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| C:\Users\s.kanakis\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\ACC Logo_L_rgb_lrg.jpg | **Aranmore Catholic College**  **Mock Examination, 2014**  **Question/Answer Booklet** |

Please place your student identification label in this box

HUMAN BIOLOGICAL SCIENCE

**Stage 3A/3B**

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student’s Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Time allowed for this paper

Reading time before commencing work: ten minutes

Working time for paper: three hours

**Materials required/recommended for this paper**

To be provided by the supervisor

This Question/Answer Booklet

Multiple-choice Answer Sheet

***To be provided by the candidate***

Standard items: pens, pencils, eraser, correction fluid, ruler, highlighters

Special items: non-programmable calculators satisfying the conditions set by the Curriculum Council for this course

**Important note to candidates**

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non‑personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

**Structure of this paper**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time (minutes) | Marks available | Percentage of exam |
| SECTION ONE:  Multiple-choice | 30 | 30 | 40 | 30 | 30 |
| SECTION TWO:  Short answer | 10 | 10 | 90 | 100 | 50 |
| SECTION THREE:  Extended answer | 3 | **2** | 50 | 40 | 20 |
|  |  |  |  |  | 100 |

**Instructions to candidates**

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2014*. Sitting this examination implies that you agree to abide by these rules.
2. Answer the questions according to the following instructions.

**Section One:** Answer all the questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

**Sections Two and Three:** Write answers in this Question/Answer Booklet.

1. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
2. 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.

**Section One: Multiple-choice 30% (30 Marks)**

This section has **30** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square; do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

**Suggested working time: 40 minutes.**

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1. One of the functions of the Periosteum is:

(a) To provide a place of attachment for tendons.

(b) To insulate the bone.

(c) To reduce Friction.

(d) All of the above.

2. Which of the following substances would cross most easily through a cell membrane channel proteins?

(a) Fatty acids because they are soluble in lipid.

(b) Water molecules and small water soluble ions.

(c) Proteins molecules.

(d) Amino acids in peptide chains as they are inorganic and positively charged.

3. ATP

(a) is required for the movement of glucose through a channel protein.

(b) gains energy when phosphate is added to it to form ADP.

(c) is used by a sodium potassium pump during an action potential.

(d) is a form of long term energy storage.

4. During ossification:

1. the cartilage becomes calcified, killing the cartilage cells.
2. Sodium sulphate invades the collagen fibres.
3. osteoclasts invade the cartilage and cut off the supply of blood to the osteocytes.
4. Haversian canals are covered over.

5. A chicken bone was left in vinegar for three days. After this time the bone found to be bendy and no longer strong and rigid. This would have been due to which of the following?

(a) removal of haversian canals.

(b) removal of collagen.

(c) removal of cartilage.

(d) removal of calcium salts

.

6. Which of the following statements about nucleotides is correct?

(a) They are smaller than a nitrogenous base.

(b) It is when DNA wraps around a histone protein.

(c) They must contain a sugar, phosphate and matching pair of bases.

(d) There are four different forms.

7. The process of polymerase chain reaction (PCR) would be required in all of the following situations, except one. Which one is INCORRECT?

(a) Analysing the DNA of a 40,000 year old frozen woolly mammoth

(b) Amplification of DNA from fingerprints left at a crime scene

(c) Cloning Dolly the sheep from one mammary cell

(d) The rapid diagnosis of genetic disorders from a single embryonic cell

8. Which of the following tools of recombinant DNA technology is correctly paired with its use?

(a) Restriction enzymes – joins fragments of DNA together

(b) DNA ligase – an enzyme that cuts DNA

(c) DNA polymerase – causes DNA to unwind during protein synthesis

(d) Electrophoresis – separates DNA fragments

9. The macaque and the chimpanzee show an action of grasping that is typical of primates.

Which of the following primate features allows for this grasping by the hands?

(a) pentadactyl limb

(b) precision grip

(c) opposable thumb

(d) unspecialised hand

10. When you hold your breath, which of the following blood gas changes first stimulates you to breathe?

(a) Falling oxygen

(b) Rising carbon dioxide

(c) Falling hydrogen

(d) Rising carbon oxygen

11. The range of movement permitted at a pivot joint includes

(a) rotation.

