



WESLEY
COLLEGE

STAGE THREE HUMAN BIOLOGICAL SCIENCE
TRIAL WACE EXAMINATION
2011

SECTION A - MULTIPLE CHOICE ANSWER SHEET

NAME: SOLUTIONS

TEACHER: _____

INSTRUCTIONS

For each question shade the box to indicate the answer.
Use **only** a blue or black pen to **shade** the boxes.
For example, if b is your answer

1. a b c d

1. a b c d

2. a b c d

3. a b c d

4. a b c d

5. a b c d

6. a b c d

7. a b c d

8. a b c d

9. a b c d

10. a b c d

11. a b c d

12. a b c d

13. a b c d

14. a b c d

15. a b c d

16. a b c d

17. a b c d

18. a b c d

19. a b c d

20. a b c d

Section Two: Short answer

50% (100 Marks)

This section has **ten** questions. Answer **all** questions. Write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- **Planning:** If you use the spare pages for planning, indicate this clearly at the top of the page.
- **Continuing an answer:** If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time for this section is 90 minutes.

Question 21

(10 marks)

The following experiment was conducted. Two groups of people were tested one hour after the ingestion of 75 grams of glucose. The test monitored their blood glucose and insulin levels. One of the groups consisted of people with diabetes and the other group acted as a control group. The following results (in mmol/L) were obtained from both groups:

Time after glucose ingestion	Group A		Group B	
	0 minutes	60 minutes	0 minutes	60 minutes
Plasma glucose levels	5.3	13.0	5.3	7.8
Plasma Insulin Levels	70	70	70	350

- (a) What is the purpose of the control group? (1 mark)

To compare to the experimental group

- (b) (i) Which group (A or B) contained people with diabetes? (1 mark)

Group (A)

- (ii) Give two reasons for your answer in (b) (i) (2 marks)

↑ glucose level after 60 min (1)
Low / no change in insulin level after 60 min. (1)

- (c) Over time, the average plasma glucose level in the control group returned to 5.3mmol/L. Explain how this change occurred. (2 marks)

GLUCOSE TAKEN UP BY CELLS (1)

STORED AS GLYCOGEN OR FAT IN LIVER (1)

ANY 2

" " " IN SKELETAL MUSCLE (1)

- (d) The experimental group consisted of people described as 'Type 2 Diabetics'. How did they develop 'Type 2 Diabetes'? (2 marks)

POOR DIET RICH IN • FAT / • SUGARS / • SALT

• ↑ BODY WEIGHT / OBESITY

ANY 2

• ↓ EXERCISE

• ↑ BLOOD PRESSURE

• SMOKING

• ↑ " CHOLESTEROL

- (e) What hormones, other than insulin, are involved in the regulation of blood glucose levels? (2 marks)

• GLUCAGON (1)

• ADRENALIN } EITHER = (1)

• CORTISOL }

Question 22

(10 marks)

Water reabsorption occurs in the kidneys. The volume of water reabsorbed into the blood depends upon the permeability of the tubules which are controlled by other parts of the body. This reabsorption of water can also be influenced by other factors.

- (a) Explain why larger urine volumes tend to be produced on a cold day. (2 marks)

↓ BLOOD FLOW TO EXTREMITIES MEANS MORE BLOOD FLOWING THROUGH THE TORSO + HEAD / KIDNEYS (1)
HENCE ↑ FILTRATION BY KIDNEYS ∴ ↑ URINE VOLUME (1)

- (b) Sometimes the secretion of antidiuretic hormone into the blood is high.

- (i) Where is antidiuretic hormone produced? (1 mark)

HYPOTHALAMUS

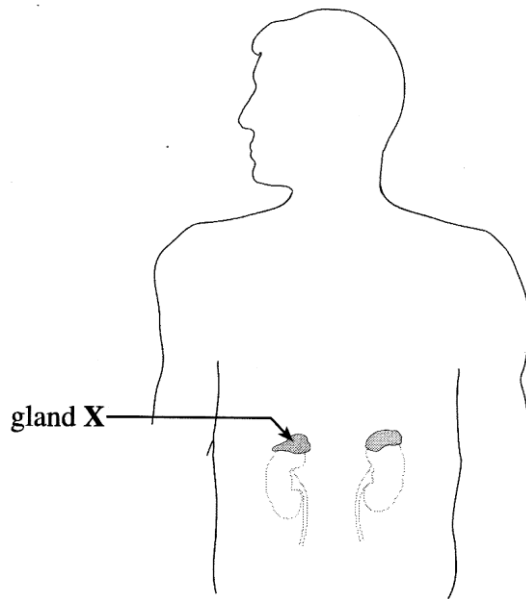
- (ii) What is the effect of high levels of anti-diuretic hormone in the blood on the body? (2 marks)

↑ WATER UPTAKE / ABSORPTION (1) FROM THE DISTAL CONVOLUTED TUBULE & COLLECTING DUCT (1)

- (c) Explain why individuals suffering 'Type 1 Diabetes' produce high volumes of urine. (2 marks)

↑ GLUCOSE LEVELS IN THE FILTRATE (1) CAUSES WATER TO BE DRAWN INTO THE TUBULE VIA OSMOSIS (1)
∴ ↑ URINE VOLUME

Use the following diagram to answer question 22 (d).



