2024 Stuvac BIOL1007 questions

From Molecules to Ecosystems (University of Sydney)

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2024 Women's BIOL1007 Stuvac
Module 1 - 4 MCQs

MODULE 1

1	What direction does RNA polymerase synthesise RNA? a. 3' to 5' b. N to C c. 5' to 3' d. C to N
2	What is the function of DNA helicase? a. Perform the replication of DNA b. Unwind part of the DNA c. Cut DNA at certain areas d. Set a piece for replication to occur in the lagging strand
3	Where is the site of transcription? a. Ribosome b. Nucleus c. Cytoplasm d. Mitochondria
4	Which of the following are characteristic of a bacterial genome? a. Large genomes (~10Mb - 150GB) b. About 6 billion base pairs c. Chromosomes condensed into chromatin d. Circular chromosomes
5	Based on the central dogma of molecular biology, genetic material cannot undergo: a. Translation b. Transcription c. Reverse translation d. Reverse transcription
6	What wavelength do proteins usually absorb most strongly? a. 260nm b. 230nm c. 280nm d. 240nm
7	Which dsDNA is would be the most stable? A. CGCGCGCGCGCG GCGCGCGCGCGC B. ATATATATATAT TATATATATATA C. AUAUAUAUAUA UAUAUAUAUAU D. CUCUCUCUCUC GAGAGAGAGAG
8	Which best describes the quaternary structure of a protein? a. The protein is arranged into alpha helices or beta sheets b. A structure made up of multiple protein subunits, such as those found in haemoglobin c. The protein is a single chain of amino acids d. A single folded structure determined by hydrogen bonding, ionic, electrostatic or polar

	attraction
9	The most common elements are: a. Carbon, Hydrogen, Nitrogen, Oxygen, Phosphorus and Sulfur b. Carbon, Helium, Nitrogen, Oxygen, Phosphorus and Sulfur c. Carbon, Hydrogen, Nitrogen, Oxygen, Boron and Sulfur d. Carbon, Hydrogen, Oxygen, Phosphorus and Sulfur
10	Which of the following correctly describes the process of anabolism? a. Large molecules break down into smaller ones b. Small molecules assemble into large ones c. Removing an electron from an atom in a compound d. Addition of an electron to a compound
11	Catabolism results in: a. energy being used b. energy being released c. the formation of ADP d. smaller molecules forming larger molecules
12	Which enzyme is responsible for replacing RNA primers with DNA on the lagging strand during DNA replication? a. DNA Gyrase b. Primase of DNA topoisomerase c. DNA Ligase d. DNA Polymerase I
13	In molecular biology, what is meant by the 'central dogma'? a. The transcription of DNA into RNA, which is translated to form a nucleotide b. The transcription of DNA into a protein, which is translated to form RNA c. The transcription of DNA into RNA, which is translated to form an enzyme d. The transcription of DNA into RNA, which is translated to form a protein e. The role of RNA in coding protein synthesis
14	Which statement about different living species is CORRECT? a. Different species share the same molecules and many basic mechanisms of life b. Genomes from different species are all the same c. There is only one way to classify living species d. DNA sequences from different species are all completely different from one another e. All living species belong to the same kingdom
15	Replication is a. the synthesis of DNA from an RNA template b. the synthesis of DNA from a DNA template c. the synthesis of protein from an RNA template d. the synthesis of DNA from a protein template e. the synthesis of RNA from a DNA template
16	Which of the following is primarily responsible for the helical structure in B-DNA? a. The base pairing b. The ionic repulsion between the phosphates

	c. The presence of a bond between the base and the sugar d. The rotation of the peptide bond e. The backbone hydrogen bonds in the alpha helix
17	Of the major biopolymers which one of the following is ONLY found in DNA? a. A sugar-phosphate backbone b. Thiamine c. Peptide bond d. Uracil
18	DNA is a polymer made from what subunits? a. Nucleotides b. Bases c. Amino acids d. Lipids e. Sugars
19	Proteins are polymers of: a. Nucleotides b. Bases c. Amino acids d. Lipids e. Sugars
20	The alpha helix is an example of a: a. The primary structure b. The secondary structure c. The tertiary structure d. The quaternary structure e. A holoenzyme
21	The fold of a single polypeptide chain is described as: a. The primary structure b. The secondary structure c. The tertiary structure d. The quaternary structure e. A holoenzyme
22	DNA polymerases synthesise DNA. This class of enzymes catalyse the formation of which type of bond in the DNA polymer? a. the hydrogen bonds between base pairs b. the peptide bond c. the ionic bonds between the negative phosphates and the positive bases d. the covalent bond between the backbone sugar and phosphate (phosphodiester) e. the covalent bond between the sugar and the base (A, G, C or T) (N-glycosidic bonds)
23	What is the role of DNA topoisomerase in DNA replication? a. Unwinds a segment of DNA during initiation

