



MAJLIS PEPERIKSAAN MALAYSIA



LAPORAN PEPERIKSAAN STPM & MUET 2020

Biology (964)



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BIOLOGY (964/1)

OVERALL PERFORMANCE

For Semester 1, 1 890 candidates sat for this subject and 71.27% of them obtained a full pass.

The percentage of the candidates for each grade is as follows:

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage	4.66	4.60	6.61	8.68	13.23	18.73	14.76	6.03	2.54	5.34	14.81

SEMESTER 1

RESPONSES OF CANDIDATES

SECTION A: Multiple-Choice

Answer Keys

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

General comments

In general, Questions 7 and 10 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, Questions 1, 2, 4, 5, 8, 9, 11, 13, 14 and 15 were in the range of moderate questions where 40% to 64% could answer them correctly. The easiest question was Question 10, in which 81% of the candidates answered it correctly. The most difficult question was Question 3, in which only 36% of the candidates managed to answer it 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 ability and high ability candidates.

Comments on the individual questions

Question 16

The question was about Krebs cycle. In part (a), most candidates were able to identify Reaction I as *isomerisation*. Some candidates also answered *rehydration* or *dehydration* for Reaction I, which were not accepted as the correct answer. For Reaction II, only a few candidates were able to identify the reaction as *oxidative decarboxylation*. Most candidates answered *oxidation decarboxylation* and *reduction*, which were not accepted as the correct answer.

In part (b), the majority of the candidates managed to answer *M* as NADH. Some candidates answered *M* as NAD^+ , NADH_2 , NaDH, nicotinamide adenine diphosphate, nicotinamide adenine dinucleotide without the word reduced, as NADH is the reduced form of NAD^+ . Most candidates were able to answer correctly that *Q* is carbon dioxide.

In part (c), most candidates answered correctly for *N* and *P* as α -ketoglutarate and succinyl coenzyme A, respectively. A few candidates wrongly spelled α -ketoglutarate as α -ketogluterate or α -ketoglutanic and succinyl coenzyme A as succinyl COA. The scientific terms must be spelled and written correctly in the explanation.

In part (d), some candidates were able to answer the question correctly. A few candidates named the enzyme as *succinyl dehydrogenase* instead of *succinate dehydrogenase*, which was the acceptable answer. There were also candidates that answered *FADH reductase*, *fumarase*, or *succinate hydrogenase*, which were incorrect.

In part (e), most candidates answered about the ATP production only without mentioning that the Krebs cycle also produces other high energy molecules which act as reducing agents. The candidates should have answered the importance of Krebs cycle which was to produce FADH_2 , NADH and GTP/ATP. There were also a few candidates who answered the importance of Krebs cycle in biosynthesis reactions.

Question 17

The question was about the enzymatic reactions in the presence of inhibitor. The candidates were tested on their understanding of enzyme kinetics, application of Lineweaver-Burk plot and calculation of the K_M values.

In part (a), the majority of the candidates were able to give the type of inhibitor correctly as *competitive inhibitor*. A few candidates wrongly spelled competitive inhibitor as *competitive inhibiter* or *competative inhibitor*.

In part (b)(i), the candidates were able to determine the values for *X* and *Y* correctly. Some candidates calculated the values correctly but wrote the wrong units or did not write any unit at all.

In part (b)(ii), the majority of the candidates interpreted the K_M value based on the graph specifically. The candidates answered *the K_M value for X is higher than Y due to the presence of competitive inhibitor*. The candidates did not relate the K_M value with the affinity of enzyme to the substrate.

In part (c), only a few candidates managed to score marks. A few candidates answered the K_M value of *X* and *Y* are different but it has the same V_{\max} value. Some common answers given by the candidates which were not accepted are *K_M increase*, *the V_{\max} increase*, *K_M value directly proportional to V_{\max}* and *K_M value is independent of V_{\max}* .

In part (d), a few candidates were able to answer the question correctly. The candidates wrote the *inhibitor combined with the active site* instead of *the inhibitor binds with the active site of the enzyme*.

Candidates must use proper and accurate terms in their explanation. Only a few candidates answered *prevents the formation of enzyme-substrate complex* for the second mark.

