Content review questions

Key science skills

1 What is meant by 'independent' and 'dependent' variables?

2 Compare categorical and numerical variables by completing the following table.

Variable	Categorical		Numerical	
qualitative/quantitative				
description/number				
graphed by				
types	Nominal	Ordinal	Discrete	Continuous
example				

3 The table below summarises the 'If-then-when' hypothesis construction process.

If (the DV)	**relationship phrase** (to the IV)	**then**	**trend indicator** (effect on the DV)	**when**	**trend indicator** (action by the IV)
	…depends on… …results from... ...is affected by… ...is directly related to…		…show an increase/decrease... ....to be greater than/less than… …be larger/smaller...		...increased/decreased … ...greater/lesser… …larger/smaller…

Use the table to write a hypothesis for the research question 'Do bananas ripen faster in the dark?'.

4 Why is it important to have a control group in an experiment?

5 What is the difference between the control group and controlled variables?

6 Is experimental accuracy the same as experimental precision?

7 How can experimental precision be improved?

8 Why is a large number of individuals usually included in a treatment group?

9 When are experimental results considered to be valid and reliable?

10 Complete the following comparison of systemic and random errors.

	Errors	
	Systematic	**Random**
Sources		
Affect		
Improved by repeating		

11 State two ethical principles that must be considered when using live organisms.

Nucleic acids

12 What is the basic building block of DNA?

13 Draw and label a DNA nucleotide.

14 Which two components of a DNA nucleotide are constant?

15 The third component's chemical makeup can vary. Name the four variations.

16 What are complementary base pairs?

17 What type of chemical bond holds the base pairs together?

18 How are the above bonds broken?

19 How do RNA and DNA differ?

20 In simple terms explain how DNA codes for proteins.

21 Describe the relationship between DNA, genes and chromosomes.

22 What are triplets, codons and anticodons?

23 In terms of nucleotides and triplets, what is a gene?

24 What information is encoded by a gene?

25 Approximately how many genes does a human have in a cell?

26 Introns and exons are parts of eukaryotic gene sequences. Which parts seem to have the more important function?

27 How many different codons are possible in the genetic code?

28 Are all codons needed? How many amino acids are there?

29 Do all codons code for amino acids?

30 Describe the production of a finished piece of mRNA in eukaryotes. Include the role of enzymes.

31 List the major steps in protein synthesis.

Gene structure and regulation

32 Name two types of functions of genes. Explain whether all genes are responsible for the production of a protein.

33 Complete the following summary of the structure of a eukaryotic gene.

	Name	**Function**
A	Promoter	
B	Start triplet	
C	Coding region	
D	Stop triplet	

34 How do eukaryotic and prokaryotic genes differ?

35 Explain how the trp operon switches genes on and off in prokaryotes.

36 How are transcriptional factors made and what is their role?

Nucleic acids and proteins

37 What are the three parts of an amino acid and which part determines the type and its properties?

38 Explain in terms of protein structure what is meant by primary, secondary, tertiary and quaternary structure.

39 What type of reaction links amino acids together?

40 How is denaturing caused and what types of bonds are broken?

41 Complete the following table.

	Types of proteins	
	Fibrous	**Globular**
Example		
Role		
Solubility		
Structure		

42 With respect to nucleic acids and proteins, complete the following table.

	monomer	polymer
nucleic acid		
protein		

DNA manipulation techniques and applications

43 Where is DNA found in prokaryotic and eukaryotic cells?

44 How do eukaryotic and prokaryotic genes differ?

45 Complete the following table to summarise how eukaryotic and prokaryotic chromosomes differ.

	Chromosome	
	Prokaryote	**Eukaryote**
shape		
presence of histone		
number per cell		
location in the cell		

46 The genetic code is universal. What does this mean and why is this important in genetic engineering?

47 Complete the following table.

Enzyme	Function
endonuclease	
DNA ligase	
polymerase	
DNA polymerase	
RNA polymerase	

48 What are endonucleases (restriction enzymes) and how are they used?

49 Endonucleases were originally isolated from bacteria. What is their role in bacteria and how is this reflected in the name of the endonuclease?

