(A) 單一選擇題 (75%，每小題 3 分，答錯不倒扣)：

1. Why are biologists so interested in chemistry?
   a. Chemicals are the fundamental parts of all living things.
   b. Most chemicals are harmful to living things.
   c. They know little about life except the chemicals it is made from.
   d. If you understand the chemistry of life, you can make a lot of money.
   e. Everything about life can be known by understanding its chemistry.
2. Adding acid tends to ____ of a solution.
   a. increase the hydrogen ion concentration and raise the pH
   b. increase the hydrogen ion concentration and lower the pH
   c. decrease the hydrogen ion concentration and raise the pH
   d. decrease the hydrogen ion concentration and lower the pH
   e. either increase or decrease the pH, depending on the original acidity
3. The four main categories of macromolecules in a cell are
   a. proteins, DNA, RNA, and steroids.
   b. monosaccharides, lipids, polysaccharides, and proteins.
   c. proteins, nucleic acids, carbohydrates, and lipids.
   d. nucleic acids, carbohydrates, monosaccharides, and proteins.
   e. RNA, DNA, proteins, and carbohydrates.
4. The overall three-dimensional shape of a polypeptide is called the
   a. double helix.
   b. primary structure.
   c. secondary structure.
   d. tertiary structure.
   e. quaternary structure.
5. Enzymes are described as catalysts, which means that they
   a. are proteins.
   b. provide activation energy for the reactions they facilitate.
   c. change the rate of a reaction without being consumed by the reaction
   d. stabilize molecules in the transition state.
   e. elevate the EA barrier so the molecules will not spontaneously degrade.
6. Which of the following clues would tell you whether a cell is prokaryotic or eukaryotic?
   a. the presence or absence of a rigid cell wall
   b. whether or not the cell is partitioned by internal membranes
   c. the presence or absence of ribosomes
   d. whether or not the cell carries out cellular metabolism

(背面仍有題目,請繼續作答)

e. whether or not the cell contains DNA

7. The concentration of solutes in a red blood cell is about 2%. Sucrose cannot pass through the membrane, but water and urea can. Osmosis would cause red blood cells to shrink the most when immersed in which of the following solutions?
   a. a hypertonic sucrose solution
   b. a hypotonic sucrose solution
   c. a hypertonic urea solution
   d. a hypotonic urea solution
   e. pure water
8. When a poison such as cyanide blocks the electron transport chain, glycolysis and the Krebs cycle soon grind to a halt as well because
   a. they run out of ATP.
   b. the buildup of unused oxygen interferes with glycolysis and the Krebs cycle.
   c. they run out of NAD+ and FAD.
   d. electrons are no longer available from the electron transport chain.
   e. they run out of ADP.
9. Which of these wavelengths is least useful for photosynthesis?
   a. green
   b. yellow
   c. blue
   d. orange
   e. red
10. Mitosis and cytokinesis result in the formation of _____; meiosis and cytokinesis result in the formation of _____.
   a. 4 diploid cells; 4 haploid cells
   b. 2 diploid cells; 2 haploid cells
   c. 2 diploid cells; 4 haploid cells
   d. 2 diploid cells; 2 diploid cells.
   e. 4 haploid cells; 2 diploid cells
11. Human mitochondria
   a. are inherited as an X-linked trait.
   b. are all inherited from the father.
   c. have linear DNA.
   d. do not contain DNA.
   e. are all inherited from the mother.
12. The two strands of a DNA double helix are antiparallel. This means that
   a. the two strands are mirror images.

b. only one of the two strands can be used as a template for replication, since DNA polymerase only works in one direction.
c. one strand is actually composed of RNA.
d. one strand runs in the 5'3' direction and the other runs in the 3' 5' direction.
e. they both run in the 3' 5' direction.

13. After an mRNA molecule is transcribed from a eukaryotic gene, portions called ____ are removed and the remaining ____ are spliced together to produce an mRNA molecule with a continuous coding sequence.
a. operators . . . promoters
b. exons . . . introns
c. silencers . . . enhancers
d. introns . . . exons
e. promoters . . . operators

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15. All your cells contain proto-oncogenes, which can change into cancer-causing genes. Why do cells possess such potential time bombs?
a. Viruses infect cells with proto-oncogenes.
b. Proto-oncogenes are genetic junk and have no known function.
c. Proto-oncogenes are unavoidable environmental carcinogens.
d. Cells produce proto-oncogenes as a by-product of mitosis.
e. Proto-oncogenes are necessary for normal control of cell division.

