SECTION A MULTIPLE CHOICE QUESTIONS

(1 mark each)

Answer by shading ONE correct answer for each question in the Scantron and putting a tick (✓) beside the correct answer in the question booklet.

1. What is used to focus the beam of electrons in an electron microscope?

(a) electromagnets
(b) condenser lens
(c) light rays
(d) air
(e) glass

2. Prokaryotes can be found in the domain(s)

(a) Archaea ✓
(b)Bacteria ✓
(c) Fungi
(d) (a) and (b)
(e) (b) and (c)

3. _____ and _____ are the product of ancestral engulfment of prokaryotic cells according to the theory of endosymbiosis.

(a) Nucleus; mitochondria
(b) Chloroplasts; Golgi apparatus
(c) Nucleolus; nucleus
(d) Mitochondria; chloroplasts
(e) Thylakoids; carboxysomes

4. All of the following are components of peptidoglycan EXCEPT:

(a) N-acetylglucosamine ✓
(b) N-acetylmuramic acid ✓
(c) lipopolysaccharide ×
(d) amino acids
(e) peptide cross-links

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5. An absent-minded laboratory technician forgot to add safranin in his Gram staining procedure. As a result

(a) Gram positive bacteria are stained purple while Gram negative bacteria are colorless.

(b) Gram positive bacteria are colorless while Gram negative bacteria are stained purple.

(c) Both Gram positive bacteria and Gram negative bacteria are stained purple.

(d) Both Gram positive and Gram negative bacteria are stained pink.

(e) Both Gram positive and Gram negative bacteria are colorless.

6. All of the following are true about bacterial outer membranes EXCEPT:

(a) They contain hopanoids.

(b) They are found only in Gram-negative bacteria.

(c) They contain endotoxin.

(d) They contain proteins involved in transport.

(e) They contain lipopolysaccharide.

7. Eukaryotic microbes that lack a cell wall may use _____ to circumvent osmotic shock.

(a) Golgi bodies

(b) contractile vacuoles

(c) endoplasmic reticulum

(d) magnetosomes

(e) gas vesicles

8. The movement of a bacterial flagellum to propel the cell forward can best be described as

(a) shaking

(b) vibrating

(c) wavelike

(d) whiplike

(e) propeller-like

9. Which of the following statements regarding the capsule of bacteria is **TRUE** ?

(a) Capsules confer motility to bacterial cells.

(b) Capsules prevent cell lysis due to osmosis.

(c) Capsules determine the shape of the bacterial cell.

(d) Capsules enable bacterial cells to survive for short periods in dry conditions.

(e) Capsules limit the size of a bacterial cell.

10. Which of the following is NOT an end product of fermentation?

(a) carbon dioxide
(b) lactic acid
(c) pyruvate
(d) ethanol
(e) none of the above i.e. all of the above are end products of fermentation

11. The greatest amount of reduced coenzyme NADH is produced during which of the following ?

(a) glycolysis
(b) fermentation
(c) TCA cycle
(d) Entner Dudoroff pathway
(e) oxidative phosphorylation

12. Which of the following is an example of Chemolithotrophy ?

(a) breakdown of molecules using light energy
(b) oxidation of organic compounds to CO_2 and H_2O
(c) CO_2 fixation
(d) oxidation of inorganic electron donors such as Fe^{2+} using O_2 as electronic acceptor
(e) none of the above

13. Which of the following contain proteins involved in the electron transport chain ?

(a) mitochondrial inner membrane
(b) chloroplast thylakoids
(c) the outer membrane of Gram-negative bacteria
(d) (a) and (b)
(e) (a) and (c)

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14. Bacteria that form symbiotic relationships with giant tube worms in hydrothermal vents:

(a) require oxygen to survive ×

(b) catabolize glucose provided by the worm to produce ATP ⇐

(c) produce ATP by photophosphorylation ×

(d) cannot fix carbon dioxide × ???

(e) lack an electron transport chain ⇐

15. *Plasmodium falciparum* is a/an _____ and is transmitted to the human host by the bite of a _____.

(a) Prokaryote; mosquito ←

(b) Eukaryote; tsetse fly

(c) Prokaryote; reduviid bug

(d) Eukaryote; mosquito ←

(e) Prokayote; sand fly

16 Which of the following applies/apply to methanogens .

(a) The belong to the Crenarchaeota group ×

(b) They can be found in the digestive tracts of termites ✓ ⇐ ???

(c) They cannot survive in the presence of oxygen ✓

(d) (a) and (b)

(e) (b) and (c)

17. The genome of some _____ single stranded RNA viruses can be used directly as a template by ribosomes for protein translation in the infected host.

(a) positive (+) sense

(b) negative (-) sense

(c) all

(d) small

(e) large

18. A key factor in the fast evolution of influenza virus is that it

(a) has only 8 genes in its genome
(b) has a genome made of DNA
(c) is enveloped
(d) has a segmented genome
(e) infects pigs

19. What happens to the <u>virus protein coat</u> when a bacterial cell is infected?

(a) It enters the cytoplasm of the host cell with the viral genome.
(b) It remains on the outside of the host cell.
(c) It enters the cytoplasm of the host cell shortly after the viral genome.
(d) It is degraded by the bacterial cell.
(e) It is used by another virus as a coat protein.

20. Which of the following steps is NOT part of the lytic cycle of a phage?

(a) Phage DNA is injected into the bacterial cell.
(b) The phage DNA integrates into the bacterial chromosome.
(c) Many copies of phage DNA are made.
(d) The phage DNA is transcribed and the resulting mRNA is translated to make capsid proteins.
(e) All of the above steps are part of the life cycle of a lytic phage.

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Section B For each question below (questions 21 to 25), <u>choose one correct answer from the choices in the box</u>. Indicate the letter corresponding to the correct answer besides each statement in this booklet. (0.5 marks each; 2.5 marks total)

(a) Phase contrast microscope
(b) Fluorescent microscope
(c) Brightfield microscope
(d) Scanning electron microscope
(e) Transmission electron microscope.

21. Microscope used to view intracellular structures of living, unstained cells. Answer A

22. Microscope used to view killed, microbial cells that are treated with a simple stain. Answer C

23. Microscope used to view the surface structures of a virus after staining. Answer D

24. Microscope used to observe a specimen that emits light after illuminated by light of a specific wavelength Answer B

25. Microscope used to view the internal structures of a bacterial cell stained with heavy metal. Answer E

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SECTION C FILL IN THE BLANKS QUESTIONS

Answers are to be written in this question booklet. Fill in the blanks (0.5 mark each; 1.5 marks total)

26. The movement of solutes down its concetration gradient through a transport protein embedded in the cytoplasmic membrane is known as simple diffusion X. In contrast, the transport of solutes through the cytoplasmic membrane against its concentration gradient is known as active transport ✓.

27. Name a bacteria that does not have a cell wall : mycoplasma ✓

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SECTION D SHORT ANSWER QUESTIONS (1 mark total)

28. Explain in as much detail as you can how the enzyme lysozyme causes bacterial cell lysis. (1mark)

The enzyme lysozyme causes bacterial cell lysis through its interactions with the bacterial cell wall. Peptoglycans that compose X the cell wall through layers, joined by peptide bonds between acetyl-M ~~acetyl~~ ~~acetyl-G~~ molecules, threaded further with teichoic acids. Lysozyme acts to ~~destro~~ clear this linkage, which thus allowing for bacterial cell lysis, when the concentration gradient within the bacterial cell can no longer be contained.

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