by students for this sub part was 40%. Usage of plant growth substances to induce parthenocarpy was included to the answer. Most of the students lost marks as they stated that growth promoting substances that are not oxynes could be used. Instead of giving example of a crop, some students provided a name of a plant where parthenocarpy occurs naturally and hence they lost marks.

C. (i) Question in this sub part had been asked with the aim of testing the knowledge on mitosis and the facility displayed was 77%. Some students lost marks as they did not follow the given instructions.

(ii) In this sub part, it was expected to name the enzyme that participates in the synthesis of m-RNA molecule. Out of the students 41% have answered it correctly.

(iii) Facility index for this sub part was 61%. Some students lost marks as they arranged the complementary nitrogenous bases for synthesizing m-RNA molecule also similar to that of synthesizing a DNA molecule from the DNA strand.

(iv) In this sub part, names of 4 enzymes that function with DNA molecules were given and the role of each enzyme had been questioned. Facility shown was 15% which is low. Most of the students lost marks as they could not state the role of enzymes using correct glossary terms.

Question 3

3 (A) (i) Some structures found in invertebrates are as follows;

(a) Spines (b) Antennae
(c) Suckers (d) Tentacles
(e) Hooks (f) Radula
(g) Internal skeleton (h) Pedicellaria

Which of the above structures is/ are found in each of the animal groups given below?

Cephalopode ..... f, c, d, g .....

Asteroidea ..... a, g, h .....

Cestoda ..... c, e .....

Diplopoda ..... b .....

Gastropoda ..... d, f .....

Trematoda ..... a, c .....

Crustacea ..... a, b .....

Scyphozoa ..... d .....

(***17 × 2 marks***)

(ii) Complete the following dichotomous key to identify chiton, snail, octopus, oyster and slug.

1. Shell is absent 2
   Shell is present 3
2. Siphon is present Octopus
   Siphon is absent Slug
3. Tentacles are present Snail
   Tentacles are absent 4
4. Head is present Chiton
   Head is absent Oyster

(***06 × 2 marks***)

(iii) Which of the animal given in (A) (ii) above is/are immediately affected due to pollution caused by ships?

Oyster .....

(01 x 2 marks)

(iv) What is the international convention/protocol which helps to control the pollution caused by ships?

Marpol .....

(01 x 2 marks)

(B) (i) Name **five** greenhouse gases.

Carbon dioxide

Methane

Nitrous oxide / Oxides of nitrogen

Ozone

Hydrofluorocarbons / Chlorofluorocarbons

Water vapour

any 5
(05 x 2 marks)

(ii) Explain how greenhouse gases contribute to sea level rise.

Some radiation is trapped by greenhouse gases /

Prevents radiating back of some radiation (into space)

atmosphric / global temperature increases (global warming)

polar ice caps melts,

increase in the volume of ocean water.

(04x 2 marks)

(iii) In addition to sea level rise, what are the other consequences of the emission of greenhouse gases?

- Changes in pattern of atmospheric flow / Changes of wind patterns / Changes of climatic factors / Changes of rainfall pattern.
- Affect agricultural production
- Changes in composition of vegetation / distribution of vegetation / forest cover / grasslands / limits of deserts.
- Increase drought conditions./ increase in demand for irrigation water
- Increase of floods
- Loss of habitats / Extinction of some species.
- Increase of forest fires
- Increase in heat diseases / Death by heat diseases.
- Increase in spread of tropical diseases.
- Increase coastal erosion.
- Destruction of fisheries.

any 10
(10 x 2 marks)

(iv) What is the international convention/protocol which help to control the emission of greenhouse gases?

Kyoto Protocol

(01 x 2 marks)

(C) (i) What is meant by a natural resource?

Sources of material and energy found naturally which are of use in everyday life and for economic development .

(01 x 2 marks)

(ii) Give one example for each of the following.

(a) Non living renewable resources ..... water / soil .....

(b) Living renewable resources ..... forest / fisheries .....

(c) Non-living recyclable ..... iron / copper / aluminium / zinc .....

.....

(d) Non - living non- recyclable ..... fossil fuels / apatite / bauxite / gems / graphite .....

(04 x 2 marks)

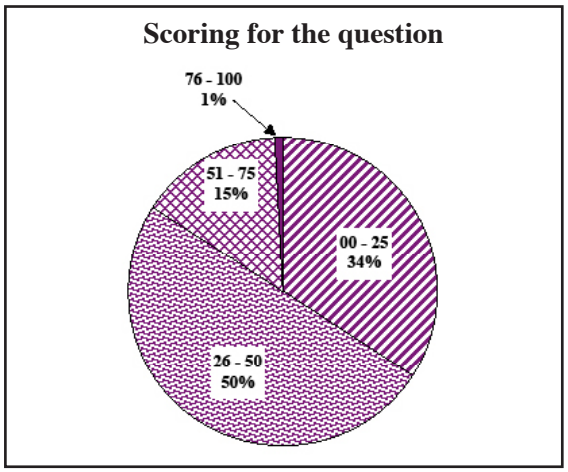
(iii) What is meant by sustainable utilization of natural resources?

Judicious use of resources in a manner that ensures long term prosperity of human societies and the ecosystem that supports them. / Use of natural resources without compromising the ability of future generations to use them.

(01 x 2 marks)

(51 points)
(any 50 x 2 = 100 marks)

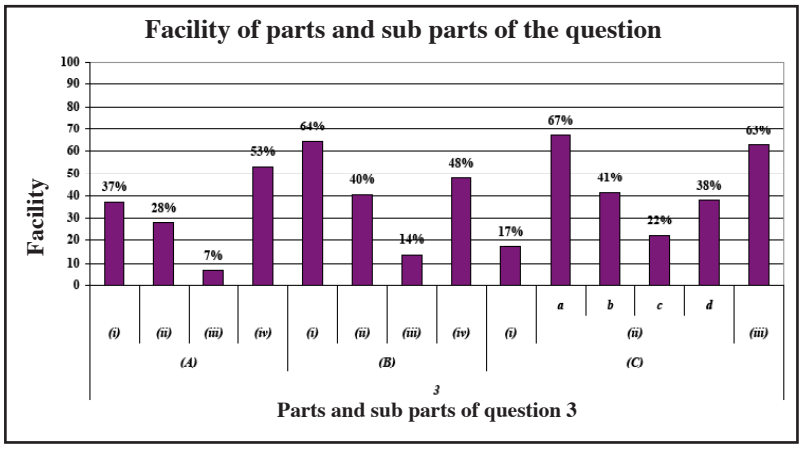
Overall observations, conclusions and suggestions regarding the answers to question 3



Although question 3 is compulsory, only 99.2% of the candidates had answered it. Marks allocated for this question is 100. The percentages of candidates scoring within the following four intervals are:

00 – 25 ⟶ 34%
26 – 50 ⟶ 50%
51 – 75 ⟶ 15%
76 – 100 ⟶ 1%

The percentage that scored 51 or above was 16% while those who scored 50 or below 50 was 84%.



This question had 14 sub parts and the facility of 3 sub parts was above 60%. The highest facility was for C (ii) a and its facility was 67%. The lowest facility was for the sub part A (iii) and its facility was 7%.

3. A. (i) The facility displayed by candidates for this question was 37%. The question was to test the knowledge of students on biodiversity unit. In order to answer the question correctly, it is essential to have knowledge on structures that could be seen in organisms in few Classes of invertebrates. Students were asked to select structures that could be found in each of the animal groups given. It seemed that students did not to have a clear understanding in doing that and it was indicated by the facility of 37%. If organisms were observed and external features were identified during practical sessions, following the instructions given in the teachers guide, it would have been easier to answer this question.

3. A. (ii) Facility displayed by students for this question was 28%. Question was to test the ability of students to construct the steps of a dichotomous key correctly. It is essential for students to have an understanding of features of organisms provided to prepare a dichotomous key. The knowledge that could be acquired through the biodiversity unit of teachers guide was required to provide correct answer to this question. Not having an understanding, about external features of animals given, seemed to be the reason for low facility.

3. A. (iii) Facility displayed by candidates for this question that comes under biodiversity of marine animals was very low (7%). In order to select the animals that are affected immediately due to pollution caused by ships (leakage of crude oil, etc), students should have had an understanding of mode of life of listed animals; they could not select the correct answer due to lack of knowledge on mode of life of oysters.

