**Q1.**          Choose words from this list to complete the sentences below.

genes           pollen grains             seeds             sperm(s)

          A young animal looks like its parents. This is because of information passed on in the

          egg and ................................................................. from which it formed.

          These reproductive cells carry information in ............................................................... .

**(Total 2 marks)**

 **Q2.**          When scientists look at dividing cells under a microscope, they can see strands that contain a chemical called DNA.

A photograph of these strands can be cut up and re-arranged.

The diagram shows an arrangement of the strands from a human cell.



(a)     What name is given to the strands containing DNA shown in the diagram?

Draw a ring around **one** answer.

|  |  |  |
| --- | --- | --- |
| **alleles** | **chromosomes** | **genes** |

**(1)**

(b)     Look carefully at the diagram.

(i)     The cell was taken from a man and not from a woman.

How can you tell?

............................................................................................................... **(1)**

(ii)     What evidence is there that the strands are from a body cell, and not from a gamete?

Tick () **one** box.

|  |  |
| --- | --- |
| The strands are arranged in order of size. |  |
| The strands are in pairs. |  |
| Gametes are made in the testes and ovaries. |  |

**(1)**

(iii)     When a human cell is not dividing the strands containing DNA are **not** clearly visible.

Draw a ring around the correct answer to complete the sentence.

|  |  |
| --- | --- |
|   | cell membrane. |
| In a human cell, the DNA is normally found in the | cytoplasm.  |
|  | nucleus. |

**(1)**

**(Total 4 marks)**

**Q3.**         We breed animals with the characteristics that we prefer.

(a)     The photograph shows a rabbit with some of its babies.



Photograph supplied by iStockphoto/Thinkstock

Use words from the box to complete the sentences about inheritance in rabbits.

|  |  |  |  |
| --- | --- | --- | --- |
| **characteristic** | **chromosome** | **gene** | **gamete** |

(i)     The colour of a rabbit’s fur is known as a ...............................................

**(1)**

(ii)     This colour is controlled by a .................................................................

**(1)**

(iii)     Each sex cell of a rabbit is known as a .................................................

**(1)**

**Q4.**          Humans reproduce sexually.

Draw a ring around the correct answer to complete each sentence. **(1)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   |   | chromosomes |   |
| (a) | (i) | At fertilisation | genes | join together. |
|  |   |   | sex cells |   |

|  |  |  |
| --- | --- | --- |
|   |   | chromosomes. |
| (ii) | At fertilisation a single cell forms, which has new pairs of | nuclei. |
|  |   | sex cells. |

(b)    Cystic fibrosis can be inherited by children whose parents do not have it.

|  |  |  |  |
| --- | --- | --- | --- |
|   |   | two |   |
| (i) | A person who has cystic fibrosis has | threefour |  copies of the cystic fibrosis allele. |

|  |  |  |
| --- | --- | --- |
|   |   | large. |
| (ii) | The cystic fibrosis allele is | recessive. |
|   |   | strong. |

**(1)**

(c)     The diagram shows a human body cell.



Choose the correct answer from the box to complete each sentence.

|  |  |  |  |
| --- | --- | --- | --- |
| **cell membrane** | **cell wall** | **cytoplasm** | **nucleus** |

(i)      The part of the cell labelled **B** is the ..............................................................

**(1)**

(ii)      The part of the cell labelled **C** is the ..............................................................

**(1)**

(d)     Which part of the cell, **A**, **B**, **C** or **D**:

|  |  |  |
| --- | --- | --- |
| (i) | contains the allele for cystic fibrosis |  |

**(1)**

|  |  |  |
| --- | --- | --- |
| (ii) | is affected by cystic fibrosis? |  |

**(1)**

**(Total 8 marks)**

 **Q5.**          There are two types of reproduction, asexual and sexual. Use the words in the box to complete the sentences about reproduction.

You may use each word once or not at all.

|  |
| --- |
| asexual              eggs              gametes              fertilisation              inheritanceovaries              sexual            sperms                     testes                    variation |

The genetic information from the mother is carried in the ........................................

which are made in the ........................................ .

The genetic information from the father is carried in the ........................................

which are made in the ........................................ .

In ........................................ reproduction, offspring are produced that are genetically

different from either parent.

This happens because genetic information from each parent is carried in the

......................................... and joined together during ........................................

to develop into a fetus.

In ........................................ reproduction, genetically identical offspring are

produced because no mixing of genetic material takes place.

**(Total 8 marks)**

 **Q6.**  Maize plants reproduce sexually to form maize cobs.
Each maize cob has many seeds.

The colour of the seeds is controlled by a gene.
The gene has two alleles, purple and yellow.

The diagram shows the cobs produced by breeding maize plants.



(a)     Use words from the box to complete the sentences.

|  |  |  |
| --- | --- | --- |
| **dominant** | **environmental** | **recessive** |

(i)      The first generation plants show that the purple allele is

..................................................................

**(1)**

(ii)     The second generation plants show that the yellow allele is

..................................................................

**(1)**

(b)     The allele for purple can be represented by the letter **A**.
The allele for yellow can be represented by the letter **a**.

(i)      What alleles does a yellow seed have?

Draw a ring around **one** answer.

|  |  |  |
| --- | --- | --- |
| **AA** | **Aa** | **aa** |

**(1)**

(ii)     What alleles does a purple seed from a *first* generation plant have?

