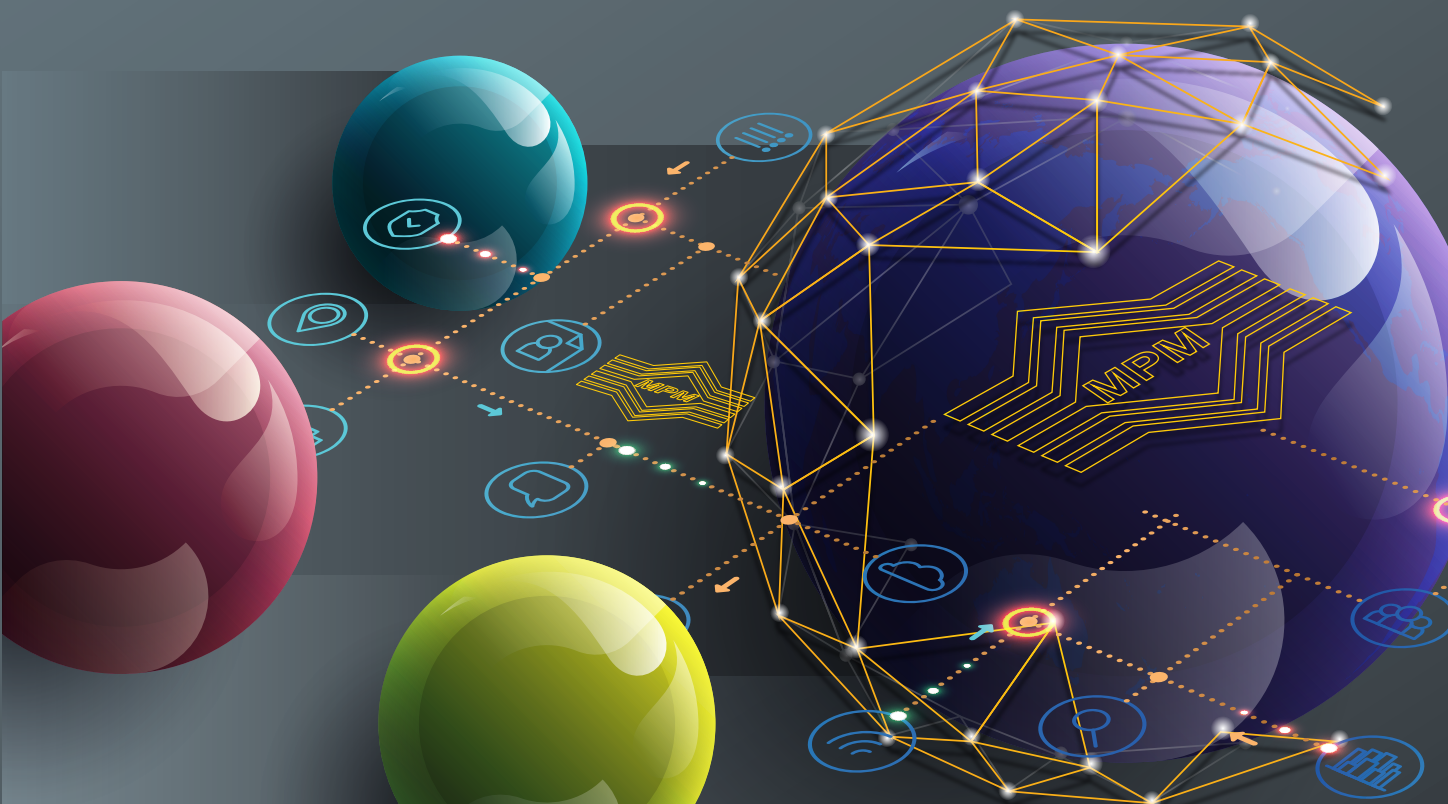
MAJLIS PEPERIKSAAN MALAYSIA

SASBADI

LAPORAN PEPERIKSAAN STPM & MUET 2021

Biology (964)



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BIOLOGY (964/1)

OVERALL PERFORMANCE

For Semester 1, 1 886 candidates sat for the examination of this subject and 69.10% of them obtained a full pass.