	b. Prevents supercoiling of DNA c. Joins Okazaki fragments on the lagging strand d. Prevents small segments of lagging strand from degrading or base-pairing
24	Enzymes: a. Do not alter reaction rate b. Increase the rate of the reaction c. Make the thermodynamics of the reaction more favourable d. Increase the activation energy of the reaction e. Inhibit the reverse reaction
25	Which of the following occurs in replication but NOT in transcription? a. Can copy a new strand 3’ to 5’ b. Forms a phosphodiester bond c. Initiates at ATG d. Uses a genomic DNA template e. Copies both strands simultaneously
26	How does transcription terminate? a. RNA polymerase dissociates from the DNA template when it reaches the next promoter b. RNA polymerase dissociates from the DNA template when it reaches the next START codon c. A protein factor Rho causes RNA polymerase to dissociate from the DNA template d. When RNA polymerase reaches the ribosome binding site (RBS) it dissociates from the DNA template e. When RNA polymerase reaches the STOP codon it dissociates from the DNA template
27	What structural feature identifies the start of a sequence of DNA? a. the 3’ hydroxyl group b. the 5’ phosphate c. the promoter d. the start codon e. the sequence AUG
28	What type of single point mutation would never impact protein structure? a. Missense b. Silent c. Nonsense d. Duplication
29	Which one is a nucleobase that can only be found in RNA ? a. Guanine b. Uracil c. Cytosine d. Thymine
30	In order to synthesise a protein, translation must start and stop at the appropriate places. How is this achieved? a. Translation starts at the 5' end of an RNA molecule and is stopped by a stop codon.

	b. Random sequences of RNA are translated and the amino acids are assembled in the correct order after translation is complete. c. Translation starts at a special start codon and continues until the 3' end of the RNA molecule. d. Translation proceeds from the 5' end to the 3' end of the RNA molecule. e. There are special start and stop codons.
31	During aerobic respiration, the last carrier protein transfers a pair of electrons to: a. Water. b. NADH c. Coenzyme Q d. a proton (H+) e. Oxygen
32	In cellular respiration, carbon dioxide is formed from the oxidation of the following: a. Oxygen b. Cytochrome oxidase c. NADH d. Glucose e. Water
33	How do electrons enter the electron transport chain? a. By the oxidation of water b. By the oxidation of NADH c. By the reduction of water d. By the reduction of oxygen e. By the reduction of NADH
34	What metabolic pathway by itself produces the greatest amount of ATP? a. Glycolysis b. Electron transport chain c. Citric acid cycle d. Fermentation
35	What accumulates in the lumen of the thylakoid sacs of chloroplasts, and drives the synthesis of ATP? a. NADPH b. ADP c. Protons d. Oxygen e. NAD
36	Which of the following binds most tightly to the active site of an enzyme? a. Water b. Substrate c. Any other enzyme d. Product e. None of these choices are correct

37	Which of the following best describes epigenetics? a. Mutation of the DNA to achieve different gene expression b. A widespread gene epidemic c. Chemical modifications that alter the way a DNA sequence is read d. The set of all RNA molecules in one cell

MODULE 2

38	Which statement is true for CAM photosynthesis? a. Spatial separation occurs; it involves both mesophyll cells and bundle sheath cells. b. Photorespiration increases due to oxygenation by Rubisco. c. Temporal separation occurs; stomata open at night and stays closed during the day. d. Lower water-use efficiency due to an increase in photorespiration.
39	In Krebs cycle, a six carbon compound is formed by the combination of the acetyl group from Acetyl CoA with: a. Citric acid b. Malic acid c. Oxaloacetic acid d. Succinic acid
40	How many photosystems are involved in non-cyclic phosphorylation? a. 0 b. 1 c. 2 d. 6
41	Where does glycolysis occur? a. Mitochondrial matrix b. Cytosol c. Intermembrane space d. Cristae of the mitochondria
42	What metabolic pathways do autotrophs and heterotrophs both share? a. Calvin cycle and Glycolysis b. Light dependant reaction and oxidative phosphorylation c. Electron transport chain and Calvin cycle d. Glycolysis and oxidative phosphorylation
43	What happens to pyruvate before it enters the Krebs Cycle? a. It removes electrons and puts them into NADH b. It forms citric acid c. It loses a carbon and becomes an acetyl group carried by co-enzyme A (CoA) d. It generates small amounts of ATP
44	What is one difference between the light dependent and light independent reaction in photosynthesis? **a.** Light dependent reaction produces oxygen and light independent reaction produces glucose b. Light dependent reaction produces glucose and light independent reaction produces oxygen c. Light dependent reaction produces water and light independent reaction produces glucose d. Light dependent reaction produces oxygen and light independent reaction produces water

