QATs
Quality Assessment Tasks

NAME: _____

VCE® BIOLOGY

UNITS 3 & 4 Practice Written Examination

Reading time: 15 minutes **Writing time: 2 hours 30 minutes**

Structure of book

Section	*Number of Questions*	*Number of Questions to be answered*	*Number of Marks*
A	40	40	40
B	13	13	70
			Total 110

• Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
• Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
• No calculator is allowed in this examination.

Materials supplied
• Question and answer book of 42 pages.
• Answer sheet for multiple-choice questions.

Instructions
• Write your **name** in the space provided above on this page.
• Detach the answer sheet for multiple-choice questions during reading time.
• Write your **name** on your answer sheet for multiple-choice questions.
• All written responses must be in English.

At the end of the examination
• Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring into the examination room mobile phones and/or any other unauthorised electronic devices.

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SECTION A - Multiple Choice Questions

Instructions for Section A
Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** for the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1

Which of the following statements is true for movement across a plasma membrane?

A. Lipophobic gases such as carbon dioxide can cross by facilitated diffusion.

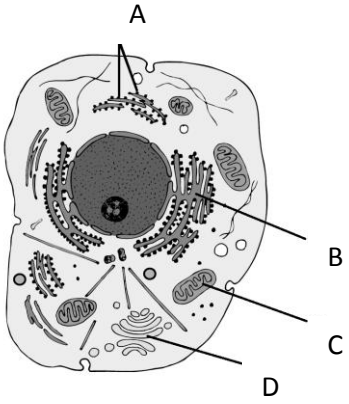
B. Amino acids always require ATP to cross the membrane.

C. Water will move via osmosis from a region of low water concentration to a region of high water concentration.

D. Uncharged polar molecules can diffuse across the plasma membrane.

Question 2

Observe the diagram of the cell:



Source:http://content.jacplus.com.au/

An accurate description of the structures in the cell is

A. D is the endoplasmic reticulum and protein synthesis occurs in C.

B. A is the site of protein synthesis and proteins are packaged for export in D.

C. C is the golgi apparatus and modification of proteins occurs in B.

D. B is organelle that packages proteins for export from the cell.

Question 3

Endocytosis

A. is a passive process.

B. is demonstrated by phagocytosis.

C. involves formation of vesicles by the golgi body .

D. occurs with the concentration gradient.

Question 4

A condensation reaction between two amino acids will produce

A. monomers.

B. water.

C. energy.

D. DNA.

Question 5

The tertiary structure of a protein can include

A. two polypeptide chains.

B. three polypeptide chains.

C. alpha helices.

D. only peptide bonds.

Question 6

The proteome can best be described as

A. all of the proteins that a cell can produce.

B. all of the genes in a cell.

C. only the proteins that are needed by the organism.

D. the complete array of the gene pool.

Question 7

A codon can be described as degenerate because

A. the same codon can code for multiple amino acids.

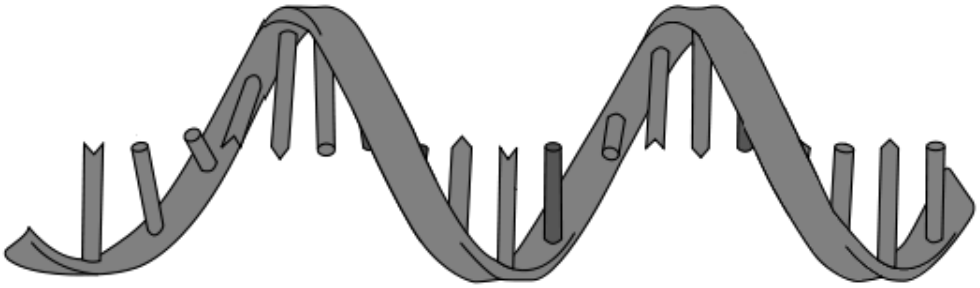
B. the same amino acid can be coded for by more than one codon.

C. nonsense mutations lead to stop codons.

D. a single stop codon can terminate the sequence.

Question 8

The molecule shown below is extracted from the cytosol of a cell



Source: http://userscontent2.emaze.com

If a chemical analysis was done on this molecule, you would expect to see

A. phosphate groups and thymine.

B. phospholipid groups and guanine.

C. phosphate groups and uracil.

D. phospholipid groups and adenine.

Question 9

Structural and regulatory genes both contain

A. DNA polymerase.

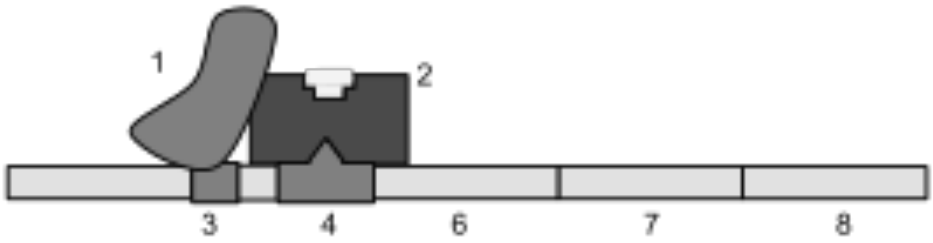
B. RNA polymerase.

C. exons.

D. transcriptional factors.

Questions 10 and 11 refer to the following information.

A repressed lac operon is represented by the following diagram.



Source: https://qph.ec.quoracdn.net

Question 10

The promotor region is represented by

A. 1

B. 2

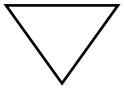
C. 3

D. 4

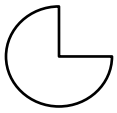
Question 11

Transcription would begin in the presence of which of the following molecules

A. 

B. 

C. 