(b) flexion and extension.

(c) abduction and adduction.

(d) circumduction.

***The next TWO questions refer to the information below:***

The Measles vaccine is a [vaccine](http://en.wikipedia.org/wiki/Vaccine) created by reducing the [virulence](http://en.wikipedia.org/wiki/Virulence) of the [pathogen](http://en.wikipedia.org/wiki/Pathogen), but still keeping it viable (or "live").

12. This is:

(a) an example of an attenuated virus.

(b) a recombinant form of the measles virus.

(c) a toxin filtered vaccine.

(d) a toxoid vaccine.

13. What type of immunity was offered by the measles vaccine?

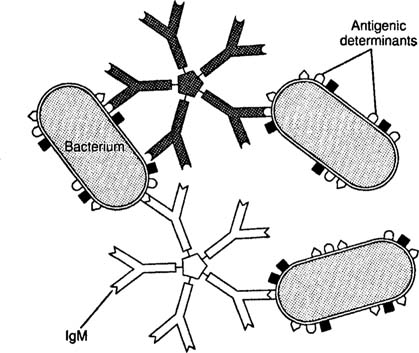
(a) Artificial active

(b) Artificial passive

(c) Natural active

(d) Natural passive

14. The diagram below shows one way in which antibodies can react with pathogen bacteria.



The diagram shows:

(a) Lysis.

(b) Opsonisation.

(c) Agglutination.

(d) Phagocytosis.

15. The bacterium, *Clostridium botulinum*, produces a toxin that causes botulism, a rare but severe type of food poisoning. This toxin also inhibits the presynaptic release of acetylcholine. If the toxin was present in the nervous system

(a) the heart would not be able to increase its rate via the sympathetic nervous system.

(b) receptors in the motor end plate would not be stimulated.

(c) the enzyme cholinesterase, that breaks down acetylcholine, would be required in large amounts.

(d) vasodilation of blood vessels by the parasympathetic nervous system would continuously occur.

16. Although hormones and nerves both control homeostasis, they act in different ways.

Which of the following is correct?

(a) Hormonal action is controlled from one central source, whereas nervous action

has several control centres.

(b) Nervous control involves electrochemical changes, whereas hormonal control only

involves electrical changes.

(c) Responses to stimuli by nervous control are much faster than responses by

hormonal control.

(d) Effects produced by nervous control are longer lasting than those produced by

hormonal control.

17. The bionic eye is classified as a type of artificial replacement that can be used to treat

a patient suffering from blindness. Which of the following would also be classified as an

artificial replacement?

(a) lung transplant for a patient suffering from lung disease

(b) lower leg prosthesis for a patient who has had a leg amputated

(c) genetically engineered spray-on skin for a patient with severe burns

(d) tissue graft in the knee of a patient with a torn ligament

18. The suture joints of the skull contain:

(a) cartilaginous joints.

(b) fibrous joints.

(c) synovial joints.

(d) Hinge joints.

19. Which of the following pairs of hominins and their culture is correctly matched?

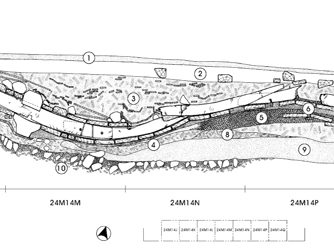
(a) *Homo neanderthalensis* – agriculture

(b) Australopithecines – first to make hafted stone tools

(c) Australopithecines – first to have spiritual beliefs

(d) *Home erectus* – first to make fire

**The next two questions refer to the diagram of ground stratum shown below.**



20. Which of the following statements are true?

(a) Stratum 2 is older than stratum 1, but younger than stratum 10.

(b) Stratum 3 is older than stratum 4, but younger that stratum 10.

(c) The species in stratum 10 would have evolved from the species in stratum 5.

(d) The exact date for the time that the species in stratum 1 can be calculated from the diagram above.

21. Any bones found in layer 10 can be absolute dated using:

(a) Dendrochronology.

(b) Superposition,

(c) Radioisotope dating.

