8) Chemistry – *Multiple Choice* Which of the following statements about the Daniell cell is NOT correct?

W) Zinc is oxidized
X) Copper is reduced
Y) There is a net transfer of 1 mol of electrons per reaction.
Z) Zinc and Copper II sulfate are used in the solution.

ANSWER: Y) THERE IS A NET TRANSFER OF 1 MOL OF ELECTRONS PER REACTION.

8) Chemistry – *Short Answer* Order the following 3 steps of the Williamson Ether Synthesis in the correct order: 1) Sodium attaches to the alkoxide ion; 2) The alcohol is deprotonated; 3) Alkoxide attacks the alpha carbon of the alkyl halide.

ANSWER: 2, 1, 3

8) Chemistry – *Short Answer* What functional group contains a three-membered ring with an oxygen atom and 2 carbon atoms, all connected via single bonds?

ANSWER: EPOXIDE

8) Chemistry – *Short Answer* Order the following 3 elements by increasing electron affinity: 1) Carbon; 2) Nitrogen; 3) Oxygen.

ANSWER: 2, 1, 3 (ACCEPT: NITROGEN, CARBON, OXYGEN)

8) Chemistry – *Multiple Choice* Which of the following elements is most stable at a +1 oxidation state?

W) Indium
X) Thorium
Y) Germanium
Z) Thallium

ANSWER: Z) THALLIUM

8) Chemistry – *Multiple Choice* Which of the following most accurately describes the catalyst of a hydrogenation reaction?

W) Aliphatic
X) Amorphous
Y) Homogenous
Z) Heterogenous

ANSWER: Z) HETEROGENOUS

13) Biology – *Multiple Choice* Which of the following statements about auxin is NOT true?

W) They promote dormancy breaking.
X) It is also known as indoleacetic acid.
Y) It mediates apical dominance.
Z) Pin proteins are used to transfer auxin

ANSWER: W) THEY PROMOTE DORMANCY BREAKING

13) Biology – *Multiple Choice* During a karyotype, you find that chromosome 5 is missing a portion and chromosome 2 has extra DNA. Given that only one transformation occurred, what type of transformation occurred?

W) Insertion
X) Deletion
Y) Inversion
Z) Duplication

ANSWER: W) INSERTION

8) Chemistry – *Multiple Choice* Which of the following is NOT an addition reaction on an Alkene?

W) Hydroboration Oxidation
X) Hydrohalogenation
Y) Ozonolysis
Z) Oxymercuration Demercuration

ANSWER: Y) OZONOLYSIS

8) Chemistry – *Short Answer* Rank the following 3 molecules from least to greatest in oxidation state of the oxygen atom: 1) Peroxide; 2) Superoxide; 3) Ozonide.

ANSWER: 1, 2, 3

8) Chemistry – *Short Answer* What is the bond order for the molecule: B_2?

ANSWER: 1

8) Chemistry – *Short Answer* A system suffers an increase in internal energy of 80 J and at the same time has 50 J of work done on it. What is the heat change of the system in Joules?

ANSWER: 30

13) Biology – *Multiple Choice* Which of the following cell types would not be in a sample of epidermis tissue?

W) Langerhan Cells
X) Merkel Cells
Y) Chondrocytes
Z) Keratinocytes

ANSWER: Y) CHONDROCYTES

13) Biology – *Short Answer* Identify all of the following 3 statements that are examples of human ontogeny: 1) Body hair grows; 2) Vestigial organs evolve out; 3) Baby teeth fall out.

ANSWER: 1 AND 3

8) Chemistry – *Multiple Choice* Which of the following statements is NOT true regarding acid-catalyzed hydration reaction of alkenes?

W) It is a syn addition
X) An alcohol will be produced
Y) Water acts as the electrophile
Z) The product will be optically active

ANSWER: W) IT IS A SYN ADDITION

8) Chemistry – *Short Answer* Identify all of the following 3 species that are considered polar and protic: 1) H_2S; 2) DMSO; 3) THF.

ANSWER: 1 ONLY

13) Biology – *Multiple Choice* Which of the following most accurately describes the role of tropomyosin?

W) To release troponin from tropomyosin, allowing myosin to bind to the actin filament

X) To release calcium from the sarcoplasmic reticulum
Y) To prevent myosin from continuing to slide up the actin filament
Z) To aid in myosin 'cocking' on the actin filament

ANSWER: Y) TO PREVENT MYOSIN FROM CONTINUING TO SLIDE UP THE ACTIN FILAMENT

13) Biology – *Short Answer* The glyoxylate cycle centers on the conversion of Acetyl-COA into what other biomolecule?

ANSWER: SUCCINATE

8) Chemistry – *Short Answer* Order the following 3 groups in order of increasing electron-donating ability on a benzene ring: 1) O^-; 2) OH; 3) NO_2

ANSWER: 3, 2, 1

8) Chemistry – *Multiple Choice* For the reaction A + B yields C, where the rate constant for the forward reaction is k_f and the rate constant for the reverse reaction is k_r, what is the equilibrium constant in terms of k_f and k_r?