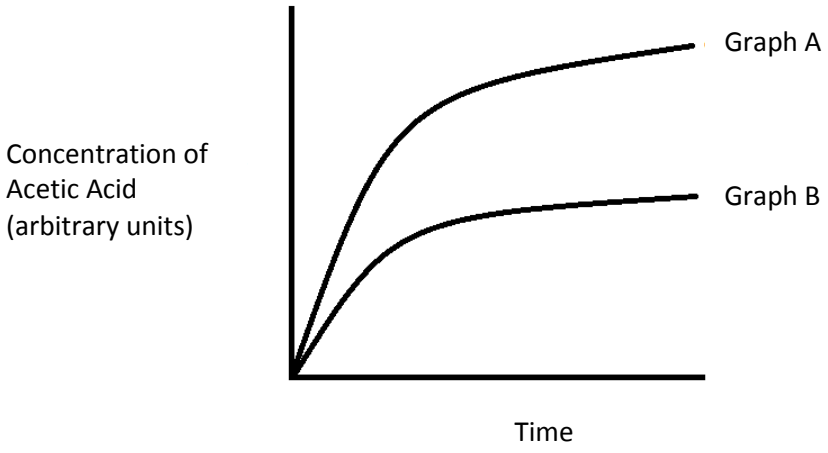
D. 

Questions 12 and 13 refer to the following.

Cholinesterase is an enzyme that breaks down acetylcholine to prevent its accumulation in the cell. It catalyses the breakdown of acetylcholine into acetic acid and choline.

Question 12

Below shows a graph of acetylcholinesterase action



A reasonable explanation for the difference in lines is an increase in the amount of

A. acetic acid in Graph A.

B. cholinesterase in Graph B.

C. acetylcholine in Graph A.

D. cholinesterase in Graph A.

Question 13

Anti-cholinesterase is a molecule that prevent cholinesterase from breaking down acetylcholine by binding to the active site. This could be considered to be a

A. competitive inhibitor that is reversible.

B. competitive inhibitor that is irreversible.

C. non-competitive inhibitor that is reversible.

D. non-competitive inhibitor that is irreversible.

Question 14

Which of the following could be referred to as a 'loaded' coenzyme?

A. NAD

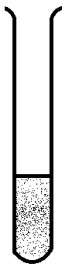
B. FAD

C. ATP

D. NADP

Question 15

A test tube contains a solution containing mitochondria that had been extracted from cytoplasm, as shown below.



In the absence of cytosol the addition of

A. glucose would result in an increased concentration of pyruvate.

B. pyruvate would result in an increased concentration of carbon dioxide.

C. water and oxygen would result in an increased concentration of glucose.

D. oxygen would result in increased glucose breakdown.

Question 16

A plant hormone capable of cell elongation is

A. gibberellins.

B. ethylene.

C. abscisic acid.

D. cytokinins.

Question 17

An example of a condition most likely caused by a pathogen is

A. hypersensitivity.

B. skin cancer.

C. food poisoning.

D. rheumatoid arthritis.

Question 18

Prions

A. are larger than viruses.

B. contain nucleic acids.

C. replicate by binary fission.

D. may have different secondary structures compared to normal protein.

Question 19

Fire blight is a plant disease caused by the bacteria *Erwinia amylovora*. It affects pome fruits, including apples and pears.

Source: http://www.omafra.gov.on.ca/english/crops/facts/fireblight.htm

A likely defence the plant would have in response to the bacteria is

A. production of specific antibodies.

B. development of a gall.

C. production of interferon.

D. engulfment by phagocytes.

Question 20

The lymphatic system

A. contains fluid that is pumped by the heart.

B. is the site of the cell mediated immune response only.

C. is able to trap cancerous cells.

D. is the site of innate immune responses.

Question 21

Cells that act as phagocytes include

A. monocytes and neutrophils.

B. basophils and mast cells.

C. lymphocytes.

D. natural killer cells.

Question 22

A list of events that occur in the allergic reaction, in no particular order include

1. Immunoglobulin E binds to mast cells
2. B plasma cells produce specific antibodies
3. Inflammation occurs
4. Degranulation occurs
5. Allergens react with IgE

The correct sequence of events is

A. 5, 1, 2, 3, 4

B. 4, 5, 2, 1, 3

C. 2, 3, 5, 1, 4

D. 2, 1, 5, 4, 3

Question 23

Multiple sclerosis is an example of an

A. autoimmune disease.

B. allergy.

C. immunodeficiency.

D. infectious disease.

Question 24

Monoclonal antibodies are a relatively new type of drug that is being used to treat cancer.

Which of the following is **not** a mode of action of monoclonal antibodies?

A. Inhibiting the growth of new blood vessels to cancerous tissue.

B. Binding to antigens on cancerous cells to attract immune cells.

C. Binding to receptors to block the reception of growth factors.

D. Inducing necrosis of cancerous cells.

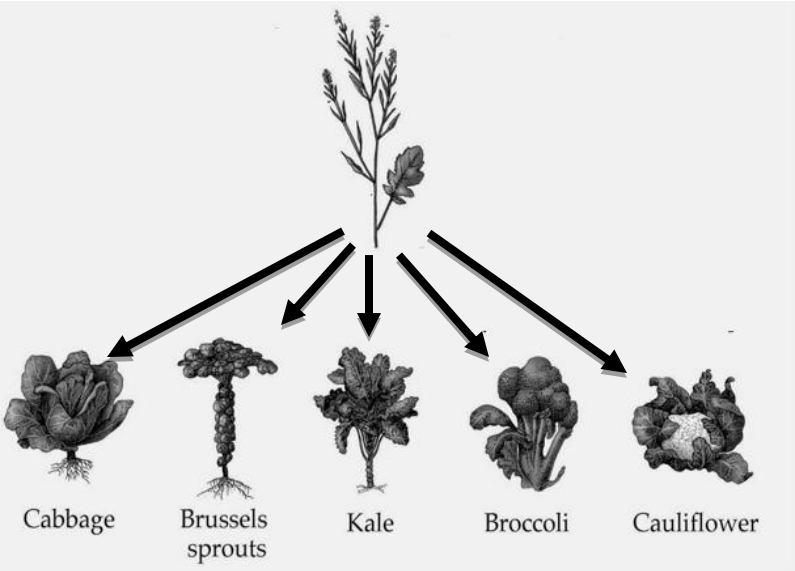
Question 25

The following scenario that is matched with the correct type of immunity is

	Scenario	Type of immunity
A.	A person has an immune response against antigens on the varicella zoster virus which causes chicken pox.	Active, natural
B.	Injection of diphtheria antitoxin to a person living with a family member infected with the bacteria *Corynebacterium diphtheria*.	Active, passive
C.	A child is breastfed by their mother who was vaccinated against whooping cough during her pregnancy.	Induced, Passive
D.	A person receives an injection of influenza antibodies.	Induced, Active

