SMJK PEREMPUAN CHINA PULAU PINANG
UPPER SIX MID YEAR EXAMINATION 2009
STPM BIOLOGY PAPER 1

Name: _____ Class: _____ Time: $1\frac{3}{4}$ hour

Instruction: Answer **all** 50 questions by choosing the best option.

1. Which statement best explains the polarity of water?
A The angle between hydrogen atoms is 104.3°.
B Oxygen is more electronegative than hydrogen.
C Hydrogen is covalently bonded to oxygen to form water.
D Polar compounds with partial charges tend to dissolve in water.

2. Which of the following is true of a non-steroid hormone?
A It causes gene expression.
B It combines with a receptor in the cytoplasm.
C It causes the effect of action to be longer.
D It combines with a receptor on the plasma membrane.

3. The hormone which plays an important role in seed germination is
A ethene **C** cytokinin
B auxin **D** gibberellin

4. The primary physiological role of insulin is to increase
A glycogenesis
B glycogenolysis
C gluconeogenesis
D glucose oxidation

5. Which molecule is made up of or contains glucose molecules?
A Fructose
B Cellulose
C Ribonucleic acid
D Deoxyribonucleic acid

6. Rubisco binds with both carbon dioxide and oxygen in
A C_3 plants
B C_4 plants
C CAM plants
D C_4 and CAM plants

7. If 60% of the bases in one strand of DNA are adenine and guanine, the percentage of thymine and cytosine in the complementary strand is
A 20% **C** 40%
B 30% **D** 60%

8. Which of the following is **not** complimentary to stop codons?
A ACC
B ACT
C ATC
D ATT

9. Which statement is true of transcription?
A It begins with ATG and ends with TAG.
B The sense strand is used as a template.
C The DNA polymerase is used to synthesise DNA.

10. The *carrying capacity* is defined as
A the maximum population growth rate under ideal conditions.
B the change in the population size per individual per unit time.
C the maximum population size that can be supported by an

D It uses 70S ribosome in prokaryote and 80S ribosome in eukaryote.

11. Which of the following is/are true of chemosynthetic bacteria?

I They are autotrophic.
II They get the energy from sunlight.
III They oxidise inorganic compounds to obtain energy.

A I only
B II only
C I and III
D II and III

12. Which of the following is true of non-cyclic photophosphorylation in photosynthesis?

A It produces ATP and NADPH.
B Only photosystem I is involved.
C Carbon dioxide is reduced by RuBP.
D It occurs in the stroma of chloroplast.

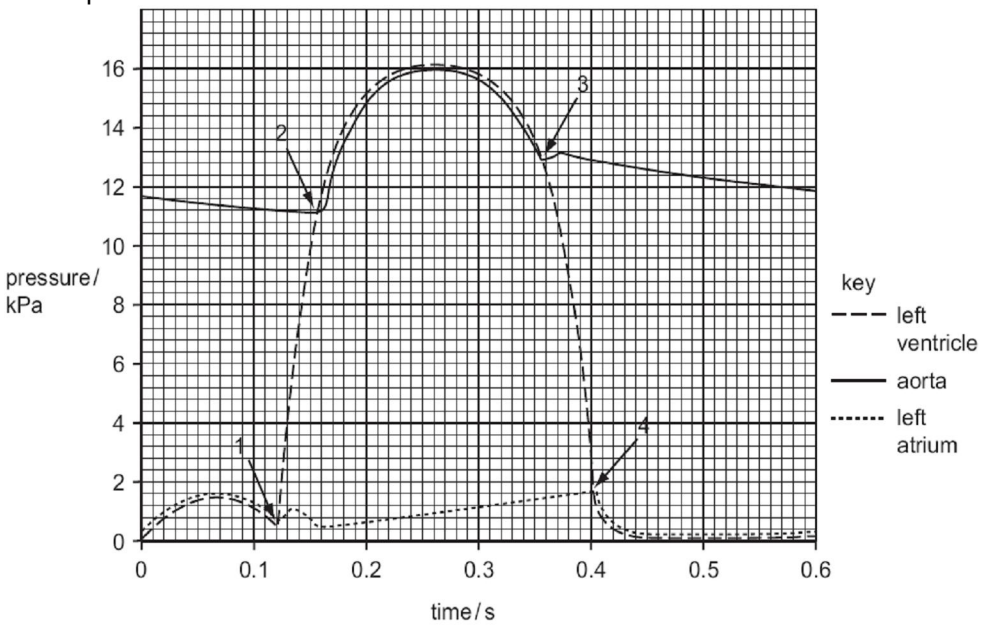
13. At which levels of protein structure do hydrophobic interactions occur?