(d) Fluorine dating

22. The following list of conditions can affect the formation and discovery of fossils.

I – presence of oxygen

II – absence of oxygen

III – rapid burial

IV – sedimentary soils

V – cold environment

VI – acidic conditions

VII – hot conditions

VIII – geological disturbances

IX – pressure

X – short periods of time

Which of the conditions listed above would allow fossils to be formed?

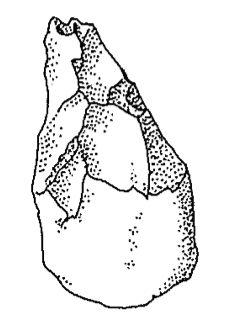
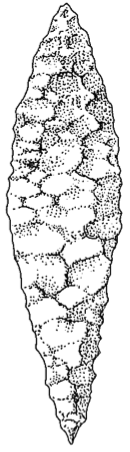
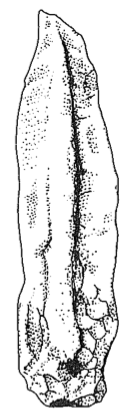
(a) III, IV and IX

(b) I, V and X

(c) II, VII, and IX

(d) I, VI, and VIII

**The next TWO questions refer to the following tools that were unearthed in a variety of locations. They are not drawn to scale.**



A B C D

23. In which order would these tools have been developed?

(a) D B A C

(b) B D C A

(c) A B D C

(d) C D B A

24. Tool D would have been made by

(a) *Homo habilis.*

(b) Cro-Magnon man.

(c) Neanderthal man.

(d) *Homo erectus.*

25. As male has suffered damage to his brain. This damage has caused him to be unable to feel full when eating. He eats such large amounts that he is now classified as being obese. The part of his brain **most** likely to have been damaged is his:

(a) hypothalamus.

(b) cerebral cortex.

(c) medulla oblongata.

(d) cerebellum.

26. Which of the following statements is correct?

(a) Osteoarthritis occurs due to the uneven ratio of activity of osteoblasts and osteoclasts.

(b) Osteoporosis occurs more quickly in people who take hormone replacement therapy (HRT).

(c) People suffering from hypothyroidism show an enlarged neck, lethargy and weight loss.

(d) Parkinson’s sufferers lack dopamine and develop a stooped posture and shuffling gait.

27. A woman burnt her finger on a hot iron as she got ready for work. She felt the pain after she had moved her hand away from the iron. Why was this?

(a) It takes some time for her cerebrum to process all the information it receives about the incident.

(b) The nerve impulse from the motor nerve takes time to get to the sensory nerve that detects the pain.

(c) The receptors detect pain faster than the effectors can contract.

(d) The connector neuron sends information to the motor nerve and cerebrum, but the motor nerve pathway is shorter.

28. Histone modification and DNA methylation

(a) modify gene expression.

(b) cause changes that cannot be inherited.

(c) both switch genes on.

(d) will occur due to the presence of methyl groups in the DNA.

29. The diagram below shows the limbs of different vertebrates. These limbs are described

as homologous organs.



The differences between these limbs shows that

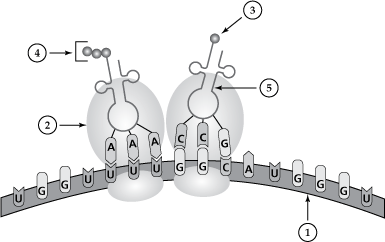
(a) changes due to genetic drift have occurred over a long period of time.

(b) variations in structure have evolved from a common ancestor.

(c) structures have evolved from different ancestors existing in similar environments.

(d) different structures have been acquired to suit different environments.

30. Part of the process of protein synthesis is shown below.



The process shown in the diagram occurs in the

1. nucleus
2. cytoplasm
3. vacuole
4. chromosome

**End of Section One**

**Section Two: Short answer 50% (100 Marks)**

This section has **ten** questions. Answer **all** questions. Write your answers in the spaces 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 your answer.

