Biology (964)

OVERALL PERFORMANCE

The number of candidates for this subject was 5036. The percentage of candidates who obtained a full pass was 72.92%, a decrease of 3.38% compared with the previous year.

The achievement of candidates for this subject according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	4.71	6.69	10.94	11.85	12.41	14.14	12.18	8.65	6.87	6.95	4.61

RESPONSES OF CANDIDATES

PAPER 964/1 (MULTIPLE-CHOICE)

Keys

Question number	Key	Question number	Key	Question number	Key
1	**B**	18	**B**	35	**C**
2	**D**	19	**D**	36	**C**
3	**D**	20	**C**	37	**D**
4	**C**	21	**B**	38	**C**
5	**D**	22	**C**	39	**C**
6	**A**	23	**D**	40	**A**
7	**B**	24	**A**	41	**D**
8	**A**	25	**B**	42	**A**
9	**D**	26	**B**	43	**A**
10	**B**	27	**D**	44	**B**
11	**C**	28	**D**	45	**A**
12	**D**	29	**B**	46	**B**
13	**A**	30	**C**	47	**D**
14	**B**	31	**C**	48	**C**
15	**A**	32	**A**	49	**C**
16	**D**	33	**C**	50	**D**
17	**C**	34	**C**		

General comment

The mean score was 29.11 (58.22%) and there was a very good spread of scores with a standard deviation of 8.73. More than 80% of candidates answered questions 39 and 43 correctly. Question 5 was answered correctly by less than 30% of candidates. The rest of the questions fell in the medium range, with 30% to 80% of candidates obtaining correct answers.

PAPER 964/2 (STRUCTURE AND ESSAY)

General comments

In general, candidates' answers were satisfactory in terms of planning and presentation. The answers can be improved by using scientific terms and writing scientific names. Only few candidates managed to answer accordingly and systematically. The overall performance of candidates was average with a mean of 25.57 and a standard deviation of 15.47.

Comments on individual questions

Question 1

In part (*a*), the majority of candidates were unable to correctly answer the curve represented by C. The answers frequently given were energy change or ΔH or energy release instead of free energy change or ΔG or overall energy released from the reaction.

In part (*b*), some candidates were unable to give the correct definition for activation energy. They merely mentioned the energy required to start a reaction but the correct definition is 'the initial or minimum energy required to start a reaction.'

In part (*c*), some candidates gave the answer as increase in temperature will increase the rate of reaction without writing the words *until optimum temperature.* The term *suboptimal temperature* was rarely used by most candidates.

In part (*d*), most candidates could answer this part quite well. Some excellent candidates managed to answer this part according to the answer scheme.

Question 2

In part (*a*), several candidates answered this part as *P* as vascular tissue instead of vascular bundle. Many candidates answered *R* and *S* as palisade mesophyll cell and spongy mesophyll cell respectively, but the word *cell* was not acceptable.

In part (*b*), a few candidates answered this part as structure *R* is arranged side by side or structure *R* is in parallel arrangement instead of tightly packed or regular arrangement. Many candidates preferred to use the wrong words *absorption of light* instead of *exposure to light* in answering the function of *R.* Some candidates mentioned that structure *S* has many spaces or has large vacuoles, which are not acceptable instead of has large intercellular spaces.

In part (*c*), several candidates gave the answer as prevent water loss instead of regulate or control water loss.

Question 3

In part (*a*), the majority of candidates were unable to identify the stage of the seed germination (the torpedo stage). Some of the incorrect answers given were organogenesis or seed development stage or double fertilisation.

In part (*b*), very few candidates managed to identify *W*, *X*, *Y* and *Z* correctly. The function of *W* was wrongly given as nutrient for cotyledon or food for seed. The correct answer was food storage for the developing embryo. The function of *X* was also wrongly answered by the majority of candidates.

In part (*c*), most candidates were unable to answer this part correctly.

