

#	Ans	Workings/Remarks
1	D	The layer surrounding the vacuole in a plant cell is called tonoplast. The layer surrounding the cytoplasm in an animal cell is called cell surface membrane. Both are membranes.
2	B	W – mitochondrion X – smooth endoplasmic reticulum Y – ribosome Z – rough endoplasmic reticulum
3	D	
4	A	Purple colour in the biuret test indicates the presence of protein. White emulsion with ethanol indicates the presence of fat.
5	C	An increase of 10°C doubles the rate of reaction. Therefore, within the same time frame, the amount of starch digested at 30°C would be twice of that at 20°C.
6	C	Above 40°C, the reaction will still proceed till the temperature reaches 60°C, but the rate of reaction will get slower. This happens because the shape of the active site of the enzyme is altered. Hence it is harder, but still possible, for the substrate to bind to the active site, thereby decreasing the probability of a successful reaction.
7	A	Salivary gland (1) secretes salivary amylase while pancreas (3) secretes pancreatic amylase.
8	C	Most of the excess glucose is converted into glycogen and a small fraction is converted into fats.
9	C	Water diffuses from soil into root hairs via osmosis and travels up the plant to the leaves via the xylem vessels. Gaseous exchange takes place through the stomata.
10	C	2 and 4 are chloroplasts which trap sunlight for the photosynthetic reaction to make glucose (where the chemical energy is stored).
11	D	The cell remains turgid in solution X, suggesting that the water potential in the cell sap is equal or lower than that of solution X and so there is no movement of water out of the cell. The cell becomes plasmolysed in solution Y, suggesting that the water potential in cell sap is higher than that of solution Y and so water moves out of the cell, cytoplasm shrinks and the cell membrane detaches from the cell wall.
12	D	Xylem transports water and dissolved mineral salts only.
13	D	Phloem translocates sugar and amino acids from the leaves to the storage organs and growing parts of the plant.
14	B	Carbon dioxide is a respiratory by-product in muscle cells. It is small enough to diffuse through the partially permeable membrane of the muscle cells, and through the blood capillary into the blood, which transports it to the heart and eventually to the lung to be excreted.
15	A	

16	B	<p>The entire heart cycle, made up of systole and diastole, takes about 0.8 seconds.</p> <p>During systole, the heart muscle contracts and chambers pump blood. (Systole actually refers to contraction of the ventricles, as atrial contraction in systole only lasts for a brief period of time and it is not as powerful as ventricular contraction)</p> <p>During diastole, the chambers are filling. Ventricular systole and diastole are generally equal in duration, lasting about 0.4 seconds each.</p> <p>Atrial systole (contraction) is observed during the first 0.1 second of systole, as shown by the sudden surge, but small, in pressure at P. This pumps blood into the ventricles, showing simultaneous increase in pressure.</p> <p>The atria starts to relax as soon as ventricles contracted fully (at Q), as shown by the large increase in ventricular pressure. This period of atria diastole (relaxation) lasts for 0.7 seconds, during which the atria are filling with blood returning from the vena cava. The atria contracts again when the ventricles are fully relaxed (at P).</p>
17	C	<p>Carbon dioxide is produced as a metabolic by-product in all respiring cells. It is removed from the body via the lung. Therefore, it has to be transported from the rest of body to the lung via the blood.</p> <p>Carbonic anhydrase converts carbon dioxide from respiring cells to carbonic acid and bicarbonate ions, which could then be transported by the red blood cells.</p> <p>When red blood cells reach the lungs, carbonic anhydrase converts bicarbonate ions back to carbon dioxide which diffuses into alveolus and is breathed out.</p>
18	C	<p>Nicotine stimulates the secretion of adrenaline, which prepares the body for fight-or-flight response. This results in an increase in alertness, heart rate and blood pressure.</p>
19	B	<p>Anaerobic respiration in muscles produces lactic acid and a small amount of energy.</p>
20	A	
21	A	<p>Anti-diuretic hormone (ADH) increases the permeability of collecting duct and thus allows more water to be reabsorbed from the glomerular filtrate in the kidney tubule back into the blood. When a person drinks a large volume of water, blood is diluted, less ADH is secreted, less water is reabsorbed, and more urine is produced, bringing up the concentration of blood</p>