3. A. (iv) Candidates have shown median facility for this sub part which was 53%. It is a knowledge based question from the Ecology unit. It had a definite answer allowing 53% facility. Some students could not answer as the subject matter was not in the memory. The question could be categorized into somewhat easy type.

3. B. (i) Facility for this was 64%. It was a knowledge based question coming under Ecology unit. It was a question that the students could answer easily by keeping the facts in memory.

3. B. (ii) This question also was from Ecology unit and the facility was 40%. Answer had been prepared using the facts given in the teachers guide. Therefore, it was not difficult to answer but many students did not provide the correct answer.

3. B. (iii) Facility of this was 14%. In addition to sea level rise, other consequences of the emission of green house gases were asked. Subject matter required to answer this question is well explained in teachers guide. However, it seemed that students were poor in keeping the facts in memory by understanding them or they were unable to present all relevant facts for the question; thus they could not get marks.

3. B. (iv) This sub part had the facility of 48%. The question based on specific facts.

3. C. (i) Facility of this sub part was 17%. Definite definition is given in the teachers guide. It could be pointed out that it is necessary for students to get the training to present subject matter correctly.

(ii) (a) Facility of this sub part was 67%.
(ii) (b) Facility of this sub part was 41%.
(ii) (c) Facility of this sub part was 22%.
(ii) (d) Facility of this sub part was 38%.

In order to provide correct answers to sub parts C. (ii) a, b, c and d, students should have had a good understanding on classification of natural resources with correct examples and kept them in memory. It seemed that students have not given attention to do that, resulting low marks.

3. C. (iii) Facility of this sub part was 63%. Correct definition has been kept in memory with a clear understanding by many students and therefore, the facility was relatively high level;

Question 4

4. (A) (i) What is the basic physiological feature of muscles?

Contractility

(01 x 2 marks)

(ii) What is a muscle fibre?

Muscle cell

(01 x 2 marks)

(iii) State **three** physiological differences between human cardiac muscle fibres and skeletal muscle fibres.

Cardiac muscle fibres	**Skeletal muscle fibres**
- Do not fatigue	- Fatigue easily
- Contraction slow	- Contraction fast
- Involuntary	- Voluntary
- Rhythmic contraction	- Nonrhythmic contraction /
Myogenic / Contracts without	- Neurogenic / Nervous
nervous stimulation	stimulation required

any 03
(03x 2 marks)

(iv) State **three** structural differences between human cardiac muscle fibres and smooth muscle fibres.

Cardiac muscle fibres	**Smooth muscle fibres**
(Short) cylindrical	Fusiform / spindle shape
Branched	Unbranched
Sarcomeres present	Sarcomeres absent
Intercalated discs present	Intercalated discs absent

any 03
(03x 2 marks)

(v) According to the sliding filament theory what happens to the length of A-band, H-zone and I-band during skeletal muscle contraction?

	Length
(a) A - band	- Remains unchanged
(b) H - zone	- Shortens
(c) I - band	- Shortens

(03 x2 marks)

(vi) What is the by-product of muscle contraction used in homoeostasis?

Heat

(01 x2 marks)

(vii) Name **two** hormones which act on human skeletal muscles.

Glucagon

Insulin

Growth Hormone

Thyroxine

(any 02 x 2 marks)

(B) (i) What is an animal hormone?

A chemical (messenger),

secreted by an endocrine gland ,

into blood ,

act on a distant organ/ cells / tissue / target organ and

brings about a physiological / structural change.

(05 x 2 marks)

(ii) Why is acetylcholine considered as a neurotransmitter and adrenaline as a hormone?

Actylcholine - is secreted into a synapse and

act on the post synaptic cell / membrane (in close proximity)

Adrenaline - is secreted by an endocrine gland / organ into blood and

act usually on a distant tissue / target organ

(***04 × 2 marks***)

(iii) State **three** differences between hormonal and nervous coordination in humans.

Nervous coordination	Hormonal coordination
Fast transmission	Slow transmission
Chemical & electrical transmission	Chemical transmission
Local response	Wide spread response
Quick response	Prolonged response
Specific pathway	Nonspecific pathway

any 03

(03 x 2 marks)

(iv) Name **three** trophic hormones which influence the menstrual cycle of women.

GnRH FSH LH

(03 x 2 marks)

(v) Name **three** hormones secreted from a common structure formed from two individuals.

Oestrogen Progesteron Placental lactogen

(03 x 2 marks)

(vi) For each of the hormones of man given below state the site of production and **one** main function.

Hormone	Site of production	Main Function
(a) Growth hormone	Anterior pituitary	Promotes tissue growth / Regulates metabolasm
(b) Oxytocin	Hypothalamus	Stimulates ejection of milk / Stimulates contraction of smooth muscles of breast / Stimulates contraction of uterine wall/ womb / Stimulates contraction of smooth muscles of uterine wall / womb
(c) Cortisol	Adrinal Cortex	Increases blood glucose level / Stimulates breakdown of proteins
(d) Glucagon	α cells of pancreas	Increases blood glucose level
(e) Thymosin	Thyms	Stimulates production of T-lymphocytes / Stimulates maturation of T-lymphocytes

(10 x 2 marks)

(C) (i) What are the essential components of a blood circulatory system?

Circulatory fluid / blood

Pump / Heart

Tubes / Blood vessels

(03 x 2 marks)

(ii) Name the **three** components of the conducting system of human heart.

SA node .....

AV node .....

AV bundle / Bundle of His .....

(03 x 2 marks)

(iii) State **three** functions of human lymphatic system.

Protection from microorganisms / Phagocytosis of microorganisms .....

Immunity / Production and maturation of lymphocytes .....

Tissue fluid drainage .....

Absorption of fatty acids / glycerol / fat soluble vitamins .....

(any 03 x 2 marks)

(iv) Name **two** human diseases that could be diagnosed using blood antibody testing.

Dengue .....

AIDS .....

Filaria .....

Malaria .....

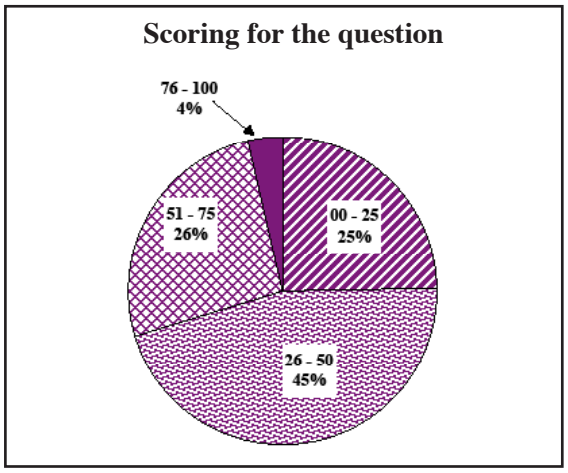
Chickungunya .....

any 02 (02 x 2 marks)

(53 points)

(Any 50 x 2 = 100 marks)

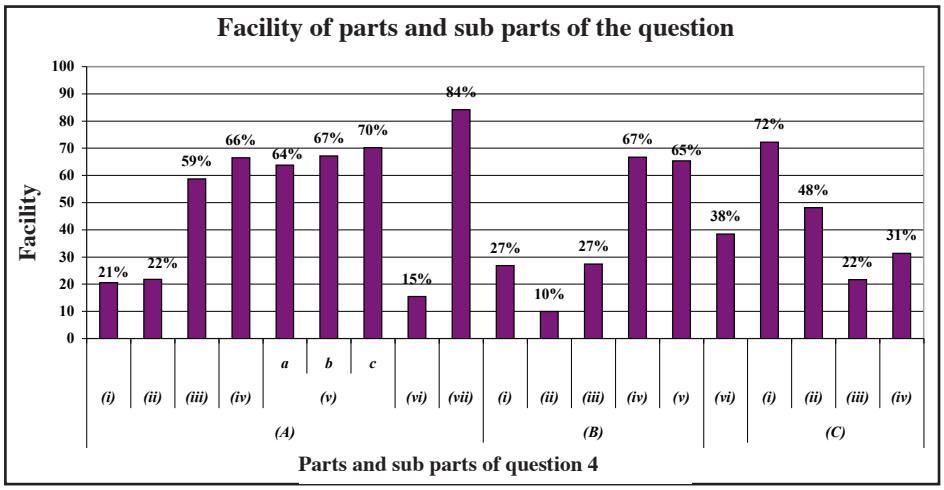
Overall observations, conclusions and suggestions regarding the answers to question 4 :



Although question 4 is compulsory, only 98.5% candidates have answered it. Marks allocated for this question is 100. The percentages of candidates scoring within the following four intervals are:

00 – 25 ⟶ 25%
26 – 50 ⟶ 45%
51 – 75 ⟶ 26%
76 – 100 ⟶ 4%

Percentage scored 51 or above was 30% while those who scored 50 or below 50 was 70%.



