Chapter	State	Question	Topic/ Question/ HOTS question	Caveats
F4C2	JOHOR	Q1	Role of Golgi apparatus. Density of organelles in specifc cell. Role of contractile vacuole and cilia in Paramecium.	Use "more" or related words to justify density of certain organelles.
	MRSM	Q1	Function of chloroplast. Compare animal cell and plant cell. Production of extracellular enzyme.	Use connectors such as 'whereas', 'while' when comparing things.
	PAHANG	Q1	Definition of cell. Describe the importance of cell organisation in the animal. Explain why the bone is tissue not organ.	Recall definition of cell, tissue and organ.
	SELANGOR	Q1	Explain the consequence of nuclues absenteeism in plant cell. Explain what organell that can be found in high density at the shoot tip.	IF the question given is in negative form, the answer must also be in negative form. E.g. Q: if mitochondria are **absent**; A: **no energy** is produced. Use "more" or related words to justify density of certain organelles.
	N9	Q1	Level of organisation of leaf.	Recall cell organisation in multicellular organism.
F4C3	TERENGGANU	Q1	POTATO STRIPS IN DIFF. CONC. OF SUCROSE SOLUTION (GRAPH), Condition of plant cell in solutions, Importance of turgidity, food preservation with salt solution.	Must know how to determine isotonic point in graph.
	KELANTAN	Q2	Simple diffusion and facilitated diffusion. Adaptation of villus. Effect of diet pills on health. Absorption of nutrients.	Use term like "more" or give specific feature (like one-cell thick) in the explanation of adaptation.
	PENANG	Q1	Differentiate Simple diffusion and active transport. Draw condition of plant cell in salt solution. How toxin affects transport of ions in roots.	Use connectors such as 'whereas', 'while' when comparing things. Drawing must come with labels.
	SELANGOR	Q2	Characteristic and example of molecules that can pass through phospholipid bilayer. Compare active transport and facilitated diffusion. Draw the condition of plant cell after being immersed in distilled water.	Characteristics: small, polar, non-polar, water-soluble, lipid-soluble. Comparison is done within a sentence. Drawing must be accompanied by labels.

	JOHOR	Q2	Crenation and haemolysis of RBC (graph). Vinegar and preservation of fruits. Effect of drought on plants.	Animal cells: haemolysed or crenated; plant cells: plasmolysed or turgid. (Differ condition (plasmolysed) and process (plasmolysis). Never relate vinegar to osmosis, e.g. Conc. salt solution = osmosis; vinegar = low pH Soil water is **hypertonic** to cell sap of plant. Water **diffuses** (reject: enter/ move) out of plant cells by **osmosis** (must mention osmosis).
F4C4	N9	Q2	Level of organisation in protein structure. Formation of extracellular enzyme.	
	PAHANG	Q3	basic unit of lipid. Importance of waxes to leaf.	
	SELANGOR	Q1	Explain the role of RER and Golgi apparatus in the production of enzyme.	Reject RER, accept only rough endoplasmic reticulum.
	SELANGOR	Q3	Give examples of protein for each protein structure. Explain how monomers form protein. Lock- and- key hypothesis and the characteristics of enzyme. Explain the result of shirt washed at 60 degree celcius.	Please familiarise with the characteristics of enzyme. Answers must be based on the Diagram.
	SBP	Q1	Hydrolysis and condensation. Function of enzyme.	In hydrolysis and condensation process, must state the number of molecules involved/ formed.
F4C5	TERENGGANU	Q2	how to tell if mitosis or meiosis? Draw chromosomal behaviour. How crossing over and independent assortment contribut to variation?	Metaphase I: homologous chromosome; mitosis/ metaphase II: sister chromatids. Synapsis--> chismata--> crossing-over--> exchange of genetic segment between **non-sister chromatids**.
	PENANG	Q6	procedure/ advantages/ disadvantages of Cloning/ tissue culture.	explant--> callus--> plantlet--> plant (clone)

