1. Green algae are now classified as protists because
   (1) some of them do not have a true nucleus in the cells.
   (2) some of them are single-celled organisms.
   (3) their bodies do not differentiate into stems and leaves.
   A (1) only  B (1) and (3) only
   C (2) and (3) only  D (1), (2) and (3)

Directions: Questions 2 and 3 refer to the nitrogen cycle below.

2. Which of the following is the correct matching of the processes and the bacteria involved?

   Process 4                      Process 5
   A nitrogen fixing bacteria     denitrifying bacteria
   B nitrifying bacteria          denitrifying bacteria
   C denitrifying bacteria        nitrogen fixing bacteria
   D nitrogen fixing bacteria     nitrifying bacteria

3. Decomposers are involved in

4. Which of the following structural features of reptiles is/are better adaption for living on land, when compared with those of amphibians?
   A lungs and walking legs
   B skin with hard scales and eggs with shells
   C the ability to absorb oxygen through their skin
   D an internal skeleton and sharp teeth
Directions: Questions 5 and 6 refer to the food web below.

5 The amount of cereal available to man can be most effectively increased by the removal of

6 What is/are the relationship(s) between mice and aphids?
(1) predation   (2) competition   (3) commensalism
A (1) only   B (2) only   C (1) and (2) only   D (2) and (3) only

7 In which of the following sites does primary succession occur?
A a grassland after a fire   B a deforested forest   C an abandoned wheat field   D a piece of land formed after a volcanic eruption

8 In an ecosystem, energy flow is similar to cycling of materials in that
A it flows in a cycling manner.   B it is effected through food chains.   C it reduces in quantity step by step.   D it flows in a single direction.

9 Driving cars after consuming a large quantity of alcohol is dangerous because alcohol
(1) affects the drinker’s judgment.   (2) blurs the drinker’s vision.   (3) lengthens the drinker’s reaction time.
A (1) and (2) only   B (1) and (3) only   C (2) and (3) only   D (1), (2) and (3)
10 Which of the following are the benefits of having regular aerobic exercise?

(1) strengthen the heart and the lungs
(2) promote the release of growth hormone
(3) keep bones and muscles strong

A (1) and (2) only  B (1) and (3) only
C (2) and (3) only  D (1), (2) and (3)

11 A patient was confirmed to be attacked by pathogen X. The doctor prescribed antibiotic Y to the patient. However, the disease was not cured after completion of the course of the antibiotic. Which of the following are the possible reasons?

(1) Pathogen X is a virus.
(2) Pathogen X is an antibiotic resistant strain.
(3) Antibiotic Y has little or no effect on pathogen X.

A (1) and (2) only  B (1) and (3) only
C (2) and (3) only  D (1), (2) and (3)

12 Which of the following are the correct matching of the diseases and the type of pathogens that cause these diseases?

<table>
<thead>
<tr>
<th>Athlete’s foot</th>
<th>Cholera</th>
<th>Dengue fever</th>
</tr>
</thead>
<tbody>
<tr>
<td>A protist</td>
<td>bacterium</td>
<td>virus</td>
</tr>
<tr>
<td>B fungus</td>
<td>bacterium</td>
<td>virus</td>
</tr>
<tr>
<td>C bacterium</td>
<td>virus</td>
<td>fungus</td>
</tr>
<tr>
<td>D virus</td>
<td>protist</td>
<td>bacterium</td>
</tr>
</tbody>
</table>

13 Hepatitis B is mainly transmitted by

A body fluids.
B vectors.
C contaminated food and drinks.
D air.
**Directions:** Questions 14 and 15 refer to the pedigree below, which shows the inheritance of a disease in a family. The disease is controlled by a pair of alleles.