Question 26

Different farmers who have cultivated crops of the common wild mustard (*Brassica oleracae*) have produced a number of different plants available to consumers today including: Brussel sprouts, cabbage, cauliflower, broccoli and kale. The farmers only allowed plants with particular traits to reproduce.



source: https://feralbigten.files.wordpress.com

Crops of the new plants were cultivated through a process of

A. natural selection.

B. manipulating the gene pool.

C. genetic technologies.

D. environmental selection pressures.

Question 27

Allopatric speciation requires a physical barrier like a river or mountain range to divide a population in order to

A. temporarily isolate the populations.

B. create environmental selection pressures.

C. allow mutations to accumulate.

D. prevent gene flow.

Question 28

A region of a genetic code of a gene is shown below.

….TACCTCTGACAGTTCTGCTAGCTAGTCGTAGCTAGCTGATCGATCGTAGC….

The type of mutation which will cause the greatest chance of creating a non-functional gene is a

A. point mutation where the first **A** is substituted for a **T.**

B. block mutation where the following sequence **TGACAGT** is inverted.

C. cytosine being inserted at the start of the sequence.

D. sequence CTA being deleted from the sequence.

Question 29

Which of the following is not able to reduce the variation in a population?

A. Mutation

B. Genetic drift

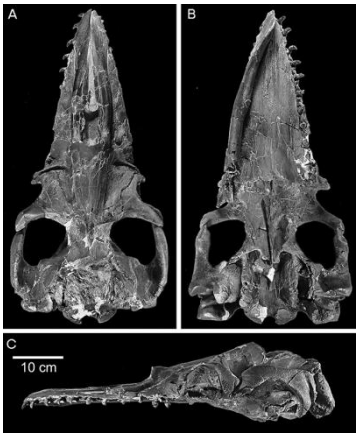
C. Bottleneck effect

D. A natural disaster

Question 30

An extinct species of the baleen whale *Aetiocetus weltoni* is an early species of whale that showed origins similar to that of the modern whale species. Fossilised fragments of partial skulls and cranial remains show that it had incisor, canine and molar teeth like many other mammals and lacked the baleen (keratin based filter feeding plates) found in modern mammals.

Aetiocetus weltoni fossilised skull



Source: https://www.researchgate.net/

From the information given, it is likely that

A. the *Aetiocetus weltoni* individual shown above had a frameshift mutation.

B. *Aetiocetus weltoni* is a reliable index fossil.

C. *Aetiocetus weltoni* is an example of a transitional fossil.

D. *Aetiocetus weltoni* must have lived during the Jurassic period.

Question 31

Methods of determining the relative age of fossils include

A. radiometric dating.

B. stratigraphy.

C. biogeography.

D. electron spin resonance.

Question 32

Species relatedness determined by changes to nucleotide sequences at a particular rate can be inferred by using

A. molecular clock concept.

B. comparative genomics.

C. phylogenetic analysis.

D. comparative embryology.

Question 33

Which of the following provides accurate evidence for *Homo sapiens* and *Homo neanderthalensis* having interbred?

A. Evidence of Neanderthal DNA in all modern humans.

B. Identical positions of the foramen magnum.

C. Recently discovered cave paintings of Neanderthals.

D. Evidence of Neanderthal DNA in non-African descended populations.

Question 34

A characteristic of hominins not shared by other hominoids is

A. a bowl-shaped pelvis.

B. comparatively longer arms compared to the legs.

C. larger teeth.

D. the ability to communicate.

Question 35

A characteristic feature of skulls of early species of the genus Homo is that they had relatively

A. smaller brain cases.

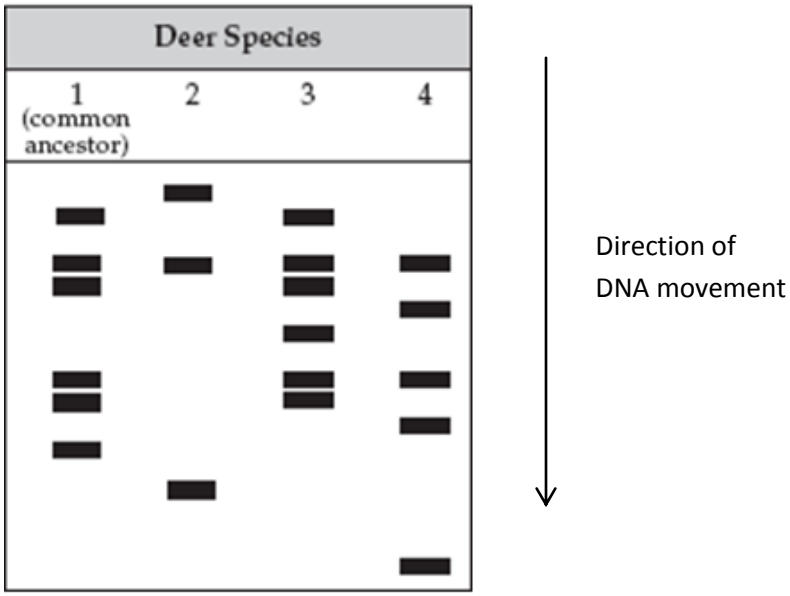
B. smaller brow ridges.

C. less pronounced muzzle.

D. more vertical forehead.

Questions 36 to 39 refer to the following diagram.