Question 4

Most candidates did not perform well in this question. Their main weaknesses are inability to interpret results or make conclusions based on graphs, and lack of knowledge or inability to write scientific names of organisms according to the rules and regulations of the International Code of Nomenclature.

The correct way of writing the generic and specific names for the two organisms are *Paramecium aurelia* or *P. aurelia* or Paramecium Aurelia or P. Aurelia, and *Paramecium caudatum* or *P. caudatum* or Paramecium caudatum or P. caudatum. Since the answers were hand-written, the underlined options were considered.

The majority of candidates were unable to underline the generic and specific names, while some candidates wrote their answers as P. aurelius and P. caudatum.

In part (*a*), some candidates managed to answer the types of competition correctly but there were also candidates giving the wrong answer as *parasitism* instead of *interspecific* or *interspecies competition*.

In part (*b*), candidates made the conclusions without referring specifically to the graph given in the question. For example, many candidates mentioned that *P. caudatum* decreased in population without indicating after day 7 or 8.

In part (*c*), several candidates gave the answer as lack of space instead of starvation or low reproductive rate or low competitive capability as one of the reasons for the decrease in *P. caudatum* population.

In part (*d*), the majority of candidates were not able to answer this part correctly. The correct answer should have been the population of *P. aurelia* increased while the population *P. caudatum* decreased.

In part (*e*), the majority of candidates managed to answer the types of competition correctly but there were also candidates giving the wrong answer as commensalism instead of intraspecific or intraspecies competition or competitive exclusion.

Question 5

In part (*a*), most candidates tended to elaborate details on the transferring of electrons in the electron transport chain (ETC). They understood the topic quite well but they gave less attention to the usage of the correct terms. For example, proton gradient was written as electrochemical gradient and ATP synthase was written as ATP synthetase. Only a few candidates managed to define chemiosmosis and oxidative phosphorylation correctly.

In part (*b*), some candidates mentioned that cyanide is a competitive inhibitor and it binds to the enzyme which is incorrect and not acceptable. Many candidates mentioned that cyanide interferes with ETC without explaining how it interferes, which is by inhibiting the action of cytochrome oxidase and blocking the transfer of electron to oxygen.

Question 6

In part (*a*), most candidates' answers were unsatisfactory. They only mentioned that sulphur bacteria obtained the source of hydrogen from H_2S without mentioning the words *oxidation from* H_2S. Many candidates did not mention water as one of the products of photosynthesis in sulphur bacteria. Candidates made the mistake in writing the correct scientific names. Some candidates managed to answer correctly either the green or the purple sulphur bacteria.

In part (*b*), most candidates were unable to describe the characteristic processes in holozoic nutrition correctly. The answers given were incomplete. For examples, food is ingested without mentioning by mouth, food is digested without mentioning by in the alimentary canal, digested food is absorbed without mentioning into the cells, and undigested food is egested without mentioning through the anus. Many candidates were able to answer the types of holozoic nutrition correctly. However, some candidates did not spell the terms correctly. For example, herbivore was written as herbivorous and carnivores was written as carnivorous. There were also candidates who included parasitism and commensalism in their answers.

Question 7

This question required candidates to have skills in drawing a correctly labelled scientific diagram. Most diagrams drawn by candidates were not satisfactory and none of them obtained full marks for the diagram. This is because none of the diagrams indicated the presence of the sympathetic and parasympathetic nerves.

Candidates who attempted this question understand the topic quite well. However, in describing the mechanism and control of the heartbeat, they should have given more attention to the usage of correct terms. Some candidates answered that the heart is myogenic instead of heart muscle is myogenic. Candidates also mentioned that the atrium contracts and ventricle contracts but the acceptable answers are both atria contract and both ventricles contract. Some candidates gave the answer as wave of depolarisation instead of impulse and some candidates explained the cardiac cycle instead.