![Pedigree Diagram]

**Key:**
- normal male
- normal female
- male with disease
- female with disease

14. From which of the cross(es) can we predict the normal allele is dominant?

A. individuals 1 and 2  
B. individuals 3 and 4  
C. individuals 6 and 7  
D. individuals 3, 4 and 6, 7

15. What is the chance of the second child of individuals 3 and 4 getting the disease?

A. 100%  
B. 75%  
C. 50%  
D. 25%

16. Which of the following statements about variations is *incorrect*?

A. Variations cause some individuals to be better adapted to the environment than others.  
B. Variations exist in every species.  
C. Variations play an important role in evolution.  
D. Variations are due to mutations only.

**Directions:** Questions 17 and 18 refer to the DNA fingerprint below.

![DNA Fingerprint]

17. Which of the bands in the DNA fingerprint consists of the largest DNA fragments?

A. band 1  
B. band 3  
C. band 4  
D. band 6
18 DNA fingerprinting can be used to identify
(1) whether a man had sexual relationship with a woman who died one year ago.
(2) whether a suspect is the criminal in a murder case.
(3) whether a herb is true or fake.
A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

Directions: Questions 19 and 20 refer to the table below, which shows the numbers of difference in amino acid sequence in a protein cytochrome c among different organisms.

<table>
<thead>
<tr>
<th></th>
<th>Human</th>
<th>Monkey</th>
<th>Pig</th>
<th>Horse</th>
<th>Dog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monkey</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pig</td>
<td>10</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dog</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

19 Which animal shown in the table has the closest evolutionary relationship with the horse?
A human
B monkey
C pig
D dog

20 The information in the table provides evidence on the evolutionary relationship of the organisms because organisms having similar amino acid sequence
A have similar body structures.
B have similar body functions.
C have similar enzymes.
D have similar base sequence in DNA.

21 The diagram below shows an experimental set-up for investigating the rate of photosynthesis.
After 4 hours, the volume of gas collected in all the test tubes is the same. Which of the following changes can increase the volume of the gas collected?

A  increase the temperature
B  increase the volume of sodium hydrogen carbonate solution
C  increase the concentration of sodium hydrogen carbonate solution
D  replace the light bulb with a brighter one

22 The diagram below shows a label on a food package.

The label contains a warning that the food may contain traces of peanut, nuts and sesame because these food ingredients

A  may cause allergy in some people.
B  contain carcinogens.
C  contain harmful food additives.
D  are rich in cholesterol.

23 In Hong Kong, women, especially those who have previous HPV infections, early sex or smoking habits, are advised to join the ‘Cervical Screening Programme’. Some cells are taken from the cervix and examined under the microscope for the presence of

(1) human papillomavirus.
(2) abnormal cells.
(3) carcinogens that may induce cervical cancer.

A  (1) only
B  (2) only
C  (1) and (3) only
D  (2) and (3) only
24 The diagram below shows the antibody concentration in serum of a patient who was infected by a certain pathogen.

![Antibody Concentration Graph](image)

Which of the following statements is correct?

A The course of the disease was the most severe on day 7.
B The pathogen began to destroy the antibodies on day 7.
C The patient would never suffer from the same disease again.
D The same pathogen infected the patient again on day 14.

25 Different stages of primary immune response are shown below:

1. The helper T cells inactivate the B cells.
2. The antibody combines specifically with the antigen.
3. The B cells differentiate to form antibody-producing cells.
4. The antigen combines with receptors on the B cells.

Which of the following is the correct sequence of these stages?

A (1)\(\rightarrow\)(3)\(\rightarrow\)(4)\(\rightarrow\)(2)
B (2)\(\rightarrow\)(1)\(\rightarrow\)(4)\(\rightarrow\)(3)
C (3)\(\rightarrow\)(2)\(\rightarrow\)(4)\(\rightarrow\)(1)
D (4)\(\rightarrow\)(1)\(\rightarrow\)(3)\(\rightarrow\)(2)

26 The diagram below represents a certain stage of protein synthesis.

![Protein Synthesis Diagram](image)

Which of the following statements about this diagram is/are correct?

1. Transcription is taking place.
2. Translation is taking place.
3. Eight ribonucleotides are shown.

A (1) only  
B (2) only  
C (1) and (3) only  
D (2) and (3) only
27 Which of the following comparisons between translation and transcription is **incorrect**?