50 What is the function of CRISPR-Cas9 in bacteria?

51 Complete the following table.

CRISPR-Cas 9 compound	Function
RNA Guide	
Cas 9 endonuclease	

52 What are the potential applications of CRISPR-Cas 9 technology?

53 Explain the steps in the polymerase chain reaction (PCR) and give examples of its use.

54 Give two reasons for performing gel electrophoresis on DNA.

55 Use three words to summarise the steps in each PCR cycle.

56 Why is Taq polymerase, the restriction enzyme, often used in PCR?

57 Complete the following table summarising the use of gel electrophoresis in the separation of DNA of unknown lengths.

Component	Function
Agarose gel	
Electric field	
Line of wells	
Dye in the samples	
Buffer	
Ethidium bromide	
Standard	

58 What two features of DNA allow it to be sorted using gel electrophoresis?

59 What are short tandem repeats (STRs)?

60 Using a flow chart, summarise the main steps in DNA profiling.

61 Why are up to 10 different STR sites commonly used in DNA profiling?

62 Complete the following table summarising the differences between plasmids and prokaryotic chromosomes.

	Plasmid	Prokaryotic chromosome
Size		
Shape		
Number per cell		
Replication		
Number of gene loci		
Can be transformed (transferred to another bacterial cell)		

63 What is a recombinant plasmid?

64 What role do recombinant plasmids play in DNA manipulation?

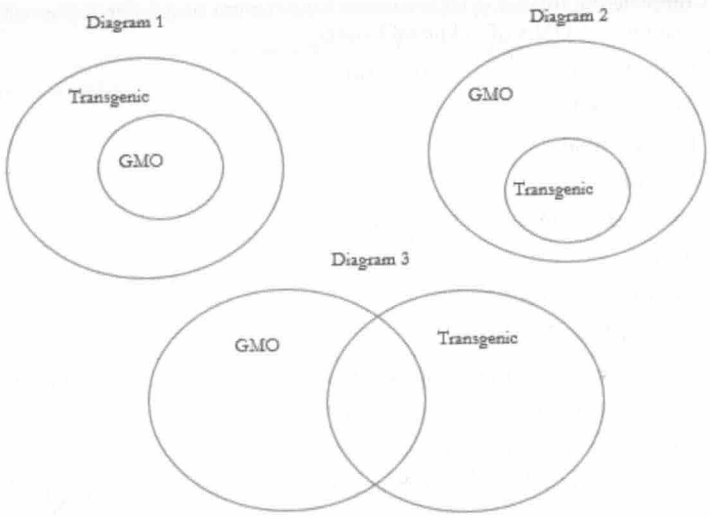
65 Outline the steps in producing human insulin using bacteria.

66 What is a common technique used to determine which bacterial cells have been transformed?

67 Give advantages and disadvantages of using recombinant DNA technology by completing table.

Advantage	Disadvantage
•	•

68 Which of the diagrams on the following page best shows the relationship between genetically modified organisms (GMOs) and transgenic organisms? Explain your choice.



69 What is the difference between transformation and transfection?

70 List the ways foreign DNA can be inserted into a cell.

71 Explain how the Ti plasmid is used to transfer genes into plants.

72 Complete the following table.

Use of GMO	Example	Advantage
To provide resistance to insect predation		
To provide resistance to disease		

73 Complete the following table by stating three reasons why we should use GMOs and three reasons why we shouldn't.

For	Against

Multiple-choice q

Use the follow

The diagram below represen

74 [VCAA 2015 SA Q3]

A single DNA nucleotide is sl

A X alone.

B X and Y together.

C Y and Z together.

D X, Y and Z together.

75 [VCAA 2015 SA Q4]

A feature of DNA that can be

A the anti-parallel arrangeme

B the process of semi-conse

C its ribose sugar–phosphat

D its double-helix structure.

76 [VCAA 2018 SA Q4]

The genetic code is described

This means that

A in almost all organisms th acid.

B some amino acids may be

C a single nucleotide cannot

D three codons are needed to

77 [VCAA 2020 SA Q7]

The codon table that follows nucleotide sequence.