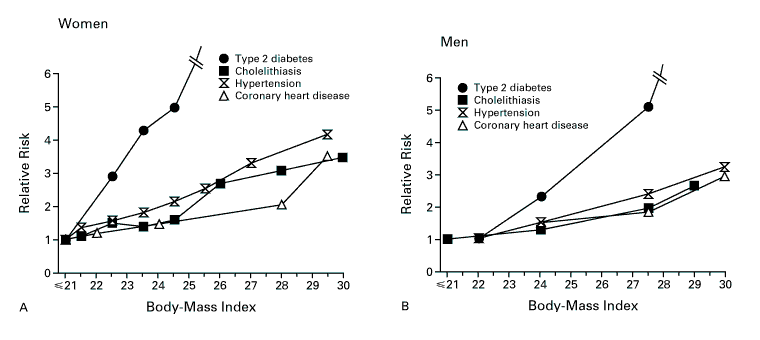
* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
* Continuing your answer: if you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s)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

**Suggested working time: 90 minutes.**

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**Question 31. (18 marks)**

Use the graphs below to answer question 31. Body mass index is ratio of someone’s body mass to height.

(a) With regard to type 2 diabetes state one trend shown in the two graphs above?

(1 mark)

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(b) What is the independent variable in the graph above? Give a reason for your answer.

(2 marks)

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(c) What is the relative risk of Hypertension for a man of Body-Mass Index 25?

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(d) Explain the effect of Type 2 diabetes on the regulation of blood glucose

(2 marks)

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(e) Type 2 diabetes may increase the risk of Alzheimer's disease. The poorer your blood sugar control, the greater the risk appears to be. The exact connection between these two conditions still remains unclear. What are the symptoms of Alzheimer’s disease and what changes occur in the brain that bring about the symptoms?

(6 marks)

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(f) A worldwide study starting next year in Perth and other cities around the world will test the effect of insulin sensitising drugs on the incidence of Alzheimer’s.

(i) What hypothesis would they be testing? (1 mark)

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(ii) The scientists have decided to use a placebo in this study. What is a placebo and what is the advantage of using a placebo in a scientific trial? (2 marks)

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(iii) The scientists have also decided to use a double blind trial. What is the main advantage of such a trial? (1 mark)

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(g) Fifty years ago, a drug called thalidomide was given to pregnant women to cure their morning sickness. Soon a causal link between the drug and the number of babies being born without arms and/or legs was identified. In 1998, the United States Food and Drug Administration approved the use of thalidomide to treat leprosy and now scientists are looking to trial it in the treatment of AIDS, tuberculosis and some types of cancer. What ethical criteria must be considered prior to permitting the use of thalidomide for these diseases? (2 marks)

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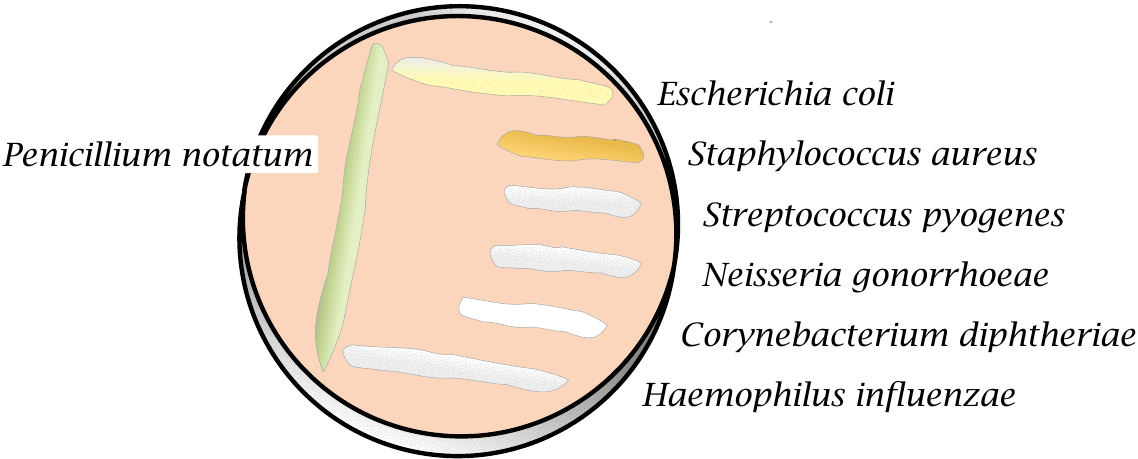
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**Question 32. (6 marks)**

The antibiotic producing mould, Penicillium notatum, was grown on a petri dish as were a number of bacteria. The resulting colony growths are shown below.