This question had 19 sub parts and the facility of 3 sub parts was above 70%. The highest facility was for sub part A (vii) which was 84%. The lowest facility was for sub part B (ii) which was 10%.

4 A (i) Facility of this sub part was 21%. The glossary term used to describe the basic physiological feature of muscles was expected as the answer to this question. Students were unable to present the glossary term that is used to describe the ability of a muscle to contract or shorten and they have lost marks. It is very important to emphasize the value of having an understanding of glossary terms like this that are included in the teachers guide.

(ii) Facility of this sub part was 22%. In order to answer this question, it is important to have an understanding and knowledge on basic structural features of a muscle.

4. A (vi) Facility displayed by candidates for this sub part was 15%, which is low. Question was to be answered based on basic knowledge but using analytically. Most of the time it was observed that the students are poor in answering questions like this.

4 B (i) Facility for this sub part was 27%. In order to give the correct meaning, a complete definition should be presented. Students could not get marks as the definition given was incomplete. It has to be emphasized to students that a definition should always be presented in the complete form.

4	B	(ii)	Facility for this sub part was 10% which is very low. Actylcholine is secreted into synapse while adrenaline is secreted by an endocrine gland to blood. Writing as production instead of secretion was the cause for not scoring.
4	B	(iii)	Facility for this sub part is 27%. In presenting the differences between nervous coordination and hormonal coordination, students lost marks as they did not state the concomitant difference. Most of the times a specific feature stated on nervous coordination was not presented with the concomitant difference observed in hormonal coordination, was the reason for failure to get marks.
4	B	(iv)	Facility of answering this sub part was 67%. In naming hormones, correct standard name/ accepted abbreviation of the name should be given. Example: Instead of GnRH if GNRH was written marks were not given..
4	B	(v)	It was expected to name three hormones secreted by the placenta as the answer to this question. The facility of answering was 65%. Students lost marks by writing additional hormones that were wrong.
4	B	(vi)	In this sub part, 5 hormones were given from (a) to (e) and the students were asked to state site of production and main function of each. Facility displayed by students was 38%. Many students were able to state the site of production but failed to present the main function and lost marks. It is essential to understand the main function of each hormone. Students are expected to use correct glossary terms such as promotes, regulates, stimulates.
4	C.	(iii)	Facility of this sub part was 22%. Stating three functions of human lymphatic system was not done successfully, because students hadn't used specific terms in their answers. eg : though phagocytosis was written by most students as the functions of lymphatic tissue. The accepted answer was phagolytosis of microorganisms.
4	C	(iv)	Facility of this sub part was 31% students should have the knowledge about human diseases that could be diagnosed using blood antibody testing. Those who wrote HIV as a disease did not score as the disease was Acquired Immunity Deficiency Syndrome (AIDS) which should be written in English only using capital letters if abbreviation is written.

Question 5

Part B - Essay

5. (a) Describe the basic chemical nature and functions of proteins.

1. Proteins are linear polymers of amino acids.

2. High molecular weight.

3. Contain C,H,O,N, and (sometimes) S.

4. 20 different amino acids are involved in making proteins.

5. In proteins amino acids are joined by peptide bonds.

6. Amino acid contain NH2 - group and

7. - COOH group.

8. Exhibits amphoteric properties.

9. Complex structure of proteins exists in 4 stages.

10. Primary structure,

11. sequence of amino acids.

12. Secondary structure,

13. helical or pleated sheet structure maintained by H bonds.

14. Tertiary structure,

15. formed by bending / folding of polypeptide chain to produce globular shape.

16. Quaternary structure,

17. aggregation of 2 or more polypeptides to form a complex structure.

Functions

18. Structural - 19. Keratin / Collagen

20. Catalyst - 21. Enzyme/ any enzyme accepted

22. Transport - 23. Haemoglobin / Myoglobin / Cytochrome

24. Storage - 25. Casein

26. Contractile - 27. Actin / Myosin

28. Protective - 29. Antibody

30. Hormonal - 31. Insulin /Glucagon / any pituitary hormone

32. Toxic - 33. Snake venom

(b) Explain briefly the role of RNA in protein synthesis.

34. 3 types of RNA are involved in protein synthesis.

35. Messenger RNA/ m- RNA

36. Transfer RNA/ t- RNA

37. Ribosomal RNA/ r - RNA

38. m- RNA molecule is formed as a complementary strand

39. to the single stranded DNA template and

40. RNA polymerase catalyze the reactions / synthesis of m - RNA

41. This process is called transcription

42. m - RNA molecules leave the nucleus and attach with ribosomes.

43. m - RNA carries the genetic code of DNA

44. as a sequence of complementary nitrogenous bases

45. r - RNA provides the site on the ribosome for assembly of amino acids.

46. t - RNA molecule is attached to a specific amino acid

47. t - RNA molecules having the complementary anticodon carry the specific amino acid to the ribosome / The triplet base sequence of the anticodon is directly related to the amino acid carried by that t - RNA.

48. Peptide bond forms between the adjacent amino acids.

49. Once new amino acid has been added to the growing polypeptide chain,

50. the ribosome moves along the m - RNA.

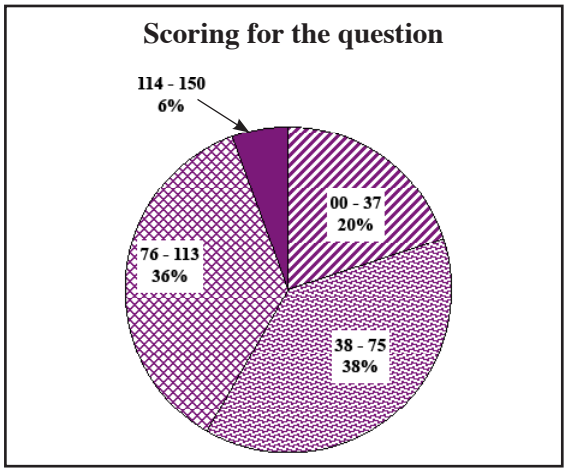
51. The polypeptide chain is formed which is the primary structure of a protein.

52. This process is called translation

52 points

any 50 x 3 = 150 Marks

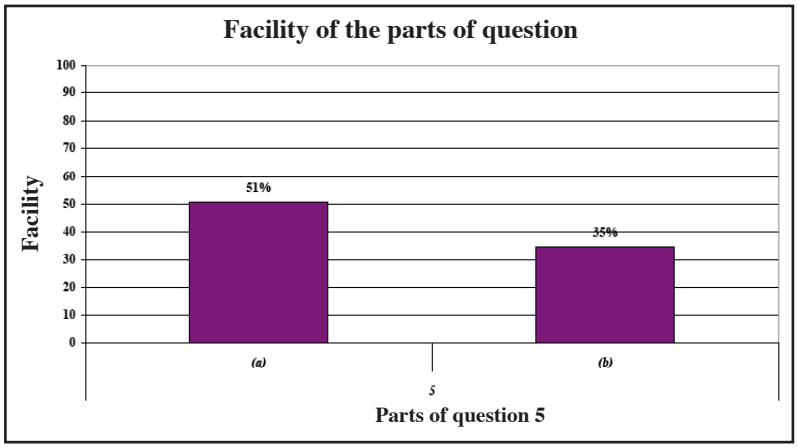
Overall observations, conclusions, and suggestions regarding the answers to question 5:



Question no. 5 had been answered by 84.6% of candidates. For this question, 150 marks are allocated. The percentages of candidates scoring within the following four intervals are:

00 – 37 ⟶ 20%
38 – 75 ⟶ 38%
76 – 113 ⟶ 36%
114 – 150 ⟶ 6%

Percentage scored 76 or above was 42% while those who scored 75 or below was 58%.



This question has two parts and both had facility above 35%. Facility of part (a) was higher which was above 51%. Facility of part (b) was lower and it was 35%.