Chapter 3
How are biochemical pathways regulated?

Keywords and terms

Regulation of biochemical pathways in photosynthesis and cellular regulation

activation energy	active site	adenosine diphosphate
adenosine triphosphate	anabolic	catabolic
catalyst	coenzyme	cofactor
endergonic	enzyme	exergonic
induced-fit model	irreversible inhibition	lock-and-key model
metabolism	NADH	NADPH
product	reactant	substrate

Photosynthesis as an example of a biochemical pathways

Calvin cycle	grana	photosynthesis
stroma	light dependent stage	light independent stage
Rubisco	C_3 plant	C_4 plant
CAM plant		

Cellular respiration as an example of a biochemical pathway

aerobic respiration	anaerobic fermentation	cellular respiration
cristae	electron transport chain	glycolysis
pyruvate	Krebs cycle	mitochondrion

Biotechnology applications of biochemical pathways

biomass	biofuel

Content review questions

Regulation of biochemical pathways in photosynthesis and cellular respiration

1 Is energy used by living organisms?

2 Why do cells need energy?

3 What is the difference between anabolic and catabolic reactions?

4 What is the difference between exergonic and endergonic reactions? Give an example of each type.

5 Define the term 'enzyme'.

6 What is the 'lock-and-key' model and how does it differ from the induced fit?

7 Use the terms 'substrate', 'enzyme' and 'product' to explain the role of enzymes in living organisms.

8 Do enzymes increase the amount of product produced in a reaction?

9 With respect to reactions involving enzymes, what is meant by the rate of reaction?

10 What is an enzyme's active site and how is it formed?

11 Enzymes can be denatured. How is this done and what are the consequences?

12 Explain the difference between competitive and non-competitive enzyme inhibitors.

13 What are coenzymes and what do they do?

14 Complete the following table.

Loaded coenzyme	Unloaded form	Function	Involved in photosynthesis/ cellular respiration
ATP			
NADH			
NADPH			

15 What is ATP (adenosine **tri**phosphate)? Explain its role in cells.

Photosynthesis

16 Enzyme function is affected by

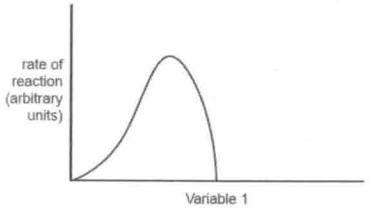
A: temperature

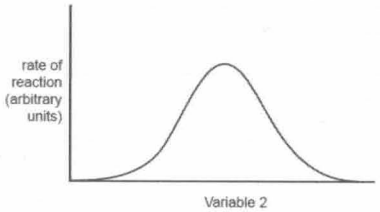
B: pH

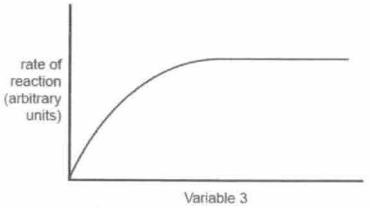
C: substrate concentration

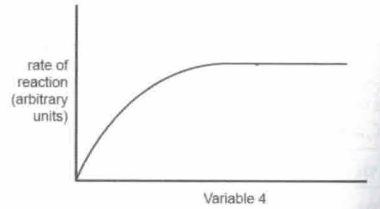
D: enzyme concentration

Match the above factors to the graphs below and explain the shape of the curve.









Variable	Factor	Explanation
1		
2		
3		
4		

17 Do all enzymes work efficiently under the same conditions?

18 What is the major difference between heterotrophic and autotrophic organisms?

19 List the different sorts of organic compounds that heterotrophs require. What form is each type of compound in when moved into or out of cells? (No longer specifically on the course but useful background information.)

20 Write down the word and chemical equations for photosynthesis.

21 Where does photosynthesis occur?

22 Draw a diagram of a leaf section. Use labels to show how various materials involved in photosynthesis move to and from the site of production.