		back to normal.																				
22	B																					
23	C																					
24	D	Spinal cord is the main pathway for information connecting the brain and the peripheral nervous system.																				
25	D	Blind spot (2) does not contain photoreceptors. Fovea centralis (1) is part of the retina, which contains photoreceptors to detect light that falls on it. Iris (5) is the effector, whose antagonistic action would be regulated to adjust the size of the pupil and thus the amount of light entering the eye, in response to the change detected by the photoreceptors at (1).																				
26	C																					
27	A	Fertilisation involves the fusion of male and female gametes. Asexual reproduction involves only one parent and therefore does not involve any fusion of gametes i.e. fertilization.																				
28	A	Since only plant 1 produced seeds, pollination only occurred in plant 1. Since the buds in plant 2 and plant 3 were isolated and no seeds are produced after they blossomed into flowers, this implies that self-pollination is not possible. Therefore, the pollination that occurred in plant 1 is cross pollination, which involved the transfer of pollen grains from another plant.																				
29	C																					
30	D																					
31	B	Ovary contains eggs. Stamen consists of filament and anther, which contains the pollen grains. Testis produce sperms. Eggs, pollen grains and sperms are gametes produced by meiosis.																				
32	B																					
33	D	Zygote is the result of fertilization i.e. the fusion of two haploid gametes. Meiosis produces haploid gametes.																				
34	B	A gene is composed of nucleotides, each of which is made up of a phosphate group, a sugar and a base. The ratio of phosphate to base is therefore 1:1.																				
35	C	Before introducing (3) the vector (i.e. the bacteria) containing the recombinant DNA into the host cell (i.e. the organism from the second species), it must be cloned. Cloning is necessary to produce numerous copies of the recombinant DNA since the initial supply is inadequate to insert into the host cell.																				
36	A	<p>Let B denote allele for brown fur. Let b denote allele for white fur.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: left; padding-right: 20px;">Parent phenotype</td> <td style="text-align: center;">Brown Fur</td> <td style="text-align: center;">X</td> <td style="text-align: center;">Brown Fur</td> </tr> <tr> <td style="text-align: left; padding-right: 20px;">Parent genotype</td> <td style="text-align: center;">Bb</td> <td style="text-align: center;">X</td> <td style="text-align: center;">Bb</td> </tr> <tr> <td style="text-align: left; padding-right: 20px;">Gametes</td> <td style="text-align: center;">(B) (b)</td> <td></td> <td style="text-align: center;">(B) (b)</td> </tr> <tr> <td style="text-align: left; padding-right: 20px;">F₁ genotype</td> <td colspan="3" style="text-align: center;"> </td> </tr> <tr> <td style="text-align: left; padding-right: 20px;">F₁ phenotypic ratio</td> <td colspan="2" style="text-align: center;">75% brown fur</td> <td style="text-align: center;">25% white fur</td> </tr> </table>	Parent phenotype	Brown Fur	X	Brown Fur	Parent genotype	Bb	X	Bb	Gametes	(B) (b)		(B) (b)	F ₁ genotype				F ₁ phenotypic ratio	75% brown fur		25% white fur
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37	C	Down's syndrome is caused by the presence of an extra chromosome in the body cells, amounting to a total of 47 chromosomes.																				

38	C	<p>Natural selection acts on the phenotype of organism. Alleles that govern the favourable phenotype would pass on to the next generation, ensuring the survival of the species. Option D is wrong because if the problem of food shortage persists, the stronger elephants would die eventually. There is no phenotype of elephant that could make elephant survive without food. Natural selection is therefore not playing a part here.</p> <p>Evolution refers to the change in genetic material of a population from one generation to the next, possibly resulting in the emergence of new species. The change in genetic material could be caused by mutation of genes, passing of genes from one species to another, or recombination. Nature selects a population with more favourable traits to survive and reproduce, while genetic drift might allow the survival of population with rare traits by chance.</p> <p>Both natural selection and genetic drift governs the process of evolution.</p>
39	D	
40	A	