

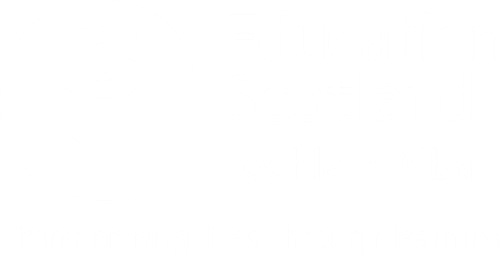
**National 5 Biology**

**Relevant Past Paper Questions from SQA Standard Grade Credit**

**and Intermediate 2 papers**

**Unit 2: Multicellular Organisms**

**March 2014**



Transforming lives through learning

**N5 Biology Past Paper Questions**

This resource has been produced in response to the requests from practitioners who attended the National Qualifications Sciences events at Hampden Stadium in December 2013 which Education Scotland organised in partnership with the SQA.

The questions in this resource relate to the Multicellular Organisms Unit for National 5 Biology and have been taken from the 2011, 2012 and 2013 Standard Grade and Intermediate 2 Past Papers.

For Multicellular Organisms (Unit 2), the mandatory course key areas are as follows:

* Cells, tissues and organs
* Stem cells and meristems
* Control and communication
* Reproduction
* Variation and Inheritance
* The need for transport
* Effects of lifestyle choices on human transport and exchange systems

In cases where the questions relate to more than one of the National 5 Units, the constituent parts of the question have been separated into their respective key areas. The stem of the question has been retained to give the context of the question. If practitioners require the full integrated question, they should refer to the original past paper on the [SQA website](http://www.sqa.org.uk/pastpapers/findpastpaper.htm?subject=Chemistry&level=).

Past paper questions for the other two National 5 Units, Cell Biology and Life on Earth, are also available from Education Scotland’s National Qualifications Glow portal: <http://www.educationscotland.gov.uk/nqcoursematerials/> (cut and paste link into your browser).

Education Scotland would like to acknowledge the support of the SQA in helping us produce this resource. We hope it proves helpful to practitioners across Scotland and assists with the implementation of the national qualifications.

**Cells, tissues and organs**

This topic did not appear in recent past papers due to sampling requirements.

**Stem cells and meristems**

This topic did not appear in recent past papers due to sampling requirements.

**Control and communication**

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| --- | --- | --- |
| *St Gr*  *2011:*  *(14)(c*) | The grid below shows structures related to the nervous system. | Marks |
|  | |  |  |  |  | | --- | --- | --- | --- | | A  Relay Nerve Cell | B  Muscle | C  Motor nerve cell | D  Sensory nerve cell | |  |
|  | Complete the sequence below, using letters from the grid, to show the order of the structures through which a nerve impulse travels in a reflex action. |  |
|  | stimulus → touch receptor → \_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_ → response | 1 |

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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 14 (c) |  |  | 1 |

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| St Gr.  2012:  4.(*a*) | Complete the table below to show parts of the brain and their functions. | Marks |
|  | |  |  | | --- | --- | | Part of Brain | Function | | Cerebrum |  | | Cerebellum |  | |  | Controls breathing and heart rate | | 2 |

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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 4 (a) |  | controls movement | 2 |

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| Int2  2011 AQ 23. | The list below refers to stages in the response of the nervous system to a stimulus. | Marks |
|  | 1 Central nervous system sorts information.  2 Nerve impulses sent to muscles.  3 Nerve impulses sent to central nervous system.  4 Senses detect the stimulus.  5 Response is produced. |  |
|  | The correct order of the stages is  A 4 →3 →1 →2 →5  B 3 → 4 →2 →1 →5  C 4 →3 →2 →1 →5  D 3 →4 →1 →2 →5. |  |

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| Question | Answer |
| 23 | A |