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

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	4.19	4.67	7.32	8.32	15.38	13.10	16.12	7.85	4.14	3.82	15.11

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice*

Answer Keys

Question number	Key	Question number	Key	Question number	Key
1	**A**	6	**D**	11	**A**
2	**B**	7	**C**	12	**C**
3	**B**	8	**C**	13	**A**
4	**C**	9	**B**	14	**D**
5	**B**	10	**A**	15	**D**

General comments

In general, Questions 1, 5, 9, 13 and 14 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, Questions 3, 4, 6, 7, 8, 10, 11 and 15 were in the range of moderate questions where 40% to 64% could be answered by the candidates correctly. The easiest question was Question 9, in which 79% of the candidates answered the question correctly. The most difficult question was Question 2, in which only 20% of the candidates answered the question correctly.

SECTION B AND C: *Structured and Essay Questions*

General comments

In general, the questions covered all aspects, which include factual recall, understanding the biological concept, and application of knowledge. The questions widely covered the syllabus of STPM from topic 1 to topic 6. The depths of the questions were in accordance with the syllabus. The questions were comprehensive and provided appropriate challenges to the candidates. The questions were able to differentiate between the low potential and high potential candidates.

Comments on the individual questions

Question 16

The question was about nucleic acids. Candidates were required to differentiate between the molecule of DNA and RNA by comparing its structural differences. Candidates were expected to have knowledge, understanding and as well as able to analyse the following: bond that links the two strands of polynucleotide, hydrogen bonds linking the paired bases, and understand the basic principle of base pairing in DNA to calculate the percentage of each nitrogenous base.

For part (*a*), candidates lost marks for not describing the structure of DNA and RNA as presented in the diagram. The candidates should describe the pentose sugar for DNA and RNA as *deoxyribose* and *ribose* respectively. Few candidates able to differentiate the nitrogenous bases for DNA and RNA correctly. For instance, the candidates should answer the nitrogenous bases for DNA are *adenine*, *guanine*, *cytosine* and *thymine* whereas the nitrogenous bases for RNA are *adenine*, *guanine*, *cytosine* and *uracil*.

For part (*b*), most candidates were able to name the bond correctly as *hydrogen bond*. However, only few candidates were able to calculate correctly the total number of hydrogen bonds formed in DNA molecule given.

For part (*c*), the candidates were able to understand that the percentage of bases A-T and C-G are equal but did not show the clear step in calculating the percentage of guanine. Some candidates did not indicate the bases they are referring to in their calculation.

Question 17

The question was about the concepts of water potential in plant cells. The candidates were required to calculate the water potentials of two adjacent plant cells.

For part (*a*), majority of the candidates were able to calculate correctly the value of water potential for plant cells *P* and *Q* with correct unit as well. Most of the candidates were able to answer the direction of water flow is from *Q* to *P*.

For part (*b*), few candidates were able to answer this question correctly. Candidates should have understood that any cell immersed in distilled/pure water would achieve the same water potential of distilled/pure water at equilibrium which is 0 kPa. For part (*c*), few candidates were able to answer this question as the candidates could not relate the effect of the solute to the total kinetic energy of water molecule.

Question 18

In part (*a*), the question was about the denaturation of enzyme by temperature. The candidates were required to describe how extreme temperature affects the increase of kinetic energy which leads to the breaking of chemical bonds in an enzymatic reaction and thus affects the formation of enzyme-substrate complex and formation product. Candidates also need to describe the effect of bond breaking on the active sites of enzyme and the consequences on the formation of enzyme-substrate complex. Many candidates lost marks due to misunderstanding the meaning of denature temperature. Majority of candidates describe denature temperature as *higher temperature than optimal temperature* or *high temperature above 37°C* or *temperature of 60°C*. The acceptable answer was *extreme or very high temperature*. The candidates must use specific term in explaining their answer such as *extreme or very high temperature* instead of *high temperature*.

