**Elgin High School**



**CfE Higher Human Biology**

**Homework/Revision Booklet 2014**

**This Booklet covers all homework for CfE Higher Human Biology – look after it carefully.**

**If you lose it you will be charged for a replacement.**

**Unit 1 - Human Cells**

**Division and Differentiation:**

2012 Paper:

Section A:

1. Which of the following is not a use of stem cells? (1)

A Skin grafts

B Drug testing

C IVF treatment

D Bone marrow transplant

2. Which line in the table below describes correctly cell division in a specific cell type? (1)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Cell Type | Type of Cell Division | Chromosome number in cells produced |
| A | Somatic  | Meiosis | Diploid |
| B | Somatic | Meiosis | Haploid |
| C | Germline | Mitosis | Haploid |
| D | Germline | Mitosis  | Diploid |

2012 Paper:

Section B1:

The diagram below shows some stages in the development of blood cells and nerve cells.



1. What are stem cells? (1)
2. State the location of the tissue stem cells which develop into blood cells. (1)
3. Describe what is meant by the term *differentiation.* (1)
4. Both embryonic stem cells and tissue stem cells are used in medical research.

Give **one** reason why embryonic stem cells are potentially more useful than tissue stem cells. (1)

SQP Section B1:

The human body contains hundreds of cell types all of which have developed from stem cells in the early embryo.



1. (i) What are stem cells? (1)
2. (ii) Name two types of cell that may develop from tissue stem cells in red bone marrow. (1)
3. A company has developed a drug that could treat the symptoms of an inherited disease. Before proceeding to clinical trials using volunteers, the company decides to carry out additional tests in the laboratory using stem cells.

What ethical considerations might have influenced this decision to use stem cells? (2)

**Structure and Replication of DNA:**

2012 Section A:

3. How many adenine molecules are present in a DNA molecule of 4000 bases, if 20% of the base molecules are cytosine? (1)

A 400

B 600

C 800

D 1200

4. Which of the following statements about DNA replication is correct? (1)

A Polymerase adds nucleotides to the 3’ end of a DNA strand

B Polymerase adds nucleotides to the 5’ end of a DNA strand

C Ligase adds nucleotides to the 3’ end of a DNA strand

D Ligase adds nucleotides to the 5’ end of a DNA strand

SQP Section C1A:

Give an account of DNA under the following headings:

1. The structure of DNA (5)
2. The replication of DNA (5)

**Gene Expression:**

2013 Section A:

5. Which of the following terms describes types of mutation which occur in both genes and chromosomes? (1)

A Deletion

B Insertion

C Duplication

D Translocation

SQP Section B2:

The diagram below shows stages in the synthesis of a protein.



1. Complete the table below to name stages 1 and 3 and give the exact location within the cell where these stages occur. (2)

|  |  |  |
| --- | --- | --- |
| Stage | Name | Exact Location |
| 1 |  |  |
| 3 |  |  |

1. Name the enzyme that catalyses stage 1 of this process. (1)
2. (i) Explain why a primary mRNA molecule is so much shorter than chromosomal DNA. (1)

(ii) Explain why a final mRNA molecule is shorter than a primary mRNA molecule. (1)

1. Name two forms of RNA, not shown in the diagram, that are involved in protein synthesis. (1)

**Genes and Proteins in Health and Disease:**

2013 Section A:

6. The following is a list of single gene mutations.

1 Nonsense

2 Missense

3 Frameshift

Which of these gene mutations is the result of a single-nucleotide substitution?(1)

A 1, 2 and 3

B 1 and 2 only

C 3 only

D 1 only

SQP Section A:

1. The diagram below shows two chromosomes, M and N, before and after a chromosomal mutation.



The form of mutation that has taken place is a (1)

A translocation

B duplication

C insertion

D deletion.

**Human Genomics:**

2012 Section A:

8. During the polymerase chain reaction (PCR) samples of DNA are repeatedly heated and cooled.

Why are the samples cooled? (1)

A To denature DNA polymerase

B To slow the reaction down

C To allow primers to bind to target sequences

D To separate the DNA strands

9. What is the function of a DNA probe? (1)

A To replicate a particular region of DNA

B To join fragments of DNA together

C To remove non-coding sections of DNA

D To detect the presence of specific DNA sequences

10. The diagram below shows the results of a paternity test. It compares DNA samples from five individuals.

Woman S is the mother of child X and child Y. Men P and Q are possible fathers of these children.