(d) (i) Identify gland X ADRENAL GLANDS (1 mark)

(ii) What hormone (other than ADH) does gland X secrete to regulate the composition of urine?
ALDOSTERONE (1 mark)

(iii) What effect does this hormone have on the composition of urine? (1 mark)

↓ Na⁺ ions / ↑ K⁺ ions

Question 23**(12 marks)**

Absolute dating relies on scientific techniques that allow actual fossil age to be determined. One absolute dating technique is radiocarbon dating. The following table shows the radioactive decay of carbon 14 (C^{14}) over 35 000 years.

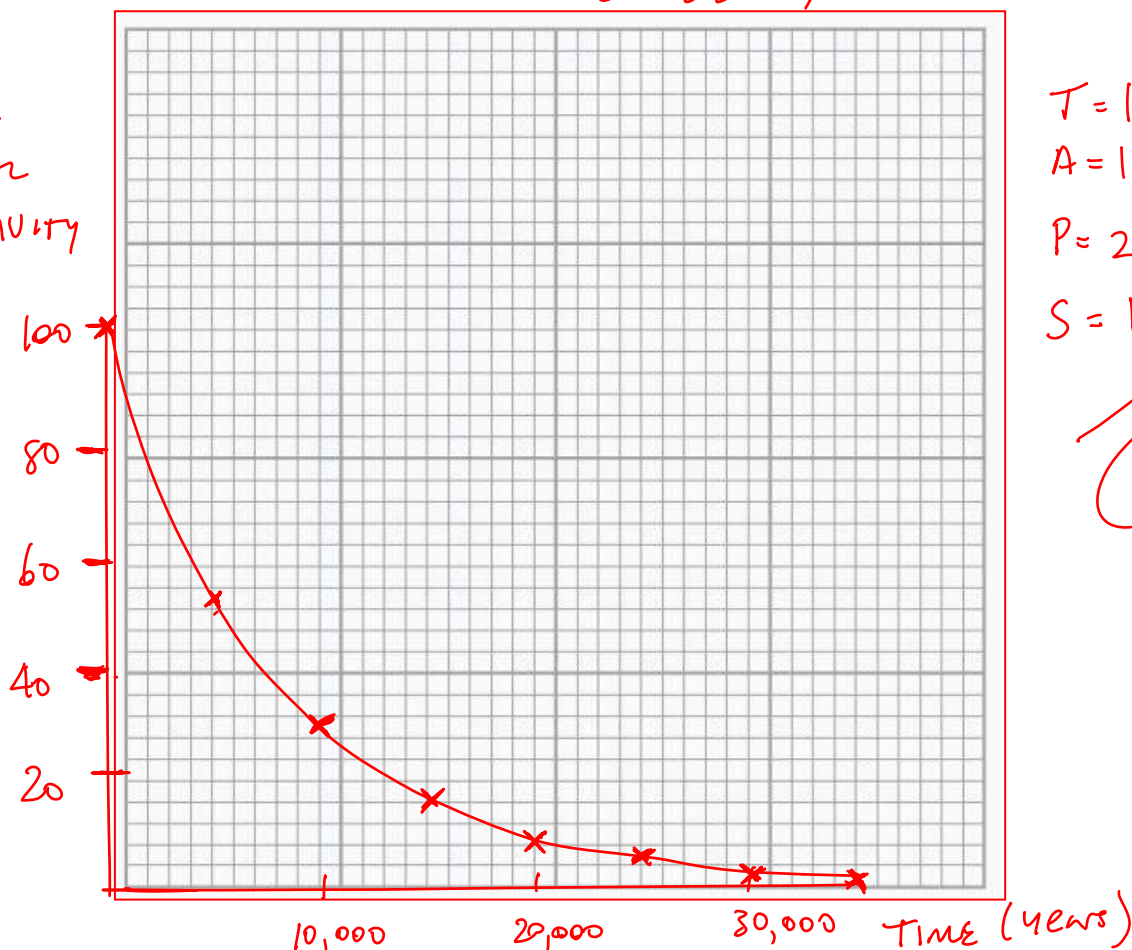
Time (years)	Percentage of original radioactivity
0	100
5000	54
10000	29
15000	16
20000	8
25000	5
30000	2
35000	1

- (a) Graph the results from the table on the grid provided on the next page. (5 marks)

(If you wish to have a second attempt at the graph, the grid is repeated on page 42 at the end of this Question/Answer Booklet. Indicate clearly on this page if you have used the second grid and cancel the working on the grid on this page.)