In part (*b*), the question was about the principle of immobilised enzyme in the development of biosensor for monitoring blood glucose level. Few candidates scored for this part due to lack of detailed explanation. There were candidates who explained the dipstick test instead of electronic biosensor. Very few candidates were able to write the immobilised enzyme name, *glucose oxidase* correctly. Many

candidates also write *glucose oxidase reacts glucose in the blood* instead of *glucose oxidase oxidised glucose in the blood*. Few candidates mentioned *chemical signal or biological signal converted into electrical signal* instead of *biochemical signal converted into electrical signal*. Some candidates did not write complete answer such as *electrical signal is amplified* instead of *amplifier amplify electrical signal* which caused the candidates losing marks.

Question 19

In part (*a*), was about the production of ATP in liver cells and the total number ATP produced. The candidates should describe the production of ATP via glycolysis, Krebs cycle and briefly in electron transport chain. In general, candidates' knowledge on glycolysis and Krebs cycle were good by judging through their answer explanation. However, some candidates describe the reactions involved partly correct because the candidates did not specify the number of molecules reacted as well as the number of products produced. Few candidates misspelled the substrate and molecule involved. Some candidates did not use the specific/scientific terms to describe the reactions such as *oxidised, reduced, phosphorylated, oxidative decarboxylation and susbtrate-level phosphorylation* instead of *dephosphorylate, convert, change, react and combine*. There were candidates who did not describe the pathway in details as required, just a brief explanation on glycolysis and Krebs cycle.

In part (*b*), the question was about the effects of cyanide in aerobic respiration. Only few candidates were able to explain the effect of the proton gradient formation and the flow of proton through ATP synthase. Candidates must explain in details the answer such as *ATP cannot be produced through oxidative phosphorylation*. Majority of the candidates only mentioned that ATP could not be produced without mentioning the process involved. Some candidates used incorrect term such as *incompetitive inhibitor* instead of *non-competitive inhibitor*. Candidates must relate the effect of cyanide binding to the inhibition of terminal transfer of electron. Few candidates wrongly explained the inability of cytochrome oxidase to bind to the substrate instead of to form enzyme - substrate complex.

Question 20

In part (*a*), the question was about the cyclic photophosphorylation in *Hibiscus* sp.. Many candidates lost mark because they associating the primary electron acceptor with FeS, which was not accepted. Candidates also lost marks when they were unable to use the words such as *photoexcited electrons* and *low energy electrons*. In some other cases, candidates mixed up the answer with non-cyclic photophosphorylation process, which was not required to answer the question. Few candidates able to spell correctly the name of the electron carriers such as *Ferredoxin/Fd, Cytochrome complex (cytochrome a,b,c) and plastocyanin/Pc*. Majority of the candidates write *the electrons flowback to PS1/P700* instead of *the low energy electron flows back to PS1/P700*, which was the correct answer.

In part (*b*), the question was about the carbon dioxide fixation in CAM plants. Candidates need to avoid using general terms such as *convert* and *combine* in explaining the processes in their answer. Candidates must use accurate terms such as *carbon dioxide is fixed with the PEP to form oxaloacetate*. Candidates also must state the fate of oxaloacetate and reactions that occur during the day. Candidates need to mention the second carbon fixation, its acceptor and the enzyme that catalyse the reaction. Some candidates confused whether to use term oxidised or reduced in the reactions involved. For example, *oxaloacetate was reduced to malate*, but some made mistake by stating that *oxaloacetate was oxidised to malate*. In plant, the reduction coenzyme is NADPH, but some candidates write it as NADH, which was not accepted. Few candidates did not recognise that CAM plants do not have Kranz anatomy, and the reactions occur in the same cell but first and second carbon fixation is separated temporally.

BIOLOGY (964/2)

OVERALL PERFORMANCE

For Semester 2, 1 878 candidates sat for the examination of this subject and 50.91% of them obtained a full pass.