45	What is the first process in cellular respiration? a. Krebs cycle b. Electron transport chain c. Carboxylation d. Glycolysis
46	Which process in non-cyclic phosphorylation is responsible for replacing the electron that was lost in photosystem II? a. The absorption of light in photosystem II b. The absorption of light in photosystem I c. The splitting of water by photosystem II d. The production of NADPH by photosystem I
47	How many times does the Calvin cycle have to 'turn' to create 1 molecule of glucose? a. 3 b. 2 c. 1 d. 6
48	What type of muscle is found in the small intestine? a. Epithelial muscles b. Skeletal muscles c. Smooth muscles d. Cardiac muscles
49	Which muscle tissue cell is multi nucleated? a. Cardiac b. Skeletal c. Smooth d. All of the above
50	Why is Rubisco's oxygenase activity problematic? a. It prevents carboxylation from occurring effectively within the Calvin cycle. b. Oxygenation produces a waste product which is unable to enter the Calvin cycle and is energetically expensive to deal with. c. Oxygenation produces excess pyruvate which interferes with the Krebs cycle in cellular respiration. d. When Rubisco fixes oxygen, excess water is lost via the stomata through transpiration, reducing water-use efficiency in plants
51	Red blood cells put in a hypertonic solution will: a. shrivel and become crenulated b. not be affected in any way c. form linear edges. d. be destroyed by haemolysis
52	Red blood cells do not contain mitochondria. How do red blood cells generate most of their ATP? a. via oxidative phosphorylation b. through aerobic respiration c. through glycolysis coupled with lactic acid fermentation d. through chemiosmosis e. through glycolysis coupled with ethanol fermentation
53	One way to clone an organism is to transfer the nucleus of a cell taken from animal A, place it into an egg from animal B whose nucleus has been removed, and then implant it into a surrogate

	mother, animal C. The cloned animal would be close to identical to: a. none of the animals above because an offspring will have half of their DNA in common with the mother and half with the father b. animal C because this was the mother of the cloned animal c. animal B because the egg with its nucleus removed contains DNA d. animal A because the nucleus contains DNA
54	Facilitated diffusion requires: a. Enzymes b. Lipid or carbohydrate carriers c. Carbohydrate carriers d. Carrier proteins e. Lipid carriers
55	Both the concentration gradient and the electrical gradient affect the diffusion of _____ across membranes. a. Water b. Lipids c. Ions d. Proteins
56	Which of the following would be found in an animal cell, but NOT in a bacterial cell? a. Cell wall b. DNA c. Ribosomes d. Plasma membrane e. Endoplasmic reticulum
57	The movement of solutes against a concentration gradient is known as _____ and requires _____ as an immediate source of energy. a. active transport; ATP b. passive transport; Na+ c. diffusion; K+ d. facilitated diffusion; ATP e. facilitated transport; ADP
58	Which one of the following parts of the human body is likely to contain cells with the highest density of mitochondria? a. Skin b. Hair c. Heart muscle d. Bone e. Cartilage
59	Erythrocytes from an isotonic blood transfusion are transferred to an individual with abnormally high sodium in the blood. The most likely impact on the erythrocytes in this transfusion is: a. Water will diffuse into the cell, causing the cells to lyse. b. There will be no net diffusion of water either into or out of the cell. c. Water will diffuse out of the cell, causing the cells to crenate. d. Water will diffuse out of the cell, causing the cells to lyse.
60	The hormone insulin is a protein produced in the pancreas and then secreted into the blood stream after a meal to increase glucose uptake by tissues. What cellular process is used to secrete insulin from the pancreas?

	a. Endocytosis b. Exocytosis c. Facilitated diffusion d. Active transport
61	What are the first organisms to master noncyclic photophosphorylation that led to the Great Oxidation Event? a. Bacteria that live in O2 b. Cyanobacteria c. Bacteria that live in CO2 d. Chlorophyll
62	Which of these is not a product of glycolysis: a. Pyruvate b. H+ c. Acetyl CoA d. Pyruvate
63	Which of the following correctly describes microfilaments? a. microfilaments are made of various proteins which mesh all the way throughout the cell b. microfilaments are made of actin and are located around the cell under the plasma membrane c. microfilaments are made of tubulin and radiate like spokes on a wheel from organisation centres d. are made of alpha and beta subunits which form dimers in a staggered fashion to give the cell strength
64	What process does a cell use to self-destruct when it is too damaged to repair? a. Phagocytosis b. Pinocytosis c. Exocytosis d. Apoptosis