23 What is the role of pigments in photosynthetic organisms and why is there a range of different pigments?

24 In eukaryotes, photosynthesis occurs in the chloroplast. Describe the structure of the chloroplast. Include in your description where light is absorbed and what wavelengths are involved.

25 Use a table to explain what happens in the light-dependent and light-independent stages of photosynthesis.

26 What is the role of NADP in photosynthesis?

27 Complete the following table.

Stage	Location	Inputs	Outputs
light dependent reaction			
light independent reaction (Calvin)			

28 What is RuBisCo and what is its role in the Calvin cycle?

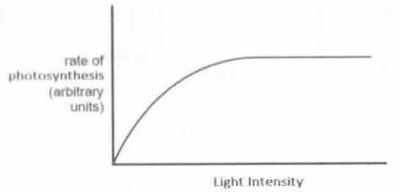
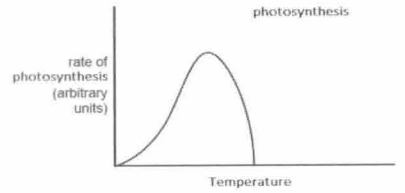
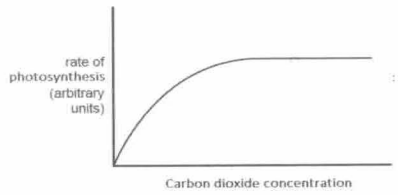
29 Why is the rate of photosynthesis in C_3 plants decreased on hot dry days?

30 Explain how C_4 and CAM plants are able to maintain a high rate of photosynthesis on hot dry days.

31 Complete the following table.

	C_3	C_4	CAM
CO_2 converted before the Calvin cycle			
Site of the Calvin cycle			
Stomata open (day/night)			
Examples			

32 Explain the following graphs by completing the table.

Factor affecting photosynthesis	Explanation
	
	
	

33 What other property of light, apart from intensity, affects the rate of photosynthesis?

34 How might the availability of water affect the rate of photosynthesis in C_3 plants?

Cellular respiration

35 Write down the word equation for aerobic cellular respiration.

36 Convert the above equation to a balanced chemical equation.

37 In eukaryotes, aerobic respiration occurs in the mitochondrion. Describe the structure of a mitochondrion.

38 Explain what happens in the three main stages of aerobic respiration.

39 Write down the word equation for anaerobic respiration in:

a animals

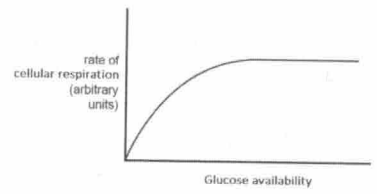
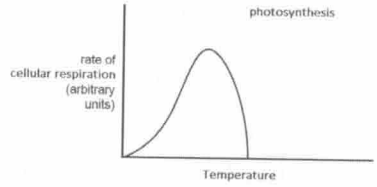
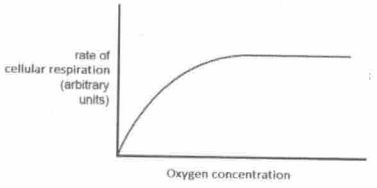
b yeast

40 Aerobic respiration is said to be more efficient than anaerobic respiration. Explain this statement.

41 Photosynthesis is similar to respiration. Do you agree?

42 Mitochondria and chloroplasts contain many membranes embedded with enzymes. How would this increase efficiency?

43 Explain the following graphs by completing the table.

Factor affecting photosynthesis	Explanation
	
	
	

Biotechnical applications of biochemical pathways

44 Describe how the CRISPR-Cas9 technologies may be used to improve photosynthesis efficiency and crop yields.

45 What is meant by the terms 'biomass' and 'biofuel'?

46 Explain how biomass can be used to make biofuel.

Multiple-choice questions

47 [VCAA 2015 SA Q6]

An experiment was conducted to investigate enzyme activity. A small quantity of amylase solution was added to a solution of starch dissolved in water at 35 °C. It was observed that maltose was produced.

Which one of the following is the substrate in this reaction?

A water
B starch
C maltose
D amylase

48 [VCAA 2013 E1 SA Q8]

Consider the following reaction in which substrate molecule R and substrate molecule S are converted into product molecule T and product molecule U.