CURVE OF C^{14} DECAY

% OF ORIGINAL RADIOACTIVITY



$T = 1$
 $A = 1$
 $P = 2$
 $S = 1$

5

- (b) Define what is meant by the *half life* of an isotope. (2 marks)

THE TIME TAKEN FOR HALF OF ANY QUANTITY OF RADIOACTIVE MATERIAL (1) TO DECAY INTO STABLE NON RADIOACTIVE MATERIAL (1)

- (c) A fossil was found to contain 40% of its original radioactivity. What is the approximate age of this fossil? (1 mark)

7000 ± 500 YEARS

- (d) Explain why the measurement of carbon 14 (C^{14}) in a hominin fossil may not be a useful radiometric dating technique (2 marks)

C^{14} HAS A VERY SHORT $\frac{1}{2}$ LIFE - LIMITED TO \approx 60-70,000 (1)

HOWEVER, MANY HOMININ FOSILS CAN DATE UP TO ^{YEARS}
3-4 MILLION YEARS. LIMITED USE (1)

- (e) Briefly explain how fossils provide scientists with *compelling* evidence for evolution. (2 marks)

A SERIES OF FOSILS OF CLOSELY RELATED
SPECIES WILL SHOW SUBTLE CHANGES OVER
TIME, INDICATING ANCESTRY.

Question 24

(8 marks)

- (a) Complete the table below by writing the term translation or transcription next to the statement in reference to protein synthesis.

(2 marks)

Statement	Stage of Protein Synthesis
Ribosomes are involved	TRANSLATION
tRNA is involved	TRANSLATION
mRNA is made	TRANSCRIPTION
DNA acts as a template	TRANSCRIPTION

$\frac{1}{2}$ EACH

The table shows some amino acids and their corresponding mRNA codon. The mRNA codon for a stop signal is also shown. Below the table, a section of DNA is also shown. Use this information to answer Questions (b) to (f).

Amino acid/stop signal	mRNA codon
Alanine	CGG CGA CGU CGC
Arginine	GCA GCG GCU GCC
Cysteine	ACA ACG
Glutamine	CUU CUC
Glycine	CCU CCG CCA CCC
Leucine	GAA GAG GAU GAC
Proline	GGU GGG GGA
Serine	AGG AGA AGU AGC
Stop signal	AUU AUC ACU
Threonine	UGC UGA UGU UGG

DNA Strand

A C A C T T A C A G C C G G T G G G
 Triplet 84 Triplet 85 Triplet 86 Triplet 87 Triplet 88 Triplet 89

- (b) What amino acid is coded for by Triplet 85?

(1 mark)

LEUCINE

- (c) List the sequence of amino acids found in the polypeptide chain that is coded for by the DNA strand above.

(1 mark)

THREONINE - LEUCINE - THREONINE - ALANINE - GLYCINE - GLYCINE

- (d) Where would you find an anti-codon? What is the role of an anti-codon?

(2 marks)

ON A tRNA MOLECULE. BONDS WITH CODON ON mRNA TO DELIVER APPROPRIATE AMINO ACID TO THE RIBOSOME.

- (e) Triplet 89 coded for the **last** amino acid in the polypeptide chain. What is the next codon?

(1 mark)

AUU OR AUC OR ACU

- (f) Give the polypeptide chain if Triplet 90 was ACT and the next Triplet was CTT on the DNA molecule.

(1 mark)

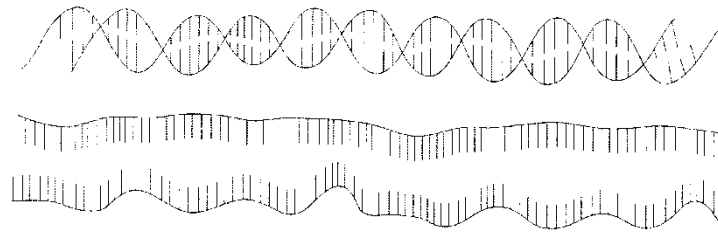
THREONINE - LEUCINE - THREONINE - ALANINE - GLYCINE -
GLYCINE - THREONINE - LEUCINE

Question 25

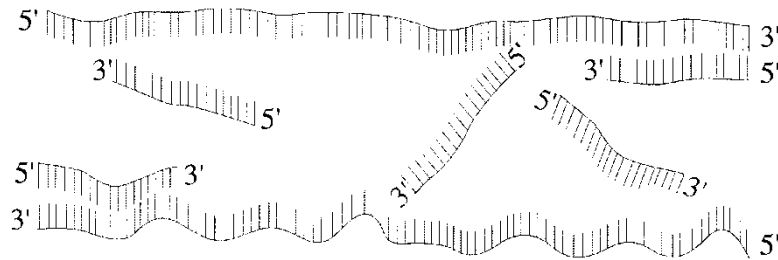
(14 marks)

The diagram below illustrates three steps involved in the Polymerase Chain Reaction (PCR).

