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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, 2013**  **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 | 9 | 9 | 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 2013*. 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. Movement of skeletal muscle to cause movement of the hands is initiated in the cerebrum and its coordination:

(a) requires input from the hypothalamus.

(b) requires input from the cerebellum.

(c) requires input from the parasympathetic nervous system.

(d) requires no other input.

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

(a) Fatty acids because it is soluble in lipid.

(b) Glucose because it is a small molecule.

(c) Oxygen because the middle of the cell membrane is hydrophobic.

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

3. ATP

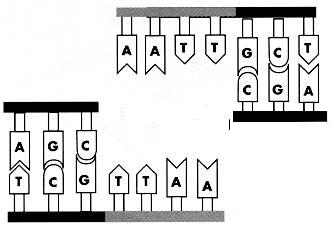
(a) is required for the movement of glucose through a channel protein.

(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.

1. During ossification:
2. the cartilage becomes calcified, killing the cartilage cells.
3. calcium sulphate invades the collagen fibres.
4. osteoclasts invade the cartilage and cut off the supply of blood to the osteocytes.
5. Haversian canals are covered over.
6. Look at the diagram below and use it to answer this question.



The diagram above shows:

(a) two blunt end DNA fragments.

(b) two complimentary sticky end DNA fragments

(c) two non-complimentary sticky end DNA fragments.

(d) one blunt end and one sticky end DNA fragment.

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. DNA technology is extremely useful in a variety of medical fields. Which of the following techniques is NOT routinely used at present?

(a) Production of hormones to treat diabetes and dwarfism

(b) Production of viral proteins for use in vaccines

(c) Identification of genes causing genetic diseases such as breast cancer

(d) Introduction of genetically engineered genes into gametes to cure cystic fibrosis

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 dioxide and falling oxygen

11. An excessive loss of both water and salt, such as through extreme diarrhoea, would

(a) cause an increase in aldosterone secretion.

(b) result in the release of ADH.

(c) immediately cause an increase in blood pressure.

(d) cause vasodilation to occur in the arterioles of the extremities.

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

The polio virus is transmitted through dirt and soil. In most people, infection by the polio virus

results in an intestinal disturbance which has few or no symptoms. However, in some people, the virus causes paralysis when it moves from the intestine to the nervous system. Polio is now rare in Australia because of the vaccination programme begun in the 1950’s using the Salk vaccine. This involved an injection of the dead virus. Later the Sabin method was introduced which consisted of a weakened living virus that was swallowed as a liquid.

12. The Sabin form of the vaccine

(a) was an example of an attenuated virus.

(b) and Salk form were based on a recombinant form of the polio virus.

(c) would be more effective in developing countries than the Salk form.

(d) would typically be given to adults rather than children.

13. What type of immunity was offered by both the Sabin and Salk forms of vaccination?

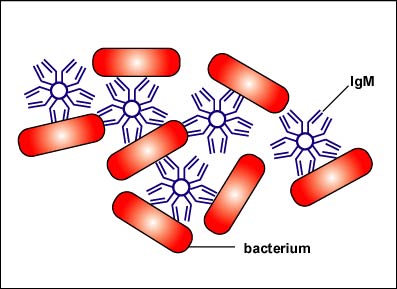
(a) Artificial active

(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:

1. Lysis.
2. Opsonisation.
3. Agglutination.
4. 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. Which of the following structures of the central nervous system are correctly matched with their function?

(a) Medulla oblongata - thinking and memory

(b) Cerebellum – motor coordination

(c) Hypothalamus – regulates breathing rate and depth

(d) Cerebrum – controls sleeping and sexual cycles

17. In bipedal primates:

(a) the foramen magnum is nearer the back of the skull.

(b) the foramen magnum is nearer the centre of the skull.

(c) the pelvis to femur joint is fused.

(d) the pelvis is long and narrow.

18. You unearth a fossil and tests indicate that its carbon 14 to carbon 12 ratio is about 1/16 that of similar present day organisms. What is the approximate age of the fossil you found?