Which of the following conclusions can be drawn from these results? (1)

A Man P could be the father of child X

B Man P could be the father of child Y

C Man Q could be the father of child X

D Man Q could be the father of child Y

SQP Section A:

2. Amplification of DNA by PCR commences with 1000 molecules of DNA in the reaction tube.

How many DNA molecules would there be after four cycles of PCR? (1)

A 4000

B 8000

C 16 000

D 32 000

**Metabolic Pathways:**

2013 Section A:

7. Metabolic pathways can be controlled by feedback inhibition where (1)

A an end product binds to an enzyme found at the start of the pathway

B an end product binds to an enzyme found at the end of the pathway

C an enzyme binds to a substrate found at the start of the pathway

D an enzyme binds to a substrate found at the end of the pathway.

2013 Section B1:

Trypsin is an enzyme which catalyses the breakdown of proteins in the small intestine.

The graphs below show how pH and temperature affect the activity of trypsin.



1. (i) State the optimum conditions for trypsin activity. (1)

(ii) State the range of conditions over which trypsin shows at least 40% of its maximum activity. (1)

1. Explain the role of the active site in enzyme-catalysed reactions. (3)

SQP Section A:

3. Which of the following is the best description of metabolism? (1)

A The breakdown of chemicals to release energy

B The rate at which an organism produces heat energy

C The chemical reactions of organisms

D The breakdown of food molecules

SQP Section B3:

An experiment was carried out to investigate the effect of substrate concentration on product production in an enzyme controlled reaction.

The enzyme urease was used which breaks down urea into ammonia.



Urease and urea solutions were mixed together

and added to test tubes containing agar jelly as

shown in the diagram.

Five different concentrations of urea solution

were added to the test tubes.

During the reaction the ammonia produced

diffused through the agar changing the indicator

from yellow to blue.

The length of the agar stained blue was measured

after the experiment had been allowed to run for

48 hours. Results are shown in the table below.

|  |  |
| --- | --- |
| Urea concentration added (molar) | Average length of agar stained blue (mm) |
| 0•50 | 32 |
| 0•25 | 16 |
| 0•13 | 8 |
| 0•06 | 4 |
| 0•03 | 2 |

1. Plot a line graph to illustrate the results of the experiment. (2)
2. Name **three** variables which should be controlled when setting up this investigation. (2)
3. What feature of this investigation makes the results reliable? (1)
4. Explain why the test tubes had to be left for 48 hours before the results were obtained. (1)
5. What conclusion can be drawn from the results of this experiment? (1)
6. Use the information in the table to predict the length of agar that would have been stained blue if a 0·75 molar solution of urea had been used in the experiment. (1)
7. Thiourea is a competitive inhibitor of urease.

In a further experiment another test tube of agar jelly had the urease solution, 0·5 molar urea and 0·5 molar thiourea added to it.

After 48 hours 7 mm of agar had turned blue.

(i) Explain why less agar turned blue in this experiment than in the first

experiment which also used 0·5 molar urea solution. (1)

(ii) Explain why 7 mm of agar jelly was able to turn blue in this experiment. (1)

**Cellular Respiration**:

2013 Section A:

8. High-energy electrons from NADH are used in the final stage of respiration.

Which of the following statements about the role of these electrons is not correct? (1)

A They are involved in ATP synthesis.

B They are involved in pumping hydrogen.

C They are involved in the release of energy.

D They are involved in the formation of carbon dioxide.

9. A build-up of which of the following combinations of substances would inhibit the activity of phosphofructokinase? (1)

A Citric acid and ATP

B ATP and lactic acid

C Citric acid and creatine phosphate

D Creatine phosphate and lactic acid

2013 Section B2:

 The diagram below shows the metabolism of three energy sources in a cell.



1. Name X, Y and Z. (2)
2. What term describes the breakdown of carbohydrate into pyruvate during respiration? (1)
3. Describe what happens to acetyl coenzyme A during respiration. (1)
4. When might the body obtain most of its energy from proteins? (1)
5. Carbohydrate is stored in the body.
6. State the form in which carbohydrate is stored and where it is stored. (1)

SQP Section B4:

The diagram below summarises part of the respiratory pathway within a cell.