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| Int2  2011 B Q12 (b) i & ii | (i) Complete the chart by inserting the names of the missing neurones.  Complete the chart by inserting the names of the missing neurones. | Marks |
|  |  | 2 |
|  | (ii) Describe a function of a reflex response. | 1 |

|  |  |  |  |
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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 12 (b) i | 1. sensory  2. relay/association/ interneurone  3. motor  **3/2 correct names = 1 mark**  **All 3 in correct order = 1 mark** |  | 2 |
| ii | provides a rapid response/  protects the body (from harm)/  prevent further damage | Protection/rapid  Prevents harm  example on its own | 1 |

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| Int2  2012 B Q12 (a) | The diagram below shows the structures found in a reflex arc.    Complete the table below to identify the structures and their functions. | Marks |
|  | |  |  |  | | --- | --- | --- | | *Structure* | *Letter* | *Function* | | Sensory Neurone |  | Carries impulses from the receptor to the spinal chord | |  | P |  | | Effector |  |  | | 3 |

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| --- | --- | --- | --- | --- | --- | --- |
| Question | | Acceptable Answer | Unacceptable Answer | | | Marks |
| 12 (a) | | All 4= 3  3= 2  2/1=1 | Any example e.g. blinks/withdraws hand  Carries out an action/reaction | | | 3 |
| Int2  2013 A Q 24 | The following diagram shows a human brain. | | | Marks |
|  | Which letter indicates the site of memory and conscious responses? | | | 1 |

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| --- | --- |
| Question | Answer |
| 24 | A |

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| Int2  2013 A  Q 25 | The diagram below shows neurones connecting the eye with the central nervous system. | Marks |
|  | Which line in the table below identifies correctly the types of neurones and the direction of impulses which travel along them? | 1 |
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| Question | Answer |
| 25 | B |

**Reproduction**

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| --- | --- | --- |
| Int2  2012 B Q8 (a) + (c) | The diagram below represents some of the processes involved in human reproduction.  The sex chromosomes are shown in each cell. | Marks |
|  |  |  |
| (a) | Which cell(s) are female?  **Circle the correct cell(s) below.**  Cell 1 / Cell 2 / Cell 3 | 1 |
| (c) |  | 2 |

|  |  |  |  |
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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 12 (a) |  |  | 1 |
| (c) | All 3 = 2  1/2 = 1 |  | 2 |

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| Question | Answer |
| 13 | A |

**Variation and Inheritance**

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| St Gr  2011 Q15  (a), (b) & (c) | | The difference between blue and green feather colour in budgerigars (budgies) is  determined by a single gene. The allele for green (G) is dominant and the allele  for blue (g) is recessive.  True-breeding blue males were allowed to breed with true-breeding green females.  The offspring were allowed to interbreed to produce a second generation. | | Marks |
|  | |  | |  |
| (a) | | Explain what is meant by the term “true-breeding”, in terms of the alleles  present. | |  |
| (b) | | Give the genotype(s) and phenotype(s) of the F1 generation.  genotype(s)  phenotype(s) | |  |
| (c) | | In 1974, a mutation occurred in a budgie which gave rise to one chick with a  speckled pattern of wing feathers never before seen. Such birds are called  “spangles”. It is now 37 years since the hatching of the first chick, and the  number of spangles now living is estimated to be 80 000 in a total population  of 30 million captive budgies. | |  |
|  | | 1. In which structures in the nucleus of a cell do mutations arise? | |  |
|  | | (ii) Give an example of a factor which can influence the rate of mutation in an organism. | |  |
|  | | (iii) Calculate the average yearly increase of spangles. Express your answer to the nearest whole number.  *Space for calculation* | |  |
| Question | Acceptable Answer | | Unacceptable Answer | | | Marks |
| 15 (a) | Both (alleles) are the same / Both (alleles) are dominant **or** both are recessive  Only one form of allele / Identical alleles  Parents are either GG or gg | | Both have the same alleles  Homozygous  Both genes are the same | | | 1 |
| (b) | genotype Gg  phenotype green both correct | | G, g  Heterozygous (Not negating)  What looks like two different genotypes because of spacing | | | 1 |
| (c) i | chromosomes / genes / chromatids | | Alleles | | | 1 |
| ii | Radiation / atomic radiation / radioactivity / nuclear radiation / UV radiation / UV light / sunlight / X-rays / high temperatures / mustard gas / cochicine | | Age  Nuclear waste  Temperature  Mutagenic agent | | |  |
| iii | 2162 | | Answers including decimal places | | |  |