Electrophoresis Gel of Deer Species



Source: http://mdk12.msde.maryland.gov

Question 36

The species of deer most recently diverged from the common ancestor is

A. 1

B. 2

C. 3

D. 4

Question 37

Which species contains the smallest fragments of DNA being analysed?

A. 1

B. 2

C. 3

D. 4

Question 38

The enzyme needed to produce the DNA fragments is

A. restriction enzyme.

B. DNA ligase.

C. DNA polymerase.

D. acetyl Co-Enzyme A.

Question 39

Which of the following is not an example of a transgenic technology?

A. 'Golden' rice crops expressing a bacterial gene to produce more Vitamin A.

B. Humans having a working copy of the gene inserted that can potentially cure cystic fibrosis.

C. Tomato plants having genes from fish inserted into them for frost resistance.

D. Mice that have had a jellyfish gene inserted allowed them to glow under UV light.

Question 40

A vector is an organism that carries a pathogen from one host to another. In gene technology a vector such as a plasmid can be used to transfer DNA to the target organism. The property that is not necessary for a vector is that it

A. can replicate in the target organism.

B. has at least one recognition site for a restriction enzyme.

C. contains a genetic marker that can identify successfully transferred DNA.

D. already contains a number of regulatory genes.

SECTION B – Short Answer Questions

Instructions for Section B

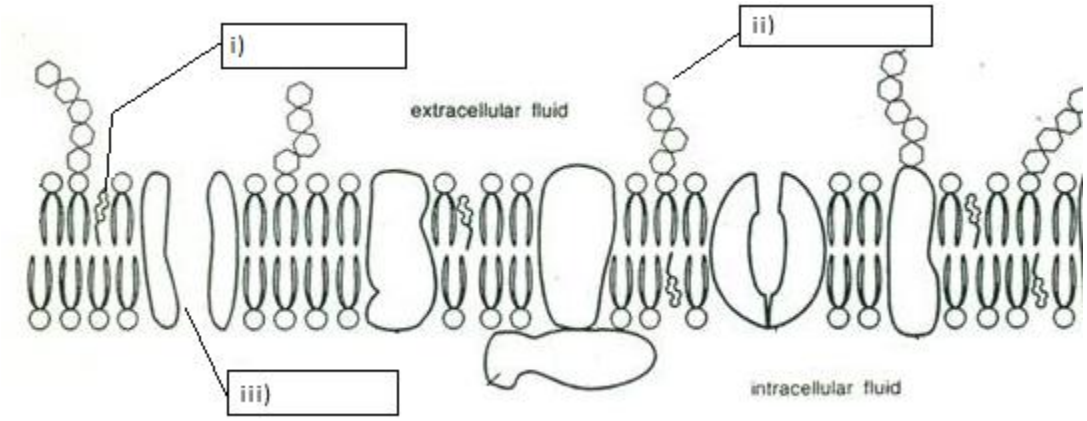
Answer this section in **pen.**
Answer **all** questions in the spaces provided.

Question 1 (5 marks)

Membrane fusion is integral to many cell functions including the secretion of molecules such as antibodies and neurotransmitters from cells. Membrane fusion is the process by which two separate membranes join to form one continuous membrane. Recent studies have lead researchers to believe that membrane fusion is currently more complex than was previously known. This research can lead to advancements in the ways that drugs are developed.

a. Label the component of the neural cell membrane in the diagram below:

1 mark



http://www.grootfeest.info

b. What is the role of structure labelled **i)**? 1 mark

_____

_____

c. Name and explain the process by which a neuron releases neurotransmitters. 1 mark

_____

_____

d. **i)** Explain how the structure of a neurotransmitter can cause a response in the target cell. 1 mark

_____

_____

ii) What does this suggest about the solubility of neurotransmitters? 1 mark

_____

_____

Question 2 (6 marks)

Fang blennies (*Meiacanthus grammistes*) are little fish that have large fangs capable of delivering venom to their victims. The venom is made up of a number of substances, including an opioid peptide. It is thought that when the fang blennies bite the 'would be' predator the opioid causes a drop in blood pressure. This would then disorientate and slow the predator down, giving the fang blennies a chance to escape. It could also relax the jaws and allow them to escape.

Source: https://s-media-cache-ak0.pinimg.com

Nucleic acids found in the cells of the fang blennies are needed for the synthesis of the opioid proteins found in the cells of the blennies.

a. Explain how the roles of the 3 different types of RNA within the cells of the blennies that are needed to produce the venom. 3 marks

rRNA	
mRNA	

→

tRNA	

b. When studying the venom of the fang blennies, why would scientists be interested in the proteome in this species, rather than just the study of a single gene? 1 mark

The following image shows a close view of a receptor for the opioid protein (found in fish). It is known that a single gene codes for this receptor.

Source: https://www.mitchmedical.us

c. What hierarchal level of protein structure is pictured? Give a reason for your choice. 2 marks

Reference: https://www.sciencedaily.com/releases/2017/03/170330142149.htm

Question 3 (4 marks)

A number of genes called E2F genes are regulatory genes controlling the development of the placenta during embryonic development. Two of the genes from this family of genes have been identified: E2F7 and E2F8. The absence of these genes results in a placenta that is composed of overly crowded cells that are not able to function properly. These genes are believed to have a role in supressing other genes that control cell division.

a. Explain how the E2F genes could interact in utero to control the cells and lead to a healthy baby. 2 marks

_____

_____

_____

_____

b. Explain the role that the identification of the E2f7 and E2f8 genes could have in applications of better understanding cancer. 1 mark

_____

_____

_____

c. Are the E2F genes structural or regulatory? Circle the correct response below.

Structural **Regulatory**

Describe a structural gene. 1 mark

_____

_____

_____

Source: https://www.sciencedaily.com/releases/2012/04/120416125318.htm

Question 4 (10 marks)

A leaf shaped sea slug, *Elysia chlorotica*, pictured below, has the ability to take chloroplasts from the algae that it eats and is able to preserve them in working order to use them for its own metabolic purpose for the entire duration of the sea slug's life. The sea slug not only takes these organelles but is able to incorporate chlorophyll producing genes into its own genetic make-up.