1. Stage 1 is the energy investment stage of glycolysis while stage 2 is the energy pay-off stage of glycolysis.

(i) What happens during the energy investment stage? (1)

(ii) What happens during the energy pay-off stage? (1)

1. During glycolysis hydrogen ions are released.

(i) Name the type of enzyme that removes hydrogen ions from one of the intermediate compounds. (1)

(ii) Name the coenzyme molecule that the hydrogen ions are passed to. (1)

1. (i) Name compound X. (1)

(ii) Describe what happens to acetyl coenzyme A in the next stage of the respiratory pathway. (1)

**Energy Systems in Muscle Cells:**

2013 Section C1B:

Give an account of skeletal muscle cells under the following headings.

(i) Lactic acid metabolism; (4)

(ii) Slow twitch muscle fibres; (3)

(iii) Fast twitch muscle fibres. (3)

2012 Section A:

12. The graph below shows the changes which occur in a body’s food stores during four weeks of food deprivation.



Which of the following conclusions can be drawn from the graph? (1)

A The glycogen food store decreases at the fastest rate during week one.

B Between weeks three and four the body gains most energy from protein.

C Each food store decreases at a constant rate during week one.

D Between weeks one and four the body only gains energy from lipid and protein.

13. Which of the following equations describes correctly the role of creatine phosphate? (1)

A ADP + phosphate + creatine creatine phosphate + ATP

B creatine phosphate + ADP ATP + creatine

C creatine phosphate + ATP ADP + phosphate + creatine

D ATP + phosphate creatine phosphate + ADP

14. Which line in the following table describes correctly fast-twitch muscle fibres? (1)



SQP Section A:

4. Which of the following statements about slow twitch muscle fibres is correct? (1)

A They cannot sustain contractions for as long as fast twitch muscle fibres.

B They have many more mitochondria than fast twitch muscle fibres.

C They are better for activities like weightlifting and sprinting than fast twitch fibres.

D They store fuel mainly as glycogen while fast twitch muscle fibres store fuel as fat.

**Unit 2 – Physiology & Health**

**The Structure and Function of Reproductive Organs and Gametes and their role in Fertilisation:**

2012 Section A:

16. The sperm counts of a sample of men taken between 1940 and 2000 are shown in the graph below.



What is the average reduction in sperm count per year? (1)

A 0·67 million/cm3/year

B 0·75 million/cm3/year

C 0·92 million/cm3/year

D 45 million/cm3/year

SQP Section A:

5. The diagram below shows a cross-section of part of a testis.



Which cell can produce testosterone? (1)

6. The table below contains information about four semen samples.



Which semen sample has the highest number of active sperm per cm3? (1)

**Hormonal Control of Reproduction:**

2013 Section A:

11. The graph below shows changes in the concentration of hormones X and Y in the blood during the menstrual cycle.



Which of the following correctly identifies hormones X and Y? (1)



12. Changes in the ovary during the menstrual cycle are described below.

1 Corpus luteum forms

2 Ovulation occurs

3 Progesterone is produced

4 Corpus luteum degenerates

5 Follicle develops

The sequence in which these changes occur following menstruation is (1)

A 2, 3, 1, 5, 4

B 2, 1, 3, 4, 5

C 5, 3, 2, 1, 4

D 5, 2, 1, 3, 4.

2013 Section B:

5. The flowchart summarises the processes involved in the production of semen.



1. Name hormone X and tissue Y. (2)
2. Semen contains substances secreted by structure Z.

(i) Identify structure Z. (1)

(ii) Describe the role of the secretions from the seminal vesicles and structure Z. (1)

1. Complete the table to show the percentage of each type of cell which would contain a Y chromosome. (1)



6. The graphs below show changes in the volume and composition of milk produced by a woman in the first week following the birth of her child.



1. From Graph 2, describe two ways in which the composition of milk produced in the first three days after birth differs from milk produced later. (1)
2. What was the volume of milk produced on day 3? (1)
3. (i) Between days 2 and 3 this woman produced a constant mass of IgA. Explain why the concentration of IgA in her milk decreased during this time. (1)

(ii) Express, as a simple whole number ratio, the concentration of IgA

compared to the concentration of lactose produced on day 6. (1)

(1g = 1000 mg)

1. Using **Graphs 1 and 2**, calculate the mass of lactose produced on day 5. (1)

SQP Section C2A:

Describe hormonal control of the first half of the menstrual cycle. (10)

**The Biology of Controlling Fertility:**

2013 Section A:

15. The morning after pill works by (1)

A causing thickening of cervical mucus

B preventing release of oestrogen

C preventing implantation

D causing menstruation.

