Sample Exam I questions for IB426

The Exam will consist of short answers, multiple choice, True/False, and may be one essay question. The following are examples of questions in each category.

I. Examples of Short answers:

(1). Give two reasons why pre-gastric fermentation is a more nutritive digestive strategy than post-gastric fermentation (4pts).

(2). What is the name of the bond between the glucose monomers in the following 2 diagrams?(2pts)

(a). ______________________________        (b). _________________________________

(iv.) (3 pts): What is the name of compound (a) and (b)?

(a). ______________________________        (b). _________________________________

(c). Vertebrate animals have no enzyme to break which bond (circle one)? (a) or (b)
3. (Total 16 pts) The basilisk lizard’s run on water consists of 3 steps (slap, stroke and protraction) per stride, as shown in the given diagram. (I) Draw and label on the diagram arrows that depict the forces involved and the direction of the force (4 pts). (ii) Describe concisely what occurs at each step that together allow the lizard to run through water and not sink (12 pts.)

A. Slap

B. Stroke

C. Protraction
II. Examples of Multiple Choice Questions:

1. Which of the following regarding salt and water balance in aquatic organisms is/are correct?
   
   A. With respect to seawater, marine chondrichthyes are isosmotic and iso-ionic.
   B. With respect to seawater, marine chondrichthyes are hypo-ionic, and retains urea to achieve isosmoticity.
   C. With respect to seawater, marine teleosts are hyposmotic and hypo-ionic, and need to acquire more salt from seawater.
   D. With respect to seawater, marine invertebrates are hyperosmotic and hyper-ionic
   E. With respect to pond water, a frog is hyperosmotic and iso-ionic.

2. Regarding aerobic metabolism and oxidative phosphorylation, which of the following is correct?:

   A. The glycolysis pathway breaks down a 6-carbon sugar (glucose) into two 3-carbon pyruvate, and generates two net ATP molecules, and O₂ is consumed in one or more of the reactions.
   B. From 1 molecule of pyruvate, the TCA cycle generates 4 NADH, 1 FADH₂, 1 ATP, and O₂ is consumed in one or more of the reactions.
   C. The Electron Transport Chain transport electron from NADH and FADH₂ down hill energetically, and the energy is coupled to pumping H⁺ (proton) from the mitochondrial intermembraneous space to the mitochondrial matrix, generating a proton gradient across the inner membrane.
   D. Dissipation of the proton gradient is via a one-way exist through the ATP synthase in the mitochondrial inner membrane, and the energy released is coupled to the phosphorylation of ADP to form ATP.
   E. O₂ is the terminal electron acceptor in the Electron Transport Chain, and the reaction: 
      \[
      \frac{1}{2}O_2 + 2e^- + 2H^+ \rightarrow H_2O
      \]
      takes place at the ATP synthase.

3. In the evolution of the Earth’s atmosphere:

   A. In the pre-biotic era, the Earth’s atmosphere has some molecular oxygen but was predominantly a reducing atmosphere of N₂, CO₂ and H₂S gases
   B. In the pre-biotic era, the Earth’s atmosphere was a reducing atmosphere of N₂, CO₂ and H₂S gases, and oxygen was not free but tied up in H₂O and CO₂.
   C. In the early biotic era, molecular (gaseous) O₂ was produced by photosynthetic micro-organisms and it accumulated linearly with time in the atmosphere.
   D. In the biotic era, molecular (gaseous) O₂ was produced by photosynthetic organisms and green plants but it could not accumulate in the atmosphere until the oceanic and land Fe'''' sinks were saturated.

4. Hemoglobin’s binding affinity for O₂ is modulated in the following manner except:

   A. High \( PCO_2 \) and low pH shift Hb \( O_2 \) dissociation curve to the right and increases \( P_{50} \).
   B. High blood 2,3-DPG concentration shifts Hb \( O_2 \) dissociation curve to the right and increases \( P_{50} \).
   C. High blood ionic concentration shifts Hb \( O_2 \) dissociation curve to the right and increases \( P_{50} \).
   D. High temperature shifts Hb \( O_2 \) dissociation curve to the left and decreases \( P_{50} \).
   E. Low \( PCO_2 \) and high pH shift Hb \( O_2 \) dissociation curve to the right and increases \( P_{50} \).
III. Examples of True or False questions:

1. _____ A 0.5M solution of NaCl and a 1M solution of glucose will have very similar freezing points and boiling points.
2. _____ The Cambrian explosion is the first major speciation event in fossil records and occurred at about 500 million years ago and lasted about 30 million years.
3. _____ A osmoconformer that allows its body fluid osmotic concentration follow the environmental solute concentrations over a wide range is called stenohaline.
4. _____ Adult basilisk lizards over 200 gm cannot run on water because the rate of increase of the area of their feet is much less than the rate of increase of their body mass.

IV. Example of an essay question (10 pts)

1. Contrast the Pay before Pump model of python (an infrequent eater) digestion of Secor and Diamond versus the Pump before Pay model of Starck and Beese. State the key experimental evidence each study put forth to support their inference.