Question 8

In part (*a*), some candidates mentioned neurotransmitter and pre-synaptic membrane instead of acetylcholine and post-synaptic membrane. A few candidates wrongly spelt acetylcholine as acetycholine. Candidates who did not understand the mechanism of action of curare were unable to answer satisfactorily.

In part (*b*), most candidates understood the topic quite well but their main weakness was inability to use the correct terms in giving the explanations. For example, many candidates only mentioned that calcium ions bind to troponin molecules without mentioning the location on the actin or thin filament. The answer should have been myosin head but candidates only mentioned myosin. Sarcoplasmic reticulum and troponin were wrongly spelt as sacroplasmic reticulum and tromponin respectively.

Question 9

In part (*a*), some candidates misunderstood the question by giving the functions of the various hormones such as oestrogen and progestron, while several candidates gave the differences between steroid and non-steroid hormones. Many candidates managed to describe the characteristics of human hormones quite well.

In part (*b*), the less able candidates were unable to use the correct terms in describing the mechanism of hormone actions via gene activation. Most candidates mentioned the words *moves through* or *get into* instead of *diffuses through*. Some candidates answered that steroid hormone diffuses through the plasma membrane without mentioning into the cytoplasm, and they answered that hormone-receptor complex passes into the nucleus without mentioning through the nuclear pore.

Question 10

In part (*a*)(i), the answer given by most candidates was quite general especially on the definition of conservation biology.

In part (*a*)(ii), most candidates did not use the words *to maintain*, *to prevent* and *to protect* in answering the question.

In part (*b*), most candidates mentioned only the facts such as replantation, enforcement of laws and education, without further explanation on the facts given, in explaining the sustainable management of tropical rain forest. Some candidates gave the negative version of the answers. For example, conservation is necessary to prevent extinction of species; however the candidates wrote that if there is no conservation, extinction of species will occur.

PAPER 964/4 (WRITTEN PRACTICAL TEST)

General comments

In general, the performance of this year's candidates was less satisfactory than performance of previous year's candidates.

Comments on individual questions

Question 1

In part (*a*), the majority of candidates were able to give the answer correctly as monocotyledonous plant, but were not able to explain their answers. The candidates just explained that it contains two cotyledon or the cell arrangement is specific instead of phloem and xylem forming in a ring.

In part (*b*), the majority of candidates were unable to name *M* as a vascular cylinder and *N* as a cortex. This may be due to lack of practice in identifying plant structure.

In part (*c*)(i), most candidates were unable to name the structures *O*, *P*, *Q* and *R* correctly. The answers are *O* is a passage cell, *P* is an endodermis, *Q* is a metaxylem and *R* is a phloem.

In part (*c*)(ii), most candidates lost their marks due to the wrong answers given in part (*c*)(i).

In part (*d*), the majority of candidates were unable to give the answer correctly as casparian strips.

In part (*e*), most candidates were unable to give the answer correctly as parenchyma.

In part (*f*), the majority of candidates gave the answer correctly as mineral and water.

In part (*g*), most candidates were able to give the answer correctly as matured, but were not able to explain their answers.

Question 2

In part (*a*), most candidates gave the answer correctly as Insecta, but some candidates were unable to spell Insecta correctly. For example, Insecta was spelled as Insectae or Insect.

In part (*b*), most candidates answered correctly that Insecta have one pair of antenna and three pairs of legs or six legs.

In part (*c*), most candidates were able to name the organisms *S*, *T*, *U, V, W, X, Y* and *Z* correctly. The answers are *S* is a butterfly, *T* is a moth, *U* is a cicada, *V* is a beetle, *W* is a dragonfly, *X* is a damselfly, *Y* is an ant and *Z* is a bee.

In part (*d*), most candidates were unable to group the organism according to their respective orders due to lack of basic knowledge in ecology and taxonomy.

In part (*e*), most candidates were unable to answered *T* and *U* correctly as light trap but were able to answer *S* and *X* correctly as swift or aerial net.

In part (*f*), the majority of candidates correctly answered *W* and *X* as aquatic organisms.