A Primary, secondary and tertiary
B Primary, secondary, tertiary and quaternary
C Tertiary and quaternary
D Quaternary only

14. Which of the following is a list of entirely abiotic factors?

A Temperature, soil pH, oxygen content of soil.
B Viral infections, predators, competition for resources.
C Sunlight levels that penetrate the canopy, soil pH, number of species.
D Predators, temperature, sunlight levels that penetrate the canopy.

15. The diagram shows pressure changes in the left side of the heart and aorta over time. The length of this cardiac cycle is 0.6 s. Points 1, 2, 3 and 4 indicate when atrio-ventricular valves and semilunar valves either open or close.



What is the total time during one cardiac cycle that the atrio-ventricular valves and the semi-lunar valves are both closed at the same time?

A 0.03 s **B** 0.04 s **C** 0.07 s **D** 0.21 s

16. In the breakdown of glucose to release energy in the process of respiration, there are different stages of metabolism. These include the conversions between different carbon-containing compounds, as shown below:

α-ketoglutarate → succinate → fumarate → malate

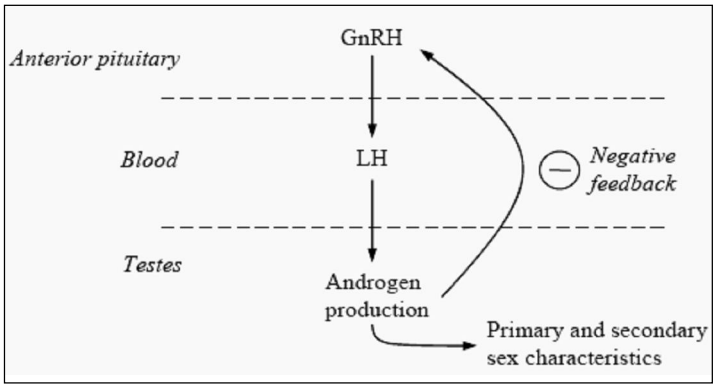
If the enzyme responsible for the conversion of succinate to fumarate became inactive, which of the following would occur?

I Some accumulation of succinate.
II Continued breakdown of α-ketoglutarate.
III Gradual disappearance of fumarate.
IV An immediate stop to the production of malate.

A. I and II **B.** II and III **C.** III and IV **D.** I, II and III

17. The following diagram shows the regulation of the production of the male reproductive hormones.

Gonadotropin-releasing hormone (GnRH) stimulates the anterior pituitary to release luteinising hormone (LH) which acts upon the testes to promote the production of androgens, such as testosterone.



If a male bodybuilder takes steroid androgens, what effect would be seen?

A. The level of GnRH released from the anterior pituitary would decrease.
B. The level of LH in the blood would accumulate.
C. The stimulation of primary and secondary sex characteristics would increase.
D. The production of natural androgens would be much less.

18. Certain amino acids are considered essential in an animal's diet because they cannot be produced from other compounds within the body. Which of the following cellular processes would be most **DIRECTLY** affected by a dietary deficiency in essential amino acids?

A Translation of mRNA.
B Replication of DNA.
C Cell division.
D Cellular respiration.