R and S → T and U

Chapter 4
How do organisms respond to pathogens?

Keywords and terms

Responding to antigens

allergen
antigen
bacterium
complement protein
eosinophil
fever
humoral immunity
infection
lymph
major histocompatibility complex (MHC)
neutrophil
pathogen
specific immune response
helper T cell
antibody
antigen-presenting cell
cell mediated immunity
dendritic cell
interferon
histamine
immune response
inflammation
lymph node
mast cell
non-self-antigen
phagocyte
T lymphocyte
virus
adaptive immune response
B lymphocyte
clonal expansion
disease
microbiotic
host
immunoglobulin
innate immune response
macrophage
memory cell
non-specific immune response
self- antigen
T cytotoxic cell

Acquiring immunity

active immunity
artificial immunity
cancer
immunotherapy
passive immunity
pandemic
virulence
AIDS
agglutination
epidemic
monoclonal antibody
HIV
vaccination
zoonose
allergy
autoimmune disease
herd immunity
natural immunity
quarantine

Content review questions

Responding to antigens

1 How do organisms determine which cells are theirs and which cells are foreign?
2 Distinguish between the following terms: pathogen, antigen, antibody and allergen.
3 What is disease? Are all diseases infectious?
4 Explain the relationship between infectious diseases and pathogens.
5 In terms of pathogens, what is meant by the term 'host'?
6 Pathogens can be non-cellular or cellular. Give three examples of each.
7 What physical and chemical barriers do plants have against infection?
8 The human body has a number of levels of defence against disease. What is the first line of defence?
9 Complete the following table.

Component of the innate immune response	Role in the innate immune response
Macrophage	
Neutrophil	
Dendritic cells	
Eosinophil	
Natural killer cell	
Mast cell	
Complement protein	
Interferon	

10 What are the functions of inflammation?
11 Describe the stages of inflammation.
12 Explain whether the features described above provide specific defence.
13 Give two roles of fever in the immune response.

Acquiring immunity

14 Complete the following table.

	Examples
Primary lymphoid organs	
Secondary lymphoid organs	

15 What are the two main functions of lymph vessels?
16 What is the function of lymph nodes?
17 What is the role of the adaptive immune response?
18 Distinguish between T lymphocytes and B lymphocytes. Where is each sort of cell formed and matured?
19 What is the difference between antibodies and antigens? How do they relate to each other?
20 What are antibodies made of and by what cells are they made?
21 Why is the shape/structure of antibodies so important?
22 List the major steps involved in humoral immunity.
23 List the major steps involved in cell-mediated immunity.
24 Describe the different ways that T cells are involved in specific defence.
25 How does natural immunity differ from artificial immunity?
26 What is the principle behind active immunity?
27 How does active immunity differ from passive immunity? Which is best?
28 Explain why most people get mumps or measles once only. (Assume they were not vaccinated!)
29 What are the differences between infectious and non-infectious diseases?
30 Explain the relationship between infectious diseases and pathogens.
31 Give two explanations as to why new diseases emerge.
32 Why is scarlet fever considered to be a re-emerging disease?

33 Give two reasons why diseases re-emerge.

34 Distinguish between an epidemic and a pandemic by completing the table below.

	Epidemic	Pandemic
Definition		
Cause		
Death rates		
Example		

35 What diseases did the first European settlers bring to the Aboriginal and Torres Strait Islanders?

36 Why did the diseases brought to Australia with the European settlers have such a devastating effect on the Aboriginal and Torres Strait Islander peoples?

37 Apart from the introduction of pathogens, how has the health of Aboriginal and Torres Strait Islander peoples been affected by European settlement?