	JOHOR	Q3	Meiosis. Draw daughter cells after meiosis. Occurrence of Turner's syndrome. Cloning and advantages.	Non-disjunction= failure of **homologous chromosome** (during Ana I) or **sister chromatids** (during Ana II) to separate, this results in chromosomal mutation (**lack** of chromosome in Turner's but **extra** chromosome in Down's and Klinefelter's). Chromosomal mutation can lead to Down's syndrome, Turner's syndrome and Klinefelter's syndrome.
	MRSM	Q2	Chromosomal behaviour during prophase. Draw product of mitosis. Cloning procedure and its advantages. Characteristics of clones.	
	SBP	Q2	Significance of mitosis to human. Role of mitosis in cloning. Explain how diploid chromosomal number is maintained from one generation to another. Explain how carcinogen leads to different chromosomal number in daughter cells.	Different chromosomal number is caused by non-disjunction (due to failure of spindle fibres to form)
	N9	Q3	Importance and differences of mitosis and meiosis. Function of centriole. Effect of gamma ray on the daughter cell. Regeneration of lost limb.	Formation of cancer= mutated DNA--> cell cycle distupted--> uncontrolled mitosis--> benign tumour--> malignant tumour.
F4C6	TERENGGANU	Q9	Digestion and assimilation of lipid. Calculate the calorie. Justify the diet. Consequences of diet to health.	Please mention the **example of food** shown in Diagram in your essay, otherwise **ZERO** mark.
	KELANTAN	Q6	Adaptations of leaf. Light and dark reaction. Food precessing and preservation.	IF caption (such as diagram 4.1 and diagram 4.2) is given in the question, please state the caption in your answer. ELSE, **ZERO** mark.
	PENANG	Q2	compare heterotroph and autotroph. Digestion of cellulose in ruminants. Compare human dan cow digestive system. Effect of low bacterial population to cows.	IF caption (such as diagram 4.1 and diagram 4.2) is given in the question, please state the caption in your answer. ELSE, **ZERO** mark.

	JOHOR	Q7	explain autotroph and heterotroph. Compare and contrast ruminant and rodent digestive system. Effect of malfunctioned liver and pancrease to food digestion.	IF the question given is in negative form, the answer must also be in negative form. E.g. **no** bile secreted, **no** emulsification of lipid; **no** insulin secreted, **no** conversion of glucose to glycogen. Use "**secretion**" instead of "production" of enzyme.
	MRSM	Q8	Explain what happens to the digestion in stomach if gastric glands fail to function. Importance of appropriate balance diet to pregnant lady, kid, and labourer.	IF the question given is in negative form, the answer must also be in negative form. E.g. **no** pepsin secreted, **no** digestion of protein to polypeptide; **no** HCl secreted, **no** conversion of glucose to glycogen.
	N9	Q1	Adaptations of palisade mesophyll cell.	Use term like "more" or give specific feature (vertically closely packed) in the explanation of adaptation.
	N9	Q6	Explain the assimilation of glucose, amino acids and lipids. Discuss the relationship between the unhealthy eating habits in aneroxia nervosa and obesity. Suggest ways to overcome these conditions.	
	PAHANG	Q3	Differences between palisade and spongy mesophyll. Dead trunk usually becomes habitat for termites and also as food sources for them. Explain how digestion in alimentary tract of termites occurs.	FYI, digestive tract of thermites contains protozoa that secrete cellulase.
	SBP	Q1	Main function of carbohydrate and protein. Malnutrition in infant.	
	SBP	Q8	Describe how greenhouse ensures crop production throughout the year. Justify the menu of a pregnant lady.	Greenhouse manipulates factors affecting rate of photosynthesis. Please say "agree" or disagree" when justifying. Otherwise, **ZERO**. Please include **examples of food** in your justification.

	SELANGOR	Q7	Explain factors to increase the volume of CO2 intake by plants in greenhouse. Suggest food taken to achieve ideal body weight (for the underweight and overweight)	
	PAHANG	Q8	Describe light and dark reaction. Explain the importance of improving the quality and quantity of food production. Describe biological control, selective breeding and aeroponic.	Please familiarise yourself with biological control,selective breeding and aeroponic.
F4C7	PENANG	Q3	compare aerobic and anaerobic respiration. Suggest why muscles become fatigue. Suggest why athelete wears tracksuit. Why % of O2 in exhaled air is lesser.	Use table to compare. Make equivalent comparison.
	JOHOR	Q8	compare respiration rate at rest and during vigorous activity. Effects of smoking on respiratory system.	
	MRSM	Q8	Predict what will happen to the plant that remains at compensation point.	
	N9	Q7	What causes oxygen debt to occur? Explain the effect of the increase in concentration of carbon dioxide in the blood (regulation). breathing rate of the student is different during resting and during vigorous activity, why?	
	SBP	Q6	Explain the role of diaphragm in breathing. Explain the similarities and differences between human and insect respiratory system. Describe the regulatory mechanism of oxygen content in the body after a 100m run.	Explain= 1F and corresponding explanation.
	SELANGOR	Q4	Explain why athlete takes a few deep breaths.	
	SELANGOR	Q7	Explain how light intensity affects the intake and release of CO2.	Question relates photosynthesis to regulation of opening of stomata.
	PAHANG	Q4	Explain the importance of the respiratory structure of insect to **maximise** the rate of gaseous exchange. Explain the breathing mechanism in insects. Why would a fish die when is taken out from water?	**maximise** = adaptations.