ANSWER: Kf/Kr

13) Biology – *Short Answer* Proteins that are covalently marked by ubiquitin are further degraded by what other protein structures?

ANSWER: PROTEASOMES

13) Biology – *Short Answer* What part of the kidney tubule forms a long loop in the medulla of the kidney where water and other salts can be reabsorbed into the blood?

ANSWER: LOOP OF HENLE

8) Chemistry – *Short Answer* Identify all of the following 3 reactions that have an intermediate: 1) E1; 2) E2; 3) E1CB.

ANSWER: 1 AND 3

8) Chemistry – *Short Answer* Hydrogen peroxide goes through what type of reaction where oxygen is both oxidized and reduced?

ANSWER: DISPROPORTIONATION

13) Biology – *Short Answer* What factor in bacterial conjugation comes in both + and - variants, and forms 2 + factors afterward?

ANSWER: FERTILITY (ACCEPT: F)

13) Biology – *Short Answer* What disease is caused by a defective or missing clotting factor named VWF?

ANSWER: VON WILLEBRAND DISEASE (ACCEPT: VWD)

8) Chemistry – *Short Answer* What law states that the relationship between the temperature of a blackbody and the max wavelength at which it emits the most light is always equal to a constant?

ANSWER: WIEN'S LAW

8) Chemistry – *Short Answer* A carbonyl compound can be changed into an alkene via what reaction using a phosphorus ylide?

ANSWER: WITTIG REACTION

13) Biology – *Short Answer* What type of vesicle can be used for drug delivery, and are formed when a surfactant is added to a mixture or by sonication?

ANSWER: LIPOSOME

13) Biology – *Short Answer* Identify all of the following three species that are considered alveolates: 1) Brown Algae; 2) Apicomplexans; 3) Dinoflagellates.

ANSWER: 2 AND 3

13) Biology – *Multiple Choice* Which of the following pH values is closest to that of the skin?

W) 2
X) 5
Y) 7
Z)11

ANSWER: X) 5

13) Biology – *Short Answer* Order the following 3 choices in order from first to last to occur for the inflammatory response of an animal cell: 1) Antimicrobial peptides enter the affected tissues; 2) Neutrophils digest pathogens; 3) Mast cells release histamine.

ANSWER: 3,1,2

8) Chemistry – *Multiple Choice* Which of the following reagents would be most effective for converting N,N-dimethylpropanamide into N,N-dimethylpropanamine?

W) $NaBH_4$ and ether
X) NaBH4, and water
Y) $LiAlH_4$ and ether
Z) LiAlH4, and water

ANSWER: Y) LIALH4 AND ETHER

8) Chemistry – *Short Answer* Consider the coordination compound, $K_2[Cu(CN)_4]$. A coordinate covalent bond exists between which two species?

ANSWER: Cu^{2+} AND CN^- (ACCEPT: COPPER AND CYANIDE)

13) Biology – *Multiple Choice* In the process of urea formation, ATP breakdown is required to drive which of the following reactions?

W) Transamination of oxaloacetate to aspartate.
X) Transamination of glutamate to alpha-ketoglutarate
Y) Hydrolysis of urea from arginine
Z) Conversion of bicarbonate to ammonium acceptor

ANSWER: Z) CONVERSION OF BICARBONATE TO AMMONIUM ACCEPTOR

13) Biology – *Short Answer* Identify all of the following 4 statements that are true according to the modern synthesis model, but not according to Darwin's model of natural selection: 1) Recombination can be favorable to the organism's reproductive success; 2) Few offspring survive to reproductive age; 3) Some variation within a population is heritable; 4) Adaptive or neutral mutations can become pervasive in the gene pool

ANSWER: 1 AND 4

8) Chemistry – *Short Answer* The reaction of benzaldehyde in basic condition into benzyl alcohol and benzoic acid is an example of what disproportionation reaction where aldehydes are converted into an alcohol and a carboxylic acid.

ANSWER: CANNIZZARO REACTION

8) Chemistry – *Multiple Choice* After enolization with a lithium based base, an enolate is highly reactive. Which of the following groups would be the best to allow an enolate to exist at room temperature rather than extreme conditions?

W) Tert-butoxycarbonyl
X) Aziridine
Y) Trimethyl silane
Z) Formyl

ANSWER: Y) TRIMETHYL SILANE

13) Biology – *Short Answer* Even though some reactants are not chiral because they have 2 hydrogens attached to the same carbon, they can still be thought of as "psuedo" chiral by enzymes because the hydrogens are distinct in their functions. What system in nomenclature allows for the distinction between these hydrogens?

ANSWER: PRO CHIRALITY

13) Biology – *Short Answer* What is the co-transduction frequency for the A and B genes, from the following dataset?(Assume that there has been selection for the A+ form of the A gene
A+B+ C+ = 10
A+B+ C- = 30
A+ B- C+ = 20
A+ B- C- = 40

ANSWER: .4

8) Chemistry – *Multiple Choice* Which of the following would be reduced the fastest in the presence of BH_3 THF?

W) Aldehyde
X) Ketone
Y) Ester
Z) Carboxylic Acid

ANSWER: Z) CARBOXYLIC ACID