38 Complete the following table.

Method	Explanation	Type of pathogen
Morphology		
Genetic		
Immunology		

39 In terms of pathogens, what is meant by the term 'host'?

40 Explain why cleanliness in food, water and personal hygiene practices assist in control of disease.

41 What are the major ways in which pathogens are transmitted from host to host?

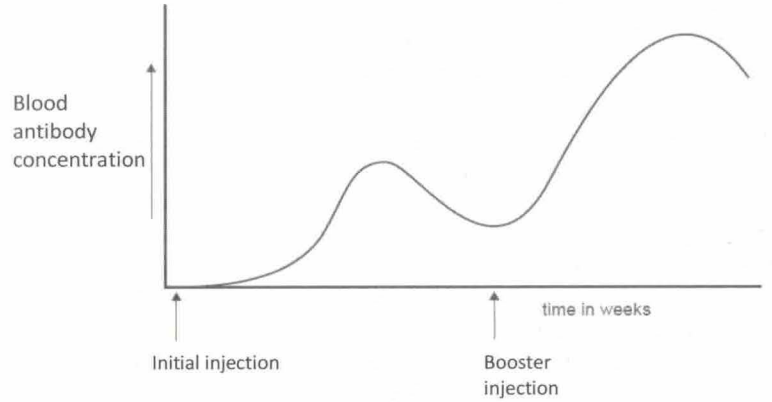
42 Complete the following table summarising procedures that reduce the spread of disease.

Procedure	How it stops spread	Examples of diseases that are stopped
Personal hygiene		
Community hygiene		
quarantine		
vaccination		
Public health programs		
Pesticides		
Genetic engineering		

43 Complete the following table.

Type of vaccine	Description
Live attenuated vaccine	
Inactivated or killed vaccines	
Inactivated bacterial toxin	
Pathogen sub-unit	

44 The graph below shows antibody levels after initial immunisation followed by a booster injection. Explain the shape of the graph.



45 The hepatitis B vaccine is given at birth, 2 months, 4 months and 6 months. Why?

46 Explain why both quarantine and vaccination are used to stop the spread of disease.

47 Why does herd immunity rely on the immunisation of most of the population?

48 What is multiple sclerosis?

49 How is cancer related to cell division?

50 How do tumour cells evade the immune response?

51 What is immunotherapy?

52 What are monoclonal antibodies and how can they be used to treat cancer?

53 How can monoclonal antibodies be used to treat autoimmune diseases?

54 Explain how conjugated monoclonal antibodies can directly deliver drugs and or radiation to tumour cells.

55 Complete the following table:

Type of cancer vaccine	Antigens contained in the vaccine	How the vaccine works
Preventive		
Therapeutic		
Personalised		

Chapter 5
How are species related over time?

Keywords and terms

Genetic changes in a population over time

adaptation
allele
allele frequency
allopatric speciation
antigenic shift
bacterial resistance
antigenic drift
evolution
biological evolution
conjugation
bottleneck effect
extinction
fitness value
founder effect
gene flow
gene pool
gene pool
genetic diversity
genetic drift
genetic variation
genotype
germ line cell
heterozygous
homologous chromosome
homozygous
isolating mechanism
mutation
natural selection
non-disjunction
phenotype
point mutation
polymorphic population
polyploidy
population
selection pressure
selective breeding
somatic cell
speciation
species
translocation

Changes in species over time

absolute dating
allopatric speciation
carbon dating
cast
convergent evolution
fossil
index fossil
transitional fossil
genetic divergence
divergent evolution
faunal succession
homologous structures
index fossil
isotope dating
mould
palaeontology
relative dating
sympatric speciation
transitional fossil

Determining relatedness of species

adaptive radiation
common ancestor
DNA hybridisation
mitochondrial DNA
molecular homology
molecular clock
phylogeny
phylogenetic tree
vestigial structures

Human change over time

Australopithecus
binocular vision
Cro Magnon
foramen magnum
hominin
hominoid
Homo
Homo erectus
Homo denisovana
Homo sapiens
Homo neanderthalensis
mitochondrial DNA
mammal
putative
primate
opposable thumb

Content review questions

Unit 2 revision

1 Why is meiosis significant to sexually reproducing organisms? You should be able to make several points.

2 What is the difference between an allele and a gene? Are they the same thing?

3 Distinguish between the terms 'homologous', 'homozygous' and 'heterozygous'.

4 What is the difference between the terms 'genotype' and 'phenotype'? What factors determine each?

Changes in the genetic makeup of a population

5 What is meant by variation when looking at members of a population?

6 List the major types of variation that exist between organisms.

7 List the various sources and processes that provide genetic variation in a population. Start with variation that arises during gamete production.