Question no. 5 was an essay type question with 2 parts as 5a and 5b. Facility displayed by students in answering part (a) was 51%. Facility showed by students in answering part (b) was low (35%). As a whole, 20% of students scored 37 marks or below 37. Percentage of students who could obtain more than half of the allocated 150 marks that is more than 75 marks was 42%. Percentage of students who got more than 75% of allocated marks (that is more than 114 marks) was 6%.

In part a, students were asked to describe the basic chemical nature and functions of protein. Students were poor in presenting definite facts specifically and that was the reason for facility to stay at this level.

When naming the 4 stages of structure of protein, instead of primary, secondary, tertiary and quaternary structures, students have written primary protein, secondary protein, tertiary protein and quaternary protein and hence they could not get marks.

Many students were weak in naming correct protein related to the function.

In part b, students were asked to explain the role of RNA in protein synthesis and the expected answer was to describe the mechanism of protein synthesis. Students had tried to mention the roles of 3 types of RNA incompletely. It was observed that the subject matter presented by students on the role of RNA in transcription, and translation in protein synthesis was not sufficient. Therefore they were failed to get marks.

Question 6

6. Write an account on Blood pressure of man

1. Blood pressure is the pressure / force excerted by blood on the walls of blood vessels.
2. (Has two components) systolic and
3. diastolic pressure.
4. Systolic pressure is the pressure excerted by blood (on the arteries) during the contraction of the (left) ventricle (of heart).
5. In healthy adults it is about 120 mm Hg or 16 kPa.
6. Diastolic pressure is the pressure excerted by blood (on the arteries) during relaxation of the ventricles (of heart).
7. In healthy adults (normal) its about 80 mm Hg or 11 kPa.
8. Blood pressure is (usually) written as 120/80 mm Hg or 16/11 kPa.
9. Difference between Systolic and Diastolic pressure is called pulse pressure.

Blood pressure varies with

10. age,
11. sex / gender,
12. time of day,
13. activity,
14. stress / emotional states (excitement / fear / anxiety / anger / pain),
15. posture.

Blood Pressure is determined by several factors,

16. cardiac output,
17. peripheral arterial resistance,
18. heart rate,
19. blood volume,
20. constriction of arterioles,
21. dilation of arterioles,
22. elasticity of arterial walls,
23. venous return / amount of blood returning to heart (through veins).
24. baro receptors (in aortic arch and carotid sinus),
25. chemoreceptors (in the carotid and aortic arches / bodies),
26. higher centers of brain / medulla oblongata,
27. autonomic nervous system (sympathetic / parasympathetic),
28. kidneys,
29. ADH,

30. aldosterone,

31. renin / angiotensin / angiotensinogen.

32. Sustained elevation of blood pressure is called hypertension.

Reasons for hypertension

33. High salt intake,

34. hardening of arterial walls / increase in fibrous tissue in arterial walls,

35. deposition of low density lipoprotein on artery walls.

36. stress,

37. consuming alcohol / smoking,

38. obesity.

Consequences of hypertension

39. Heart attacks / Coronary thrombosis

40. Kidney failure

41. Stroke / Cerebral thrombosis

42. Rupture of blood vessels / Internal bleeding

43. (Sometimes leading to) death.

44. Sustained reduction of blood pressure called hypotension.

Reasons for hypotension

45. Blood loss (Haemorrhage / Bleeding)

46. Fasting / Low nutrition

47. Dengue haemorrhagic fever

Consequences of hypotension

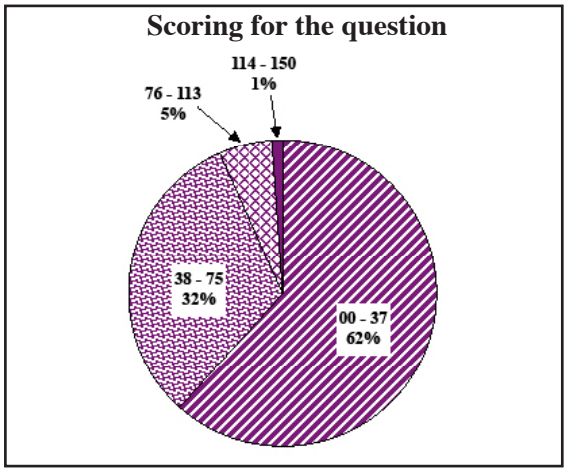
48. Kidney failure

49. Brain damage / Unconsciousness

50. (Sometimes leading to) death.

$50 \times 3 = 150$ *Marks*

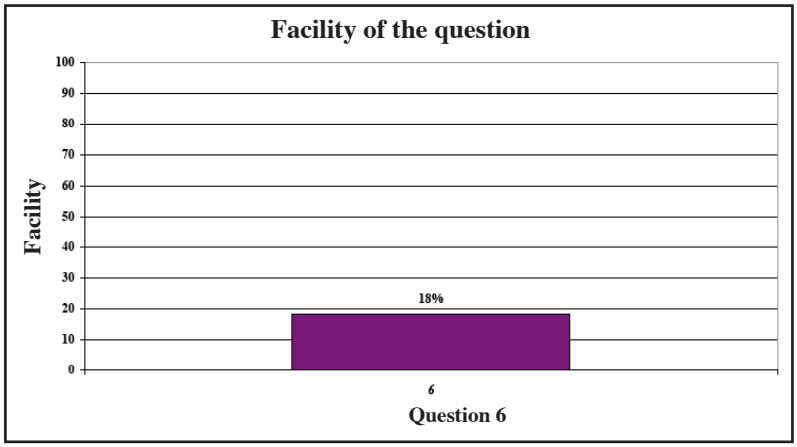
Overall observations, conclusions and suggestions regarding the answers to question 6 :



Question no. 6 had been selected to answer by 55.6% of the candidates. For this question, 150 marks were allocated. The percentages of candidates scoring within the following four intervals are:

00 – 37 ⟶ 62%
38 – 75 ⟶ 32%
76 – 113 ⟶ 5%
114 – 150 ⟶ 15%

Percentage scored 76 or above was 38% while those who scored 75 or below 75 was 94%.



Facility displayed by candidates who answered this question was low which was18%.

Question no. 6 was an essay type question to write an account on the blood pressure of human. Facility index calculated for answering the question was low (18%).

In answering the question, the student had to synthesize his answer by analyzing subject contents studied under the units, co-ordination, homeostasis, excretion and transportation of the syllabus. The question had been planned to measure high intelligent abilities. Students had showed overall weaknesses, when presenting facts by analyzing learnt subject matter. They had constructed their answer avoiding many facts that should be highlighted.

Students were unable to define and describe blood pressure as well as they were unable to present the values using standard procedure. As an example, blood pressure should be written as 120/80mmHg, however, these values were given with different deficiencies and the students lost marks.

Example: When the unit was given as Hg mm and 80/120mm Hg were not scored.

In presenting the values of systolic blood pressure and diastolic blood pressure, the students who did not write “in healthy adult” lost the opportunity of getting marks. In answers of most of the students, pulse pressure which is the difference between systolic and diastolic pressure was not included.

Knowledge of students on high blood pressure which is a non-communicable, common, health problem in the society seemed to be very poor.

From the students who answered this question 62% have obtained less than 38 marks. The percentage of students who obtained more than half of the allocated marks for the answer, that is over 75 was 6%. Only 1% of students (very few students) could obtain more than 75% of the allocated marks for the answer.

When writing the account on blood pressure, students were unable to present complete subject matter (they have presented only few facts) on reasons for variation in blood pressure, factors that affect blood pressure, regulation of blood pressure, hypertension and reasons for hypertension with consequences of hypertension, hypotension and reasons for hypotension with consequences of hypotension which caused for reduction in overall marks for the answer.

Question 7

7. (a) Describe briefly the global importance of Photosynthesi.

1. Provides carbon and energy to all living organisms.

2. Provides food either directly or indirectly to all living organisms.

3. Provides oxygen for all aerobes (in the biosphere).

4. Maintains the balance of O_2 and CO_2 in the atmosphere.

5. It supplies fossil fuels.

(b) Explain the role of light in Photosynthesis

6. Light provides energy for photosynthesis.

7. Energy in the form of ATP and reduced NADP/ NADPH are produced during light reactions.

8. Photosynthetic light reactions utilize red & blue region of visible spectrum.

9. During light reactions light energy (photons) is absorbed by chlorophylls & carotenoids.

10. present in the antenna complex,

11. located in the grana membrane / thylakoid.