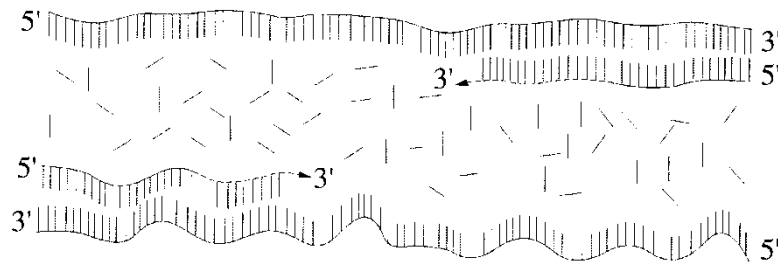
Step 1



Step 2



Step 3



- (a) Describe what is happening in each of the steps shown in the diagram above. (3 marks)

STEP 1 - DNA MOLECULE IS DENATURED ①

STEP 2 - PRIMERS ARE ADDED TO SINGLE DNA STRANDS
TO INITIATE REPLICATION ①

STEP 3 - NUCLEOTIDES ADDED TO BUILD 2 NEW DNA
STRANDS USING DNA POLYMERASE ①

- (b) Describe one use for the PCR process. (2 marks)

- FORENSICS - TO AMPLIFY TRACE DNA EVIDENCE FROM CRIME SCENES.
 - DETECTION OF HEREDITARY DISEASE IN QUICK TIME
 - " " VIRAL " " TO ALLOW FOR QUICK TREATMENT
- ANY 1

- (c) Recombinant DNA technology involves the introduction into cells of DNA that is foreign to the organism or that has been modified. It could be used for the benefit of individuals suffering from a disease caused by a faulty gene or genes. Explain what is meant by the

following terms in relation to recombinant DNA technology:

(i) DNA ligase:

(2 marks)

IS AN ENZYME ①

CAPABLE OF JOINING DNA STRANDS TOGETHER ①

(Given correct complimentary base sequences)

(ii) Ligation:

(2 marks)

THE PROCESS OF JOINING SHORT STRANDS OF

DNA TOGETHER

(iii) Plasmids:

(2 marks)

SMALL CIRCULAR STRANDS OF DNA SEPARATE TO THE
GENOMIC DNA OF BACTERIA ①

LIMITED GENES & CAPABLE OF INDEPENDENT REPLICATION ①

(d) Describe the use of DNA recombinant technology in the manufacture of **ONE** hormone.

(3 marks)

• INSULIN GENE CUT FROM HUMAN DNA USING
RESTRICTION ENZYME ①

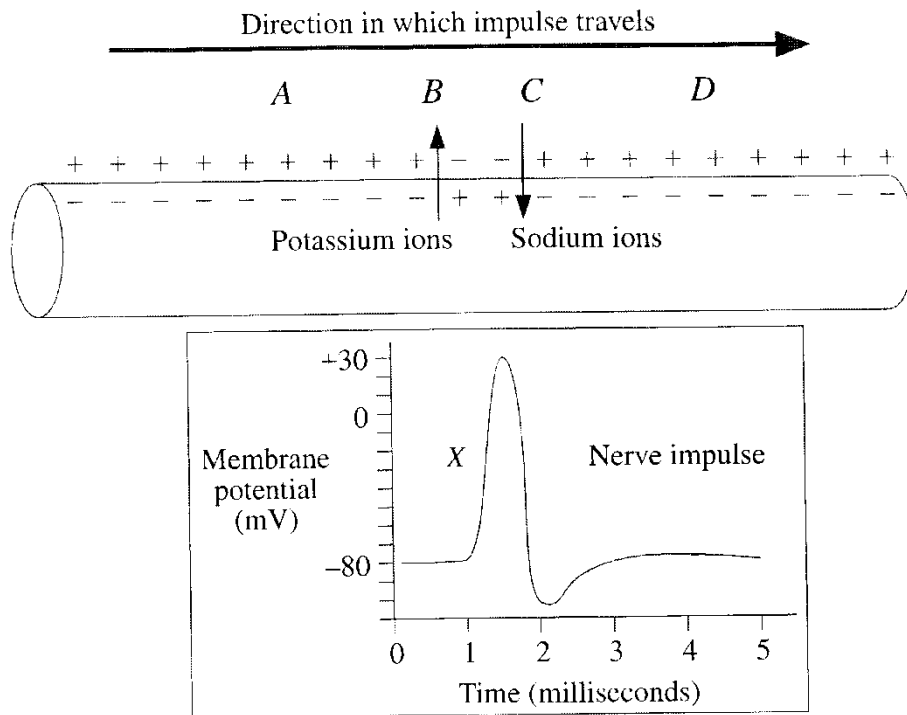
• GENE INSERTED & JOINED TO BACTERIAL PLASMID
USING DNA LIGASE ①

• BACTERIA PRODUCES INSULIN FOR HUMAN USE ①

Question 26

(9 marks)

The diagram below shows a nerve impulse travelling along an axon.