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

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	5.43	5.06	9.37	6.92	9.32	5.70	9.11	8.31	6.34	5.91	28.54

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice*

Answer Keys

Question number	Key	Question number	Key	Question number	Key
1	**B**	6	**C**	11	**D**
2	**D**	7	**B**	12	**C**
3	**C**	8	**C**	13	**A**
4	**D**	9	**A**	14	**A**
5	**B**	10	**A**	15	**–**

General comments

In general, Questions 4, 7, 9 and 13 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, Questions 1, 2, 5, 6, 8, 10, 11 and 12 were in the range of moderate questions where 40% to 64% could be answered by the candidates correctly. The easiest question was Question 4, in which 75% of the candidates answered the question correctly. The most difficult question was Question 3, in which only 30% of the candidates answered the question correctly.

SECTION B AND C: *Structured and Essay Questions*

General comments

In general, the quality of the questions was good and within the syllabus of Biology Semester 2 STPM. Some essay questions require candidates to give specific process and terminology. The questions were presented with proper instructions and it tested the candidates understanding and knowledge of the intended topics learned in Semester 2. The questions were able to differentiate between the low ability and high ability candidates.

Comments on the individual questions

Question 16

The question was about structural characteristics of the stoma.

For part (*a*), few candidates were able to identify structures *P* and *Q* as subsidiary cell and guard cell respectively. Candidates should answer the differences between *P* and *Q* in terms of possessing the chloroplast and structural characteristics of the cell wall. However, there were few candidates gave the differences in terms of the function, which was not required to answer the question.

For part (*b*), most candidates were able to describe the increase of potassium ion concentration in cell *Q* caused the stoma to opened. However, only a handful of candidates were able to mention the decrease of potassium ion concentration in cell *Q* caused the stoma to close.

For part (*c*), the candidates were required to describe the effect of long exposure of the red light to the guard cell/*Q*. Some candidates were able to mention that cell *Q* become turgid due to the water potential in the cell decreases. Few candidates were able to describe hydrogen ions were actively transported out of *Q* and potassium ions accumulate in the *Q* in their answer description. There were also candidates answered the red light stimulated the photoperiod event, which was not accepted.

Question 17

The question was about the action of muscle contraction. For part (*a*), most candidates were able to identify correctly the structures of *R*, *S* and *U*.

For part (*b*), some candidates were able to answer what happen to *R* when sacromere contracts but few of them written that *U* was disappeared.

For part (*c*), candidates were required to describe the interactions between *S* and *T* if they know the position of myosin binding site at *T*. Only few candidates were able to give complete answer such as *myosin binding is exposed* instead of *myosin binding site on the actin is exposed*. There were also candidates who mentioned *myosin attaches to expose site* instead of *myosin head attaches to expose site*.

Question 18

In part (*a*), the question was about the production of the first heart sound. The candidates should explain the sequence of blood flow through the heart chambers. The candidates should describe how the first sound is produced. However, there were candidates that wrote a lengthy process of blood flow through the heart chamber, which was unnecessary. Majority of candidates were able to describe the sequence of blood flow during atrial systole and ventricular systole in relation to the production of first heart sound. There were also few candidates who described the impulse or neuron function, which were not accepted as answer.

In part (*b*), the question was about the development of atherosclerosis which could lead to angina pectoris. Few candidates able to answer this question correctly. Angina pectoris is caused by the lack of oxygen supply to the heart muscle due to restricted blood flow. This is due to the deposition of calcium on the wall of arteries which had caused it to become harden and less elastic. Many candidates answered the deposition of fats or cholesterol in the arteries but not on the wall or lining of arteries. Some candidates mentioned that *the deposition of fat causing arteries to become narrow* instead of *the deposition of fat causing lumen of arteries to become narrow*. Few candidates able to relate the lack of oxygen supply to the heart muscle will cause angina pectoris. Candidates are advised to use appropriate and accurate terms in their explanation. For example, candidates should mention the correct arteries in the development of atherosclerosis, not only blood vessel or blood capillaries in their answer and explanation.