Question 18

In part (a), the question was about the differences between polar and non-polar amino acid groups. Candidates must present their answer specifically and scientifically. For example, candidates answered *polar amino acid group is hydrophilic and non-polar amino acid group is hydrophobic*. Candidates' answer was supposed to be specific on the R-group due to the fact that amino acid have another two groups in its chemical structure. Other than that, some candidates were able to differentiate between polar and non-polar amino acid based on the solubility in aqueous solution and organic solution. Only a few candidates were able to relate the location, the presence and the distribution of charge of polar and non-polar amino acid.

In part (b), the question was about the efficiency of photosynthesis in sugar cane plants in a dry and hot season. Few candidates were able to relate Hatch-Slack pathway with the effectiveness of the photosynthesis process. Candidates must use the correct scientific terms in their explanation. Candidates answered *carbon dioxide combine with PEP* or *carbon dioxide is converted into PEP* instead of *fixation of carbon dioxide with molecule of PEP*. Some candidates answered *photorespiration is prevented or inhibited* instead of *photorespiration is minimised or reduced*, which was the correct answer. A few candidates lost marks due to incomplete answer. The candidates answered *PEP carboxylase has high affinity to carbon dioxide* without mentioning *even at a low concentration of carbon dioxide*.

Question 19

In part (a)(i), the question was about the characteristic of the structure of parenchyma cell. Most candidates were able to answer this question very well. However, only a few candidates answered *parenchyma cell is arranged loosely*. Some candidates lost mark due to misspelling the term used, for example, *intracellular space* instead of *intercellular space*.

In part (a)(ii), the question was about the functions of parenchyma cell. Most candidates performed well in this part of the question. However, some candidates answered *mechanism support* instead of *mechanical support* and *herbal plants* instead of *herbaceous plants*. Candidates must be able to use correct, accurate and proper terms and words in their answer.

In part (b), the question was about the functions of lysosome. In general, there were some candidates that were confused between autophagy, autolysis, exocytosis and endocytosis. Majority of candidates were able to write *autolysis* and *autophagy* as their answers. Only a few candidates were able to give answers such as *digest materials intracellularly* and *release enzymes to the outside of the cell to digest other cells*.

Question 20

In part (a), the question was about the cofactors and their roles in enzymatic reactions. In general, the candidates' performance were satisfactory. The majority of the candidates were able to explain coenzyme and prosthetic group correctly. However, only a few candidates mentioned ion activator as one of the type of cofactor in their answer. Some candidates have mixed up the cofactors and its corresponding roles in their answer. A few candidates wrongly spelled the terms. For example, candidates wrote *prostetic group*, *prothetic group* or *prothetic group* instead of *prosthetic group*. Besides that, candidates also did not use the correct term for ion activator. Candidates wrote *metal ion activator* or *enzyme activator* which were not accepted.

In part (b), the question required the candidates to explain the hydrolysis of starch that stops when heavy metal ions were added to the enzymatic reaction which was caused by non-competitive inhibition. Most candidates performed well in this question. However, some candidates described the heavy metal ions as *competitive inhibitor* or *cofactor*. A few candidates lost marks due to incomplete answers. For instance, *the inhibitor changes the shape of enzyme* instead of *the inhibitor change the shape of the tertiary structure of enzyme*. Some candidates were confused about the binding of the inhibitor. Candidates were also unable to state the effect of the binding of inhibitors on enzyme.

BIOLOGY (964/2)

OVERALL PERFORMANCE

For Semester 2, 1 862 candidates sat for this subject and 49.30% of them obtained a full pass.

The percentage of the candidates for each grade is as follows:

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage	5.48	3.65	8.86	7.41	9.34	5.75	8.81	7.41	7.14	6.87	29.27

RESPONSES OF CANDIDATES

SECTION A: Multiple-Choice

Answer Keys

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

General comments

In general, Questions 5, 6, 9, 10, 14 and 15 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, Questions 1, 2, 4, 7, 12 and 13 were in the range of moderate questions where 50% to 65% could be answered correctly by the candidates. The easiest question was Question 15, in which 87% of the candidates answered the question correctly. The most difficult question was Question 3, in which only 43% of the candidates managed to answer the question correctly.