MODULE 3

65	Why is E. coli sometimes used as a host cell instead of yeast? I. Fastest growth II. easy to extract III. better for expressing eukaryote genes IV. are recognised as safe a. I, II only b. I, II, and III c. I, III and IV d. I, II, III and IV
66	Which of the following statements is correct regarding agar plates? a. Mannitol salt agar is differential and enriched. b. Nutrient agar is differential and selective. c. Blood agar is differential and enriched. d. All of them are correct
67	Which of the following enzymes is used to join pieces of DNA onto the plasmid?

	a. Restriction enzyme b. T4 ligase c. Thermostable polymerase d. Adenosine triphosphate
68	What is a plasmid? a. A constituent of blood b. Circular DNA elements found in microbes c. A single celled organism d. Recombinant DNA
69	Which of the following types of microbes produce methane and consume carbon dioxide? a. Methanotrophs b. Phototrophs c. Methanogens d. Protists
70	Which microbe is used to make thermostable polymerase enzymes for making DNA in biotechnology? a. Archaea b. Bacteria c. Fungi d. Viruses
71	Which state of bacterial colonisation is considered best for the gut microbiome? a. High bacteroidetes & high firmicutes b. Low bacteroidetes & high firmicutes c. High bacteroidetes & low firmicutes d. Low bacteroidetes & low firmicutes
72	Which of the following indicates the complete breakdown of red blood cells? a. Gamma-haemolysis b. Alpha-haemolysis c. Beta-haemolysis d. Mitosis

MODULE 4

73	A plant species releases spiky seeds that cling to the fur of animals, the plant relies on this for seed dispersal and reproduction; the animal is unaffected. This is an example of what type of ecological interaction? a. Mutualism b. Commensalism c. Competition d. Amensalism
74	Which of the following is NOT a model of ecological succession? a. Pioneering b. Inhibition c. Facilitation d. Tolerance
75	In a food pyramid consisting only of primary producers, primary consumers and secondary

	consumers, how much energy (kilocalories) would we expect to be in the secondary consumer trophic level if 200,000 Kcal is produced by the primary producers? a. 20,000 b. 2000 c. 200 d. 20
76	Which of these lists of interactions feature interactions that all result in only one species being negatively impacted? a. Herbivory, commensalism, predation b. Amensalism, predation, competition c. Predation, amensalism, parasitism d. Mutualism, competition, commensalism
77	Which one of the following statements best explains the energy hypothesis prediction in trophic ecology? a. Ecosystems that have high productivity should have shorter food chains compared to ecosystems with lower productivity. b. Energy in a food chain is lost only between the producer and primary consumer trophic level and is primarily lost by heat energy. c. Ecosystems that have high productivity should have longer food chains compared to ecosystems with low productivity. d. Food chains containing a higher number of trophic levels are less stable due to fluctuations at low trophic levels magnifying at high levels.
78	Which of the following is not a true statement about pioneer plant species? They: a. can contribute to the nitrogen cycle b. are shade-intolerant c. are important for primary succession d. produce large numbers of big seeds
79	Which of the following factors is not associated with Jared Diamond's 'Evil Quartet' of Extinction? a. Alien species b. Over-hunting c. Habitat loss d. Co-existence
80	Which one of these statements is true? a. A group has a particular structure whereas a population doesn’t b. A group comprises of the same species whereas a population doesn’t c. A group can include the same and different species but a population includes only the same species d. A group includes the same and different species just like a population
81	What would be the estimated population size if 80 individuals were marked in the first capture, 72 were captured in the second capture, and 45 of them were marked from the first capture? a. 124 b. 126 c. 128 d. 130
82	Which of the following is an example of mutualism? a. penicillium secreting penicillin, killing bacteria b. birds eating insects, controlling their population

	c. bees pollinating flowers d. barnacles living on whales
83	Increased levels of male-male competition or females that are increasingly selective in their mating behaviours may result in a species displaying _____. a. predator avoidance strategies b. sexual dimorphism c. photosynthesis d. adaptation
84	Which is correct regarding population growth? a. N(t)=N(t+1) + Births - Deaths b. N(t+1) = N(t) + Births - Deaths + immigrants - emigrants c. N(t+1) = N(t) - Births + Deaths d. N(t+1) = N(t) - Births + Deaths - immigrants + emigrants