16. The diagram below shows the transmission of the gene for albinism.



This condition is inherited as a characteristic which is (1)

A dominant and not sex-linked

B recessive and not sex-linked

C dominant and sex-linked

D recessive and sex-linked.

2012 Section A:

17. Which of the following forms of contraception causes thickening of the cervical mucus? (1)

A Mini-pill

B Barrier methods

C Morning-after pill

D Intra-uterine device

**Ante- and Post- Natal Screening**

2013 Section A:

14. Nicotine is a chemical which may affect ante-natal development.

The diagram shows the stages of development when major and minor malformations of organs may occur if there is exposure to nicotine.



For how many weeks during pregnancy is there a possibility of major malformations to organs during development? (1)

A 6

B 7

C 9

D 13

17. Familial hypercholesterolaemia (FH) is caused by an autosomal dominant allele.

The family history below shows the inheritance of FH through three generations.



Which individual confirms that this condition is autosomal? (1)

2013 Section B4:

Haemophilia is a sex-linked disorder caused by a recessive allele (h) which results in an individual producing a faulty blood clotting protein.

The diagram below shows the sex chromosomes from two individuals.

1. Individual A is male while individual B is a female carrier of the allele for haemophilia.



(i) Complete the diagram by labelling the alleles on the sex chromosomes of individual B. (1)

(ii) State the genotypes of individuals A and B. (1)

(iii) What is the chance that a daughter produced by this couple will have haemophilia?

Explain your answer. (1)

1. Damage to blood vessels sets in motion a series of events which results in the formation of a blood clot.

A plasma protein is converted into a meshwork of threads, causing the blood to clot.

Name this plasma protein and describe how it is converted into threads. (2)

2012 Section A:

18. The graph below shows the growth in length of a human fetus before birth.



What is the percentage increase in length of the fetus during the final 4 months of pregnancy? (1)

A 33·3

B 60·0

C 62·5

D 150·0

2012 Section C2B:

Discuss the screening and testing procedures which may be carried out as part of antenatal care. (10)

SQP Section A:

8. In which of the following situations might a fetus be at risk from Rhesus antibodies produced by the mother? (1)



12. Cystic fibrosis is a genetic condition caused by an allele which is not sex-linked.

A child is born with cystic fibrosis despite neither parent having the condition.

The parents are going to have a second child.

What is the chance this child will have cystic fibrosis? (1)

A 75%

B 67%

C 50%

D 25%

SQP Section B5:

Sickle cell disease is an autosomal blood disorder in which a faulty form of haemoglobin, called haemoglobin S, is produced. This protein is an inefficient carrier of oxygen.

The allele for normal haemoglobin (H) is incompletely dominant to the allele for haemoglobin S (S).

Heterozygous individuals (HS) suffer from a milder condition called sickle cell trait.

The diagram below shows the incidence of these conditions in three generations of a family.



1. State the genotypes of individuals 1 and 5. (1)
2. Individuals 3 and 4 go on to have a 3rd child.

What is the percentage chance that this child will have the same genotype as the parents? (1)

1. Sickle cell disease is caused by a substitution mutation in the gene that codes for haemoglobin.

(i) Describe how this form of mutation affects the structure of the gene. (1)

(ii) Suggest how this might change the structure of a protein such as haemoglobin. (1)

1. During IVF treatment, it is possible to detect single gene disorders in fertilised eggs before they are implanted into the mother.

What term describes this procedure? (1)

1. It has been discovered that the gene which codes for fetal haemoglobin is unaffected by the substitution mutation that causes sickle cell disease.

This gene is “switched off” at birth.

Use this information to suggest how a drug designed to treat sickle cell anaemia in young children could function. (1)

**The structure and function of Arteries, Capillaries and Veins:**

2013 Section B7:

The diagram below shows some blood vessels within muscle tissue of an athlete.

The direction of blood flow is indicated by the arrows.



1. Name the type of blood vessels labelled X and Y. (1)
2. Name two substances which are at a higher concentration in the blood at point P than at point S. (1)
3. The athlete ran on a treadmill at high speed for ten minutes.