12. Light energy is absorbed by antenna complex.

13. is passed on to a reaction centre, chlorophyll

14. in photosystems.

15. Reaction centre chlorophyll P700 in photosystem I absorbs the wave length of light at 700 nm.

16. Reaction centre chlorophyll P680 Photosystem II absorbs the wave length of light at 680 nm.

17. Absorption of light at photosystem II causes an electron to be boosted to high energy level.

18. This excited electron is accepted by a primary electron acceptor and

19. passes through several electron acceptors of

20. lower energy level.

21. The energy released in this process produces ATP.

22. This is called photophosphorylation.

23. At the same time photolysis of water takes place.

24. in grana,

25. in photosystem II,

26. resulting in formation of protons / H^+,

27. electrons and

28.O2.....

29.The electrons formed as a result of photolysis (of water).....

30.replace the electrons released earlier from photosystem II.....

31.When P700 chlorophyll molecule of photosystem 1 are exited,.....

32.its electrons are accepted up by a primary electron acceptor,.....

33.which finally move down another electron transport chain and.....

34.combine with hydrogen ions (from photolysis of water).....

35.to form NADPH.....

36..ATP and NADPH produced during light reactions...are used for.....

37.CO2..fixation (.during photosynthesis.).....

38.to produce..carbohydrates.....

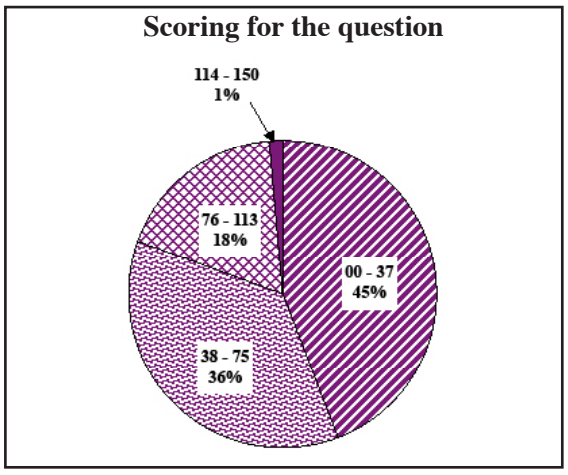
.....

.....

38 X 04 = 152 Marks

Max = 150 Marks

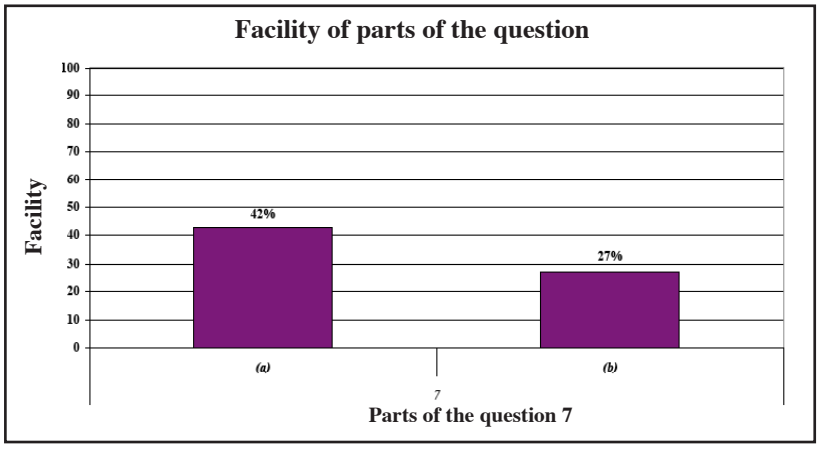
Overall observations, conclusions and suggestions regarding the answers to question 7 :



Question no. 7 had been selected to answer by 83.9% of the candidates. Marks allocated for this question was 150. The percentages of candidates scoring within the following four intervals are:

00 – 37 ⟶ 45%
38 – 75 ⟶ 36%
76 – 113 ⟶ 18%
114 – 150 ⟶ 1%

Percentage scored 76 or above was 19% while those who scored 75 or below 75 was 81%.



This question has 2 parts and the facility of each part was below 50%. The higher facility was for Part a which was 42%. The lower facility was for Part b and it was 27%.

Part (a) of the question expected the students to describe the global importance of photosynthesis briefly. Marks were allocated for 5 points while the answers of students were limited to 2 or 3 points and therefore they could not get full marks.

Answers of most of the students were poor; they have not stated "provide oxygen for all aerobes" as well they have not stated "provide carbon and energy for all living organisms". Students should pay attention to the fact that when answering an essay type question, they are expected to present facts with details unlike for the structured essay questions where marks are allocated for the direct and prominent facts. Students have given less attention for the importance of photosynthesis in production of fossil fuels by organic substances produced in photosynthesis Organic foods produced by plants during photosynthesis undergo high pressure and are sedimented under anaerobic conditions after plants are dead producing peat and later producing coal; after a long period, they became fossil fuel such as mineral oil and petroleum.

In Part (b), students were asked to explain the role of light in photosynthesis and according to answers of students, the facility was 27%. One of the reasons for this low facility was usage of unaccepted symbols. For example, "e" had been used for electron and " " had been used to indicate an increase.

Apart from that in photosynthesis, in reaction center, the specific chlorophyll molecule P 680 and P 700 were exchanged commonly in the answers.

Furthermore, some students have spent more time to explain the mechanisms of light reaction in detail with a diagram including electron flow diagram. Though a diagram is required to describe a structure, most of the time marks are not allocated for a flow diagram used to explain a mechanism. Facts that were included to the diagram were not described again by the students and they were unable to get marks for the points included in the diagram.

Though the students know the subject matter of the process of photosynthesis, their ability of presenting it in writing was poor resulting low marks.

Points that were included in the marking scheme were not presented completely by students in their answers; this was another reason for not getting marks. Students seemed to tempt to give recited answers given for questions in past examinations while they were expected to give a detailed answer with more relevant facts for the question in the present paper; students should be made aware of this situation.

Depending on the way that the question had been presented, it is expected to present relevant, specific answers correctly and the inability to do that was a common weakness of students.

Students have attempted to write answers given in past exam papers by heart, they had not include descriptive facts.

Question no. 7 has 150 marks. However, the percentage of students who scored less than 38 marks was 45%. Percentage of students who were able to get more than 50% of allocated marks that is above 75 was 19%. Percentage of students who were able to obtain more than 75% of allocated marks that is above 114 marks was a very low figure such as 1%.

Question 8

8. (a) Explain what is meant by biodiversity.

1. Is the variability among living organisms

2. found in terrestrial and aquatic ecosystems

...Components of biodiversity

3. Genetic diversity

4. is the genetic variability within a single species of organisms

5. Species diversity

6. diversity among species within an ecological community

7. Ecosystem diversity

8. is the variety of habitats, living communities and ecological processes in the living world

(b) List the causes of loss of biodiversity.

9. Fragmentation of lands

10. Habitat loss.

11. Extensive clearance of forests / Deforestation for

12. agricultural practices,

13. industry and

14. human settlements.

15. Introduction of alien species / invasive species.

16. Pollution.

17. Over exploitation of plant and animal species.

18. Global climatic changes.

19. Genetic erosion resulting from agriculture (with the displacement of traditional breeds.)

(c) Briefly describe the measures taken to conserve biodiversity at the national and global level.

20. The principal goal of conservation activity is to ensure the long term survival of as many species as possible.

21. Species that are in danger of extinction have to be specially protected and

22. steps should be taken to ensure their continued reproduction and survival.

Conservation can be done in two ways

23. In - situ conservation

24. Ex - situ conservation

In - situ conservation

In - situ conservation

25. Conservation of any component of biodiversity / species / genes / ecosystems in their natural habitat,

26. reproduction is facilitated in the natural habitat

27. large enough population and

28. adequate / appropriate habitat space have to be ensured.

Methods of in - situ conservation

29. Protected areas / Man and biosphere reserves / Traditional home gardens.

30. Sanctuaries /National parks.

31. Species reintroductions (into the natural habitat).

Ex - situ conservation

32. Conservation of any component of biodiversity / species

33. outside their natural habitats.

34. Conditions similar to the natural habitats are provided / specially created equal situations are provided,

35. reproduction and survival are ensured.