(a) 11,460 years

(b) 17,190 years

(c) 22,920 years

(d) 28,650 years

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

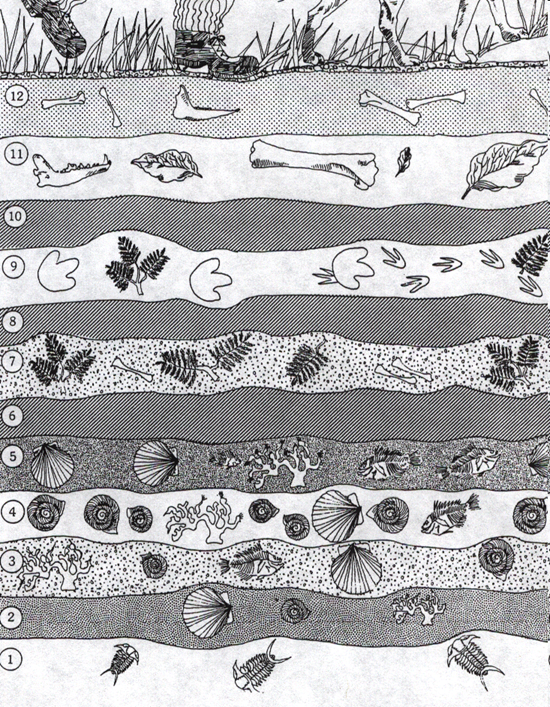
(a) *Homo neanderthalensis* – agriculture

(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 shown below.**

[](http://www.google.com.au/url?sa=i&rct=j&q=comparing+rock+strata+and+fossils&source=images&cd=&cad=rja&docid=zO6iXidCSHsAiM&tbnid=yTt3LaOnESsNmM:&ved=0CAUQjRw&url=http://www.studyblue.com/notes/note/n/geology-final/deck/4704629&ei=kkAlUpW2NMizkgX4qYCYDg&psig=AFQjCNFJbmiOqtCODad3kpnGJeiowF38Kw&ust=1378259234282493)

20. Which of the following statements are true?

(a) Stratum 5 is older than stratum 1, but younger than stratum 12.

(b) Stratum 5 is older than stratum 12, but younger that stratum 1.

(c) The species in stratum 1 would have evolved from the species in stratum 5.

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

21. The bones in layer 12 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?

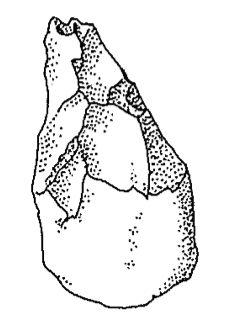
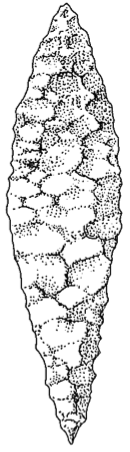
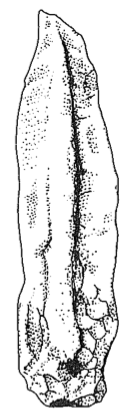
(a) III, IV and IX

(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. A man suffered damage to the occipital lobe of the cerebrum in a car crash. Which of the following may have been a symptom?

(a) Loss of the sense of smell.

(b) Problems with visual processing?

(c) Shortness of breath.

(d) Loss of fine motor skills.

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. All the statements below show how T cells and B cells are similar, except one. Which one is INCORRECT?

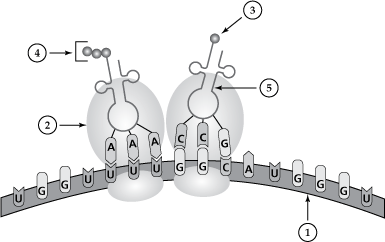
(a) They both produce memory cells to speed up the response in the future.

(b) Both of them are specific in that they only respond to one type of antigen.

(c) Once they recognise an antigen they are both activated, sensitised, enlarge and divide.

(d) They both rely on a macrophage to bring the antigen to them.

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**

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

This section has **nine** 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. (20 marks)**

“Junk food, sugary drinks and insulin may be major players in the onset of Alzheimer’s disease,” screamed the Health and Medicine section of the West Australian in January this year. The article went on to say that studies have shown that Type 2 diabetics have a 50% increased chance of developing dementia. Professor Martins, from the McCusker Alzheimer’s Research Foundation, stated that he had shown in his investigation that amyloid levels build up in response to high insulin levels. The prediction of up to 3 million people developing Alzheimer’s between now and 2050 is now believed to be only half that expected given the observed rise in obesity and Type 2 diabetes levels in this country.