Source: https://www.wired.com/2010/01/green-sea-slug/

a.

i) Draw a labelled diagram of a chloroplast and include the locations of each stage of photosynthesis. 2 marks

ii) Complete the table below for the first stage of photosynthesis. 2 marks

Name of stage:	
Name one Input:	
Name one Output:	
Role of output (above)	

b. *Elysia chlorotica* must produce approximately 16 different enzymes to allow it to produce chlorophyll a. Chlorophyllase is an enzyme that has a role in regulating chlorophyll metabolism.

i) Minerals such as magnesium and potassium are cofactors to these reactions. Define cofactor. 1 mark

_____

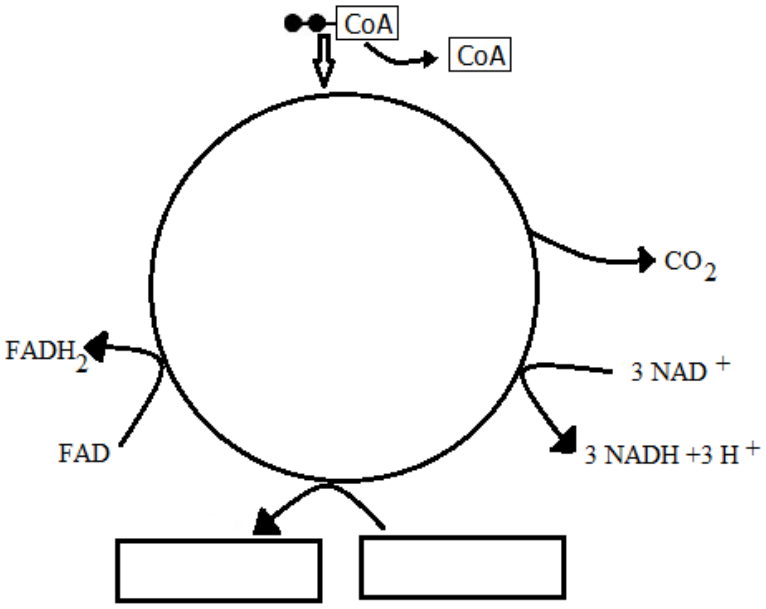
_____

ii) Chlorophyllase has optimal conditions of pH 8.5 and 50°C. Complete the table below to show what would happen to the rate of reaction of chlorophyllase at 10°C and at 70°C. Give reasons for the changes you have suggested. 2 marks

Temperature	**Change** **Increase/ stay the same/ decrease**	**Explanation for change**
10°C		
70°C		

c. By photosynthesising, *Elysia chlorotica* is able to produce a high energy containing molecule that can undergo a different process to release this energy to the cell. Consider the second stage of this process.

i) In the boxes on the diagram below, label the missing input and output. 1 mark



Source: https://s3.amazonaws.com/

ii) Name this stage and briefly outline what happens during this stage. 1 mark

_____

_____

d. Much like the *Elysia chlorotica* takes in chloroplasts and preserves them as a functional organelle it is believed that chloroplasts were once their own free living photosynthetic prokaryotic cell. State one piece of evidence that supports this theory. 1 mark

Question 5 (10 marks)

Chikungunya is a retrovirus that causes sufferers to experience fever, muscle and joint pain, headaches, nausea and fatigue. Deaths from this virus are very rare. It most commonly occurs in Africa and Asia. The word 'chikungunya' comes from an African word meaning 'to become contorted.' The virus is transmitted from human to human by the bites of infected female mosquitos.

a. Describe the general structure of the chikungunya virus. 1 mark

b. Name the vector for this virus and identify one preventative measure that an individual could take to reduce the risk of vector transmission. 1 mark

c. Explain how an infected individual could develop long term immunity against the chikungunya virus. 2 marks

d. Outline the role of a chemical in the innate immune response against the chikungunya virus.

1 mark

e. Late 2016, researches from the University of Texas developed the first vaccine against chikungunya virus. Define 'vaccine.' 1 mark

f. It is hypothesised that the vaccine that has been developed completely protects mice infected with the chikungunya virus. Design an experiment to test the effectiveness of the vaccine. In your experiment outline the following:

- Need for controls
- Dependent and independent variables
- Expected results.

3 marks

g. If the mother of a new born baby had previously been infected with chikungunya, would her child have long term immunity? Explain. 1 mark

_____

_____

Question 6 (6 marks)

The brown anole lizards (*Anolis sagrei)* inhabit a range of islands in the Caribbean. In 2004 Hurricane Frances completely submerged seven low-lying islands, wiping out several small towns and all of the lizards that had inhabited the islands. The seven islands were searched and no brown anoles could be found. Scientists, in the years following 2005, transported some colonising lizards from the two larger islands (that were not submerged) onto each of the seven islands. The lizards were selected randomly. The length of limbs was recorded over a 10 year period in data Table 1.