Methods of ex - situ conservation

36. Botanical gardens.

37. Zoological gardens / Turtle hatcheries.

38. Field genes banks / Seed banks /Germplasm centers /Genetic resource centers.

39. Captive breeding / Artificial breeding.

Acts and conventions related to conservation of biodiversity.

40. CITES / Convention on International Trade in Endangered Species of wild fauna and flora.

41. The aim of CITES is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

42. Biodiversity Convention

43. Its objectives are , the conservation of biodiversity,

44. sustainable use of its components and

45. the fair / equitable sharing of benefits arising from the use of genetic resources

46. RAMSAR convention

47. Convention on conservation of wetlands (of international important, especially as water fowl habitat.)

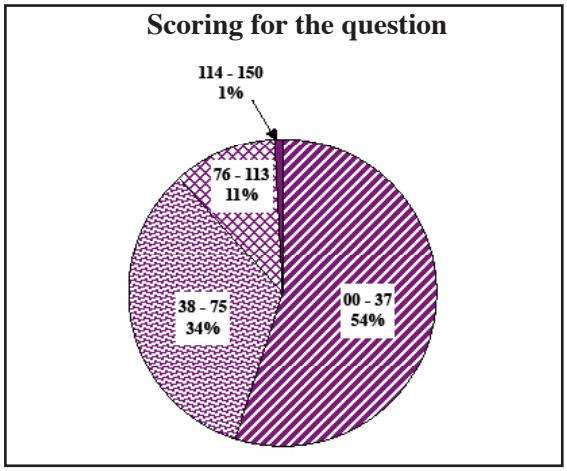
48. Fauna and Flora Protection Act / Ordinance .....

49. An Ordinance / Act which provides for the protection of the fauna and flora of Sri Lanka. .....

50. which makes provision for the establishment of national reserves / sanctuaries .....

$50 \times 3 = 150$ Marks

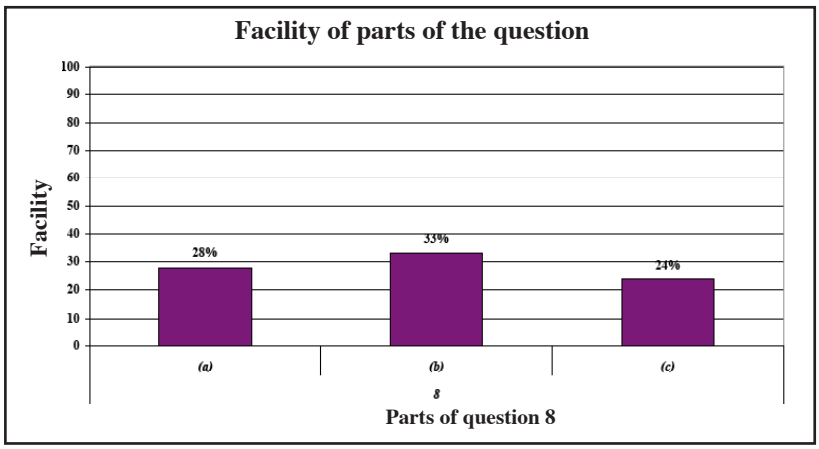
Overall observations, conclusions and suggestions regarding the answers to question 8 :



Question no. 8 had been selected by 68.3% of candidates. Question was allocated with 150 marks. The percentages of candidates scoring within the following four intervals are:

00 – 37 ⟶ 54%
38 – 75 ⟶ 34%
76 – 113 ⟶ 11%
114 – 150 ⟶ 1%

Percentage scored 76 or above was 12% while those who scored 75 or below 75 was 88%.



This question has 3 parts and all had facility below 35%. The highest facility was for part b and its facility was 33%. The lowest facility, 24% was for part C.

This essay type question was from 12th unit of the syllabus, Ecology unit. It has 3 parts.

(a) From this part, explanation of concept of biodiversity had been expected. According to answers of students facility index was 28%. Students had not understood the concept of biodiversity correctly and that was the major reason for low facility. Although students have stated genetic diversity, species diversity and ecosystem diversity, descriptions were poor.

(b) From this part, causes of loss of biodiversity had been asked and its facility index was 33%. Comparatively significant number of candidates was able to obtain higher percentage of marks Students should show higher competancy when answering such question which were included in past exam papers.

(c) Facility of this part was 24%. Although aims of conservation of biodiversity are given very clearly in teachers guide, students had not given attention and therefore it had been difficult to get marks.

Detailed explanations were not given on CITES, Biodiversity convention, RAMSAR and Fauna and Flora protection act, which are acts and conventions related to biodiversity conservation; it was a common weakness.

Due to presentation of wrong examples (examples were interchanged) for in-situ conservation and ex-situ conservation, most candidates lost marks.

Percentage that scored less than 38% for this question was 54%. Percentage that scored more than half of the allocated marks, that is above 75 was 12%. Percentage that scored more than 75% of allocated marks, that is above 114 was 1%.

Students seemed not to have a clear understanding on biodiversity concept and that was the major reason for getting low marks for the question as a whole. It was clear that students were tempted to present few points after reciting. Students seemed not aware that biodiversity consists of three main components and that it is necessary to give definite definition to each component.

Although, subject matter related to this question is included in teachers guide, students have not given attention as it is the last unit of the syllabus; this must have been another reason for low marks obtained by the students.

Question 9

9. (a) What is recombinant DNA technology

1. Joining DNA molecules obtained from different species
2. to make a functional single molecule of DNA.

(b) Describe the major steps involved in the production of a recombinant bacterium that can produce a useful animal protein.

3. Identification of the animal gene that produces the useful protein.
4. Extraction of DNA from the animal source and
5. separation of DNA using precipitation,
6. centrifugation / density gradient centrifugation.
7. Cutting the DNA into fragments with restriction endonuclease enzyme.
8. Separation of fragments of DNA by gel electrophoresis.
9. Identification of DNA piece of interest using a DNA probe.
10. Selection of a suitable bacterium (with small circular DNA molecules in their cytoplasm)
11. with a plasmid
12. with known antibiotic resistant genes / resistance.
13. E . coli bacterium is commonly used.
14. Bacterial plasmid act as DNA vector / carries the animal gene into the host cell / bacterium.
15. Separation of plasmid by centrifugation and
16. isolation by gel electrophoresis.
17. Isolated plasmid cut with the same restriction endonuclease.
18. Isolated DNA fragments (from animal source) mixed with plasmids / inserted into the plasmid.
19. Joining of DNA fragment with the plasmid using DNA ligase enzyme to form a
20. recombinant plasmid.
21. Recombinant plasmids are inserted into bacterial cells
22. by transformation .
23. Culturing of recombinant bacteria to form colonies.
24. Large number of bacterial clones (of animal gene) are produced.
25. Successfully transformed colonies are identified
26. using resistant marker genes carried by the vector / plasmid.
27. In the selective media,

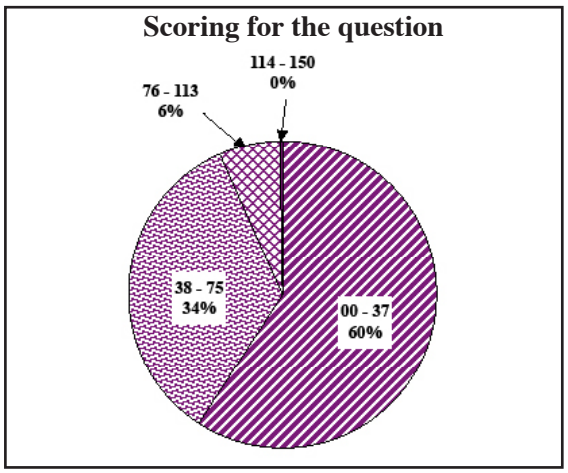
28. useful animal proteins are produced by the recombinant bacteria.