16. A biologist isolated a gene from a human cell, attached it to a plasmid, and inserted the plasmid into a bacterium. The bacterium made a new protein, but it was nothing like the protein normally produced in a human cell. Why?
a. The bacterium had undergone transformation.
b. The gene did not have sticky ends.
c. The gene contained introns.
d. The gene did not come from a genomic library.
e. The biologist should have cloned the gene first.

17. Natural selection is sometimes described as survival of the fittest. Which of the following most accurately measures an organism's fitness?

(背面仍有題目,請繼續作答)

a. how strong it is when pitted against others of its species
b. its mutation rate
c. how many fertile offspring it produces
d. its ability to withstand environmental extremes
e. how much food it is able to make or obtain

18. Bacteria can adapt to changes in the environment by means of mutation alone because
a. they are so small in size.
b. their populations are very isolated from one another.
c. a bacterium is much more likely to mutate than a larger organism.
d. they multiply so rapidly.
e. their populations are so large.

19. The oldest fossils usually
a. contain more radioactive isotopes than younger fossils.
b. are found in the deepest strata.
c. have the longest half-lives.
d. are found above younger fossils.
e. are found in sediments from the Cenozoic era

20. We know a lot about fossil crabs, snails, and corals, but not much about ancient seaweeds. Why do you suppose this is the case?
a. There were no seaweeds in the oceans until very recently.
b. Seaweeds were too soft to fossilize well.
c. Animal life was much more abundant than seaweeds in ancient times.
d. Autotrophs moved onto land, leaving only animals in the sea.
e. A mass extinction wiped out the seaweeds, but animals survived.

21. Homeostasis is
a. exchange of materials with the surrounding environment.
b. the idea that all vertebrates are built in a similar way.
c. the correlation of structure and function.
d. maintaining a relatively constant internal environment.
e. cooperation of body parts to form tissues, organs, and systems.

22. During some types of antibiotic treatments, patients often experience diarrhea because
a. antibiotics are toxic to the colon's epithelium as well as to bacteria.
b. the bacterial flora of the large intestine digest fiber, which otherwise would create osmotic pressure and result in decreased water reabsorption.
c. antibiotics interfere with the vitamin absorption process normally occurring within the large intestine.

d. after intestinal bacteria have been killed, an unusually large amount of water is reabsorbed.

e. antibiotics affect the release of enterogastrone, the hormone that controls intestinal peristalsis

23. ____ in carbon dioxide in your blood, which causes ____ in pH, would cause your breathing to speed up.

a. An increase . . . a rise

b. An increase . . . a drop

c. A decrease . . . a rise

d. A decrease . . . a drop

e. Actually, it is rise and fall of oxygen, not carbon dioxide, that control breathing.

24. When you are immune to a disease,

a. antibodies against the disease are constantly circulating in your blood.

b. certain lymphocytes are able to make the proper antibodies quickly.

c. your nonspecific defenses are strengthened.

d. B cells are stimulated to quickly engulf invaders.

e. antigens are altered so invaders can no longer attack your tissues.

25. During kidney dialysis, blood and a dialyzing solution are separated by a semipermeable membrane. For kidney dialysis to work properly, the dialyzing solution should contain

a. a lower solute concentration than blood.

b. a higher concentration of urea than blood.

c. a lower glucose concentration than blood.

d. a lower concentration of urea than blood.

e. a much smaller volume of fluid than the blood passing through it.

(B) 問答題 (25%) :

1) a) 甚麼是 PCR (Polymerase Chain reaction)? (5%)
   b) PCR 在生物研究上有甚麼重要性。(5%)
   c) PCR 如何應用在古生物研究，請說明。(5%)

2) a) 甚麼是生物多樣性 (biodiversity)? 其重要性為何? (5%)
   b) 生態環境之變化影響生物族群之存亡，請詳細說明台灣目前砥面臨之生態危機。(5%)