- (a) (i) At which point (A, B, C or D on the axon) does the depolarisation of the nerve impulse (marked X in the graph) commence? (1 mark)

B

- (ii) Explain your choice of answer in question (a) (i). (2 marks)

DEPOLARISATION OCCURS WHEN Na^+ IONS FLOOD INTO CELL (1)
 MEMBRANE VOLTAGE OR MEMBRANE POLARITY IS
 REVERSED (1)

- (b) What process maintains the correct amounts of potassium and sodium ions after the membrane potential returns to its resting level? (1 mark)

ACTION OF THE SODIUM / POTASSIUM PUMP

- (c) How does a nerve transmit information that enables muscle fibres to vary the strength of contraction? (2 marks)

IF MORE NERVE FIBRES ARE STIMULATED A STRONGER
 CONTRACTION WILL OCCUR (1)

IF FEWER NERVE FIBRES ARE STIMULATED A
 WEAKER CONTRACTION WILL OCCUR (1)

- (d) Neurotransmitters allow a nerve impulse to move from one neuron to another. What happens to a neurotransmitter after it is released into the synaptic cleft?

(1 mark)

NEUROTRANSMITTER BINDS WITH RECEPTOR SITE ON THE
NEXT NEURON TO CONTINUE THE IMPULSE.

- (e) A Red-Back Spider's bite causes the wastage or breakdown of acetylcholine. What is acetylcholine and what is the effect on the nervous system to a person if bitten?(2 marks)

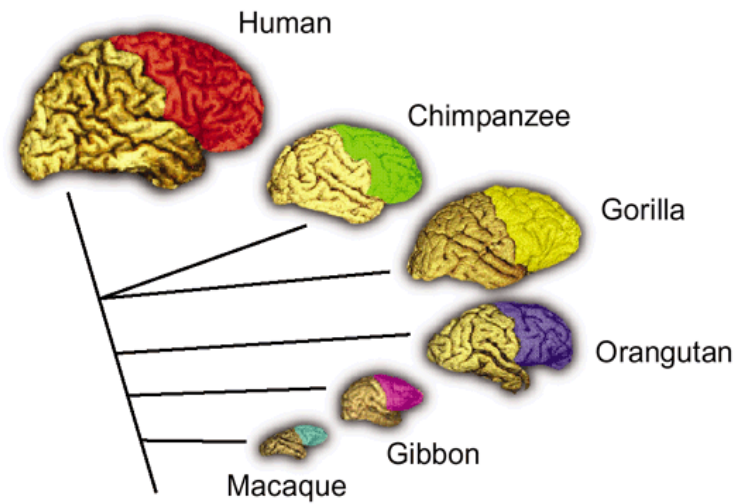
ACh - PERIPHERAL ($\frac{1}{2}$) NEUROTRANSMITTER ($\frac{1}{2}$)

STOPS TRANSMISSION OF NERVE IMPULSE TO EFFECTORS (1)

Question 27

(12 marks)

Comparison between the brain size and shape of several primates are shown below.



- (a) Two brain regions that have changed significantly from the lesser to the higher primates are the centres for olfaction and vision. Explain how these changes provide information about the trend in the olfactory and optical shift in primate.

(2 marks)

REGION FOR VISION HAS SHOWN INCREASE, REGION FOR OLFACTION HAS SHOWN A RELATIVE DECREASE (1) REFLECTING A GREATER IMPORTANCE OF VISION OVER OLFACTION IN HIGHER PRIMATES (1)

- (b) Teeth shape and dental arrangements show another trend in primate evolution.

- (i) What dental arcade or arch shape do most primates share?

(1 mark)

INVERTED U SHAPE (ACCEPT V)

- (ii) Most primates have 36 teeth whilst some have 32 teeth. Give the two dental formulas and name and describe the different primate teeth types.

(3 marks)

and the primate groups which possess them

① 2 1 3 3
2 1 3 3

APES WORLD MONKEYS, OLD WORLD MONKEYS

① 2 1 2 3
2 1 2 3

PROSIMIANS

ALL
CORRECT
①
-1/2 each
error

When comparing a Modern human skull to other hominin skulls (see below), evolutionary changes are evident.