(a) What is an antibiotic? (1 mark)

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(b) Which of the two bacteria grown is most resistant to the Penicillium notatum? Give a reason for your choice. (2 mark)

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(2 mark)

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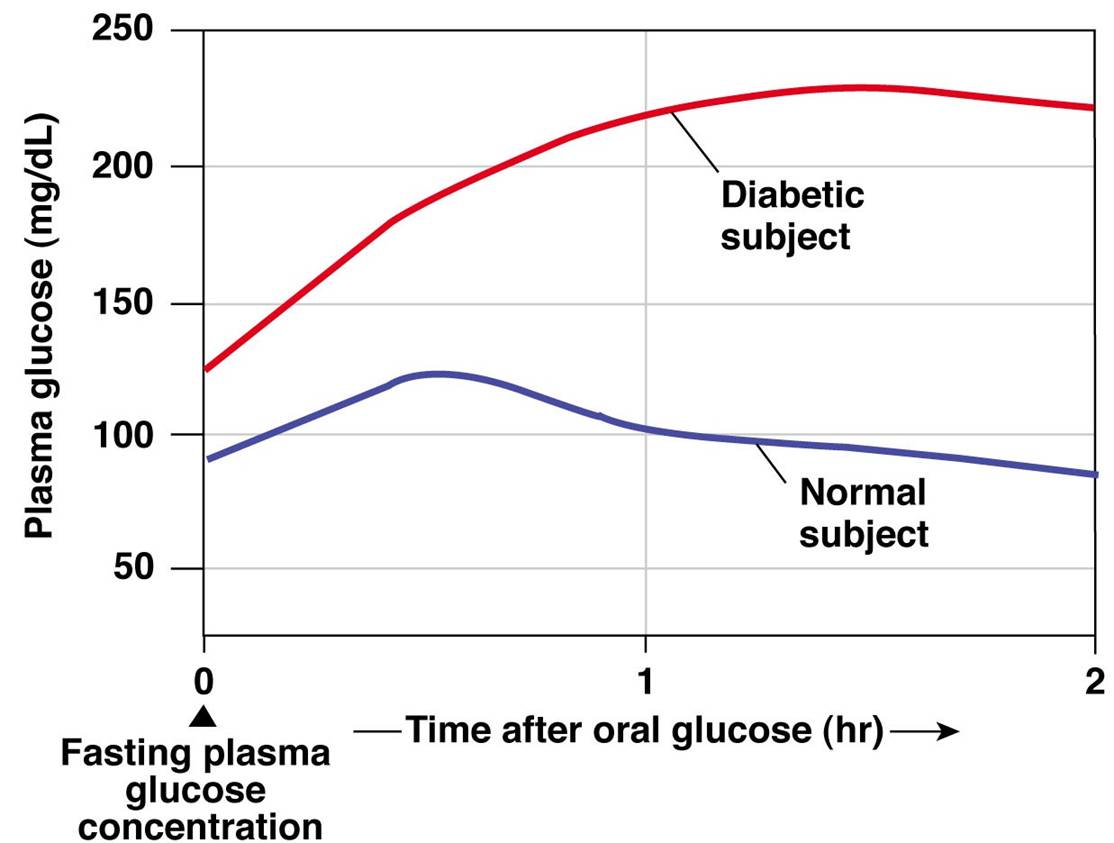
(d) What natural process could have led to the bacteria becoming resistant to this antibiotic? (1 mark)

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**Question 33. (11 marks)**

Glucose tolerance test. To confirm diabetes, a person will normally take a glucose tolerance test in a hospital. Patients do not eat for 12 hours before the test. This gets their blood glucose to its lowest level. They are then given a drink containing 75g of glucose and their blood glucose level is monitored over the next two hours**.** Use this data to answer question on the next page.



1. Describe what has happened in the body of the normal subject in the two hours after the consumption of the glucose drink.