Question 19

In part (*a*), the question was about the homeostatic mechanism of sodium ions when a person lost a lot of blood. Most candidates were able to explain the mechanism of sodium ions with the blood volume and blood pressure. Few candidates were able to describe aldosterone increases sodium reabsorption from distal convoluted tubule and collecting duct into tissue or blood. None of the candidates were able to mention angiotensin II triggers vasoconstriction or constriction of blood vessel. There were candidates who wrongly spelled some terms such as *rennin* instead of *renin* and *angiotensinogen 1*/ *angiotensinogen 2* instead of *angiotensin I*/*angiotensin II*.

In part (*b*), the question was about the response of a person's body when he drinks water frequently if he has malfunction posterior pituitary gland. A person with malfunction posterior pituitary gland, a condition known as diabetes insipidus, will not produce sufficient ADH to regulate water reabsorption. Thus, even though he drinks water frequently, the ADH will not be secreted or not sufficiently secreted. Few candidates able to mention *the person will suffer severe dehydration, leads seem death if not controlled, very low blood pressure and he must continually drink to replace water loss*. Majority of candidates were able to mention that *water is insufficiently reabsorbed that causes the person produces large volume of dilute urine*. There were candidates who wrongly spelled *diabetes insipidus* as *diabetes insipitus*.

Question 20

In part (*a*), the question was about the response of body immune system towards pathogen that activates B cells. Most candidates were able to explain the mechanism of B cell activation and how the cell destroys the pathogen. Majority of the candidates were able to describe that B cell proliferate and differentiate into plasma cell and memory B cells, then this plasma cell will secrete antibodies. Few candidates were able to mention CD-4 receptor in T_H cell enhance the interaction with the antigen presenting cell even though many candidates could be able to describe T_H cell bind to MHC-antigen complex.

In part (*b*), the question was about the mechanism of immune suppression in HIV infection. Few candidates were able to explain how HIV has used the machinery of CD-4 to replicate. Many candidates were able to mention that HIV genome that has been reverse transcribes into DNA was integrated into host genome to become provirus. Few candidates were able to answer TH cell population decreases and caused imparing of both humoral and cell mediated immune response. Some candidates also were able to mention that HIV have high mutation rate.

BIOLOGY (964/3)

OVERALL PERFORMANCE

For Semester 3, 1 872 candidates sat for the examination of this subject and 59.73% of them obtained a full pass.

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

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	10.31	4.97	5.40	7.32	9.94	12.07	9.72	7.21	5.77	3.26	21.04

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice*

Answer Keys

Question number	Key	Question number	Key	Question number	Key
1	**A**	6	**B**	11	**C**
2	**C**	7	**C**	12	**A**
3	**D**	8	**B**	13	**C**
4	**D**	9	**B**	14	**D**
5	**D**	10	**A**	15	**B**

General comments

In general, Questions 10, 11 and 14 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, the rest of the questions were in the range of moderate questions where 40% to 64% of the candidates could answer them correctly.

SECTION B AND C: *Structured and Essay Questions*

General comments

In general, the questions covered all aspects, which include the lower order thinking skills (LOTS) and higher order thinking skills (HOTS). The questions covered a range of topics in the Semester 3 syllabus, which contained both factual recall questions and questions which required application of knowledge. The questions were able to differentiate between the low ability and high ability candidates.

Comments on the individual questions

Question 16

The question was about population growth pattern. In part (*a*)(i), most candidates were able to name phase *J* and phase *L* correctly. For part (*a*)(ii) many candidates were unable to describe the factor that contributes to the growth of the population in each phase in (*a*)(i).

In part (*b*), most candidates were able to name phase *M* where carrying capacity occurs.

In part (*c*), candidates were required to state two factors that contribute to the growth of the population at phase *K*. A few candidates were able to state factors that contribute to the growth of the population which were *adequate nutrient*, *enough space*, *favourable light* and *suitable temperature*.

Question 17

The question was about genetic engineering. A good understanding of the process in cloning genes in genetic engineering is essential for this question. In part (*a*)(i), most candidates were able to name *P* and *Q* correctly which were *lag phase* and *linear phase* respectively. In part (*a*)(ii) most candidates were able to identify *X* and *Y* which were *cDNA* and *recombinant plasmid* respectively.

In part (*b*), most candidates were able to name *DNA ligase* as the answer.