Modern Human Skull



- (c) Identify THREE evolutionary changes evident in the skulls shown above and suggest ONE reason for each change.

(6 marks)

Evolutionary Change	Reason for Change
• CRANIUM MORE ROUNDED	↑ BRAIN SIZE / CRANIAL CAPACITY
• REDUCED PROGNATHISM OF FACE	↑ BALANCE / ↓ OLFACTION / ↓ TEETH SIZE DUE TO DIET CHANGE
• ↓ BROW RIDGES	↑ FRONTAL LOBE / FOREHEAD DEVELOPMENT
• SMALLER TEETH	DIET CHANGE - HERBIVOROUS → OMNIVOROUS
• ↓ ZYGOMATICAL ARCH	DIET CHANGE (AS ABOVE) ↓ MASSETER MUSCLE
• PRESENCE OF CHIN	DIET CHANGE (") & DEVELOPMENT OF SPEECH

Question 28

(5 marks)

A genetic test for prospective parents could almost eliminate the chances of them having children with inherited diseases such as cystic fibrosis. This technique could identify whether people carry genetic mutations causing up to 600 life-threatening disorders. Once identified, an individual could be treated or cured by gene therapy.

- (a) Gene therapy has been made possible by the Human Genome Project. What was the Human Genome Project? (1 mark)

A RESEARCH PROJECT WHICH SEQUENCED THE NUCLEOTIDES THAT MAKE UP THE 25,000 GENES IN THE HUMAN GENOME.

- (b) Describe **ONE** medical advancement that has occurred due to the Human Genome Project? (2 marks)

• CYSTIC FIBROSIS - I.D. OF THE FAULTY GENES / ^{RESEARCH INTO} GENE THERAPY TO TREAT IT.

• HUNTINGTON'S DISEASE - I.D. OF THE FAULTY GENE / WORK ON TURNING OFF FAULTY GENE. EITHER = 2

- (c) Another area or field of gene study is Epigenetics. It has been described as:

'The pursuit of science to clarify the mechanism by which environmental factors modify the activity of genes or gene products to the detriment of an individual.'

What does this mean? Give an example of an environmental factor currently being studied.

(2 marks)

INDIVIDUALS GAIN 'FACTORS' IN THEIR LIFETIME WHICH MODIFY GENE EXPRESSION (OFTEN NEGATIVELY) ①

EXAMPLES: SMOKING, DIET etc. ①

Question 29

(10 marks)

The body's defences against disease can be non-specific or specific. Pathogens that penetrate the non-specific barriers are confronted by the specific defences and are usually destroyed by these defences.

- (a) What does the term 'specific resistance' to pathogens mean? (1 mark)

THE BODY'S DEFENCE MECHANISM IS PARTICULAR TO THAT CERTAIN PATHOGEN DISPLAYING A PARTICULAR ANTIGEN

T-cells play a crucial role in the body defences against disease and health complications experienced by a person.

(b) What foreign micro-organisms are recognised by T-cells? (2 marks)

BACTERIA, VIRUSES, FUNGAL PARASITES,
PROTOZOAN PARASITES, (ACCEPT TRANSPLANTED ORGANS/CELLS)

ANY 2 = (2)

(c) Describe the process that occurs to T-cells when activated or sensitised by foreign antigens. (4 marks)

T CELLS MULTIPLY/CLONE TO FORM SPECIFIC
KILLER T CELLS, HELPER T CELLS AND
MEMORY CELLS. (1)

KILLER T CELLS MIGRATE TO THE SITE OF INFECTION
& DESTROY ANTIGEN (1)

HELPER T CELLS PROMOTE PHAGOCYTOSIS (1)

MEMORY CELLS REMAIN TO ALLOW FOR A RAPID

RESPONSE TO A REPEAT INFECTION (1)

Serious side effects were suffered by an unusual number of children to a type of 'flu' vaccine in 2010. The probable cause of this problem was due to an unstable vaccine. This type of adverse reaction is rarely seen in widespread vaccination programs that prevent the spreading of serious infections.

(d) What is a vaccine? (1 mark)

IN ANTIGEN PREPARATION CAPABLE OF PRODUCING AN
IMMUNE RESPONSE WITHOUT CAUSING THE DISEASE

(e) Comment on the type of immunity provided by a vaccination and the duration of the immunity. (2 marks)

ACTIVE IMMUNITY ACHIEVED VIA VACCINATION (1)

LONG TERM RESISTANCE TO PATHOGEN VACCINATED AGAINST (1) DUE TO THE BODY UNDERGOING AN IMMUNE RESPONSE.