8 Point mutations are minor alterations to base sequences in genes. Describe the three major types of point mutation.

9 Explain why mutations are usually harmful. Which of the three types of point mutation are the least harmful? Why? Refer to frameshift in your answer.

10 What are block mutations?

11 Give an example of a condition that arises as a result of non-disjunction. Explain what must have happened during meiosis.

12 How do aneuploidy and polyploidy differ?

13 List some causes of mutation.

14 Distinguish between germline and somatic mutations.

15 Which sorts of mutation can be beneficial to a species' long-term survival? Explain.

16 Which is the more important source of variation – recombination during meiosis or mutation? Justify your opinion explaining the significance of each.

17 What is meant by the terms 'gene pool' and 'allele frequency'?

18 How is allele frequency calculated?

19 In terms of the gene pool and allele frequency, what is the difference between gene flow and genetic drift? When will the two processes have the greatest effect on allele frequency?

20 Complete the following table.

	Bottleneck	**Founder effect**
Definition		
Genetic diversity		

21 What is biological evolution? Is evolution a process or a result? Explain.

22 Is biological evolution a theory or fact?

23 How are 'Natural Selection' and 'Biological Evolution' related?

24 If natural selection is to occur, what must exist in a population?

25 Is selection at the phenotypic or genotypic level? Explain what sorts of individuals are most likely to survive in a particular environment.

26 Does the 'fitness' of an individual vary and if so, what determines an individual's fitness?

27 Which individuals in a population are most likely to survive in a particular environment?

28 Which individuals in a population are most likely to reproduce in a particular environment?

29 If an individual is to pass on its alleles (genetic information) to the next generation, how long must it live?

30 Darwin proposed the theory of 'Evolution by Natural Selection'. Since then, developments in genetics have led to its modification. Summarise the modern view of evolution by natural selection.

31 Using the Darwin/Wallace theory of natural selection, explain how peppered moths in polluted forests are mainly black whereas populations of these moths in unpolluted forests are mainly pale. This is an example of how physical conditions can affect populations.

32 Using the Darwin/Wallace theory of natural selection, explain how mosquitoes have become resistant to DDT. This is an example of how chemical conditions can affect populations.

33 Explain whether individuals with a dominant phenotype will become more frequent in a population than individuals with the recessive phenotype for the same characteristic. In other words, does 'dominance' in numbers have much to do with 'dominance' in phenotype? (HINT: in genetics only use the word 'dominant' when referring to phenotype.)

34 Complete the following table.

Environment	Genetic diversity advantage	Explanation

35 Is there any real difference in the process of 'Natural Selection' when compared with 'Selective Breeding'?

36 How does selective breeding affect genetic diversity and what are the advantages and disadvantages of this?

37 Explain how bacteria can become resistant to antibiotics.

38 Where are the genes for antibiotic resistance located within a bacterium?

39 Describe two ways that plasmids are passed on to daughter cells.

40 Explain why it is dangerous to overuse antibiotics.

41 Compare antigenic drift and antigenic shift by completing the following table.

Similarities	**antigenic drift**	**antigenic shift**
Differences		

42 What is palaeontology?

43 What is faunal succession and how does it provide evidence to support evolution?

44 Is it always true to say that fossils are the remains of dead organisms?

45 Under what environmental conditions are fossils formed? What conditions reduce the chances of good fossils forming?

46 What information can fossils provide about the lifestyle of once living organisms?

47 Why is it difficult to identify different species using only fossil evidence?

48 Describe the difference between absolute dating (radioactive isotope dating) and relative dating (stratigraphy).

49 What role do index fossils have in dating rocks?

50 Different radioactive isotopes have different half-lives. What does this mean?

51 Different radio-isotopic methods are used to date fossils of different ages. List some commonly used isotopes and state their use. Is it always the fossil that is dated?