(5 marks)

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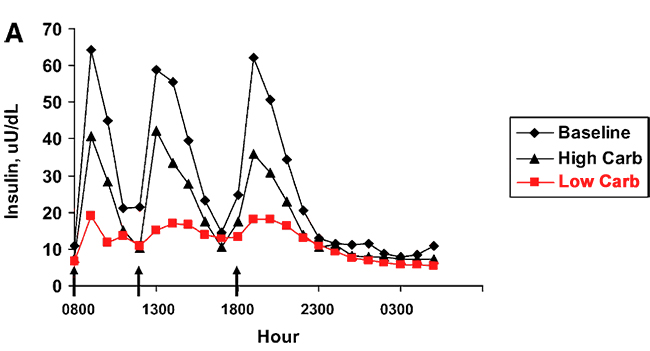
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(b). below is the insulin levels in an individual recorded over one day. Use to answer the questions that follow.



**The time is given in 24 hour Clock**

1. Is the individual normal or diabetic? Give a reason for your answer.

(2 marks)

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1. From this graph state how often the person ate, the times that they ate at and the reason for your choice of times.

(4 marks)

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**Question 34. (5 marks)**

In humans, it has been observed that the heartbeat originates in the heart itself.

(a) Name the structure in the heart that is responsible for the origin of the heartbeat.

(1 mark)

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(b) There are two sets of nerves that are sent to the heart. Which nerve pathway would cause the heart rate to slow? (1 mark)

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(c) If you are seated and then stand up and start walking, your heart rate increases. What structure in the brain is responsible for this increase in heart rate? (1 mark)

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(d) Heart rate increases during exercise. State two stimuli that occur as a result of exercise that will cause this reaction. (2 marks)

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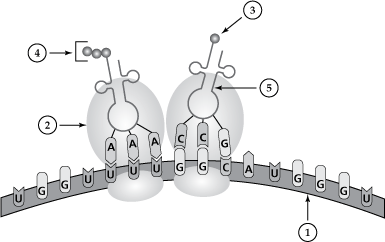
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**Question 35. (8 marks)**

The diagram below shows part of the process of protein synthesis.

[](http://www.google.com.au/url?sa=i&rct=j&q=protein+translation+diagram&source=images&cd=&cad=rja&docid=sVh3265btovfUM&tbnid=6wwYFcFV1wfkSM:&ved=0CAUQjRw&url=http://mdk12.org/instruction/clg/public_release/biology/G3_E2_I1.html&ei=oM4WUrK4F47MkQXu9IBI&psig=AFQjCNEYBxjdH-S5biysDZEeFDJQK1_S9Q&ust=1377312788122406)

(a) What is this part of the process called? (1 mark)

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(b) Name the following structures: (4 marks)

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) (i) How is structure 1 similar to DNA? (1 mark)

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(ii) How is structure 1 different to DNA? (2 marks)

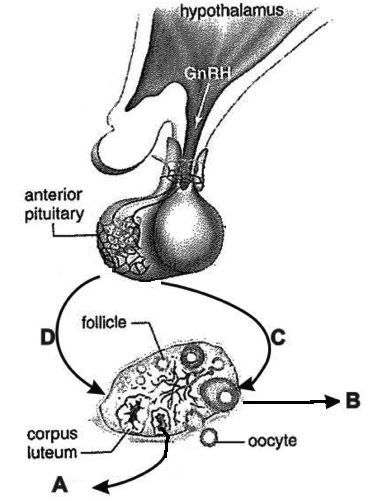
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**Question 36. (15 marks)**

The diagram below shows the relationship between the hypothalamus, pituitary and the ovary.



(a) Which hormones do the labels A, B, C and D represent? (4 marks)

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) A hormone cascade pathway is one in which the secretions of one endocrine gland cause the secretion of hormones from another endocrine gland. Besides the example shown in the diagram above, state one other cascade pathway, naming the endocrine glands involved and the hormones released. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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(c) Complete the table below comparing the different categories of hormones.

(4 marks)

|  |  |  |
| --- | --- | --- |
|  | Amine based hormone | Steroid based hormone |
| Where receptors can be located |  |  |
| Effect on cell activity |  |  |

(d) It is possible to transplant a working pancreas into a patient suffering from Type I diabetes in order to cure the disease. Explain why the use of stem cells to replace the faulty pancreas would be a better option than transplant surgery?