Explain why the concentration of lactic acid in his blood increased during this time. (1)

1. Tissue fluid surrounds the muscle cells.

Some of this fluid is reabsorbed into the bloodstream.

How else is tissue fluid removed from around the muscle cells? (1)

2012 Section B7

1. The diagram shows a section through an artery.



(i) Name the parts of the artery labelled Y and Z. (1)

(ii) Layer X contains elastic fibres.

Name one other type of tissue found in layer X. (1)

(iii) Describe the role of the elastic fibres in the wall of an artery. (1)

1. Veins are another type of blood vessel.

Name a structural feature of a vein and describe its function. (1)

1. Name the two blood vessels which carry blood away from the heart. (1)

2012 Section C2A:

Discuss the exchange of substances between plasma and body cells. (10)

**The Structure and Function of the Heart:**

2013 Section A:

20. Which line in the table below describes correctly the state of the heart valves during ventricular systole? (1)

|  |  |  |
| --- | --- | --- |
|  | Atrio-ventricular | Semi-lunar |
| A | open | open |
| B | closed | closed |
| C | open | closed |
| D | closed | open |

21. During a competition, a trained athlete can increase his cardiac output by 7 times.

If an athlete has a resting heart rate of 60 beats/min and a resting stroke volume of 70 cm3/beat, his maximum cardiac output is (1)

A 8·2 cm3/min

B 4200 cm3/min

C 29 400 cm3/min

D 36 000 cm3/min.

22. Mean arterial pressure (MAP) is a measure of blood pressure in the arteries.

Pulse pressure is the difference between systolic and diastolic blood pressure.

MAP is calculated using the following formula:

MAP = diastolic pressure + (pulse pressure/3)

Using this formula, the MAP of an individual with a blood pressure reading of 122/80 mmHg is (1)

A 42 mmHg

B 56 mmHg

C 94 mmHg

D 136 mmHg.

2012 Section B8

The graph below shows changes in the volume of blood in the left ventricle of a man’s heart.



1. How long does ventricular systole last? (1)
2. (i) What is the heart rate of this man (in beats per minute)? (1)

(ii) Calculate the volume of blood leaving this man’s left ventricle every minute. (1)

1. When this man exercises, the volume of blood leaving his heart increases significantly.

Describe how the nervous system and hormones cause this increase. (3)

SQP Section A:

13. The duration of the stages in an individual’s cardiac cycle are shown in the table below. (1)

|  |  |
| --- | --- |
| Stage | Duration (s) |
| Diastole | 0.4 |
| Atrial systole | 0.1 |
| Ventricular systole | 0.3 |

What is the heart rate of this individual?

A 48 beats per minute

B 75 beats per minute

C 80 beats per minute

D 150 beats per minute

14. The diagram shows a cross-section of the heart.



Which of the following describes correctly the movement of the valves during ventricular systole? (1)

A Valves P and Q open and valves R and S close.

B Valves P and R open and valves Q and S close.

C Valves P and Q close and valves R and S open.

D Valves P and R close and valves Q and S open.

SQP Section B7:

The graph below shows how a man’s heart beat and stroke volume changed as his oxygen uptake increased.



1. (i) What was the man’s pulse rate when his rate of oxygen uptake was 1·2 litres/minute? (1)

(ii) Describe how the stroke volume of his heart changed as oxygen uptake increased. (1)

(iii) What was the stroke volume of his heart when his pulse rate was 110 beats per minute? (1)

1. What was the cardiac output of the man’s heart when his rate of oxygen uptake was 2·4 litres per minute? (1)
2. Name the pacemaker which generates the impulses that cause the heart to contract and the hormone which increases the rate of these contractions. (2)

**Pathology of Cardiovascular Disease (CVD):**

2013 Section A:

23. Statins are drugs which are used to control blood (1)

A pressure

B insulin level

C glucose level

D cholesterol level.

2012 Section A:

21. During a competition, a trained athlete can increase his cardiac output by 7 times.

If an athlete has a resting heart rate of 60 beats/min and a resting stroke volume of 70 cm3/beat, his maximum cardiac output is (1)

A 8·2 cm3/min

B 4200 cm3/min

C 29 400 cm3/min

D 36 000 cm3/min.