19. Mammals secrete most of their nitrogenous waste as urea whereas birds mainly secrete uric acid and fish mainly secrete ammonia.

The order of toxicity of these nitrogenous compounds, from most toxic to least toxic, is:

A. Ammonia > Uric acid > Urea
B. Urea > Ammonia > Uric acid
C. Uric acid > Urea > Ammonia
D. Ammonia > Urea > Uric acid

20. Consider two different animals that are classified in the same Family. This means that they must be classified in:

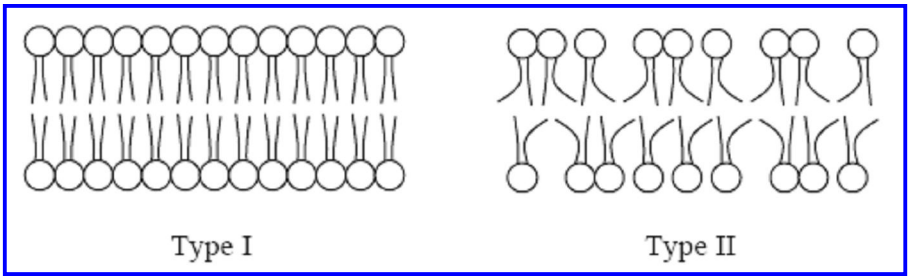
A The same Genus
B The same Class
C Different Kingdoms
D Different Orders

21. When a bunch of bananas is placed in a sealed plastic bag, they ripen quicker than they would if placed out in the open air. Which of the following plant hormones causes this effect?

A Ethylene
B Cytokinin
C Giberrellin
D Abscisic acid

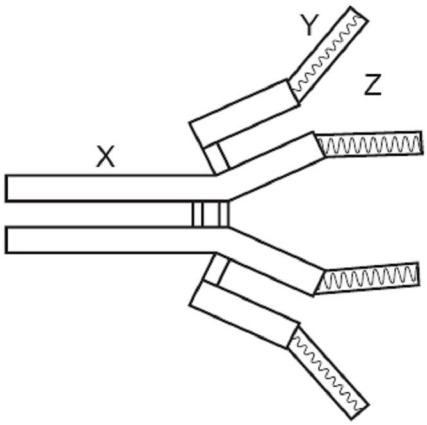
22. A mutated strain of the bacterium *Escherichia coli* was found to be incapable of incorporating unsaturated phospholipids into its plasma membrane.

Which of the following correctly depicts and describes the membrane of such a bacteria?



A The membrane would appear as type I and would be more fluid at low temperatures.
B The membrane would appear as type I and would be less fluid at low temperatures.
C The membrane would appear as type II and would be more fluid at low temperatures.
D The membrane would appear as type II and would be less fluid at low temperatures.

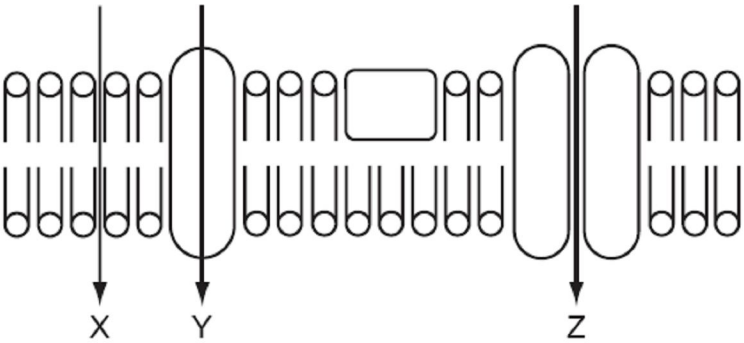
23. The diagram represents the structure of a molecule of antibody.



Which arrangement of labels X, Y and Z correctly identifies its different parts?