(2 marks)

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(e) Give three advantages of the use of Recombinant DNA technology in the treatment of Classic haemophilia brought about by a lack of factor VIII.

(3 marks)

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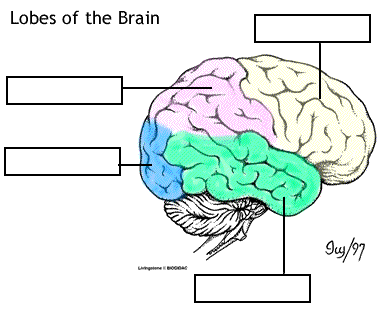
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**Question 37. (8 marks)**

(a) Label the diagram below and use it to answer the question that follows.



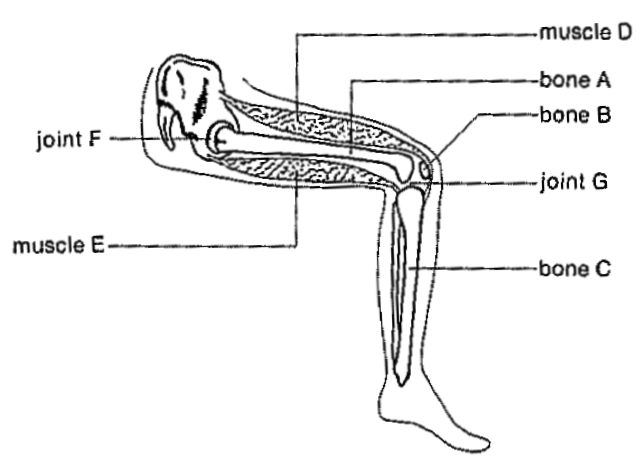
(4 marks)

(b) Based on the previous diagram complete the table below.

|  |  |
| --- | --- |
| Functional area | Lobe of brain that the area is located in |
| Sensory |  |
| Movement |  |
| Personality |  |
| Vision |  |

(4 marks)

**Question 38. (9 marks)**



(a) State two ways in which friction is reduced in Joint G. (2 mark)

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(b) (i) describe the movement of the leg, using the appropriate term, when muscle D contracts? (1 mark)

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(ii) Muscle E is relaxing when muscle D contracts. What is this relationship between the two muscles called? (1 mark)

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(c) Bone A has to withstand extremely strong forces. In fact, bone A is the strongest bone in the human body. Describe one way in which its microscopic organisation has increased its strength. (1 mark)

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(d) Complete the table to show how joints F and G are similar, yet different. (3 marks)

|  |  |
| --- | --- |
| How Joints F and G are Similar | How Joints F and G are Different |
|  |  |

(e) Describe one characteristic that differs between the pelvis of an ape and human.

(1 mark)

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**Question 39. (12 marks)**

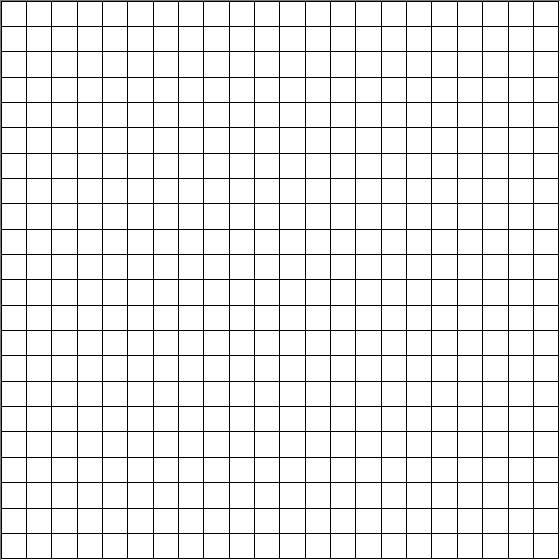
Strontium (Sr) is a pure metal with many stable and unstable isotopes. It is abundant in nature and is found primarily in volcanic rock and soils. As soils erode and filter into water and food sources, strontium is taken into the body of living organisms where it is incorporated into bone tissues in the same way as calcium. The ratio of strontium isotopes also varies from one geographical location to another. One isotope of strontium is Sr 90 .Use this information and the table below to answer the questions that follow.