Source: https://upload.wikimedia.org

Data Table 1

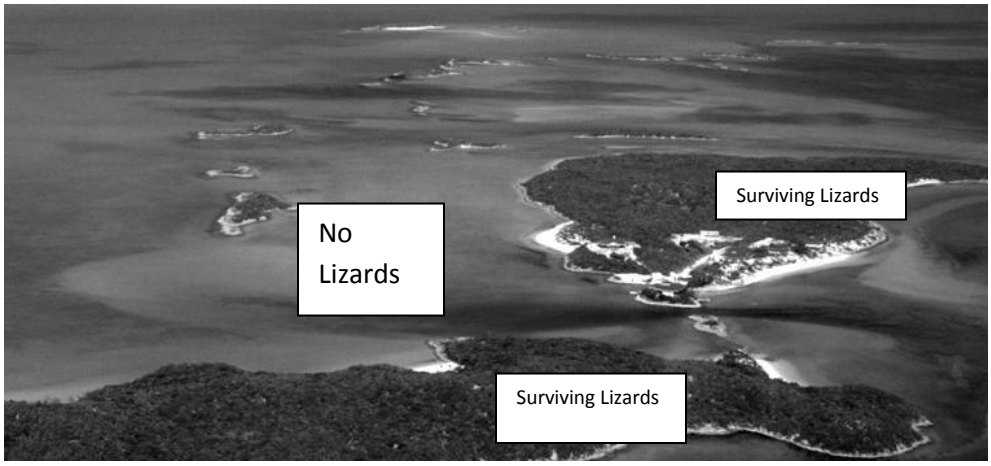
Island	Colonising lizards average limb length	Average limb length after 5 years	Average limb length after 10 years.
1	Long	Medium	Medium
2	Medium	Medium	Short
3	Medium	Short	Short
4	Short	Short	Very Short
5	Long	Long	Medium
6	Medium	Medium	Short
7	Short	Very short	Very Short

a. What effect did Hurricane Frances have on the genetic diversity of the brown anole populations in 2004? 1 mark

_____

_____

b. What evolutionary mechanism were the scientists replicating by placing a small colony of lizards on each of the 7 islands? Use Data Table 1 to provide evidence for the persistence of this mechanism after 10 years of the study. 2 marks



Mechanism:

_____

Evidence:

_____

_____

_____

c. Scientists who observed the different populations on the 7 islands observed natural selection as the lizards adapted to their new environments. Each island differs slightly in terms of the food sources available to the lizards. Scientist also noted significant differences in limb length of the lizards. Explain how natural selection would have caused these changes in the different lizard populations to cause short-limbed lizards. 3 marks

_____

_____

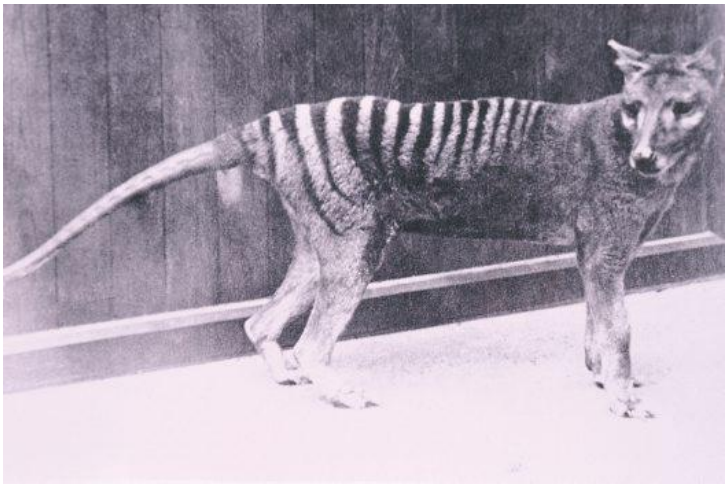
_____

_____

_____

Question 7 (6 marks)

The thylacine, *Thylacinus cynocephalus*, is an iconic Australian carnivorous marsupial that is believed to have disappeared from mainland Australia several hundred years ago. The last known thylacine died in captivity in 1936 in a zoo in Hobart.



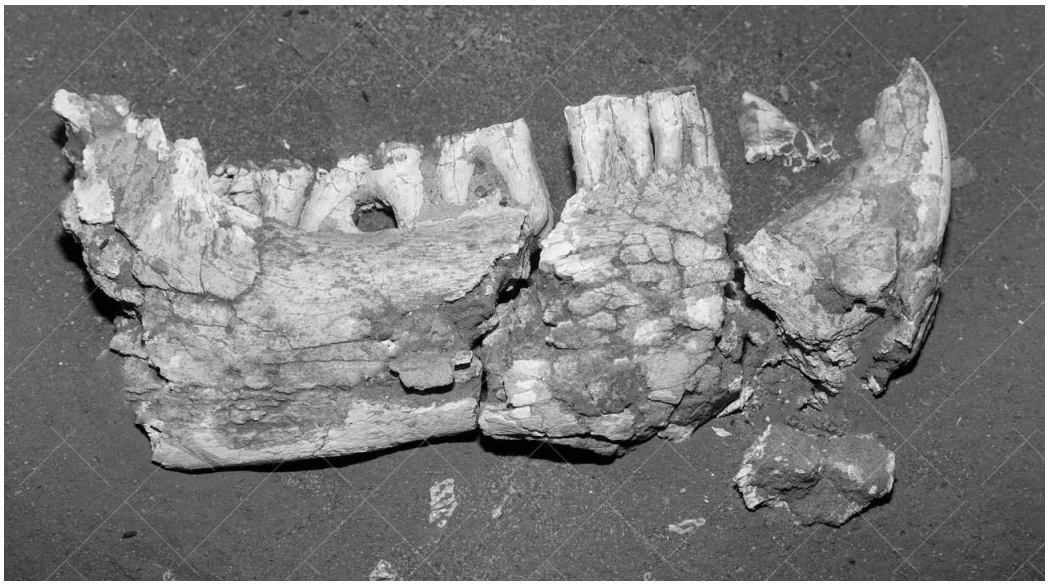
Source: https://australianmuseum.net.au/image/thylacine-at-hobart-zoo-1930s

The thylacine is a marsupial, possessing a pouch to rear its young. Although often called a 'Tasmanian tiger' or 'Tasmanian wolf' this is inaccurate as the thylacine is only very distantly related to the *canidae* family, including the grey wolf.

a. Explain how the definition of convergent evolution can be used to explain the similar appearance of the thylacine and grey wolf. 1 mark

b. Unlike all other marsupials, the teeth of the thylacine appear to be similar to the milk teeth of placental mammals such as the wolf which, when born, have a set of teeth referred to as 'milk teeth' which are eventually replaced by permanent, adult teeth. The thylacine is the only marsupial to possess a tooth that is replaced during its life.