SECTION B AND C: Structured and Essay Questions

General comments

In general, the questions covered all aspects, which included the lower order thinking skills (LOTS) and higher order thinking skills (HOTS). The questions were within the scope of STPM Semester 2 Biology syllabus, and were not skewed towards a few specific topics. The questions were presented with clear instructions and suitable in testing the knowledge and understanding of the intended topics. 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 the human liver lobule. In part (a), most candidates managed to identify the structures *T*, *V* and *W* as *canaliculus* or *canaliculi*, *hepatic portal vein* and *hepatic artery*, respectively. However, a few candidates wrongly spelt the term and they interchangeably used the term for vein and artery.

In part (b), a few candidates were able to state the function of *S*, Kupffer cell and *U*, bile duct. Some candidates mentioned *to remove bacteria* instead of *to remove bacteria in sinusoid*, which was accepted as the correct answer. A few candidates also answered *to drain bile to* instead of *to drain bile into gall bladder*, which was also accepted as the correct answer.

In part (c), candidates were required to describe the regulation of blood glucose level in *R*. Most candidates understood that the feedback mechanism took place when the blood glucose level deviates from normal but only few of the candidates were able to mention that the mechanism occurred when the blood glucose level exceeds the normal level.

Question 17

The question was about the lifecycle of malaria pathogen. In part (a), the majority of candidates answered correctly the name of pathogen as Plasmodium falciparum or Plasmodium vivax or Plasmodium ovale or Plasmodium malariae or Plasmodium knowlesi. Some candidates did not underline the name or did not use capital letter to represent the first letter of genus name.

In part (b), most candidates managed to score full marks for this part. Some candidates answered *gametophyte* instead of *gametocyte*, which was the correct answer. A few candidates also answered *sperozoite* instead of *sporozoite*, which was the acceptable answer. Some candidates were confused between the structure of gametocyte and erythrocytes in the diagram given.

In part (c), some candidates did not include multiple fission or division as a mechanism of asexual reproduction for this parasite. Others had vague information regarding different life stages of this pathogen. A few candidates wrongly spelt or used the terms such as *binary fusion* instead of *binary fission* and *meiosis* instead of *mitosis* in the answer.

In part (d), only a handful of candidates managed to answer this question but did not score full marks for this part. The candidates did not mention the name of life stages or where the life stages take place in the host body. A few candidates mentioned that the *zygote must undergo meiosis to produce sporozoites*.

Question 18

In part (a), the question was about the transpirational pull in the leaves of a plant. The candidates were required to describe the transpirational pull in the leaf area only. A few candidates were able to describe and relate that the *generation of transpiration pull assists in the transportation of water in leaves until it evaporates to the atmosphere*. The candidates need to describe that *water from the xylem was pulled into surrounding cells and air spaces*. Most candidates only emphasised on the *cohesion and adhesion forces in assisting the transportation of water*.

In part (b), the question was about pressure flow hypothesis of sugar in a germinating potato tuber. The candidates were required to describe the translocation process from the tuber of potato to the germinating part. Most candidates answered the source of sucrose was the *new leaves* instead of the *potato tuber* and the sink was *the roots* instead of *the germinating part of potato*, which were the correct

answers. A few candidates used the correct terms in the explanation such as *sieve tube*, *hydrostatic pressure* and *sap xylem*. Some candidates did not describe their answer in a complete sentence such as *sugar is loaded into sieve tube elements* instead of *sugar is loaded into sieve tube elements at the source*.

Question 19

In part (a), the question was about the growth pattern among organisms. The candidates were required to differentiate between the limited and unlimited growth patterns. Many candidates answered *limited growth pattern is a single sigmoid growth curve* but they did not compare to the unlimited growth pattern that *consists of a series of small sigmoid curve*. Some candidates answered *unlimited growth pattern has many or several sigmoid curves*, which was not accepted as the answer. Several candidates wrote incomplete answers such as *unlimited growth continues* instead of *growth continues throughout life*.