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| St Gr. 2012 Q16 (a) | The diagram below shows the two ways in which hands can be clasped together. |  |
|  | (i) This behaviour is thought to be influenced by a single gene with two forms. What term refers to the two forms of a single gene? |  |
|  | (ii) The diagram below shows whether members of a family clasp their hands with the right or left thumb on top.  **T** represents the left thumb form of the gene.  **t** represents the right thumb form of the gene. |  |
|  |  |  |
|  | What information from parent B proves that the left thumb on top is the dominant form of the gene? |  |
|  | (iii) Use the information in the diagram to complete the following table. |  |
|  |  |  |

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| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 16 (a) i | allele |  | 1 |
| ii | B is **Tt** / has both alleles / is heterozygous and clasps hands with left thumb on top |  | 1 |
| iii | tt  Tt  Tt  3 correct =2  1 / 2 correct = 1 |  | 2 |
| iv | 3 : 1 /  3 in 4 /  75%  ¾  0·75 |  | 1 |
| v | 5 : 3 |  | 1 |

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| St Gr. 2013 Q12 | (*a*) Fruit flies show variation in wing structure which can be inherited.  Flies were crossed as shown below. | Marks |
|  |  |  |
|  | (i) Using “N” for the normal form and “n” for the vestigial form, give  the genotypes of each of the following: |  |
|  |  | 2 |
|  | (ii) Which of the following flies could be described as true-breeding?  Tick (✓) the correct boxes. |  |
|  |  | 1 |
| (b) | What term is used to describe the different forms of a gene? | 1 |
| (c) | Variation in a species can be caused by mutation.  (i) What is meant by the term “mutation”? | 1 |
|  | (ii) Give an example of a factor which can increase the rate of mutation in an organism. | 1 |

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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 12 (a) i | 1 NN  2 Nn 3 correct = 2  3 nn 1 / 2 correct = 1  (Use of other letters – lose 1 mark) |  | 2 |
| ii |  |  | 1 |
| (b) | allele |  | 1 |
| (c) i | A change to the number / structure of chromosomes /  A change to the DNA / genes / genetic information / genetic code |  | 1 |
| ii | radiation / X rays / UV light / high temperature / thermal shock / chemicals / mustard gas /  colchicine | Age | 1 |

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| Int 2 2011 A Q11 | In corn on the cob, yellow seed (G) is dominant to purple seed (g). The cob shown below shows some yellow and some purple seeds. The seeds have been counted. | Marks |
|  |  |  |
|  | The genotypes of the parents that produced this cob were |  |
|  |  |  |

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| Question | Answers |
| 11 | B |

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| Int 2 2011 A Q14 | A hairy stemmed pea plant is crossed with a smooth stemmed pea plant. All the F1 plants had hairy stems. | Marks |
|  | The genotype of the F1 plants was  A heterozygous  B homozygous  C dominant  D recessive. |  |

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| Question | Answers |
| 14 | A |

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| Int 2 2011 A Q15 | Differences in the mass of sunflower seeds are due to the interaction of the alleles of several genes. | Marks |
|  | This type of inheritance is called  A dominant  B monohybrid  C polygenic  D co-dominant. |  |

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| Question | Answers |
| 15 | C |

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| Int 2 2011 B Q 7(a) | Hair appearance in mice is controlled by a single gene.  Wavy hair (H) is dominant to straight hair (h).  Two homozygous mice were crossed, one had wavy hair and one had straight hair. | Marks |
|  |  | 1 |
|  |  | 1 |
|  |  |  |