	X	Y	Z
A	antigen binding site	constant region	variable region
B	constant region	antigen binding site	variable region
C	constant region	variable region	antigen binding site
D	variable region	antigen binding site	constant region

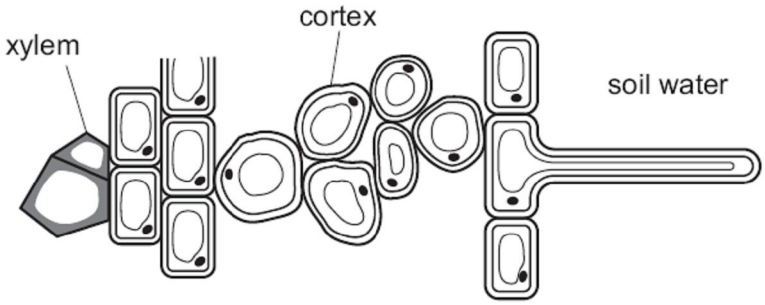
24. The diagram shows three routes through which substances can pass across a cell membrane.



Which correctly shows the routes for vitamin A, which is fat soluble, and vitamin C, which is water soluble?

	Vitamin A	Vitamin C
A	Y	X
B	X	Z
C	X	Y
D	Z	Y

25. The diagram represents a transverse section through a part of the root of a plant.

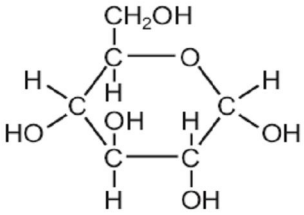


Which values of water potential (kPa) in the xylem and soil water help to explain why water passes from the soil into the xylem across the cortex?

	Xylem	Soil Water
A	–700 kPa	0 kPa
B	–1800 kPa	–700 kPa
C	0 kPa	–1800 kPa
D	–700 kPa	–1800 kPa

26. The diagrams show four different molecules.

P



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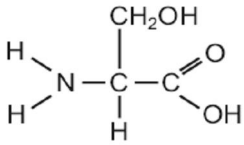

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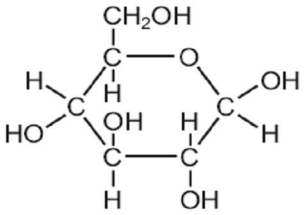
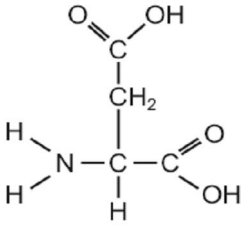


S



Which one shows the correct information about the molecule or molecules?

	contains a carboxyl group	forms 1,6 glycosidic bonds in glycogen	forms peptide bonds by condensation
A	P	P	P and Q
B	Q	R	P and R
C	R	R	R and Q
D	S	P	Q and S

27. Which of the following is true about non-steroid hormone reaction?

A Cyclic-AMP activates the enzyme.
B Cyclic-AMP stimulates the transcription.
C Hormone receptor complex reacts on the chromosome.
D Hormone penetrates the nuclear membrane.

28. What does systolic blood pressure mean?

A The blood pressure in the arteries when the heart is relaxing.
B The blood pressure in the left ventricle at the end of a contraction.
C The maximum blood pressure in the arteries.
D The maximum blood pressure in the right ventricle.

29. The reversible reaction between haemoglobin and oxygen molecules during respiration occurs according to the following equations:

$$Hb + 4O_2 \rightleftharpoons HbO_8$$

What will happen to the above reaction if the carbon dioxide concentration in the blood increases?

A The reaction shifts to the left.
B The reaction shifts to the right.
C A carboxyhaemoglobin complex is formed.
D An oxyhaemoglobin-carbon dioxide complex is formed.

30. Which of the following is the important contribution of Carolus Linnaeus to the field of taxonomy?

A Classifying organisms into seven categories.
B Inventing the phylogenetic classification system.
C Defining the term “species” accurately.
D Inventing the binomial nomenclature system.

