The second midterm covers the readings

- **Water & Membranes**
- **Energy & Life**

and the **Water / Diffusion Lab**.

(You have submitted this form before. The last time was 2003-02-26 18:11:29.0)

1) A chemical compound is composed of

- a. A single type of atom
- b. A single type of molecule
- c. A single type of element

2) The chemical properties of an atom are determined by

- a. The organization of its nucleus
- b. The organization of its electrons
- c. By its overall electrical charge

3) During alpha decay, the weight of an atom

- a. Increases by 2
- b. Decreases by 4
- c. Remains unchanged

4) When a bond forms between atoms

- a. Electrons are shared
- b. Electrons are exchanged
- c. The nuclei fuse together

5) In a polar bond

- a. The electrons are shared equally
- b. One atom gives up an electron, while the other gains an electron
- c. The electrons are shared unequally The electrons are shared unequally

6) If two atoms make a bond, the electrons will spend most of their time around the

- a. Larger atom

b. The more positively charged atom
c. The more electronegative atom

7) If you try and push two atoms closely together than their van der waals radii,

a. The nuclei will merge and you will produce a nuclear fusion event
b. They will attract each other very strongly
c. They will repell each other very strongly

8) Only some molecules are attracted by van der waals interactions

a. True
b. False

9) Consider two molecules of the same molecular weight. Which feature would lead to a higher boiling point.

a. The ability to make H-bonds
b. The ability to make van der waals interactions The ability to make van der waals interactions
c. The greater the number of electrons

10) A water molecule can make how many H-bonds with its neighbors?

a. 2
b. 3
c. 4

11) As the temperature of water increases, the molecules that move from the liquid into the gaseous phase have enough energy to

a. form new bonds
b. break the H-bonds they make with their neighbors
c. break van der waals interactions

12) A hydrophobic molecule is characterized by its?

a. inability to make H-bonds
b. ability to make H-bonds
c. large size and 'oily' nature

13) If you mix hydrophilic and hydrophobic molecules, they will tend to

- a. remain well mixed
- b. separate into aqueous and non-aqueous phases
- c. form micelles

14) Consider a molecule that self-assembles into micelles when dispered in water. Such a molecule must be

- a. hydrophilic
- b. hydrophobic hydrophobic hydrophobic
- c. amphipathic

15) As NaCl dissolves, the positive and negative ions

- a. bind even more closely with one another
- b. are kept separate by a shell of water molecules
- c. are transformed into their neutral, unionized forms

16) The pH of a solution matters (for us biologists) because it can ?

- a. alter the ionization state of weak acids and bases
- b. alter the properties of water
- c. alter the organization of lipid membranes

17) The amino group (-NH2) is a

- a. Weak acid
- b. Weak base
- c. Neutral, non-polar group.

18) In a hydrolysis reaction

- a. Water is added and a larger molecule is broken into a two smaller ones.
- b. Water is added and two smaller molecules become a single larger one
- c. Water breaks down into H+ and OH-

19) The density of water decreases continuously as the temperature decreases.

- a. True
- b. False

20) Lipids are

- a. Hydrophilic
- b. Hydrophobic
- c. Amphipathic Amphipathic Amphipathic

21) As the hydrocarbon chains of a fatty acid become longer and longer, the molecule becomes more and more

- a. Hydrophilic Hydrophilic
- b. Hydrophobic Hydrophobic ,
- c. Amphipathic

22) When a lipid assembles into a micelle or a bilayer, the entropy of the system

- a. Increases
- b. Decreases
- c. Remains unchanged

23) The plasma membrane acts to

- a. control diffusion into the cell
- b. control diffusion out of the cell
- c. both

24) The concentration of molecules in the cytoplasm represents

- a. Stored energy
- b. Increased entropy
- c. A spontaneous event

25) The glycocalyx is located

- a. Outside the plasma membrane
- b. Immediately inside the plasma membrane
- c. On the inner surface of the nucleus

26) A major function of the cell wall in prokaryotes is

- a. To resist dispersal of the cytoplasm
- b. Stabilize the plasma membrane against osmotic forces
- c. Increase the hydrophilicity of the plasma membrane surface

As the soil, however rich it may be, cannot be productive without cultivation, so the mind without culture can never produce good fruit.-- Seneca (B.C. 3-65 A.D.)