In part (b), the question was about the hormonal regulation in the development of moth. Most candidates performed well for this question. The candidates managed to give the correct name as well as the secretion location of the hormones. However, some candidates wrongly spelt the *prothoracicotropic hormone* as *prothoracicotrophic hormone*, which led to loss of mark. Some candidates seem to misunderstand about the moulting and metamorphosis processes. For example, the candidates answered *the concentration of ecdysone must be higher and juvenile hormone is lower before moulting process can occur*. It seems like the candidates assumed that juvenile hormone and ecdysone hormone are acting antagonistically.

Question 20

In part (a), the question was about plant growth regulators with their functions. The majority of the candidates were able to name three of the plant hormones correctly. However, some candidates had difficulty in matching plant growth regulators to their respective functions. Many candidates only provided the usual function of the plant hormone without relating to its uses in the agriculture field.

In part (b), the question was about the adaptation of mangrove plants to overcome problem in water regulation. The candidates were able to describe correctly the important structures present in mangrove plants such as *hydathode*, *thick cuticle layer*, *succulent leaf*, *low number of stomata* and *sunken stomata*. However, there were a few candidates who mentioned the adaptation but failed to describe how the adaptation was used by the mangrove plants to overcome the problem.

BIOLOGY (964/3)

OVERALL PERFORMANCE

For Semester 3, 1 857 candidates sat for this subject and 45.44% of them obtained a full pass.

The percentage of the candidates for each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	6.68	3.82	4.25	8.08	5.49	5.76	11.36	4.85	8.72	3.50	37.48

RESPONSES OF CANDIDATES

SECTION A: Multiple-Choice

Answer Keys

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

General comments

In general, Questions 1, 8, 12 and 14 were in the range of easy questions. More than 65% of the candidates managed to answer them correctly. Meanwhile, Questions 3, 4, 5, 6, 7, 9, 10, 11 and 15 were in the range of moderate questions where 40% to 64% of the candidates could answer them correctly. The easiest question was Question 8, in which 75% of the candidates answered the question correctly. The most difficult question was Question 13, in which only 25% 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 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 the sulphur cycle in ecosystem. In part (a), only a few candidates were able to identify *K* and *L*. Candidates wrote general answers such as *soil*, *water*, *detritus* and *ocean*, which were not accepted as the answer. The candidates should answer *K* and *L* as *sulphate* or *sulphide* and *hydrogen sulphide*, respectively. The hydrogen sulphide gas is produced by the decomposition of waste and dead organisms.

In part (b), a few candidates understood that the decaying process could only happen in aerobic condition (the presence of oxygen). Some candidates thought that decaying did not need oxygen and answered *anaerobic condition*. This is actually a misconception.

In part (c), the candidates were required to identify the steps where oxidation and reduction occur in the sulphur cycle. Most candidates were able to identify the reduction process, which was *Step IV*, as well as the oxidation process, which were *Step I*, *Step II* or *Step III*, accurately.

In part (d), only a few candidates were able to deduce the reason why bacteria in Step II were present in shallow waters and above the decaying organic matters in the question. Some candidates answered *the bacteria fed on the nutrient provided by the decaying materials below them*, which was not accepted. A few candidates answered *the bacteria could absorb oxygen that was present in shallow water*. This was inaccurate as oxygen could be present in deep water too. The fact was that these bacteria were photosynthetic bacteria that needed sunlight for photosynthesis, while the source of hydrogen was from the hydrogen sulfide/sulphide gas, released by the decaying organic matter below them. The name of the bacteria was not needed.

Question 17

The question was about the structure and function of tRNA. In part (a), the majority of the candidates were able to identify correctly the structure *P* as the *anticodon part of the tRNA*.

In part (b), a few candidates were able to name the enzyme involved in the production of tRNA correctly. Some students answered *DNA polymerase* instead of *RNA polymerase*, which was the acceptable answer. There were also candidates who answered *aminoacyl-tRNA synthetase* and *reverse transcriptase*, which were not accepted as the correct answer.

In part (c)(i), most candidates circled the wrong parts of the tRNA, including the anticodon region, 5' region or other regions of tRNA. The candidates need to circle at the specific region of tRNA for the amino acid attachment site, which was at the 3' end.

In part (c)(ii), some candidates were able to name the enzyme correctly as *aminoacyl-tRNA synthetase*. However, there were some candidates who wrongly spelled *aminoacyl-tRNA synthetase* as *amicocryl-tRNA synthetase*, *aminocyl synthetase* and *aminoacetyl-tRNA sybthetase*. Nonetheless, the term *synthetase* can also be accepted as answer.