SQP Section A:

15. Which of the following is a correct description of peripheral vascular disease (PVD)? (1)

A A blood clot in the arteries associated with the heart and brain

B A blood clot in the arteries associated with the legs

C A narrowing of the arteries associated with the heart and brain

D A narrowing of the arteries associated with the legs

16. Which of the following statements about lipoprotein is correct? (1)

A LDL transports cholesterol from body cells to the heart.

B LDL transports cholesterol from body cells to the liver.

C HDL transports cholesterol from body cells to the heart.

D HDL transports cholesterol from body cells to the liver.

**Blood Glucose Levels and Obesity:**

2013 Section A:

25. Which line in the table below identifies correctly the effects of Type 1 and Type 2 diabetes? (1)



26. The graph below shows the effect of the carbon dioxide concentration of inhaled air on the breathing rate of an individual.



If the volume of one breath is 0·5 litre, what volume of air will be breathed in one minute when the CO2 concentration is 4%? (1)

A 6 litres

B 9 litres

C 18 litres

D 36 litres

2013 Section B9:

Rising levels of obesity are a major concern in modern Scottish society. Successive governments have tried to promote healthy eating and exercise in an attempt to address this problem.

1. (i) One measure of obesity is the body mass index (BMI).

 What measurements are taken to calculate BMI? (1)

 (ii) What is the minimum value of BMI that is generally used to indicate that an individual is obese? (1)

1. Why should the dietary intake of carbohydrate in the form of free sugar be limited? (1)

(c) Describe how exercise reduces the risk of an individual becoming obese.

(d) State two ways that exercise reduces the risk factors for cardiovascular disease (CVD). (1)

2012 Section A:

23. The flow chart below shows how the concentration of glucose in the blood is regulated.



Which line identifies correctly the compounds X and Y? (1)

|  |  |  |
| --- | --- | --- |
|  | Compound X | Compound Y |
| A | glycogen | insulin |
| B | insulin | glycogen |
| C | glucagon | insulin |
| D | insulin | glucagon |

24. The graph below shows how the UK diet changed between 1988 and 1998.



Which of the following conclusions can be drawn from the data? (1)

A People ate more food in 1998 than in 1988.

B People ate less food in 1998 than in 1988.

C People ate a greater variety of food in 1998 than in 1988.

D People ate a lesser variety of food in 1998 than in 1988.

SQP Section A:

18. The graphs below contain information about the population of Britain.



How many British women between 55 and 64 years of age die from coronary heart disease annually? (1)

A 300

B 4500

C 9000

D 21000

19. High levels of blood glucose can cause clouding of the lens in the human eye. Concentrations above 5·5 mM are believed to put the individual at a high risk of lens damage.

In an investigation, subjects of different ages each drank a glucose solution. The concentration of glucose in their blood was then monitored over a number of hours. The results are shown in the graph below.



For how long during the investigation did 20 year olds remain above the high risk blood glucose concentration? (1)

A 84 mins

B 90 mins

C 120 mins

D 148 mins

**Unit 3 – Neurobiology & Communication**

**Divisions of the Nervous System and Parts of the Brain:**

SQP Section B10:

The diagram shows the main parts of the human brain as seen in a vertical section.



1. Complete the table by adding the correct letters, names and functions of the parts. (3)

|  |  |  |
| --- | --- | --- |
| Part | Name | Function |
| P |  |  |
|  | cerebellum |  |
|  |  | Regulates arousal and sleep |

1. Structure T is the hypothalamus.

(i) Explain how the hypothalamus influences structure S. (1)

(ii) State one regulatory function of the hypothalamus. (1)

1. Name the **process** which the brain uses to make sense of incoming sensory information and **explain** how this process leads to the recognition of objects.

 (2)

SQP Section C1B:

Give an account of the nervous system under the following headings:

(i) the somatic nervous system; (3)

(ii) the autonomic nervous system. (7)

**Perception and Memory:**

2013 Section B11:

Split brain patients cannot transfer information between their left and right cerebral hemispheres because the band of nerve fibres connecting these areas of the brain has been cut.

1. Name the band of fibres which connects the two hemispheres. (1)
2. Some of the functions of each hemisphere are described in the table below. These functions are unaffected in split brain patients.

|  |  |
| --- | --- |
| Left cerebral hemisphere | Right cerebral hemisphere |
| Processes information from right eye | Processes information from left eye |
| Controls language production | Controls movements of left hand |

The diagram below shows an experiment on a split brain patient.