31. What is used to determine the *K*m value of an enzyme from the Lineweaver-Burk plot?

A The intercept on the x-axis
B The intercept on the y-axis
C The reciprocal of the intercept on the x-axis
D The reciprocal of the intercept on the y-axis

32. Which of the following involve in the cell mediated immune response?

I Lymphokine
II Plasma cell
III Cytotoxic T cell
IV Helper T cell

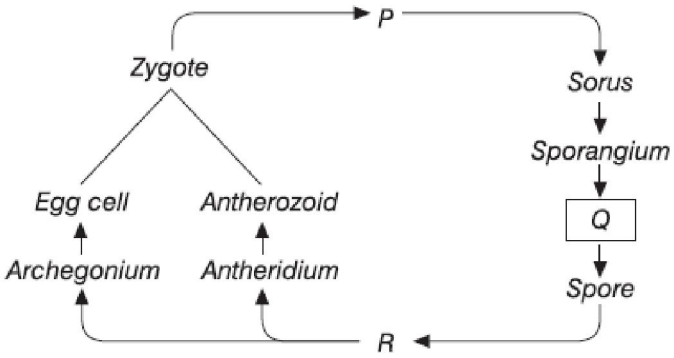
A I and III
B I, II and IV
C I, III and IV
D III and IV

33. Which of the following is **not** true about the taxon of the housefly?

I Class: Insecta
II Genus: Musca
III Order: Lepidoptera
IV Phylum: Arthropoda

A III
B II and III
C I and IV
D II, III and IV

34. The diagram below shows the life cycle of *Dryopteris*.



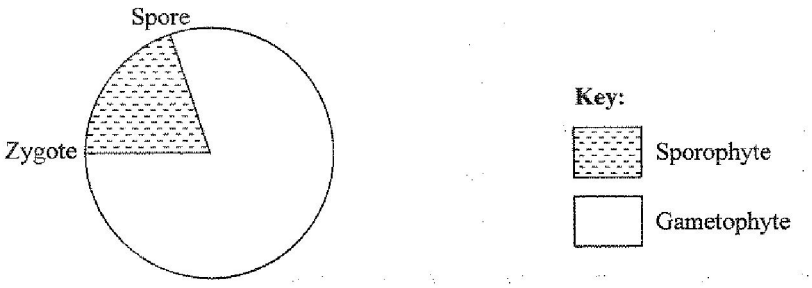
What do *P*, *Q* and *R* represent?

	P	Q	R
A	Gametophyte	Meiosis	Sporophyte
B	Gametophyte	Sporophyte	Meiosis
C	Sporophyte	Gametophyte	Meiosis
D	Sporophyte	Meiosis	Gametophyte

35. Which of the following enables the Filicinophyta to live successfully on land?
I The presence of root, stem and leaf.
II The existence of the dominant gametophyte generation.
III The vascular elements consist of tracheid and sieve cells.
IV The protective, vascular, mechanical, storage and photosynthetic tissues are clearly present.

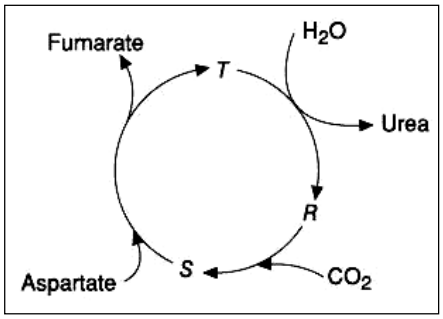
A I and II **B** III and IV **C** I, II and IV **D** I, III and IV

36. The diagram below shows the alternation of generation of a plant.



Which of the following phyla possesses the above description?
A Bryophyta **C** Coniferophyta
B Filicinophyta **D** Angiospermophyta

37. The diagram on the right shows the ornithine cycle in liver cells.



What do R, S and T represent?