(a) Use the feedback model to describe the way in which high blood glucose would be returned to an optimal level in a healthy person. (6 marks)

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(b) Explain the effect of Type 2 diabetes on the regulation of blood glucose. (2 marks)

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(c) Explain the effect of a build up of amyloid in brain tissue. (2 marks)

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(d) What would have been the dependent variable in Professor Martins’ investigation?

(1 mark)

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(e) State three symptoms experienced by someone with Alzheimer’s. (3 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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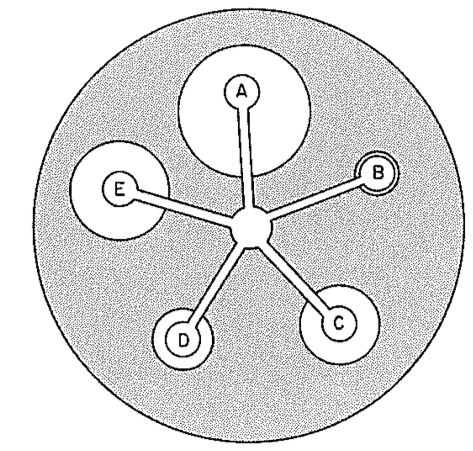
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**Question 32. (5 marks)**

A man arrived home from Bali with what he thought was a big pimple on his right buttock. Unfortunately, it quickly became enlarged, taking up almost the whole of that side of his buttock and began to encroach out onto his thigh. It was hot, red, painful and full of yellow pus that continually oozed out of an open wound at its centre. His wife took him to the doctor when he started suffering raging fever, sweats and chills. The doctor took a sample of the pus, cultured it on a nutrient agar gel in a petri dish with five different types of antibiotics (small circles A, B, C, D and E) and incubated it at 30oC. The dark shaded area shows where the bacteria have grown and the white space is where bacteria have not grown.



A = penicillin

B = tetracycline

C = tinidazole

D = enoxacin

E = erythromycin

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

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(b) The man told the doctor he was allergic to penicillin. According to the petri dish shown above, which antibiotic should the doctor give the man? (1 mark)

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(c) The bacteria causing his condition appear to be resistant to one of these antibiotics. According to the petri dish shown above, which one is it resistant to? (1 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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(e) At the turn of the century, spider webs containing trapped fungal spores were often placed over minor cuts and wounds. Why would this have been done? (1 mark)

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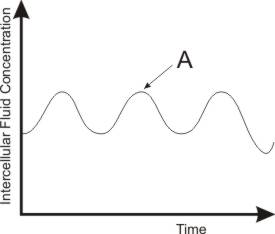
**Question 33. (9 marks)**

(a) What type of receptors detect changes in body fluid and where are they located? (2 marks)

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The graph below shows the fluctuations in body fluid over time.

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(b) Draw in the optimal intercellular fluid concentration line onto the graph. (1 mark)

(c) State two mechanisms the body might employ at point A on the graph to decrease intercellular fluid concentration. (2 marks)

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(d) (i) At one point, the person’s fluid levels seem to have dropped outside the normal

range. What might have caused this change? (1 mark)

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(ii) What is the effect of this on their: (3 marks)

water levels in their cells \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

amount of ADH produced \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

blood pressure \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 34. (7 marks)**

In vertebrates, 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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(e) Besides adrenalin, name two other hormones that would increase heart rate.

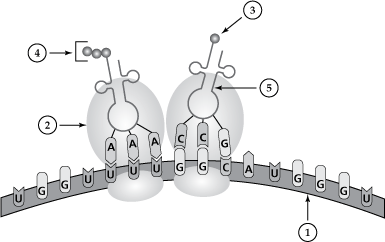
(2 marks)

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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)

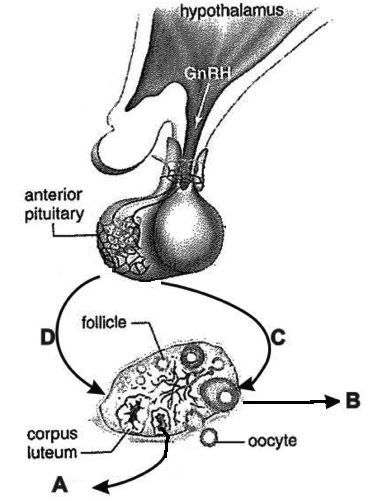
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**Question 36. (13 marks)**