In part (d), some candidates answered correctly about the complementary codon of *P*. However, few candidates were able to indicate the 5' and 3' of the codon in their answer. The candidates who wrote the sequence of codon as *UUC* (as default from 5' to 3'), can be accepted as an answer. On the other hand, *CUU* could not be accepted as an answer. However, if the candidates answered *3'-CUU-5'*, it can be accepted as the direction of the sequence is clearly given.

Question 18

In part (a), the question was about the allopatric speciation process. Most candidates were able to describe that the *speciation happened due to the separation of a population by geographical or physical barriers*. However, only some candidates were able to use terms such as *subpopulations* or *demes* to describe two or more new groups formed after the separation. A few candidates were able to answer *due to the change in allele frequencies, the newly formed demes will be genetically isolated from the original population, and the most adaptable genotypes or phenotypes will be passed to their offspring*, which were accepted as an answer. Some candidates did not mention that *speciation would only happen if the two new demes failed to mate and reproduce fertile offspring*. Some candidates also answered this question by explaining the *growth development processes, bottleneck effect, founder effect, prezygotic and postzygotic barriers*, which were not accepted as the answer. This shows that the candidates were confused about the requirement of the question. Some candidates described *example of Galapagos finches* even though it was not required by the question.

In part (b), the question was about the continuous variation in general, before relating it to speciation. In the description of continuous variation, some candidates answered *continuous variation is quantitative*. This is inaccurate as the term *quantitative* should be referring to the *phenotype or trait*, not the continuous variation itself. Some candidates mentioned that *continuous variation showed normal distribution* instead of *continuous variation showed bell-shaped graph or curve*, which was the acceptable answer. Only a few candidates were able to relate continuous variation to speciation. The candidates must describe that *the most adaptable phenotype/trait to the environment (due to variation) will be selected and passed on to the offspring*. However, many candidates answered about the *three modes of selection (stabilising, directional and disruptive), prezygotic and postzygotic isolations, as well as genetic drift*.

Question 19

In part (a), the question was about the Meselson-Stahl experiment of DNA replication with the aid of a labelled diagram. Most candidates had some basic ideas about the semi-conservative replication experiment but candidates could not describe the procedure in details. Some candidates mentioned that *the DNA was cultured in medium containing heavy and light isotopes (^{15}N and ^{14}N)*. It should be the bacteria that were cultured in the medium, not DNA. Some candidates used the term *dark band* instead of *heavy band* to indicate ^{15}N DNA, which was not accepted. The explanation about the steps in the experiment by most candidates was satisfactory. Some candidates were confused between generation 0 and generation 1, generation 1 and generation 2, and some of them also provided description of generation 3, which caused the candidates to lose marks. For the labelled diagram, both drawings with test tube or without test tube were accepted with correct labeling. A few candidates were able to provide conclusion of the results obtained from the experiment. Marks will be given if the candidates labelled the bands as ^{14}N or ^{15}N with the word DNA. Isotopes of nitrogen cannot be seen but DNA is the one that can be isolated. Quite a number of the candidates described the replication process in detail with the aid of a diagram. This was totally out of scope and was not required in answering the question.

In part (b), few candidates were able to differentiate between missense and nonsense mutation correctly. Some candidates were able to mention that *missense mutation causes a defect polypeptide/protein while nonsense mutation produces a non-functioning polypeptide/protein*. A few candidates were able to mention that *missense mutation effect causes a change in a single amino acid while nonsense mutation creates a stop codon*. Only some candidates were able to compare the two mutations from the aspects of length and function of polypeptide produced. A few candidates just listed the characteristics of missense and nonsense mutations without making any comparison.