Thylacine jaw fossil showing milk teeth



Source: https://www.dreamstime.com/

Are the teeth of the thylacine and wolf examples of homologous or analogous structures? Explain your choice. 2 marks

Structure: _____

Explanation:

_____

_____

c. The image above shows a fossil of a thylacine which is approximately fifteen million years old.

i) What method would be used to determine the absolute age of this fossil? Explain the reason for your choice. 1 mark

_____

_____

ii) In order to be preserved, remains must be subject to certain conditions to favour fossilisation. State one factor and explain its importance in fossilisation. 1 mark

_____

_____

d. The thylacine is believed to be extinct. What evidence would support this claim? 1 mark

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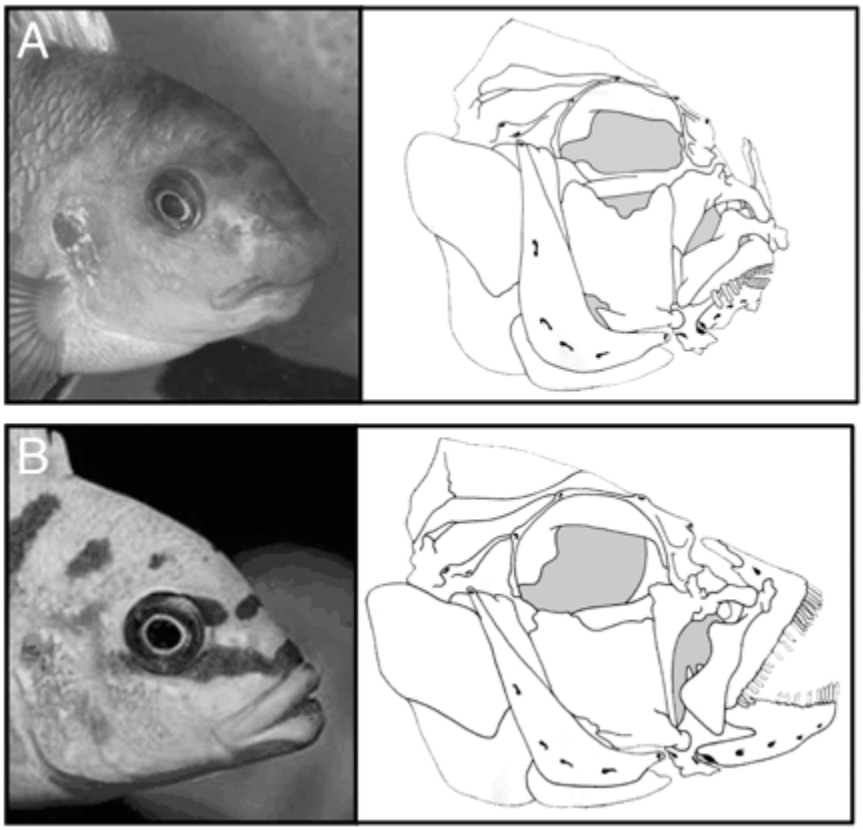
Question 8 (5 marks)

Cichlids are a large family of brightly coloured fish that are predominantly found in Africa and America and are popular pets. There are over 1600 species of cichlid found in Africa mostly spread throughout Lake Victoria, Lake Malawi and Lake Tanganyika. The region has been subject to flooding and droughts which has caused populations of cichlids to become isolated, resulting in adaptive radiation.

There is variation within the molecular genetic basis of the opening and closing mechanisms of the lower jaw of African cichlids. Their jaws are either adapted to suction feeding to consume plankton or other fish or adapted to biting, useful for picking algae from rocks or scales from other fish.

Cichlid jaws



Source: http://dev.biologists.org/content/132/5/851

Post-transcriptional modification of the BMP4 (bone morphogenic protein 4) gene is believed to account for some of the variation in the jaw structure of these fish. BMP4 is considered to be a master regulatory gene.

a. Explain how master regulatory genes are able to influence jaw development in African Cichlids. 2 marks

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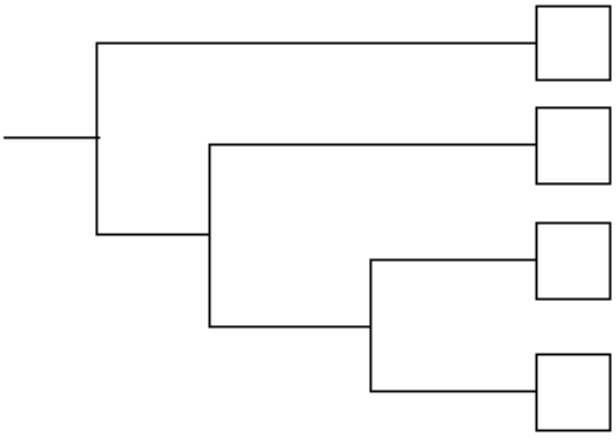
b. A phylogenetic tree can be arranged by studying the mtDNA gene ND2 of a range of African cichlids. Consider the following information about four species of cichlid. Use the information in the table to complete the phylogenetic tree:

Species	Feeding style	Egg spots	Body colour
Labeotropheus fuelleborni (Lf)	biting	present	solid
Metriaclina zebra (Mz)	sucking	present	Banded
Melanochromis auratus (Ma)	biting	present	Banded
Melanchromis vermivorus (Mv)	sucking	present	banded

i. Write the species initials (in brackets after the species name) in the boxes below. 2 marks



ii. Describe a technique that could be used to compare the sequence of the mitochondrial DNA to confirm the arrangement of the phylogenetic tree? 1 mark

Question 9 (6 marks)

In 2008 scientists unearthed a bone from the little finger of a Denisovan girl around 6 years old. After constructing the genome, scientists found traces of the genetic origins in some modern (*Homo sapien*) Asian and Papua New Guinean populations. Denisovans are part of the hominin group.