A The two processes require different raw materials.
B The two processes require different enzymes.
C The two processes take place at ribosomes.
D mRNA is involved in both processes.

28 Which of the following statements about mutations is correct?

A Mutations are unfavourable to the survival of the entire species.
B Mutations are lethal.
C Mutations make the organisms better adapted to the environment.
D Mutations serve as a source of genetic variation in a population.

End of Summer Work 1
**S.5 Biology – Summer Work 1**

**Answer sheet**

Please put a “✓” in the box to indicate the answer.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. From a survey carried out at a school, influenza was found to occur most frequently in classes with the larger number of students.
   a. Explain why influenza tends to occur more frequently in larger classes. (2 marks)

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

   b. State one way to reduce the occurrence of influenza in the school. (1 mark)

   __________________________________________________________

2. It was pouring with rain. Peter got thoroughly wet and caught a cold. Peter’s sister advised Peter to take amoxicillin pills (a kind of antibiotic) that were prescribed to her by a doctor in an earlier time.
   a. What are antibiotics? (1 mark)

   __________________________________________________________
   __________________________________________________________

   b. Give two reasons why Peter should not take the amoxicillin pills. (2 marks)

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. Choose a suitable term from the list below to fill in the blanks in the paragraph below. (6 marks)

<table>
<thead>
<tr>
<th>mapped</th>
<th>genes</th>
<th>chromosomes</th>
<th>social base</th>
<th>ethical</th>
<th>legal</th>
<th>economical</th>
<th>alleles</th>
<th>environmental</th>
</tr>
</thead>
</table>

The Human Genome Project is a research project started in 1990. A genome refers to the DNA sequence on one set of a __________________________ in an organism. The b __________________________ sequence in human DNA is determined and all the genes in the human genome are c __________________________. At the same time, d __________________________, e __________________________ and f __________________________ issues arising from the project are also addressed.
The diagram below shows the fossils of the forelimb skeletons of four related mammals (A to D) in chronological sequence.

- **A**
- **B**
- **C**
- **D**

**a** How could the approximate age of the fossil skeletons be determined? (1 mark)

- **b** Based on the fossils, suggest the evolutionary relationships between the four mammals. (1 mark)

In people with sickle-cell anaemia, a base T is replaced by a base A in the gene coding for a polypeptide chain in haemoglobin. The mutated haemoglobin has a shape different from the normal one.

**a** What type of gene mutation produces the allele for sickle-cell anaemia? (1 mark)

**b** Explain why only one amino acid is affected. (2 marks)

**c** Explain why some mutations would not cause any change in the resulting proteins. (2 marks)
6 a In tomato plants, stem colour is determined by the dominant allele $P$ (purple stem) and the recessive allele $p$ (green stem). The height of the plant is determined by the dominant allele $T$ (normal height) and the recessive allele $t$ (dwarfness). A plant of normal height with a purple stem was crossed with a green-stemmed dwarf plant and all the offspring in the $F_1$ generation were of normal height and had purple stems.

i Using the symbols given above, complete the table below:

<table>
<thead>
<tr>
<th>Generation and phenotype</th>
<th>Genotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent: purple stem and normal height</td>
<td></td>
</tr>
<tr>
<td>$F_1$ generation: purple stem and normal height</td>
<td></td>
</tr>
</tbody>
</table>

(2 marks)

ii When members of the $F_1$ generation were crossed, some $F_2$ showed the same phenotypes as the original parents. State other possible phenotypes of the $F_2$ generation. (1 mark)

iii In what ratio would you expect the phenotypes of the $F_2$ generation to appear? (1 mark)

b Red-green colour blindness is a rare disease. A couple with normal vision have a son with red-green colour blindness.

i The couple are going to have a second child. What is the chance of this second child being colour-blind? By defining the symbols you use, construct a genetic diagram to illustrate your answer. (5 marks)

ii Why is red-green colour blindness more frequently found in males than in females? (3 marks)

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

End of Summer Work 2