The patient was asked to stare at a spot in the centre of a screen and the words “key” and “spoon” were flashed briefly onto the screen in the positions shown.



(i) The patient was then told to use his left hand to pick up the objects he saw named on the screen.

Explain why the patient picked up the key but not the spoon. (2)

(ii) The patient was then asked to say what he saw written on the screen. Predict what he would have said and give a reason for your answer. (2)

2012 Section B12:

An investigation was carried out into the effect that the meaning of words has on the ability to recall them from short and long-term memory.

Two groups of people were each shown lists of five words for 30 seconds.

Group 1 was shown words with related meanings while group 2 was shown words with unrelated meanings.

 List of words with related meanings—*large, big, great, huge, wide.*

 List of words with unrelated meanings—*late, cheap, rare, bright, rough.*

Immediately after the 30 seconds, the people in both groups were asked to write down, in the correct order, the words that they had been shown.

Everyone was then asked to read a book for one hour and told that they would be asked questions about it afterwards.

Instead, after the hour had passed, everyone was again asked to write down, in the correct order, the words that they had been shown in their original list.

The results of the investigation are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Group | Meaning of words shown | Correct responses immediately after reading the words (%) | Correct responses after reading the book for one hour (%) |
| 1 | related | 96 | 54 |
| 2 | unrelated | 96 | 78 |

1. List two ways in which the investigators could minimise variation between the two groups of people. (1)
2. What aspect of memory explains the high percentage of correct responses immediately after reading the words? (1)
3. Suggest why the groups were asked to read a book during the investigation.(1)
4. State two conclusions that can be drawn from the results of this investigation.

 (2)

**The Cells of the Nervous System and Neurotransmitters at Synapse:**

2013 Section B10:

The diagram below shows a neurone from an adult.



1. Describe the direction in which an impulse would travel. (1)
2. Suggest a possible role of the nucleus in the transfer of information across a synapse. (1)
3. Complete the table below which contains information about structures found in the presynaptic knob. (1)

|  |  |
| --- | --- |
| Structure | Function |
|  | Provides ATP for synthesis reactions |
| Vesicle |  |

1. (i) How might a neurone in a newly-born child differ from the one in the diagram? (1)

(ii) n what way would this affect how the neurone functions? (1)

2013 Section C2A:

Describe how recreational drugs can affect the brain. (10)

**Communication & Social Behaviour**

2012 Section B11:

The information in the table below refers to the development of walking by infant boys.

|  |  |  |
| --- | --- | --- |
| Stage of Development | Description of Behaviour | Age (weeks) at which behaviour develops |
| Earliest | Latest |
| 1 | Rolls over | 9 | 23 |
| 2 | Sits up without support | 16.5 | 32.5 |
| 3 | Crawls | 21 | 38 |
| 4 | Pulls up and stands holding furniture | 23 | 43 |
| 5 | Walks holding on to furniture | 28.5 | 49 |
| 6 | Stands unsupported | 35.5 | 54 |
| 7 | Walks alone | 44.5 | 57.5 |

1. Predict by what age 50% of boys would be expected to walk alone. (1)
2. Identify all the stages in the development of walking that boys could be at when they are 36 weeks old. (1)
3. Myelination of the nervous system leads to the development of walking.

(i) Name the cells that produce the myelin sheath. (1)

(ii) Explain why it is important that axons are surrounded by a myelin sheath.

 (1)

SQP Section A:

24. An investigation was carried out to determine how long it takes students to learn to run a finger maze. A blindfolded student was allowed to run the maze on ten occasions. The results are given in the table below.

|  |  |
| --- | --- |
| Trial | Time(s) |
| 1 | 23 |
| 2 | 20 |
| 3 | 26 |
| 4 | 12 |
| 5 | 18 |
| 6 | 10 |
| 7 | 6 |
| 8 | 7 |
| 9 | 6 |
| 10 | 6 |

How could the investigation be improved to make the results more reliable? (1)

A Allow other students to try to run the maze ten times.

B Allow the same student some additional trials on the same maze.

C Change the shape of the maze and allow the same student to repeat ten trials.

D Record the times to one decimal place.

SQP Section B11:

A student carried out an investigation into how age affects learning ability.

Eight children from three different age groups were each given five attempts to complete a twenty-piece jigsaw puzzle, in as fast a time as possible.

