

9.7 SACE Board of South Australia 2018 Sample Paper

Booklet 1

Section A

1	J	2	K	3	K	4	K	5	K	6	J	7	K	8	L
9	M	10	L	11	K	12	M	13	L	14	M	15	L		

Section B

16. (a) A
 (b) A description of semi conservative DNA replication in eukaryotes. Each strand acts as a template for the other strand, so that each new molecule of DNA contains one old and one new strand of DNA.
 (c) one of mutagenic chemicals, UV radiation, ionising radiation, virus
 (d) If a mutation occurs in a germ cell, there is potential that this could be passed onto the offspring of that individual. If the mutation occurs in a somatic cell, it will only affect the individual, it will not be passed onto their offspring.
17. (a) Farnesyl group will not be added to prelamin A and therefore it will not need to be removed. Therefore, lamin A will be present, and so a normal nucleus is more likely and therefore the cell will be able to divide.
 (b) CRISPR could be used to fix the point mutation in the LMNA gene. This could occur if the correct guide RNA molecule is made, so that the CAS protein can recognise the mutation and correct it by replacing the nucleotide base with the correct one.
 (c) Various answers possible: CRISPR- permanent change, reduce costs of medications, doctor's visits, no side effects compared to the use of anti-drugs etc.
18. (a) Fluid Mosaic Model- phospholipid bilayer, proteins embedded in the bilayer. A diagram could be used.
 (b) transport protein or channel protein embedded across the phospholipid bilayer is used to transport substances across the cell membrane- through this protein, using a concentration gradient. No energy is required.
 (c) internal membranes enable compartmentalisation of the cell, to enable reactions to occur efficiently, or for substances to be transported etc. e.g. could use various organelles, e.g. vacuole, chloroplast or mitochondria (or others) to explain/demonstrate
19. Extended Response- 9 marks. 7 for content, 2 for communication.
 DNA sequencing could be used to identify different species by using specific genetic markers- probably would need to use a number to ensure the accuracy of the information.
 sequence DNA from each fish species in question to determine the base sequence and then confirm species by comparison to a known sequence- as each species would have its own specific sequence for each gene used.
 Discuss: Various answers possible- for example could address: should DNA sequences be collected and kept? Who controls this information, for what purpose? Not everyone may be able to access this DNA information- equity issues. Accessing the information may cost money- again will it mean not everyone can access? Could it be used to save money for criminal investigations? Everyone's DNA on a database, screen at crime scene- lead to suspects more quickly? Concerns for false readings etc..
20. (a) equation for photosynthesis
 (b) (i) and ii) Two factors including: amount of original source of CO₂, size of the leaves used, same genus used, pH, temperature etc...
 (c) increase the sample size, increases reliability of the experiment, reduces the effect of random error
 (d) more photosynthesis than respiration, more glucose available to the plant, more growth.

21. Some possible answers could include a combination of the following points:
- Communication and Collaboration- scientists from 80 countries working together for 10 years, based on this work Australian Government established NESP- which funds and works with others to conserve Australia's environment.
- NESP will assist decision makers to understand, manage and conserve Australia's environment by funding world class biodiversity and climate science. This illustrates how scientific knowledge, understanding and inquiry can enable scientists to develop solutions, design action for sustainability and make reliable predictions.
- CoML- new species identified- understanding by the scientific community what constitutes a species- common understanding/communication. This is important when species are classified and given new scientific names- this is an important scientific convention which demonstrate the use of common protocols. This enables humans to discuss new knowledge with a common understanding, potentially leading to new ways of maintaining the environment for future generations.
- Development- new processes and ways to conserve the environment through government funded projects- which use collaboration to best find solutions (which might be able to be applied to other scenarios)
- Influence-economic risks and benefits are going to influence this project. Funding is needed to enable projects like CoML to occur, and the discoveries that are made, could have economic benefits for society- new materials, areas of eco-tourism etc. The Australian Government provides funds for some of the research undertaken by The University of Tasmania. The level of funding will impact the amount of research and could even limit its outcomes.

Booklet 2

- 22 (a) (i) cellular respiration- either aerobic or fermentation- breakdown of glucose releases energy that can be used to convert ADP (+ P) to ATP.
(ii) ATP breaks down into ADP + Pi when energy is needed in a cell, to enable a cell to transport substances against the concentration gradient, to grow, to synthesis molecules.
- (b) Heat
- 23 (a) To enable enzymes to function efficiently. Proteins require specific pH ranges to maintain their 3D structure. Cells have a very small tolerance range for pH. Therefore, this ensures a suitable environment for chemical processes to occur efficiently.
- (b) Hyperventilation results in an increase in the rate of breathing, so more carbon dioxide will be removed by the lungs, meaning that the amount of CO₂ in the blood will decrease, which will result in an increase in pH of the blood. [less H⁺ ions will be in the blood, due to less carbonic acid being present, as there is less CO₂)
- (c) The brain cannot directly detect the pH of blood as H⁺ ions cannot diffuse across the blood-brain barrier of the brain. CO₂ is able to cross the blood-brain barrier.
CO₂ diffuses, reacts with water to form carbonic acid, and then dissociates into H⁺ ions, which can be detected by chemoreceptors in the brain. This results in an increased rate of breathing, which will remove CO₂ and restore blood pH.
- 24 (a) Adrenaline
(b) A sensory neuron would need to be accurately drawn.
(c) Nervous: immediate responses to increase alertness and muscle tension, very specific responses
Endocrine: produce 2 hormones that affect BP, glucose concentration, energy available to muscles - takes longer as it takes time for the hormone to be produced and to travel to the target site, multiple responses across different systems
- (d) In diabetes, glucose already elevated in the blood, as either insulin does not work effectively, or is not present. The fight or flight results in an increase in release of glucose. This would further elevate blood glucose, which can lead to medical issues such as heart attack or stroke, plus other longer term problems.
- 25 A phylogenetic tree diagram that shows that marsupials and eutherians are more closely related to each other than they are to monotremes.

- 26 (a) two required: deforestation, clearing of land, farming, hunting etc
(b) depends on answers in (a) e.g. deforestation: loss of habitat, food sources, species require others - as there is an interdependence of organisms living in the same community. Therefore could reduce their numbers which may lead to extinction of this species (and potentially others too).
- 27 (a) endangered species have a small population with low genetic diversity, individuals may randomly die, these individuals may have had unique genotype, these genes are either lost to the population and future offspring (notwithstanding mutation may reintroduce the genotype), or reduced in frequency and hence the gene pool has been reduced.
(b) loss of genetic variation, decreased chance of survival
- 28 (a) (i) multiple possible e.g. As the pH increases, the rate of reaction will also increase.
(ii) reduce the effect of random error and eliminate the presence of systematic error. Increase the reliability of the data/ improve the accuracy of the data.
(b) (i) substrate concentration (%)
(ii) incorrect line of best fit, connection of data points not correct, no numbers/scale on the Y- axis, scale on X-axis incorrect.
(iii) the concentration/number of enzymes, this would vary even if the number of human cells used in the experiment was controlled as each cell could contain different amounts of enzymes.
(iv) can only be applied to the human cells used, enzyme tested etc.
- 29 Adaptive vs Convergent Evolution
Adaptive occurs when one species diverges into multiple descendant species. E.g. Darwin's finches or Australian marsupials
Convergent evolution occurs when species have different ancestral origins but have developed similar features due to similar selective pressures.

Inheritable characteristics – mutations in germ cells, crossing over, independent assortment, fertilisation, natural selection