Reconstruction of the Denisovan girl

Source: https://s-media-cache-ak0.pinimg.com

a. Define hominin. 1 mark

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_____

b. Provide a likely explanation for these genes appearing in the *Homo sapien* genome of Asian and Papua New Guinean humans but not populations of Africans and Europeans. 2 marks

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Comparisons of Denisovans and Humans can help scientists to better understand why we are the only species alive today.

c. Give an example of one type of cultural evolution present in early humans; explain the advantage that *Homo sapiens* would have had over the other species of hominins also present at the same time as us. 2 marks

Cultural evolution example:

_____

Advantage:

_____

_____

d. Explain why denisovans could not have arisen before *H. erectus* had evolved? 1 mark

Question 10 (6 marks)

Non-invasive pre-natal testing (NIPT) is a test conducted on pregnant women at around 7- 10 weeks of pregnancy. It uses a sample of the mothers blood (taken from the arm) and is able to estimate the chance of Down's and other syndromes. A small sample of DNA called 'cell free DNA' (cfDNA) from the placenta circulates in the mother's blood while she is pregnant. These small DNA fragments are usually only around 150bp long.

In 1997 the discovery of foetal Y chromosomes fragments found in the blood plasma of pregnant women who were pregnant with a male foetus has helped to propel the investigation into the NIPT technology.

a. What is the name of the process that could enable the laboratory to sort the cfDNA fragments by size? 1 mark

b. What is aneuploidy, and why would pregnant mothers be concerned about its presence in their unborn foetus? 1 mark

c. Why is using the cell free DNA a better option that taking a sample from the placenta directly? 1 mark

d. Explain the process of Polymerase Chain Reaction which would allow the small amounts of free fcDNA to be made into a large DNA sample ready for analysis. 3 marks

Question 11 (6 marks)

Zanamivir (also known as Relenza) is a competitive neuraminidase inhibitor. It is taken through an oral inhaler for the treatment of influenza (the flu). It was produced through the process known as rational drug design. Neuraminidase is an enzyme found on the outside of influenza viruses and is needed for the detachment of the virus from the host cell. Neuraminidase cleaves the sialic acid from the glycoproteins found on the host cells. When the sialic acid is cleaved the virus can detach from the host cell receptor to which it was bound.

a. Describe rational drug design. 1 mark

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b. Explain which substance the Relenza is likely to mimic? 1 mark

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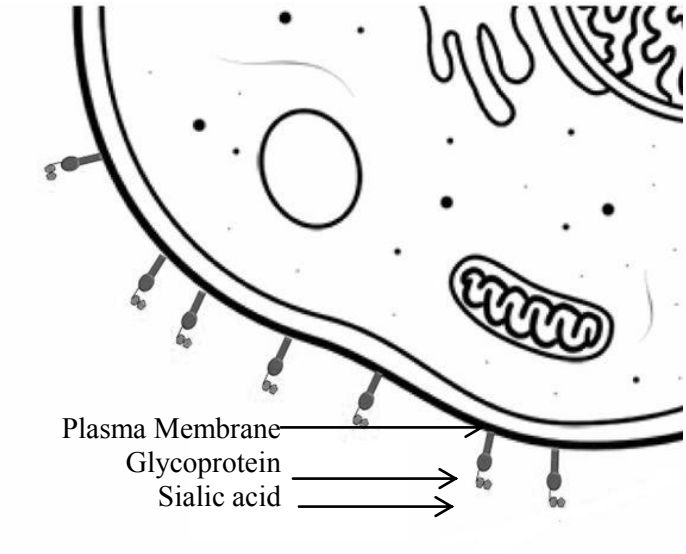
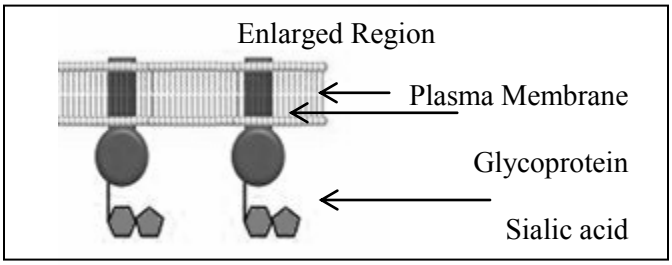
A region of a surface of the host cell is shown in the diagram below. The enlarged section is shown below.

c. Draw a labelled diagram of Relenza bound to the neuraminidase of a virus in the space provided. 2 marks

Space for diagram

Host Cell Surface





d. If an extremely virulent strain of Influenza virus was to be found in Asian countries, list a strategy that would be used to manage the new disease in Australia. 1 mark

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e. Explain the difference between an epidemic and a pandemic if there were to be an influenza outbreak. 1 mark

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END OF QUESTION AND ANSWER BOOK

MULTIPLE CHOICE ANSWER SHEET Name:……

Instructions: Shade the letter corresponding to the correct response for each question

Question 1	A	B	C	D
Question 2	A	B	C	D
Question 3	A	B	C	D
Question 4	A	B	C	D
Question 5	A	B	C	D
Question 6	A	B	C	D
Question 7	A	B	C	D
Question 8	A	B	C	D
Question 9	A	B	C	D
Question 10	A	B	C	D
Question 11	A	B	C	D
Question 12	A	B	C	D
Question 13	A	B	C	D
Question 14	A	B	C	D
Question 15	A	B	C	D
Question 16	A	B	C	D
Question 17	A	B	C	D
Question 18	A	B	C	D
Question 19	A	B	C	D
Question 20	A	B	C	D
Question 21	A	B	C	D

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Question 22	A	B	C	D
Question 23	A	B	C	D
Question 24	A	B	C	D
Question 25	A	B	C	D
Question 26	A	B	C	D
Question 27	A	B	C	D
Question 28	A	B	C	D
Question 29	A	B	C	D
Question 30	A	B	C	D
Question 31	A	B	C	D
Question 32	A	B	C	D
Question 33	A	B	C	D
Question 34	A	B	C	D
Question 35	A	B	C	D
Question 36	A	B	C	D
Question 37	A	B	C	D
Question 38	A	B	C	D
Question 39	A	B	C	D
Question 40	A	B	C	D