In part (*c*), most candidates were able to name the chemical used in the blue white screening as the *X-gal*, but failed to state its function correctly.

In part (*d*), quite a few of the candidates answered insulin instead of dwarfism.

Question 18

The question was about diversity. In part (*a*), candidates were required to describe different levels of biodiversity in Malaysia. Many of the candidates seem to understand the concept of different diversity levels. They were able to give different diversity levels which are *species diversity*, *genetic diversity* and *ecosystem diversity*.

In part (*b*), candidates were required to describe the roles of National Parks in three parts which are maintaining the sustainability of the ecosystem, biological resource and social benefit. Most candidates did have some rough idea of the role of National Parks to a certain extent. Therefore, most candidates managed to secure some marks for this question. In the roles of National Parks for maintaining the sustainability of the ecosystem, most candidates were able to mention the *protection of water resources*, the *protection of habitat* and how it *contributes to climate stability*. The weakness of the candidates in answering part (*b*) was that they presented their answers unsystematically.

Question 19

The question was about speciation. In part (a), candidates were required to describe geographical, ecological and behavioral isolations mechanism which contribute to speciation in organisms. Most candidates did not show good understanding on these isolations, especially the ecological and behavioral isolations. Some candidates were confused on seasonal isolation.

In part (*b*), candidates were required to describe polyploidy in plants. Most candidates were able to mention that polyploidy have two types, autopolyploidy and allopolyploidy. However, some candidates confused polyploidy with aneuploidy.

Question 20

The question was about genetics. In part (*a*), the question required candidates to explain the procedure of crossing the plants to determine the genotypes of the purple flower. This question required the candidates to understand the test cross and its use in determining the unknown genotypes of individuals showing dominant phenotype. Most candidates seemed to be able to understand and describe the test cross to determine the genotypes of the purple flower. However, a few candidates just drew a cross diagram without giving any explanation of the test cross in text format.

In part (*b*), the question required candidates to explain gene mutation that occurs in sickle cell anemia and its consequence. Most candidates had some idea of sickle cell anemia and its consequence which is *low efficiency in oxygen transport*. However, some terms used by the candidates were incorrect like explaining such as *substitution mutation* instead of *base substitution*.

PAPER 964/5 (WRITTEN PRACTICAL TEST)

Question 1

The question was about biochemical reaction focusing on Lineweaver-Burk plot. Most candidates did not seem to understand well the K_m, V_{max} on the Lineweaver-Burk plot. Part (*d*) of the question requested the candidates to draw Michaelis-Menten curve. Some candidates managed to draw the correct curve but they failed to label the axis of the graph correctly.

Question 2

The question was about histology of the human kidney. Many candidates failed to identify the cross section diagram as a kidney. Thus, this caused the candidates to provide totally unrelated answers to part (*a*) which requested the candidates to identify the structures in the cross section diagram. At the same time, the candidates also failed to answer the other parts of the question on the functions of the structure of the organ.

Question 3

The question was about taxonomy of insects, plants and microorganisms. Part (*a*) required the candidates to construct a dichotomous key. Most candidates were unable to construct the dichotomous key. The other parts of the question ((*b*), (*c*), (*d*) and (*e*)) received mixed responses from the candidates. Most candidates acquired some marks from these parts of the question.

LAPORAN PEPERIKSAAN STPM & MUET 2021

SASBADI SDN. BHD. 198501006847
(Anak syarikat milik penuh Sasbadi Holdings Berhad 201201038178)
Lot 12, Jalan Teknologi 3/4, Taman Sains Selangor 1,
Kota Damansara, 47810 Petaling Jaya, Selangor Darul Ehsan.
Tel: +603-6145 1188 Faks: +603-6145 1199
Laman web: www.sasbadisb.com E-mel: enquiry@sasbadi.com

MAJLIS PEPERIKSAAN MALAYSIA
Persiaran 1, Bandar Baru Selayang,
68100 Batu Caves, Selangor Darul Ehsan.
Tel: +603-6126 1600 Faks: +603-6136 1488
Laman web: www.mpm.edu.my E-mel: ppa@mpm.edu.my