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1) Glycerol-based lipids are a major structural component of the plasma membrane. The glycerol moeities of these molecules are located

- a. In the hydrophobic core of the membrane
- b. At the hydrophilic surface of the membrane
- c. In the central hydrophobic region of membrane proteins.

2) While the lipids of bacteria are composed of unbranched hydrocarbons, the lipids of archaea are composed of

- a. Cholesterol
- b. Proteins
- c. Branched isoprene polymers

3) As the temperature increases, the van waals interactions between hydrocarbon chains

- a. Become stronger
- b. Are insufficient to keep the chains closely packed together
- c. Lead to bond polarization

4) The presence of double bond in a hydrocarbon chain leads to

- a. A kink
- b. A branch
- c. A hydrophilic bubble

5) Because they cannot pack as closely to one another, the van der waals interactions between unsaturated hydrocarbon chains are

- a. Stronger
- b. Weaker
- c. Compensated by increased H-bonding

6) The hydrophilic group on cholesterol is a

- a. single hydroxyl group
- b. a glycerol group
- c. an isoprene group

7) Overton's law relates membrane permeability to

- a. A molecule?s size
- b. A molecule?s hydrophobicity
- c. A molecules?s net charge

8) Based on the self-assembly characteristics of lipids, we might reasonably expect that the membranes of early proto-organisms were

- a. Composed of long chain hydrocarbons and very leaky
- b. Composed of short chain hydrocarbons and very leaky
- c. Composed of a cholesterol and were very stiff

9) The permeability of a membrane cannot be completely explained by Overton?s law. In addition to a hydrophobic layer, there was also a evidence for

- a. Hydrophilic pores
- b. Hydrophobic centers
- c. Ion pairs

10) Diffusion is driven by the fact that

- a. Molecules are bonded together
- b. Molecules are moving
- c. Molecules have electrons

11) As temperature increases, the rate of diffusion

- a. Increases
- b. Decreases
- c. Remains unchanged

12) You find out how long it takes a molecule to diffuse 0.001 mm. You are asked to predict how long it would take to diffuse 0.1 mm. Your prediction would be that it would take

a. 10 times as long
b. 100 times as long
c. much more than 100 times as long

13) Why does water diffuse into a cell.

a. Because there is more water inside than outside
b. Because the concentration of water is lower inside the cell
c. Because water is actively pumped into the cell.

14) Osmosis can do work.

a. True
b. False

15) In cells without a cell wall, the water that enters the cell must be

a. used up in hydrolysis reactions
b. pumped back out of the cell
c. pumped out of the periplasmic space

16) Explain the difference between carriers, channels and pumps

17) We could consider an antiporter or a symporter a pump. What is the immediate source of energy for such pumps?

a. ATP
b. Concentrations gradients across the membrane
c. Protein structure

18) Why can't a uniporter act as a pump?

a. Because they run on multiple concentrations gradients
b. Because they use ATP
c. Because a single concentration gradient can only 'run

down', thats the law.

19) Working together symporters and antiporters could be used to establish concentration gradients across membranes

- a. True
- b. False

20) When ATP is hydrolysed by a pumping protein,

- a. The energy is stored transiently in the protein
- b. The energy is directly stored in the concentration gradient
- c. The energy is stored in the molecule that is transported

21) Some of the energy stored in ATP is lost upon hydrolysis. This energy is released as

- a. phosphate
- b. ADP
- c. Heat

22) As an abstract quantity, the equilibrium constant reflects

- a. The extent to which a reaction proceeds
- b. The rate at which a reaction proceeds
- c. The complexity of a reaction