F4C8	TERENGGANU	Q7	Commensalism. Graph of prey-predator dynamic equilibrium. Pest control. Food chain and pyramid of number.	
	KELANTAN	Q3	Describe dynamic equilibrium between owls and rats. Advantage and disadvatage of biological control. Nitrogen cycle.	
	JOHOR	Q5	Examples of biotic and abiotic factor. Role of green plants. Niche of organism. Construction of food web and pyramid of number. Estimation of population.	Recall the 7 formulae in biology
	MRSM	Q3	capture, mark, release, recapture technique. Effect of food supply to population size. Label hierarchy in classification of organism. State examples in kingdom. How to name an organism based on Linnaeus Binomial System.	Please study these. High chance to appear in P1.
	N9	Q9	Discuss the **adaptions** of mangrove trees in the swamp area.	
	PAHANG	Q9	Discuss the tinea and cholera disease.	Tinea is a fungal infection of the skin; cholera is a bacterial infection from contaminated food and water.
F4C9	KELANTAN	Q9	causes and ways to solve depletion of ozone layer. Practises to ensure success of 3R campaign.	
	PENANG	Q9	Eutrophication. BOD. Open burning. How to save the earth from global warming.	
	JOHOR	Q9	Good and bad effect of development (urbanisation, deforestation, industrialisation, agriculture). Explain the concept of sustainable development and the need for it to protect our environment.	
	MRSM	Q9	Bad effects by the presence of factories near rivers. Describe ways to improve river water quality.	
	N9	Q9	Effects of urbanisation and industrilisation to the environment.	

	SBP	Q9	State the good and bad effect of agriculture. Discuss the effects of mismanagement of ecosystem. Explain the importance of proper management of development and ecosytem. Explain measures taken to ensure a balanced ecosystem.	
	SELANGOR	Q9	Discuss the effect of depletion of ozone layer to humans and environment. Explain the differences of water samples collected from waterfall and river.	
	PAHANG	Q9	Give the good and bad effects about the construction of Pan Borneo Higway.	
F5C1	TERENGGANU	Q4	Funtions of lymphatic system. Formation of lypmh. Oedema. How lymphatic system complements BCS.	
	KELANTAN	Q1	Structural difference between xylem and phloem. **Adaptations** of floating plants. Effect of cyanide on transportation of ions. Regulation of stomatal **closing** during **hot** day.	stomata open when there is light. However, if the rate of transpiration is too high due to high temperature, stomata close.
	N9	Q1	How light intensity affects the **opening** of stoma.	
	PENANG	Q4	Formation of lymph. Explain what happens if the excess interstitial fluid failed to return. Formation of artherosclerosis. Ways to reduce risk of heart failure.	
	MRSM	Q6	Functions of RBC. Compare BCS in fish and frog. Explain the effect to child if their parents refuse to give their child vaccination.	
	N9	Q5	Type of immunity and related diseases. Why second injection is needed. How to treat rabies? Differences between types of immunity. Explain how fever helps in fighting against the pathogen.	
	PAHANG	Q3	Explain the importance of resin to the plant. Explain why the rate of oxygen transportation to the cells in the body of a human is faster than the fish.	

	PAHANG	Q7	Function of lymph nodes. Functions of lymphatic system. Describe blood clotting mechanism.	
	SELANGOR	Q6	Explain the body defence mechanism towards the bacteria that have entered through the wound. Explain the effects of HIV on body defense mechanism and the transmission of AIDS.	
	SBP	Q7	Explain artifical passive immunity. Predict the consequences if blood clotting fails to occur. Compare BCS and lymphatic system. Explain the rate of transpiration from 0000 hour till 1200 hour.	
F5C2	TERENGGANU	Q3	Bird wing and human arm (mechanism of limb movement). Osteoarthritis. Ways to maintain healthy skeletal system.	
	PENANG	Q7	**Adaptations** of floating plant, submerged plants and herbaceous plants and woody plants. Describe characteristics and its functions of each ground tissue.	
	MRSM	Q7	Explain the action of bicep and tricep in movement of arm. Explain bone density at different ages (4m). Suggest and explain how to prevent osteoporosis (6m)	
	N9	Q1	Structural difference between xylem and phloem. Predict the effect to plants if xylem is not lignified.	
	N9	Q5	Function of the vertebral column. Why the vertebral column is not straight. Characteristic of thoracic vertebrae and lumbar vertebrae. Function of the intervertebral discs. Possible cause of slipped disc. State three effects of prolonged bad posture to women.	
	SBP	Q3	Explain how antagonistic muscles bring about movement in limb. Similarities between biceps and triceps. Explain why an athelete shows sign of fatigue after 400 m race.	