29. eg:- Human insulin

30. Human growth hormone / Human blood clotting factors.

30 x 5 = 150 Marks

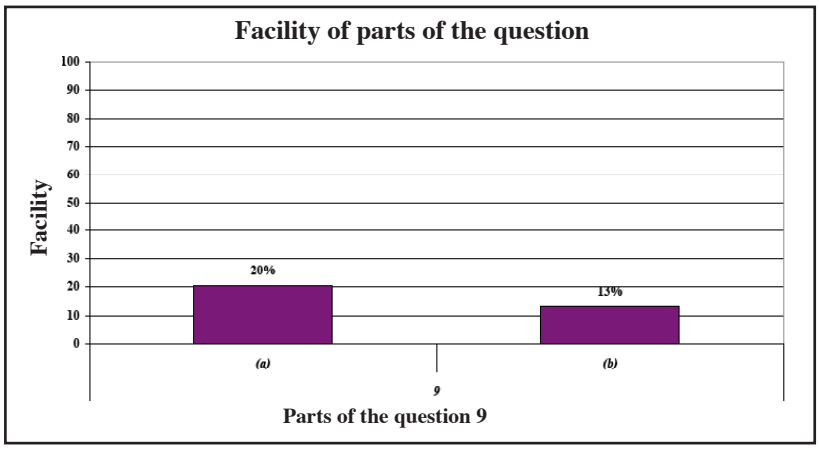
Overall observations, conclusions and suggestions regarding the answers to question 9:



This question was answered by the lowest number, that is 28.7% of candidates. The question was allocated 150 marks. The percentages of candidates scoring within the following four intervals are:

00 – 37 ⟶ 60%
38 – 75 ⟶ 34%
76 – 113 ⟶ 6%
114 – 150 ⟶ 0%

None of the candidates was able to score more than 113 marks. Very low number that is 6% was able to score more than 76 marks. The percentage of candidates scored 75 or below 75 was 94%. Candidates have experienced lot of difficulties with this question.



This question has 2 parts and the facility of both parts was below 20%. Facility was high in Part a with 20% while it was low in part b that is 13%.

Question no.9 had been based on recombinant DNA technology. Facility index for answering part a was 20% and that of part b was 13%.

In part a, definition of recombinant DNA technology had been expected but most of the students were unable to present correct definition and did not get marks; the definition is included in the teachers guide. Part b was to test the ability of applying the knowledge practically. Since mechanism of recombinant DNA technology was asked indirectly students were unable to answer.

The number that scored less than 38 marks was 60%. More than 50% of the allocated marks were scored by only 6%. There was no student who obtained more than 75% of the allocated marks. Low tendency of selecting this question also may be due to poor knowledge of students on recombinant DNA technology.

Complete process of recombinant DNA technology is given in detail in the teachers guide. However, students seemed not to have a clear understanding. It is important to explain such sections of the syllabus deeply and it is better if the teachers could make sure to give more attention to such sections during school based assessments. It would be easier to explain the facts using power point presentations.

Question 10

10. Write short notes on

(a) Salivary glands of man

1. These are exocrine glands.
2. Three main pairs;
3. Parotid glands
4. situated (on each side of face) just below the auditory meatus.
5. Submandibular glands
6. situated (on each side of face) under the angle of jaw.
7. Sublingual glands
8. on the floor of mouth / in front of the submandibular glands
9. (in addition) numerous smaller glands
10. scattered around the buccal cavity / in the buccal epithelium.
11. Consist of (fibrous) capsule
12. and number of lobules.
13. Lobules are made up of acini / secretory cells.
14. (Ducts of salivary glands) open to buccal cavity.
15. secrete saliva .
16. Secretion is under autonomic control .
17. Stimulation of sympathetic nervous system inhibits salivary secretion .
18. Stimulation of parasympathetic nervous system increases salivary secretion.
19. Secretion occurs when food is in mouth.
20. (In addition) sight / smell / thought of food stimulate salivary glands / secretion of saliva.

20 points

(b) Methods of sterilization used in microbiology

1. All glassware,
2. culture media,
3. transfer needles / inoculating needles have to be sterilized.
4. Sterilization means killing / destroying / removing
5. all forms of microorganisms and spores.
6. Glass ware (petridishes, pipettes) is sterilized hot air oven / dry heat
7. at 160 0 C for
8. 1 - 2 hours.
9. Inoculating loops / transfer needles in open flame.
10. Culture media sterilized by moist heat,

11. in an autoclave,

12. steam under pressure,

13. 15 1b / Sq inch,

14. 121 0 C for

15. 15 minutes .

16. Thermolabile liquids

17. sterilized using membrane filters,

18. pore size 0.45 am .

18 points

(c) Montane forests in Sri Lanka

Two types

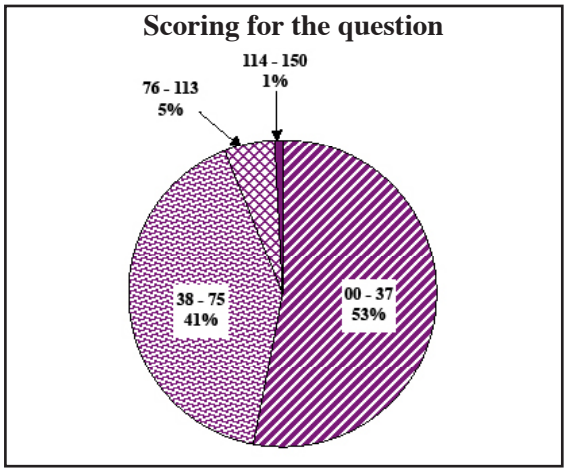
1. Lower montane
2. Upper montane
3. Montane forests occur at the elevations above 900m
4. Annual rainfall is high / over 900 mm

Vegetation

5. Evergreen
6. Stratification is not clear / not prominent
7. No emergents
8. Trees are subjected to strong winds
9. The trunks are twisted
10. Covered with lichens / mosses
11. Trees are heavily branched
12. The understory is sparse

20+18+ 12 = 50 points
50 x 3 =150 Marks

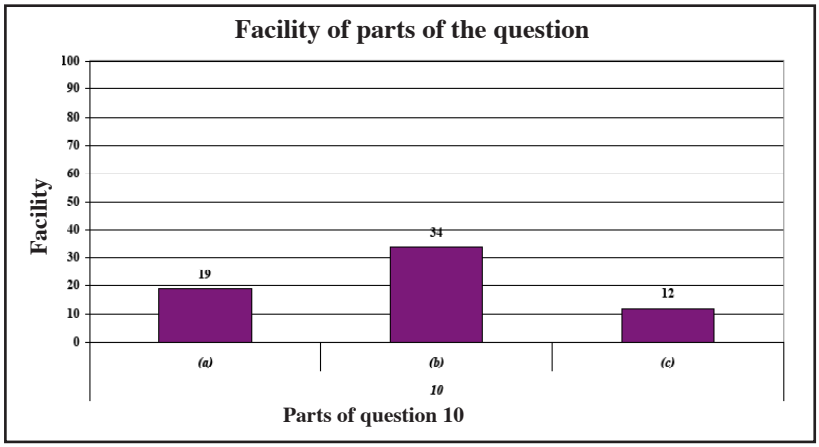
Overall observations, conclusions and suggestions regarding the answers to question 10 :



The question had been selected by 68.5% of candidates. Question was allocated with 150 marks. The percentage frequencies of candidates scoring within the following four intervals are:

00 – 37 ⟶ 53%
38 – 75 ⟶ 41%
75 – 113 ⟶ 5%
114 – 150 ⟶ 1%

The percentage scored 76 marks or above was 6% while percentage scored 75 or less than 75 was 94%.



This question has 3 parts and the facility of each part was below 35%. The highest facility was for part b and it was 34%. The lowest, 12% was recorded for part c.