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| --- | --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Negates | Marks |
| 7 (a) i | HH, hh **both = 1 mark** | different letters |  | 1 |
| ii | Wavy |  | Hh | 1 |
|  | Hh [*ok if same letter as (i)*] | different letters from (i) | wavy |  |

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| Int 2 2012 A Q 13 | An organism has two different alleles of a gene.  This genotype is | Marks |
|  | A dominant  B homozygous  C recessive  D heterozygous. |  |

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| Question | Answers |
| 13 | D |

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| Int 2 2012 A Q 14 | *Distichiasis* is a dominant characteristic in humans which causes the person to have two rows of eyelashes.  A woman who is homozygous for the condition and a man who is unaffected have children.  What proportion of their children would be expected to have *Distichiasis*? | Marks |
|  | A 0%  B 25%  C 50%  D 100% |  |

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| Question | Answers |
| 14 | D |

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| Int 2 2012 A Q 15 | In dogs, uniform coat colour is dominant to spotted coat. | Marks |
|  |  |  |
|  | From the family tree above, in which generation(s) are all the dogs heterozygous for coat colour? |  |
|  | A P only  B F1 only  C F2 only  D P and F1 |  |

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| Question | Answers |
| 15 | B |

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| Int 2 2013 B  Q 8 | Sorghum is an important food crop in some parts of the world.  The colour of the seed husk (coat) is controlled by a single gene.  Purple husk colour (H) is dominant to tan husk colour (h). | Marks |
| (a) | A true breeding purple husk plant is crossed with a true breeding tan husk plant. |  |
| (i) |  | 1 |
| (ii) | Complete the genotypes of the parental (P) generation below: |  |
|  |  | 1 |
| (iii) | State the phenotype(s) of the F1 plants. |  |
|  |  |  |
| (b) | An individual from the F1 generation is crossed with a true breeding tan husk plant. |  |
|  | (i) Complete the Punnett square to show the expected results of this cross. |  |
|  |  |  |
|  | (ii) State the expected phenotype ratio for the offspring of this cross. |  |
|  |  |  |

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| --- | --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Negates | Marks |
| 8 (a) i | homozygous | different letters |  | 1 |
| ii | HH hh  Both |  | Any other letter  used | 1 |
| iii | purple |  |  | 1 |
| (b) i |  |  | No gametes |  |
| ii | 1:1 or 2:2 |  |  |  |

**The need for transport**

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| StGr  2011 Q 7 (c) | The diagram below represents a structure found in the small intestine. The  arrows show the direction of the flow of fluids through the structure. | Marks |
|  |  |  |
|  | i What is the name of this structure? | 1 |
|  | ii Which letter identifies the position of the fluid with the highest glucose  content, after the absorption of digested food? | 1 |
|  | iii Which letter identifies the position of the fluid with the highest fat  content, after the absorption of digested food? | 1 |

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| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 7 (c) i | Villus / villi | Villa  Villius | 1 |
| ii | A |  | 1 |
| iii | C |  | 1 |

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| StGr  2012 Q 5 (a) | The diagram below represents part of a cross section through a leaf. | Marks |
|  |  |  |
|  | Identify **one** example of each of the cells described below by using letters from the diagram to complete the boxes. |  |
|  | Each letter may be used **once**, **more than once** or **not at all**. |  |
|  | Transparent cells |  |
|  | Cells which carry out photosynthesis |  |
|  | Mesophyll cells |  |
|  | Guard cells | 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 5 (a) | |  |  |  | | --- | --- | --- | | **A or D** |  |  | | **B or C or E** | | | | |  | | --- | | **B or C** | | **E** | | | | | Additional incorrect answers negate | 4 correct = 2  2/3 correct = 1 |

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| StGr  2012 Q 13 (b) | The diagram below shows how the disease malaria is spread in humans. Malaria is caused by a micro-organism that lives as a parasite in the blood. It is spread from person to person by insects called mosquitoes. | Marks |
|  |  |  |
| (b) | What substance in red blood cells is responsible for the transport of oxygen? | 1 |
|  |  |  |