52 What is the significance of fossils like *Archaeopteryx*?

53 What is meant by the term 'species'?

54 What is the most important test used to distinguish members of a species?

55 What is the significance of geographical barriers in the evolution of new species? Describe features that act as geographical barriers.

56 Summarise the important steps that lead to allopatric speciation.

57 How can you determine if you have one species or two distinct species in an area?

58 If two closely related species live in the same area, what are the possible isolating mechanisms that might prevent interbreeding?

59 Use the finches of the Galapagos Islands to explain what is meant by adaptive radiation. What type of evolution is this?

60 Name two features that characterise adaptive radiation.

61 How do allopatric speciation of sympatic speciation differ?

62 How did sympatic speciation of *Howea* plants on Lord Howe Island occur?

63 Complete the following table.

	Evidence for evolution	**Example**
Palaeontology - transitional forms		
Comparative anatomy - homologous structures - vestigial organs		

Molecular homology - Universal genetic code - similar DNA sequences - similar amino acid sequences		

64 What is molecular homology and how can it be used to determine the relatedness between species?

65 Draw a phylogenetic tree based on the following hybridisation results.

Human and chimpanzee: 97.7%

Human and gibbon: 94.7%

Human change over time

66 List the major characteristics that distinguish mammals from other animals.

67 Humans are primates. Describe the major features that distinguish primates from other mammals.

68 Why are opposable digits important to primates? In particular, how is an opposable digit important to humans?

69 Why do netballers and footballers require good stereoscopic vision?

70 What features distinguish hominins from other primates?

71 Distinguish between the terms 'hominoid' and 'hominin'.

72 Describe the location changes of the foramen magnum.

73 What changes in jaw and tooth structure have occurred during human evolution? How might behaviour have changed during this evolution?

74 Skull shape and size have changed during human evolution. Describe their changes and their significance.

75 What has been the limiting factor to a further increase in skull size?

76 What selective pressures might have led to increased brain size?

77 Is it true to say that man has evolved from chimps and gorillas? If not, rephrase the statement.

78 Complete the following table.

	Homo neanderthalensis
When did they live?	
Where did they live?	
Features of their skull	
Brain size	
Culture	
Disappeared from the fossil record	

79 How is mitochondrial DNA different from nuclear DNA?

80 Why is mitochondrial DNA useful for tracking human evolution?

81 What does the comparison of mitochondrial DNA indicate about *Homo sapiens*, *Homo neanderthalensis* and *Homo denisovan*?

82 Complete the following table summarising two theories of human migration.

Hypothesis	Description	Evidence
Out of Africa		
Multi-Regional		

83 There is debate about when humans first arrived in Australia. What is the evidence that arrival was at least 65 000 years ago?

Multiple-choice questions

*Use the following information to answer Questions **84** and **85**.*

Second letter

First letter	U	C	A	G	Third letter
U	UUU phe UUC phe UUA leu UUG leu	UCU ser UCC ser UCA ser UCG ser	UAU tyr UAC tyr UAA STOP UAG STOP	UGU cys UGC cys UGA STOP UGG trp	U C A G
C	CUU leu CUC leu CUA leu CUG leu	CCU pro CCC pro CCA pro CCG pro	CAU his CAC his CAA gln CAG gln	CGU arg CGC arg CGA arg CGG arg	U C A G
A	AUU ile AUC ile AUA ile AUG met	ACU thr ACC thr ACA thr ACG thr	AAU asn AAC asn AAA lys AAG lys	AGU ser AGC ser AGA arg AGG arg	U C A G
G	GUU val GUC val GUA val GUG val	GCU ala GCC ala GCA ala GCG ala	GAU asp GAC asp GAA glu GAG glu	GGU gly GGC gly GGA gly GGG gly	U C A G

Consider the following sequence of six amino acids that make up part of a polypeptide.

---- phe ---- leu ---- pro ---- val ---- tyr ---- ala ----

A mutation within the gene coding for this sequence of six amino acids resulted in the following six amino acids in the same position.

---- phe ---- leu ---- ala ---- val ---- tyr ---- ala ----