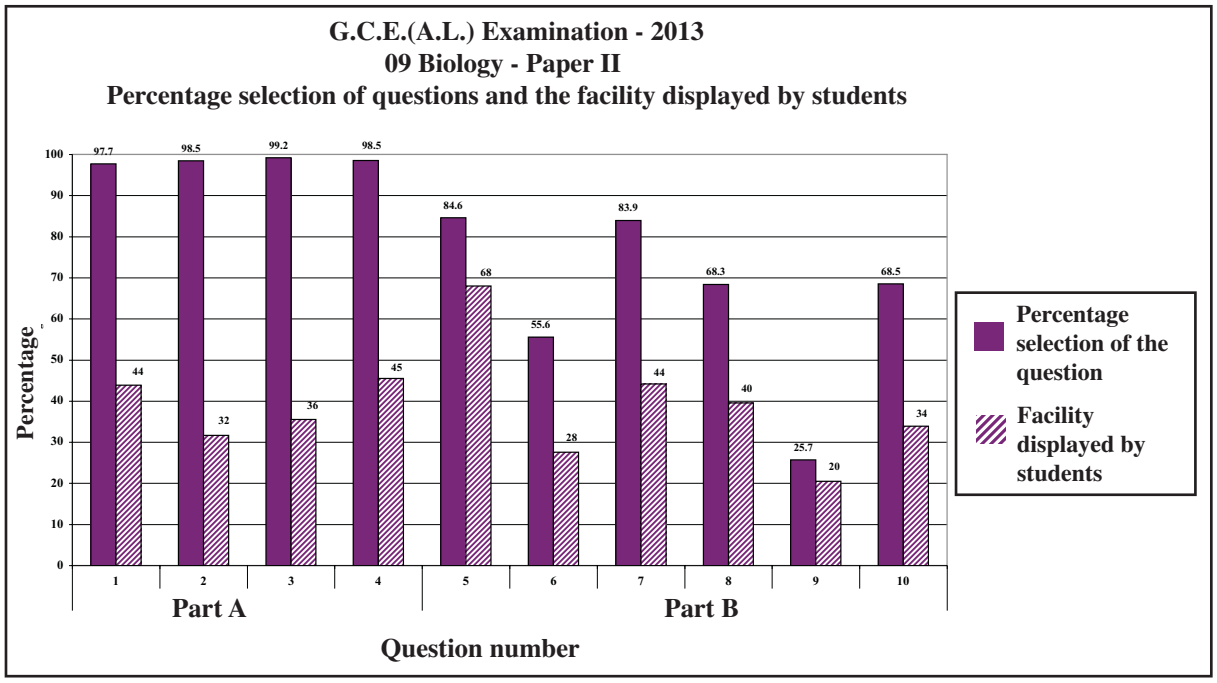
Question no 10 had been based on writing short notes with 3 parts as a, b and c. Facility for answering part a was 19%, part b was 34% and part c was 12%.

(a) This part expected to test the knowledge on salivary glands of human. Students were unable to present detailed facts on tissue structure of salivary glands and nervous control of secretion of saliva resulting low marks for this part of the question. Most students had answered about component of saliva and functions

(b) Relevant to this part, the subject matter on sterilization is clearly given in teachers guide but it seemed that the students have given less attention to this section, because students had mixed facts related to each method in their answer

(c) Although montane forests in Sri Lanka is included to the syllabus, subject contents and depth that should be taught is not given in the teachers guide; this could have contributed for less knowledge of students. In teaching subject contents like this, it would be better to make the teachers aware on subject content that should be taught and depth that should be gone.

2.2.3. Overall observations, Conclusions and suggestions regarding the answers to Paper II.



Of the four compulsory structured essay questions in part A, question 4 has shown the highest facility. Of the essay questions in part B, question 5 reports the highest facility of 68%. In part B, 5 was the question selected by the highest percentage of candidates too. All the other essay questions carry a facility of less than 50%. Question 9 being of lowest facility of 20%, was the one selected by a minimum number of candidates.

The achievement level of subject Biology would be raised by developing the learning teaching process paying more attention to the units in which the students seem to be weaker. Engaging students in the exercises of writing answers, discussing them, showing errors and shortcomings and training them to write the standard facts would also be helpful in this regard.

Part III

3. Factors to be considered when answering questions and suggestions:

3.1 Factors to be considered when answering :

Common instructions:

1. The candidates should read and understand well the basic instructions given in the question paper. They should be considerate as to how many questions to be answered from each section, which questions are compulsory, how much time is given and how much marks are allocated. They should also read the questions carefully to get a clear understanding and then select the questions.

2. Index number of the candidate should be written on each page on the relevant place.

3. Numbers of questions and sub-numbers should be written correctly.

4. According to the way the question is posed, facts should be presented logically and analytically.

5. When definite short answers are expected long descriptions should not be given. Similarly, when detailed descriptions are preferred, short answers should not be provided.

6. Answers should be written with correct and clear hand writing.

7. When answering questions in paper I, one answer which is the most correct or most appropriate should be selected and it should be marked clearly on the answer sheet using one cross (X mark).

8. In paper II, Part A, when answering the questions in structured essay paper, one should make sure to answer all 4 questions with proper time management. Each sub-part coming under the main question should be read well and only the relevant, targeted answer for each sub-part should be presented.

9. In Paper II, Part B - when answering essay question paper, make sure to answer the required number of questions only with correct management of time allocated for Part B.

10. In Paper II ,when answering the questions of Part B, answers for each main question should be started in a new page.

Essay

- Read the questions and understand well.
- After understanding, spend some time and collect the facts to write.
- Make sure not to write irrelevant facts and make sure to present a complete answer including all relevant facts in detail.
- If time is spent to write irrelevant facts, time would not be sufficient to answer all 4 essay questions causing problems; most students have answered only 3 essay questions due to this.
- Time management is important. Generally, it is sufficient to spend about 25 minutes for each essay question and about 15 minutes for a structured essay question.
- Skill of presenting a diagram with relevant, correct shape, in correct proportion should be improved to be used in describing structures. If the shape is completely wrong, marks will not be given even though the labeling is correct, Example: human heart should have a cone shape, guard cells of stomata should have the bean shape.
- Glossary terms in the subject Biology should be used in relevant places.
- When there is a calculation, each step should be written clearly to obtain the final answer.
- Correct standard units should be used at the required places.
- In writing scientific names, correct spellings should be used while following the international laws of nomenclature correctly. When using hand writings, rules of binomial nomenclature (such as underlining) must be followed thoroughly.
- In places where the chemical equations should be written, they should be balanced.
- When drawing graphs, X and Y axis should be named clearly, units should be stated at required places and correct shape of the graph should be illustrated.
- When answering essay questions of the subject, Biology, answers should not be presented only by concise methods such as tables, flow diagrams and equations.
- When answering essay questions, facts should not be presented separately using numbers or asterisks. Answers should be presented in essay form by separating paragraphs as required.
- Answers should not be presented using short symbols. Examples: $\bar{e}$ for electron, ($\uparrow$) to show an increase, ($\downarrow$) to show a decrease, RER, etc.

3.2 Comments and suggestions on learning – teaching process :

- Biology is a subject in which one should master theoretical as well as practical skills relevant for the subject and therefore, new syllabus for teaching Biology with competency based approach is presented. In a science subject, the method of generating knowledge is the scientific method. Accordingly, experiments should be carried out to test the hypothesis developed in order to solve the problems identified based on regular observations. Then the data should be analyzed to come to conclusions. Science subject like Biology is based on the knowledge discovered by these methods. Therefore, in order to maintain productivity of subject proficiency at a higher level, it is necessary to teach the subject more practically to get the training on scientific method which is the discovering methodology of the subject. Knowledge based education is a barrier to achieve above mentioned aims of this subject.

- Practical activities are very important in developing attitudes and skills in students related to science subject. For this, a teachers' guide included with recommended practical experiments are given to schools for the use of teachers. To fulfill the above aims, students should be engaged in practical activities so that they would get an opportunity to develop skills. The weaknesses of students in answering questions related to practical activities could be reduced by preparing questions related to practical activities and giving them to students to present answers, examining their answers and guiding them to follow correct procedures through discussions.

- In confirming the subject related theoretical and practical abilities modern technologies such as video clips, computer software, internet and multimedia projectors could be used depending on the available facilities.

- School based assessments and term tests could be utilized to train students to write answers for the questions related to new sections of the syllabus.

- Students should be guided to participate in workshops, seminars, projects and assignments in order to update the subject related knowledge on new information that are relevant to day to day life. School activities carried out parallel to the subject activities as well as extra-curricular activities could be utilized for this. Example: annual science day, environmental day, subject camping, exhibitions.

- Student should be guided to do assignments and assessments that could improve their abilities in analyzing and synthesizing. For this, students should be encouraged to make use of accepted, subject related text books as well as to collect information related to syllabus through internet.

- It seemed that teachers are not sufficiently knowledgeable on how to use the teachers guide. After reading and understanding the learning outcomes and objectives, lessons should be planned to achieve them. Students also should be made aware of the expected learning out comes.

- It is important to have a pre-plan in carrying out the learning – teaching process so that the role of the teacher could be discharged well.

- During the learning –teaching process, in addition to teaching, teacher should be able to hold the attention of students as well as should make arrangements to confirm that subject matter is understood by assessing learned matters (specially after assessing answers for structured essay and essay questions it is important to do the corrections).

- Further, opportunities should be provided to improve skills of presenting specific facts definitely and necessary support should be given so that the students will win at competitive examination.