Type of Hormone	Difference
-----------------	------------

Question 30

(10 marks)

Question 30

(9 mark

- (a) Hormones can be classified into two types based upon their mode of action and chemical composition. Give the two types of hormone and describe a difference between them in the table below. (4 marks)

STEROID / LIPID SOLUBLE	* CAN DIFFUSE DIRECTLY THROUGH MEMBRANE * SWITCHES GENES ON OR OFF AFFECTING PROTEIN SYNTHESIS
PROTEIN / WATER SOLUBLE	* CANNOT DIFFUSE THROUGH MEMBRANE, MUST BIND TO RECEPTOR PROTEINS. * AFFECT SPECIFIC REACTIONS BY ACTIVATING OR

In women, oestrogen, a type of steroid hormone, is given to treat osteoporosis. This disease is characterised by individuals having brittle bones and experiencing an increase in the rate of fractures.

(b) Describe at the cellular level in bones how brittle bones can form. (2 marks)

↓ IN BONE DENSITY (1) DUE TO ↓ BONE FORMATION
 COMPARED TO BONE REABSORPTION (1)

Researchers have recently found that 'bone strengthening' drugs taken to decrease the risk fractures can possibly extend a woman's life by five years. One other benefit of this treatment is increased synovial joint mobility.

(c) (i) Give an example of a synovial joint and its classification (type)? (2 marks)

HINGE - ELBOW, KNEE etc... GLIDING - WRIST, ANKLE etc...
 BALL + SOCKET - SHOULDER, HIP PIVOT - SKULL/SPINE, RADIUS/ULNARS

(ii) Describe other methods for treating osteoporosis. (2 marks)

VITAMIN D SUPPLEMENTS (1)
 CALCIUM SUPPLEMENTS (1)

End of Section Two

2011

Stage 3 HBS Trial exam

Section Three Extended Short Answers

60 marks

Question 31

(a)

	Bone	Muscle	Cartilage
Macroscopic	Outer layer of compact bone Cancellous or spongy bone Hollow filled marrow. (Any 2)	Muscle cells arranged in bundles. (1)	Cartilage Matrix (1)
Location	Internal skeleton (1)	Heart Alimentary Canal Skeletal muscle (0.5 each =1.5)	Epiphysis of bones (articular cartilage) Menisci of knee/Intervertebral discs Trachea or bronchi Outer Ear or Nose (any three @1/2) (1.5)
Normal Function or Role	Attachment points for muscles for movement. Protection of vital organs Storage organs for mineral salts and fat Blood cell production (any two) (2)	Muscles shorten or contract to cause body movement or the ability to push or move another substance. (1)	Structural support with some flexibility. Allow free movement of synovial joints Cushioning (any two) (2 X 0.5 each =1)

(12 marks)

Question 31

(b)

(8 marks)

- Sarcolemma is the cell membrane of a muscle cell.

- Sarcoplasm is the cytoplasm of the muscle cell.
- Muscle fibre is the cylindrical shaped muscle cell composed of
- Myofibrils running the length of the muscle cell.
- Composed of repeating contractile units-sarcomeres that contain contractile proteins
- Action potential → Ca ion from Sarcoplasmic reticulum
- Calcium ions bond with troponin causing tropomyosin to move
- Exposing myosin binding site for actin filaments
- Myosin (thick filament) head grabs the
- Actin (thin filament) forming a cross bridge
- and it slides across and the sarcomere/muscle shortens.
- Upon release they (relax) slide back to its original position.

(any eight)

(c)

(10 marks)

Mechanical

- Hip and knee (maybe hand, thumb, shoulder, and elbow)
- Materials like stainless steel, titanium, polyethylene plastics, replacement ceramics are used.
- Traditional – frames, gophers, canes etc

Biological

- Growing living tissue /tissue engineering
- Cells are cultured into artificial three dimensional structures
- E.g. cartilage, tendon
- Transplanted into the body for repair of the damaged parts
- Intervertebral disc is replaced with an artificial disc/device in the lumber or cervical regions
- Use of stem cells
- Adult stem cells injected into sites (affected joint)
- Grafts eg lars for acl treatment
- Pharmaceuticals to reduce joint degeneration e.g. fish oil, glucosamine sulphate/chondroitin
- Anti- inflammatory drugs – decrease pain and swelling
- Exercise – increases bone density
- Calcium supplement – increases bone density

Question 32

(a)

(4 marks)

- Four types of nitrogenous bases in DNA
- Adenine bonds with Thymine/Cytosine bonds with Guanine
- Genome refers to the sequence of the base pairs for each gene
- Will determine the type of protein or enzyme produced

(b)

(10 marks)