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) Explain why gene therapy is being considered for Huntington’s chorea and cystic fibrosis but not for changing skin colour. (1 mark)

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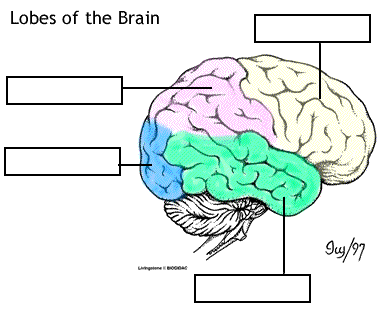
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**Question 37. (8 marks)**

1. Label the diagram below and use it to answer the question that follows.

a.



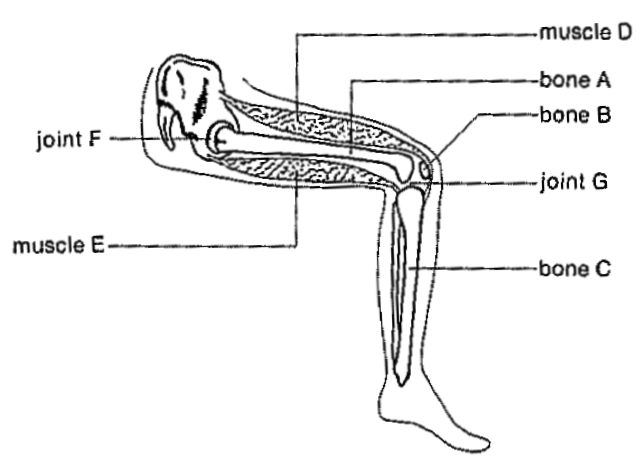
(4 marks)

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 |
| They both ….. | F ……  G……. |

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

(1 mark)

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**Question 39. (12 marks)**

Mosquitoes resistant to the pesticide DDT first appeared in India in 1959. The table below shows how the mosquito resistance to DDT changed over time in India once spraying began.

|  |  |
| --- | --- |
| Time (Months) | Mosquitoes resistant to DDT (%) |
| 0 | 4 |
| 8 | 45 |
| 12 | 77 |

(a) Graph this data. (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).

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(b) (i) What percentage of mosquitoes would you expect to be resistant to DDT at four

months ? (1 mark)

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(ii) Using correct terms explain if this is a reliable estimate. (2 mark)

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(c) Explain why genetic variation within a population is necessary for evolution.

(2 marks)

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**Question 40. (9 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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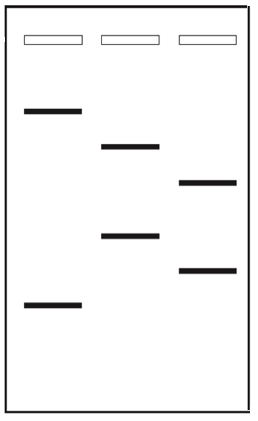
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(c) Recently, two couples in the same hospital in Korea each gave birth to a child on the same day. Three months later one couple returned to the hospital concerned that the child wasn’t theirs. The DNA test for this couple and the child they were given is shown below.

Father

Mother

Baby

(i) Explain why this child does not belong to this couple. (1 mark)

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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) A recent hominin skeletal find has contributed to our understanding of the theory of evolution in two ways: through fossil evidence and comparative anatomy. Discuss how these two pieces of evidence support the theory of evolution. (10 marks)

(b) Muscle contraction is believed to occur due to a sliding filament model. Describe the sliding filament model of muscle contraction. Use a correctly labelled diagram. (10 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)**

1. A recent fossil find showed that some hominins hafted their tools – they attached wooden handles to some of the bone hand axes they utilised for a variety of tasks. Fluorine dating was utilised in an attempt to date that tool and others found at the same site. Briefly explain how fluorine dating is carried out and identify any limitations it may have.

(7 marks)

(b) 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)

(c) Humans are classified as both primates and hominins. Describe the features that place us in each of these groups. (10 marks)

**End of Questions**

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

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**Additional working space**

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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.

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