	R	S	T
A	Arginine	Citrulline	Ornithine
B	Citrulline	Arginine	Ornithine
C	Ornithine	Arginine	Citrulline
D	Ornithine	Citrulline	Arginine

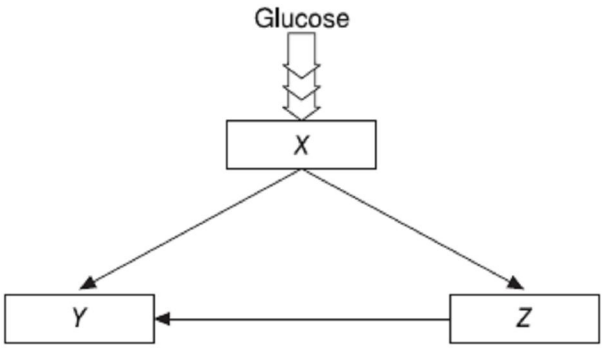
38. The Bohr's effect is very important to actively respiring cells because
A high carbon dioxide concentration causes faster release of oxygen.
B large quantity of ATP is required to facilitate the diffusion of gases.
C high rate of glucose oxidation stimulates the secretion of insulin.
D low oxygen concentration stimulates the increase in the rate of breathing.

39. Which statement is **not** true of *r* – selected species?
A The body size is small.
B The development period to achieve maturity is short.
C It involves parental care.
D The lifespan is short.

40. Which class and example do **not** correspond?

	Class	*Example*
A	Arachnida	*Limulus*
B	Chilopoda	*Lithobius*
C	Crustacea	*Penaeus*
D	Insecta	*Periplaneta*

41. The diagram below shows the biochemical process of glucose degradation occurring in a cell.



What do *X*, *Y* and *Z* represent?

	X	Y	Z
A	Acetyl coenzyme A	Ethanol	Lactate
B	Fructose-1,6-biphosphate	Dihydroxyacetone phosphate	Glyceraldehyde-3-phosphate
C	Malate	Pyruvate	Ethanol
D	Pyruvate	Lactate	Acetyl coenzyme A

42. An unidentified single-stranded molecule was described as having the following features:
    - complementary base pairing along some of its length
    - an area that can attach to a ribosome
    - a site to which a specific amino acid attaches

What is the unidentified molecule?

A DNA polymerase
B messenger RNA
C RNA polymerase
D transfer RNA

43. A total of 72 wood mice are caught from parkland, marked and released back into their original habitat. After five days, 85 wood mice are caught from the same parkland, and 8 of them have been marked.

    Estimate the size of the wood mice population in the parkland.

A 165
B 576
C 680
D 765

44. Which of the following are true of a resting neuron?

I Facilitated diffusion occurs.
II Sodium-potassium pump stops.
III Three sodium ions are pumped out for every two potassium ions pumped in.
IV Three sodium ions are pumped in for every two potassium ions pumped out.

A I and III
B I and IV
C II and III
D II and IV

45. During respiration, the chemoreceptors are stimulated by the level of

A carbon dioxide in the blood
B oxygen in blood
C glucose in the blood
D hydrogen atom in the blood

46. Which of the following describes the nutrition mode of an organism which secretes an enzyme on the surface of food material and absorbs the nutrients?

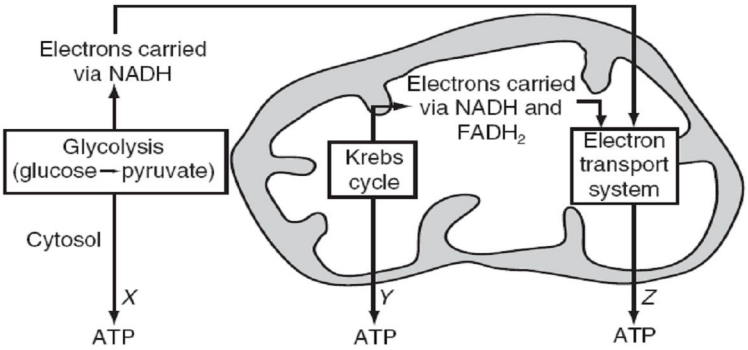
A Parasitic
B Holozoic
C Saprophytic
D Symbiotic