Question 20

In part (a), the question was about the application of DNA recombinant and gene cloning in the production of transgenic plant of California bay and Brassica sp. plants, where these plants produce rapeseed oil and lauric oil, respectively. Most candidates answer showed that they understood the basic concept of transgenic plant production. Candidates answered *the process started with the isolation of the gene of interest from the California bay plant*. However, some candidates did not mention that *the tissues of the plant must be homogenised first before extracting the DNA*. A few candidates answered that *thioesterase gene isolated in the form of mRNA* instead of *thioesterase gene isolated in the form of DNA*, which was not accepted as the answer. The type of vector used must be precise. Candidates answered the *plasmid is isolated from bacteria* instead of *isolation of Ti-plasmid from Agrobacterium tumefaciens*, which was the correct answer. After the formation of recombinant DNA/plasmid, some candidates described that *recombinant plasmid will be used to infect Brassica sp. plant cells directly*, which was not accepted. *The recombinant plasmid must be transformed back into Agrobacterium, before using the bacteria to infect Brassica cells*. Some candidates used only restriction enzyme and ligase without mentioning *same* and *DNA*, respectively, which caused them to lose marks. Few candidates were able to mention Agrobacterium bacteria, whereas some of candidates were also confused whether the infection should be done to Brassica sp. plant or California bay plant. Screening was done to identify the positive recombinant plant cells, not to identify the transgenic bacteria.

In part (b), the question was about PCR-based fingerprinting procedures in solving criminal case. The PCR was used to amplify the regions on targeted genomic DNA only. The basic principle of DNA fingerprinting remained the same. Many candidates only mentioned *the collection of tissue sample from the suspect*. Tissue samples or other samples such as blood, hair, semen or skin must be obtained from the crime scene, as well as the suspects and victim. Some candidates answered *DNA was collected directly from the crime scene*. This was incorrect as DNA could only be extracted or isolated from the tissue samples, not directly from the crime scene. Another misconception shown by the candidates was the comparison of the DNA patterns to identify the suspect. Candidates mentioned that the DNAs were compared directly. However, the DNA itself was actually too small to be seen. Hence, the patterns of DNA fragments/bands shown after gel electrophoresis were the ones being compared.

PAPER 964/5 (WRITTEN PRACTICAL TEST)

Question 1

The question was about cell structures of an animal. A few candidates understood the general structure of a cell very well. The question on application and explanation posted a great challenge for the candidates. Some candidates did not provide accurate answer, such as for question (a) on naming the structure *R*. The candidates were required to state the structure in the larger part of nucleus which was the nucleoplasm. However, none of the candidates provided the answer as stated.

For part (e), none of the candidates obtained full marks for this question. The question required the candidates to state the macromolecule in *R* which involved in the transcription as well as state the macromolecule that transported out of *R* to cytoplasm. The candidates should have answered *DNA* and *tRNA/mRNA/rRNA*, respectively.

Question 2

The question was about chromatography of plant pigments. For part (a), a few candidates were able to identify different plant pigments. The candidates should have answered *V*, *W*, *X* and *Y* as *chlorophyll a*, *chlorophyll b*, *xanthophyll* and *carotene* respectively. For part (b), a few candidates were able to calculate the R_f values correctly.

For part (d), the question tests the concept of pigment movement in paper chromatography. Some candidates answered *molecular size, solubility of pigment in solvent and adsorption of pigment to the chromatography paper*, which were accepted as the answer. For part (f), a few candidates were able to state the precautionary steps for the experiment. Candidates answered *conduct the experiment in still air condition and solvent front line must be marked before dry*, which were accepted as the answer.

Question 3

The question was about the taxonomy of insects and plant specimen preparation/preservation. For part (a)(i), candidates' response was satisfactory. The candidates were tested on general morphological characters for given insects. The candidates should have answered as *it has three pairs of jointed legs and the body divided into head, thorax and abdomen*. For part (a)(ii), none of the candidates was able to provide the order name for each insect. The order for insects *K, L* and *M* were *Odonata, Coleoptera* and *Orthoptera*, respectively.

For part (b), the question required the candidates to understand the preservation of insects. The candidates did not seem to perform well in this question. Subsequently, only one candidate managed to answer this part correctly. For part (c), the question required the candidates to understand the preservation of plants. A few candidates were able to answer correctly. The candidates should have described the procedure of step *Q* as *the specimen is spread, place it between pieces of paper, press with the heavy objects on flat surface and leave it to dry or placed in the oven (50-70°C)*.

LAPORAN PEPERIKSAAN STPM & MUET 2020



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