The fastest times that they achieved are shown in the table below.

|  |  |
| --- | --- |
|  | Fastest time achieved (s) |
|  | 8 year-olds | 12 year-olds | 16 year-olds |
|  | 123 | 97 | 99 |
|  | 98 | 68 | 74 |
|  | 111 | 75 | 62 |
|  | 138 | 112 | 67 |
|  | 87 | 93 | 84 |
|  | 136 | 83 | 101 |
|  | 79 | 75 | 58 |
|  | 120 | 81 | 55 |
| average | 111.5 |  | 75.0 |

1. Calculate the average fastest time achieved by the 12 year-old children and write your answer in the table above. (1)
2. Describe two additional variables which would have to be kept constant to ensure that a valid comparison could be made between the three groups of children. (1)
3. What conclusion can be drawn from the results of this investigation? (1)
4. (i) Suggest why the first attempt to complete the puzzle was always slower than the fifth attempt, no matter the age of the child. (1)

(ii) Suggest why some children did not produce their fastest time on their fifth attempt. (1)

1. It was found that most of the children completed the puzzle faster if other children were in the room competing against them.

What is this effect called? (1)

**Unit 4 – Immunology & Public Health**

**Non – Specific Defences:**

2013 Section C2B:

Describe non-specific defences that the body uses to protect itself from pathogens.

(10)

**Specific Cellular Defences:**

2013 Section B14:

The diagram below shows the structure of one strain of the influenza virus.



 (a) This virus can be used to prepare a flu vaccine. In order to do this the nucleic acid must be broken up but the surface proteins left intact.

Explain why it is necessary to:

(i) break up the nucleic acid

(ii) leave the surface proteins intact (2)

(b) A different vaccine is required against each strain of the influenza virus.

Suggest why different vaccines are required. (1)

(c) Researchers are attempting to develop a new vaccine which will be effective against all strains of the influenza virus. Trials of this new vaccine have shown that it increases the activity of T-lymphocytes in the body.

Describe two ways in which T-lymphocytes combat infection. (2)

(d) Clinical trials of vaccines use randomised, placebo-controlled protocols.

Describe how these protocols are set up by the researchers. (2)

**The Transmission and Control of Infectious Diseases:**

SQP Section C2B:

Describe the causes and transmission of infectious diseases and the methods that can be used to control these diseases. (10)

**Active Immunisation and Vaccination and the Evasion of Specific Immune Response by Pathogens:**

SQP Section B12:

The immune system protects the body from infection.

1. The table contains information about cells of the immune system. Complete the table to identify the cell types and their functions. (2)

|  |  |
| --- | --- |
| Cell Type | Function |
|  | Releases Cytokines |
| B Lymphocyte |  |
|  | Induces Apoptosis |

1. (i) Explain what is meant by the term active immunity. (1)

(ii) Describe the role of memory cells in providing long term immunity to a disease. (1)

1. The graph shows the number of whooping cough cases over a 65 year period>



(i) Use the graph to determine in which year a vaccine for whooping cough was introduced. (1)

(ii) In 1977 newspaper reports suggested that the vaccine was unsafe.

This led to a reduction in the number of children being vaccinated.

Calculate the percentage increase in cases of whooping cough between 1977 and 1978. (1)

(iii) The number of cases of whooping cough drops to a very low level after 2000 due to herd immunity.

Explain what is meant by the term “herd immunity”. (2)

SQP Section B13:

The diagrams below contain information about the causes of death and survival rates in two countries in 2010.

Figure 1 - Causes of death in countries A and B during 2010



Figure 2 - Percentage survival rates in countries A and B in 2010



1. (i) Identify the main cause of death in each country in 2010. (1)

(ii) Country B takes no public health measures to control the incidence of heart disease.

Suggest a reason for the lower incidence of heart disease in country B. (1)

1. An international charity organisation made a decision in 2010 to spend less money on research into heart disease and more money on research into infectious diseases.

What is likely to be the long-term consequence of this decision on the number of cases of heart disease in country B?

Give a reason for your answer. (1)

1. (i) What percentage of the population of country A die before the age of 20?(1)

(ii) In 1950 three million babies were born in country B.

Assuming no emigration occurred, how many of these individuals were still alive in 2010? (1)

1. Malaria is endemic in country B.

Explain the meaning of the term endemic. (1)