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| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 13 (b) i | haemoglobin / oxyhaemoglobin |  | 1 |

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| --- | --- | --- |
| StGr  2013 Q 9 (a), (b) | The diagram below shows some cells from the lining of a human trachea. | Marks |
|  |  |
|  | Name the microscopic hair-like structures labelled Y and describe their  function.  Name  Function | 1  1 |
| (b) | The diagram below represents an air sac in a human lung. |  |
|  |  |  |
|  | i Explain why each of the following features, shown in the diagram,  are needed for the efficient diffusion of oxygen.  1 Film of Moisture  2 Thin Lining of Air Sac | 1  1 |
|  | ii Describe what happens to oxygen after it enters a red blood cell. | 2 |
|  |  |  |

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| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 9 (a) | Name: Cilia  Function: To sweep / move mucus / trapped material away from lungs / upwards |  | 1  1 |
| (b) i | 1 Oxygen needs to be in solution / Allows oxygen to dissolve  2 Quicker / Easier / Short distance |  | 1  1 |
| ii | Combines with haemoglobin  to form oxyhaemoglobin |  | 1  1 |

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| Int2  2011 A Q 19 | The diagram below shows the human alimentary canal. | Marks |
|  |  |  |
|  | Which structure contains villi? | 1 |
|  |  |  |

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| Question | Answer |
| 19 | B |

|  |  |  |
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| Q 22 | The diagram below shows the heart and circulation. | Marks |
|  |  |  |
|  | Which line in the table describes correctly the types of blood in vessels X and Y? | 1 |
|  |  |  |

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| --- | --- |
| Question | Answer |
| 22 | D |

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| Int2  2011 B Q 11 (a), (b) | The diagram below shows an alveolus and a capillary in the lungs where gas exchange occurs. | Marks |
|  |  |  |
| (a) | Decide if each of the following statements about gas exchange is **True** or **False**, and tick (✓) the appropriate box. |  |
|  | If the statement is **False**, write the correct word(s) in the **Correction** box to replace the word underlined in the statement. |  |
|  |  | 3 |
| (b) | How is oxygen carried in the red blood cells? | 1 |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 11 (a) | True  False speed up  False carbon dioxide | higher/water | 1  1  1 |
| (b) | as) oxyhaemoglobin/(on) haemoglobin |  | 1 |

|  |  |  |
| --- | --- | --- |
| Int2  2012 A Q 17 | The diagram below shows the human alimentary canal and its associated organs. | Marks |
|  |  |  |
|  | Which numbered parts produce digestive enzymes? | 1 |
|  |  |  |

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| --- | --- |
| Question | Answer |
| 17 | D |

|  |  |  |
| --- | --- | --- |
| Int2  2012 A  Q 19 | The diagram below shows the structure of a villus. | Marks |
|  |  |  |
|  | Which food molecules are absorbed by structure Y? | 1 |
|  |  |  |

|  |  |
| --- | --- |
| Question | Answer |
| 19 | B |

|  |  |  |
| --- | --- | --- |
| Int2  2012 A  Q 25 |  |  |
|  | Which line in the table identifies the parts of the heart correctly? | 1 |
|  |  |  |

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| --- | --- | --- |
| Int2  2012 A Q 21 | The diagram below shows the heart and circulation. | Marks |
|  |  |  |
|  | Which labelled structure is the pulmonary artery? | 1 |
|  |  |  |

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| --- | --- |
| Question | Answer |
| 25 | B |

|  |  |
| --- | --- |
| Question | Answer |
| 21 | A |

|  |  |
| --- | --- |
| Question | Answer |
| 21 | A |

|  |  |  |
| --- | --- | --- |
| Int2  2012  B Q 9 (a) iii | Blood contains plasma and cells which are used for transport and in defence. | Marks |
|  |  |  |
|  | iii  Name the chemical formed in red blood cells at high oxygen levels in the lungs | 1 |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 9 (a) iii | oxyhaemoglobin |  | 1 |