Transcription

- DNA unwinds to expose the segment of DNA/gene to be copied in the nucleus
- RNA polymerase joins bases together to form messenger RNA (mRNA)
- Complimentary to exposed base sequence for desired gene
- Uracil base is used as thymine does not exist in mRNA
- A single strand of mRNA is produced
- DNA reassembles and mRNA moves out of nucleus through nuclear pores into the cytoplasm

Translation

- Ribosomes read the mRNA in the cytoplasm in sets of three bases (codon).
- Transfer RNA collects one amino acid unique for the codon
- The amino acid is attached at one end of the tRNA and the other end is a complementary set of bases called an anticodon
- Using complimentary base pairing c-g, u-a, a-t, g-c
- tRNA anticodon attaches to the codon and the amino acid is released to join the protein chain
- This process is repeated to make many protein molecules dependent upon the gene that is transcribed

(any ten)

Question 32 (c)

(10 marks)

- Foramen magnum is situated well forward or central to the base of the skull
- Therefore skull is balanced on the vertebral column/decrease need for large neck muscles
- S-shaped vertebral column to allow for a lower centre of gravity in the pelvis and over feet
- Wedge shaped lumbar vertebrae
- Short, wide pelvis to support abdominal organs and support a carrying angle at the knees/muscle attachment for gluteals
- Pelvis tilts forward to help create lumbar curve
- Carrying angle of knees so they sit directly under midline of the body
- Long femurs allow an energy efficient long stride length
- Large knee joints (condyles) absorbs pressure of the body weight in striding action

- Two arches present (longitudinal and transverse) to allow smooth transfer of weight from heel to toe and spring when pushing off
- Non-opposable and large first digit (big toe) to push off and increase stability
- Robust tarsals for load bearing especially large calcaneus (any ten)

Question 32 (d)

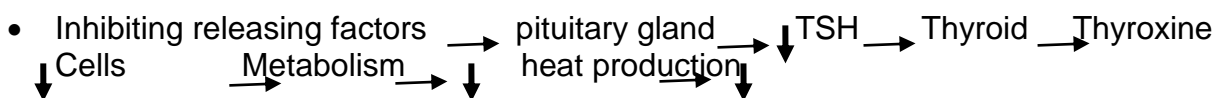
(6 marks)

- Culture is the passing of lifestyle/knowledge/skills from one generation to another through speech, symbols and learnt behavior (1)
- Examples include tool making, hunter-gather lifestyle with specific roles for gender (1)
- Existed in large groups with division of labour (1)
- Big game hunters
- Lived in caves
- Tool making/made tools to make other tools
- Afterlife beliefs through evidence of burials
- Painting (any three) (3)

Question 33 (a)

(12 marks)

- Stimulus-a change in the internal or external environment
- High external body temperature
- Receptors-detect changes in the internal or external environment
- Thermoreceptors located in the skin and hypothalamus
- Modulator-receives, processes and sends messages to effectors
- Hypothalamus
- Transmission to the – arterioles – parasympathetic
- - Sweat glands – sympathetic



2 marks if the above process is correct and links in with the stimulus response model

- Effectors-muscles or glands capable of causing a response
- Sweat glands, arterioles, body cells
- Response-change in the activities of the body due to the stimulus
- Smooth walls of arterioles will relax to cause vasodilation
- Increase heat loss gradient from skin

- Sweat glands will secrete sweat onto skin thus removing heat from blood
- Feedback-Negative due to response being the opposite to the stimulus
- Correct sequence of events: Stimulus → Response → Feedback, but no definitions of components (1)

(Any 12)

Question 33 (b)

(8 marks)

- Hypothalamus will secrete
- thyroid stimulating hormone inhibiting (TSH) factors
- The anterior lobe of the pituitary gland
- will decrease secretion of TSH
- The lack of TSH will cause the decrease secretion of thyroxine
- from the thyroid gland
- Less thyroxine in the body will decrease metabolic rate of cells
- A decreased metabolic rate will decrease cellular heat production/release

Question 33 (c)

(10 marks)

- Hypothyroidism-undersecretion of thyroxine by the thyroid gland
 - Person will experience low metabolic rate(1), lethargy (1), weight gain (1) and mental sluggishness (1)
- Any 3**
- In infants-mental retardation and short statue (cretinism)
 - Thyroid will increase in size (goitre) due to overstimulation
 - This will reduce the body's thyroxine and metabolic rate will decrease
 - Treatment = thyroxine supplements (1) or iodine supplements (1)
 - Hyperthyroidism-oversecretion of thyroxine by the thyroid gland
 - Person will experience high metabolic rate (1), sweating (1), irregular heartbeat (1), loss in weight (1), fatigue (1), protruding eyeballs (1)

Any 3

- Individuals with hyperthyroidism take a drug that's blocks the thyroids gland use of iodine
- Surgical – removal of entire thyroid or portion thereof
- Radioactive iodine to destroy thyroid tissue

End of Solutions