	SELANGOR	Q4	Special feature of cervical, thoracic and lumbar vertebrae. Type of joints. Characteristics of ligament. Explain how the bending of arm is carried out.	
	PAHANG	Q2	How the muscles in earthworm make it possible. Explain the differences of muscles action in bending and straightening the arm. Three preventive steps that can be taken to avoid muscle cramp.	
F5C3	TERENGGANU	Q8	Knee- jerk reflex action. Explain the process of coordination and response.	
	KELANTAN	Q7	Auxin and seed germination. Parthenocarpy. Fight-or-flight situation.	
	MRSM	Q7	Explain the transmission of impulse to return the shuttlecock.	
	PAHANG	Q6	Knee-jerk reflex. Compare Alzheimer's and Parkinson's disease. Explain how auxin affects the root tip of a plant toward sunlight and how ethylene plays its role in development of fruits.	
	SBP	Q4	Structural and functional differences between afferent neurone and efferent neurone. Reflex action. Thermoregulation/ hemeostasis. Response of blood vessel during cold weather.	IF table of comparison is given, do not write outside the box. **Answers outside the box will not be marked**.
	SELANGOR	Q5	State the function of cerebellum and medulla oblongata. Cerebrum has groove on the surface, why? State the structural differences between afferent neurone and efferent neurone. If the spinal nerve at the ventral root is cut off, explain the effect. Explain how to ensure the transmission of nerve impulse in one direction. Explain the effect of overuse of painkiller on the transmission of impulse across synapse.	
	N9	Q8	Fight-or-flight situation. Explain how the plant hormone causes the response of shoot tips and root tips.	

F5C4	TERENGGANU	Q6	Formation of gametes. Advantage and disadvantage of permananent and temporary contraceptive method. Menstrual cycle and hormones.	
	KELANTAN	Q4	Spermatogenesis. How chromosomal number is maintained. Radioactive and chromosomal mutation. Differentiate Prophase I and Metaphase 1. Relate Metaphase 1 to variation.	
	JOHOR	Q6	Oogenesis. How does hyperstimulation produces more oocytes at one time? Compare and contrast oogenesis to spermatogenesis. Compare identical twins to fraternal twins.	
	KELANTAN	Q5	Development of zygote. Differentiate sperm and ovum. Placenta and miscarriage. Role of umbilical cord and amniotic fluid. Use of stem cell in stem cell therapy.	
	PENANG	Q5	Double fertilisation.	
	JOHOR	Q4	Why IA and IB are known as codominant alleles? Inheritance of blood group. Punnett's square. Compatibility of blood group during blood donation. Compare genetic characteristic of normal girl to Down's syndrome boy.	
	MRSM		Explain and compare the growth curve of insect and germinating seed. Explain secondary growth process in woody plants.	
	SBP	Q5	Name the process during spermatogenesis. State the effect if differentiation does not occur during spermatogenesis. Similarity between sperm and ovum. Menstrual cycle and changes in hormonal levels. Explain why menstruation doesn't occur after day 22.	

	PAHANG	Q5	Importance of placenta. Formation of twins. Similarities between identical and fraternal twins. What will happen if the separation of embryoes in incompete. Differentiate the growth curve of human and the growth pattern of mud crab. Explain the natural moulting process of the mud crab.	
F5C5	TENGGANU	Q5	Dihybrid inheritance. Punnett's square. Thalassaemia.	Remember to **label** your schematic diagram. Thalassaemia is an autosomal disease.
	KELANTAN	Q8	Genetic engineering. Production of insulin. Inheritance of thalassaemia.	
	PENANG	Q8	inheritance of ABO blood group.	Remember to label your schematic diagram.
	SBP	Q3	Explain how a boy inherited the gene that causes muscular dystrophy.	Remember to label your schematic diagram. Muscular dystrophy is a sex-linked disease.
	-	-	Application of Genetic engineering in health, agriculture, pollution management and ecosystem. Stem cell therapy and DNA fingerprinting.	Please study these when you have time.
	SELANGOR	Q8	Inheritance of colour blindness (sex-linked disease). Suggest possible treatment for Turner's syndrome.	Colour blindness is a sex-linked disease.
F5C6	PENANG	Q8	Factors that can cause variations in the species and the importance of variations in the survival of a species.	
	MRSM	Q5	Discontinuous variation and the factors. A student is unable to roll his tongue. He practises everyday but fails. Explain why. Explain the survival of chameleon. Compare continuous and discontinunous variation	
	SELANGOR	Q8	Explain the differences between mutation in Haemophilia and Turner's syndrome.	State the difference first, followed by explanation.
	N9	Q2	Explain how gene mutation affects the formation of enzyme.	Question relates gene mutation to production of enzyme.

Disclaimer:

1) This analysis gives neither hints nor clues/ predictions to SPM 2019 Biology papers. The analysis serves to provide a checklist for students to recap important topics.
2) HOTS questions in this analysis (indicated in red colour) do not indicate its difficulty level; they are just the typical questions put forward in different ways.
3) Caveats are just some reminders/ precautions/ restrictions for students to comply with in order to score better in those questions.
4) Candidates are advised to refer to the mark schemes (of that specific paper and question) to gain an insight on how marks are given.