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| --- | --- | --- |
| Int2  2012 B Q 11 | The diagram below shows some structures of the human lungs. | Marks |
|  |  |  |
| (a) | Complete the following flow chart to give the pathway of air from X to the  alveoli by inserting the names of the structures labelled in the diagram. |  |
|  |  | 2 |
| (b) | i Name the process by which oxygen moves from the lungs into the blood. | 1 |
|  | ii State **two** features of alveoli which allow efficient gas exchange.  1  2 | 2 |
|  |  |  |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 11 (a) | **A** trachea/windpipe  **B** bronchus/bronchi  **C bronchioles** |  | All 3 = 2  ½ = 1 |
| (b) i | diffusion |  | 1 |
| ii | thin walled/large surface area/numerous/  moist (lining)/good blood supply/in close contact with capillaries/moisture layer/one cell thick lining/network of capillaries | they are one cell thick  have thin cell walls  very thin  good surface area  large SA | Any 2 |

|  |  |  |
| --- | --- | --- |
| Int2  2013 A Q 23 | The diagram below shows the human  alimentary canal. | Marks |
|  |  |  |
|  | Peristalsis occurs in | 1 |
|  |  |  |

|  |  |
| --- | --- |
| Question | Answer |
| 22 | D |

|  |  |  |
| --- | --- | --- |
| Int 2 2013 Q23 | The diagram below shows the structure of the lungs. | Marks |
|  |  |  |
|  | Which letter identifies a bronchiole? | 1 |
|  |  |  |

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| Question | Answer |
| 23 | C |

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| Int2  2013 B Q 10 | The following diagram shows the human heart. | Marks |
|  |  |  |
| (a) | i Name chamber Q and valve R.  Q  R | 1  1 |
|  | ii Describe the function of valve P. | 2 |
|  | iii **Add** an arrow **to the diagram** showing where blood enters the heart  from the lungs. | 1 |
| (b) | Name the blood vessel that carries blood to the lungs. | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Question** | Acceptable Answer | Unacceptable Answer | Marks |
| **10 (a) i** | Q left atrium **1**  R tricuspid (valve)  OR right atrio-ventricular /  right AV (valve) |  | 1  1 |
| **ii** | Stop backflow of blood/so blood only  flows in one direction  Into the heart/ventricle **or** from aorta | Keeps it flowing  Valves pushing  idea | 1  1 |
| **iii** | Arrow/line (part within vessel) | Wrong biology  eg incorrect label  on correct arrow  extra arrows | 1 |
| **(b)** | Pulmonary artery |  | 1 |

|  |  |  |
| --- | --- | --- |
| Int2  2013 B Q 11 (a) i,ii,  (b) i,iii | The diagram below shows the human digestive system. | Marks |
|  |  |  |
| (a) | i Name structures X and Y.  X  Y | 1 |
|  | ii Draw lines to link each structure with the enzyme(s) that it produces.  Each structure may be linked to more than one enzyme. | 2 |
|  |  |  |
| (b) | Glucose is absorbed from the small intestine into blood capillaries in the villi before being transported to the liver. |  |
|  | i State **one** feature of a villus that increases the rate of absorption of glucose. | 1 |
|  | iii Excess glucose is stored in the liver. Name the storage carbohydrate found in the liver. | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Acceptable Answer | Unacceptable Answer | Marks |
| 11 (a) i | X = Gall bladder both  Y = Rectum/large intestine/colon | intestine | 1 |
| ii | **4 lines correct = 2 marks**  **3/2/1 lines correct = 1 mark**  ***each extra line loses one mark to***  ***maximum minus 2*)** |  |  |
| (b) i | Large surface area/Capillary  network/good blood supply  Thin lining/wall | Thin cell wall  It is one cell thick  Moist | Any = 1 |
| iii | Glycogen |  | 1 |