47. Based on the table below, match the phyla to their characteristics.

	Phylum	***Characteristic***
I	Cnidaria *P*	Body divided into head, muscular foot and visceral mass
II	Arthropoda *Q*	Diploblastic body, polymorphism
III	Mollusca *R*	Segmented legs, chitinous exoskeleton
IV	Nematoda *S*	Body covered with thin, elastic cuticle (pseudocoelom)

	I	II	III	IV
A	P	Q	S	R
B	Q	R	P	S
C	R	S	Q	P
D	S	R	P	Q

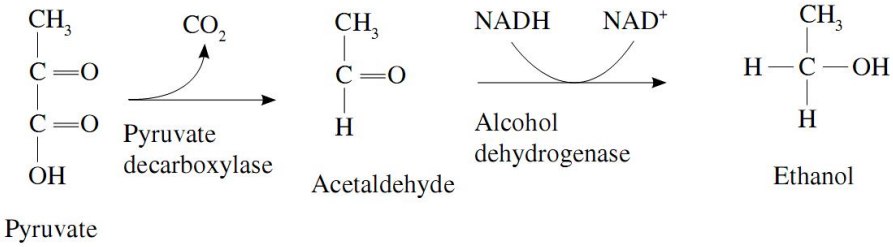
48. The diagram below shows an overview of cellular respiration.



Which of the following modes of ATP synthesis at *X*, *Y* and *Z* are correct?

	X	Y	Z
A	Oxidative phosphorylation	Substrate-level phosphorylation	Oxidative phosphorylation
B	Oxidative phosphorylation	Oxidative phosphorylation	Substrate-level phosphorylation
C	Substrate-level phosphorylation	Oxidative phosphorylation	Substrate-level phosphorylation
D	Substrate-level phosphorylation	Substrate-level phosphorylation	Oxidative phosphorylation

49. The diagram below shows the conversion of pyruvate to ethanol during anaerobic respiration.



Which of the following allows glycolysis to continue?

A The regeneration of NAD^+
B The regeneration of NADH
C The release of carbon dioxide
D The addition of yeast to ethanol

50. The function of the sympathetic nervous system is to

A slow down heartbeat
B secrete hormones
C speed up heartbeat
D regulate the blood pressure

Prepared by: Madam Yeap Chee Beng

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Paper 1 Student's Answer

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

Paper 2 Student's Answer

Section A	Score	Section B	Score
1		5	
2		6	
3		7	
4		8	
		9	
		10	
Total in **A**		Total in **B**	
Overall total (Paper 1 & 2)	/185		
Scoring after scaled to 100%	/100		

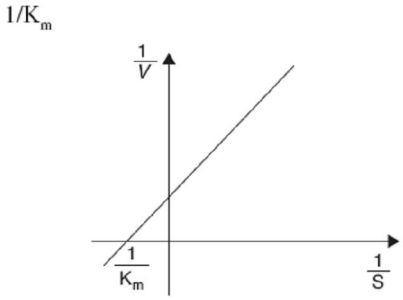
Answer Key

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

Additional notes:

1. **B** The small positive charge of the hydrogen atom and the small negative charge of the oxygen atom of the water molecule (due the uneven distribution of the electrons) contribute to the polarity of water.
2. **D** A non-steroid hormone is not soluble in lipid and cannot diffuse through the plasma membrane. Hence, it binds to a specific receptor protein on the plasma membrane.
3. **D** Gibberellin is a plant hormone which promotes the production of the enzyme α–amylase in the seeds of many plants. Energy is often stored in seeds in the form of starch which must be converted into a useable form by the germinating seed. α-amylase converts starch into simple sugars that can be used by the developing embryo.
4. **A** Glycogenesis = glucose⇨glycogen; also promotes peripheral uptake of glucose by liver and muscle cells.
5. **B** Cellulose is made up β-glucose which is a hexose. RNA and DNA contain pentose sugar.
6. **A** C_3 plants experience photorespiration the most, which is very much reduced or prevented in C_4 and CAM plants.
7. **D** A = T, G = C
   ➔ A + G = 60%
   = T + C = 60%
8. **A** The stop codons are UAA, UAG and UGA. The codons that are complementary to the stop codons are ATT, ATC and ACT.
9. **B** Transcription uses the sense strand of the DNA as a template to form the complementary mRNA and does not involve DNA polymerase and ribosome. Transcription does not necessarily begin with ATG in the template strand.
10. **C** The maximum population size that can be supported by an ecosystem with no environmental changes.
11. **C** Autotrophic organisms are organisms that make their own food. Photosynthetic organisms use energy from sunlight to make food while chemosynthetic organisms use energy from chemical reactions.
12. **A** Non-cyclic photophosphorylation in the light dependent reaction which involves both photosystems I and II occurs in the thylakoid membranes. The products of this reaction are ATP, NADPH and oxygen.
13. **C**
14. **A**
15. **C**
16. **D**

17. **D**
18. **A**
19. **D**
20. **B**
21. **A**
22. **B**
23. **C**
24. **B**
25. **B**
26. **D**
27. **A** Non-steroid hormone is a big-sized molecule and therefore, cannot enter the target cell. This hormone binds with its receptor in the plasma membrane and activates adenylyl cyclase (enzyme) that produces cyclic AMP. Cyclic AMP then activates enzyme cascade reaction through phosphorylation to bring about a rapid and amplified response to the hormone.
28. **C**
29. **A** When the concentration of carbon dioxide in the blood increases, the oxygen partial pressure decreases and the reaction moves to the left.
30. **D**
31. **C**



32. **C** Plasma cells are involved in humoral immune response.
33. **A** Common name: housefly Order name: Diptera
Common name: butterfly Order name: Lepidoptera
34. **D** Sporophytes produce spores in sorus through meiosis.
35. **D** Sporophyte is the dominant generation in Filicinophyta.
36. **A** Gametophyte is the dominant generation in Bryophyta.
37. **D**
38. **A** High carbon dioxide concentration causes the oxygen dissociation curve of haemoglobin to shift to the right (Bohr's effect)
39. **C**
40. **A** *Limulus* belongs to the class Merostomata
41. **B** This is one stage of the glycolysis process.
42. **D**
43. **D**

$$\text{Population of wood mice} = \frac{\text{Number of wood mice in first sample} \times \text{Number of wood mice in second sample}}{\text{Number of marked organisms recaptured}}$$

$$= \frac{72 \times 85}{8}$$

$$= 765$$

44. **A** The resting potential difference across the neuron membrane is maintained by facilitated diffusions whereby the membrane is more permeable to K^+ ions. Besides this, the resting potential is determined by the sodium-potassium pump where three sodium ions (Na^+) are pumped out for every two potassium ions (K^+) pumped in.
45. **A** The peripheral chemoreceptors in the carotid arteries and aorta are stimulated by a high concentration of carbon dioxide in the blood.
46. **C** Saprophytic nutrition involves the organism secreting an enzyme onto the surface of food material. The food is hydrolysed into its nutrients and the nutrients are then absorbed by the organism.
47. **B** The Cnidaria is composed of two layers of tissue, known as the ectoderm and endoderm. Thus, the organisms are said to be diploblastic.
48. **D**
49. **A** Only with the presence of NAD^+, oxidation of glucose or the intermediate can occur during glycolysis.
50. **C** The systematic nervous system consists of adrenergic motor nerves which can send impulses to the pacemaker of the heart to speed up heartbeat.

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