23) At equilibrium,

- a. The concentrations of reactants and products are equal
- b. The reactants will be completely used up
- c. The forward and backward reaction rates are equal

24) At equilibirum, if we increase a product, we will increase

- a. Increase a reactant
- b. Decrease a reactant
- c. Leave the reactant concentrations unchanged

25) We can couple reactions because at equilibrium, products combine to form reactants.

a. True
b. False

26) The rate of a reaction is determined by the step in the reaction with the

a. Smaller difference in free energy
b. Largest difference in free energy
c. Biggest conformational change

27) Increasing the temperature increases reaction rates because

a. A larger proportion of the molecules in the system have enough energy to pass through the ?activation? state
b. The energy of the ?activation? state is reduced
c. The concentration of the reactants in increased

28) A catalyst can increase the reaction rate because it

a. Changes the free energy of the products
b. Changes the free energy of the reactants
c. Changes the energy of the activation state

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It's not that I'm so smart it's just that I stay with problems longer. -- Albert Einstein

(You have submitted this form before. The last time was 2003-02-26 18:39:57.0)

1) A phototroph eats

- a. Light
- b. Photos
- c. The chemicals used to develop photographs

2) When two molecules interact and electrons are transferred, the electrons will move from the

- a. Less energetic molecule to the more energetic molecule
- b. More energetic molecule to the less energetic molecule
- c. Depends upon the specific molecules involved

3) When a molecule is oxidized, electrons are removed and the energy it contains increases

- a. True
- b. False

4) As an electron passes down an ETC, it becomes

- a. More energetic
- b. Less energetic
- c. Its energy does not change, just its position in the cell

5) When energy (electrons) flows through the ETC of a bacterial cell, H+ are pumped

- a. Into the cell
- b. Out of the cell
- c. Into NAD+

6) In a bacterial cell, H+ move (into or out of) the cell when ATP is generated by the ATP synthase

- a. Into
- b. Out of

7) **New material: Go to the complete course content site / Extracting & Storing Energy page. What is the formula for molecular oxygen?**

- a. O
- b. O2
- c. O3
- d. OH

8) **New material: Go to the complete course content site / Extracting & Storing Energy page. Inside cells, O2 acts as electron acceptor. What molecule is formed during this reaction?**

- a. glucose
- b. CO2
- c. H2O

9) **In bacteriorhodopsin, light is absorbed by?**

- a. The entire protein
- b. The retinal group
- c. The membrane
- d. the H+ gradient

10) **Photoisomerization occurs when**

- a. Light is absorbed and a molecule changes shape
- b. Light is generated spontaneously by H+ moving through the ATP synthase
- c. Electrons are passed along a electron transport chain

11) **On photoisomerization, the energy of the absorbed photon is stored transiently in**

- a. The altered structure of the pigment and the protein to which it is attached
- b. An H+ gradient
- c. ATP
- d. NADPH and glucose

12) **Consider Halobium! What happens to the H+ gradient across the membrane when the sun goes down.**

- a. It remains stable, and ATP product ions increaes
- b. It dissipates

c. It increases

13) During the dark reaction of photosynthesis, the energy stored in NADPH and ATP is used to...

a. generate a H+ gradient
b. generate more ATP
c. combind H_2O and CO_2 to form carbohydrate

14) In cyclic photophosphorylation, where do the photon-exited electrons eventually end up?

a. Water
b. a membrane gradient
c. back in the chlorophyll they originated in

15) What is the role of NADPH during photophosphorylation?

16) In non-cyclic photophosphorylation, there is constant supply of electron that come from ...

a. O_2
b. CO_2
c. H_2O
d. photons

17) When H+ move through the ATP synthase, it...

a. moves within the plane of the plasma membrane
b. moves out of the plasma membrane
c. rotates
d. contracts

18) You have a bacterial cell. Normally, the pH is 6 outside the cell and 7.5 within the cell. You change the pH in which the cell is growing to pH 8.0. What happens to the ATP concentration within the cell?