Percentage of Strontium Sr90 Isotope and Time

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | ***Time (years)*** | ***% Strontium-90 remaining*** | | 0 | 100 | | 28 | 50 | | 56 | 25 | | 84 | 12.5 | | 112 | 6.25 | | 140 | 3.125 | | 168 | 1.5625 | |

(a) Graph this data onto the graph grid on the next page. (5 marks)

(There is a spare graph page at the end of this booklet. If you need to use it, cross this graph out completely and write, “See spare graph grid” on the grid below).



1. Can Sr90 be used for absolute dating? Give a reason for your answer.

(2 mark)

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1. Other than absolute dating what are two uses that Sr90 content could have in archaeology?

(2 marks)

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1. A bone tool handle was found with a Sr90 content of 75%. How long has the animal that the bone came from been dead?

(1 mark)

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1. Was your answer to question 39 (d) extrapolation or interpolation? Give a reason for you answer.

(2 marks)

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**Question 40. (8 marks)**

You hope to study a gene that codes for a neurotransmitter in human brain cells. You know the amino acid sequence of the protein.

(a) Name the procedure you would need to undertake in order to produce: (2 marks)

(i) multiple copies of the gene to study.

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(ii) a quantity of the neurotransmitter for evaluation as a potential medication.

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(b) Describe the procedure you would use to produce multiple copies of the gene. (6 marks)

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**End of Section Two**

**Section Three: Extended answer 20% (40 Marks)**

This section contains **three (3)** questions. You must answer **two (2)** 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 your 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.

Responses could include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; labelled tables and graphs; annotated flow diagrams with introductory notes.

Suggested working time: 50 minutes.

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**Question 41. (20 marks)**

(a) Two skulls were found at an archeological dig site. The researchers were surprised as one skull (Skull A) showed primitive hominin skull features and the other(Skull B) showed modern Homo sapiens features. List what the differences in skull features would be between the primitive and modern hominin. It was estimated that Skull B was 10000 thousand years old.

(6 marks)

(b) What are two characteristics that the two skulls would share to aid an erect stance? State how it is they aid standing erect.

(4 marks)

(c) During the biological evolution of hominins from the earliest australopithecines to early Homo sapiens, there were also significant cultural advances, including tool cultures. Describe these advances in tool culture with reference to the particular hominin groups of australopithecines, Homo habilis, Homo erectus and early Homo sapiens. Including manufacture and uses.

(8 marks)

(d) Could DNA analysis be used to compare the relationship between the two skulls?

(2 marks)

**Question 42. (20 marks)**

(a) With the extreme cold temperatures seen in some parts of Europe recently, regulation of body temperature can become a matter of life and death, especially for the aged. Explain how human bodies typically act to maintain core body temperature under cold conditions, both physiologically and behaviourally. (12 marks)

(b) In 1775, a typhoon reduced the population of Pingelap, an island in Micronesia from 2000 to 20. Among the survivors was a person heterozygous for achromatopsia, an inherited form of total colour blindness. Describe how and why the gene pool of this population would have been affected by this event over time if this is an isolated population. (4 marks)

(c) Describe how mature osteocytes are supplied with their requirements.

(4 marks)

**Question 43. (20 marks)**

(a) Allele frequency can be changed by random genetic drift and genetic bottle necks.

(i) What is meant by allele frequency?

(1 marks)

(ii) Give a brief description of random genetic drift and state what type of populations it can have the greatest impact on?

(2 marks)

(iii) Give a brief description of genetic bottle necks and give one possible cause.

(3 marks)

(iv) Natural selection can also alter allele frequency. Briefly describe natural selection.

(4 marks)

(b) In recent years protein analysis and DNA analysis have been used to investigate evolution.

(i) Explain how both of these methods can be used.

(4 marks)

(ii). Darwin did not have these two methods of analysis available to him. State and briefly explain the two sources of evidence that were available to him.

(4 marks)

(iii). State one more source of evidence for evolution and describe it.

(2 marks)

**End of Questions**

Question number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Additional working space**

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Use this grid to answer Question 39 if you have cancelled your first attempt.