Draw a ring around **one** answer.

|  |  |  |
| --- | --- | --- |
| **AA** | **Aa** | **aa** |

**(1)**

(c)     The drawing shows a cob from one of the *second generation* plants.



A student counted 334 purple seeds and 110 yellow seeds on this maize cob.

What is the approximate ratio of purple seeds to yellow seeds on the cob?

Tick () **one** box.

|  |  |
| --- | --- |
| 3 purple : 1 yellow |  |
| 1 purple : 3 yellow |  |
| 1 purple : 1 yellow |  |

**(1)**

**(Total 5 marks)**

 **Q7.**   Soay sheep live wild on an island off the north coast of Scotland. No people live on the island.



Over the last 25 years, the average height and mass of the wild Soay sheep have decreased.

The scientists think that climate change might have affected the size of the sheep.

(a)     More Soay sheep are now able to survive winter than 25 years ago.

What change in the climate may have helped more Soay sheep to survive winters?

........................................................................................................................

........................................................................................................................ **(1)**

(b)     Complete the sentences.

(i)      Soay sheep show variation in size because of differences in their

............................................................................ **(1)**

(ii)     The change in the size of the Soay sheep over 25 years can be explained by Darwin’s theory of ............................................................ **(1)**

**(Total 3 marks)**

 **Q8.**         The diagram shows the evolution of a group called the primates.



(a)     Which primate evolved first?

........................................................................................................................

**(1)**

(b)     Name **two** primates that developed most recently from the same common ancestor as humans.

1 .....................................................................................................................

2 .....................................................................................................................

**(2)**

(c)     (i)     The theory of evolution by natural selection was suggested in the 1800s.

         Which scientist suggested this theory?

............................................................................................................... **(1)**

(ii)     Use words from the box to complete the passage about natural selection.

|  |  |  |
| --- | --- | --- |
| **evolution** | **environment** | **generation** |
| **mutate** | **survive** | **variation** |

Individual organisms of a species may show a wide range of ................................... because of differences in their genes. Individuals with characteristics most suited to the ................................... are more likely to .................................. and breed successfully. The genes that have helped these individuals to survive are then passed on to the next .............................................................. **(4)**

**(Total 8 marks)**

 **Q9.**         People have different shaped ear lobes, either ‘hanging’ or ‘attached’.

The diagrams show the two shapes of ear lobe.



A gene controls the shape of a person’s ear lobes.

The diagram shows a family tree.

Parents **A** and **B** both have hanging ear lobes.



(a)     The key does **not** show the symbol for a female with attached ear lobes.

Draw the symbol for the key to show a female with attached ear lobes.

Use information in the family tree and the key.

Symbol = ............................................................

**(1)**

(b)     Look at the family tree.

What does the information in the family tree tell you about the allele for hanging ear lobes?

Draw a ring around the correct word to complete the sentence. **(1)**

|  |  |
| --- | --- |
|   | dominant. |
| The allele for hanging ear lobes is | weak. |
|   | recessive. |

(c)     (i)     Parents **A** and **B** have three children, **C**, **D** and **E**.
All three children are boys.

What are the chances that the next child of parents **A** and **B** will be a girl?

Draw a ring around **one** answer.

|  |  |  |
| --- | --- | --- |
| **no chance (0 %)** | **a half (50 %)** | **certain (100 %)** |

(ii)     Which statement explains your answer to part (c)(i)?

Tick () **one** box.

|  |  |
| --- | --- |
| Some of **B**’s sperm cells have an X chromosome. |  |
| Some of **A**’s egg cells have a Y chromosome. |  |
| All of **B**’s sperm cells have an X chromosome. |  |

**(1)**

**(Total 4 marks)**

 **Q10.**         The family tree shows the inheritance of a disorder caused by a dominant allele.

Fiona and Eric have two children George and Harriet.



(a)     The son, George, has the disorder.

The daughter, Harriet, does **not** have the disorder.

(i)      Use the key to draw the symbol for Harriet next to her name **on the family tree**.

**(2)**

(ii)     The symbol **D** represents the dominant allele for the disorder.
The symbol **d** represents the recessive allele.

Fiona has the pair of alleles **dd**.

Write the correct pairs of alleles in the boxes.

|  |  |
| --- | --- |
| Harriet has the pair of alleles |  |
|  |
|  |  |  |  |

(b)     Before Harriet was born, a doctor suggested that Fiona should have the embryo
‘screened’.

(i)     Give **one** reason why the doctor suggested screening.

Tick () **one** box.

|  |  |
| --- | --- |
| To check for the **D** allele |  |

|  |  |
| --- | --- |
| To check the sex of the embryo |  |

|  |  |
| --- | --- |
| To cure the disorder |  |

**(1)**

(ii)     Why do some people believe that embryos should **not** be screened?

...............................................................................................................

...............................................................................................................

**(1)**

**(Total 7 marks)**

 **Q11.**          Animals have adaptations that enable them to survive.

(a)     The photograph shows an echidna.



          The echidna has pointed spines on its back.

          Explain how these spines might help the echidna to survive.

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

**(2)**

(b)     The photograph shows a caterpillar.

                                                     

          Explain how the caterpillar’s appearance might help it to survive.

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

**(2)**

(c)     Draw a ring around the correct answer to complete each sentence.

|  |  |  |
| --- | --- | --- |
|  (i)    Evolution can be explained by a theory called | genetic engineeringmutationnatural selection |  . |

**(1)**

|  |  |  |
| --- | --- | --- |
|  (ii)   This theory was suggested by a scientist called Charles | DarwinLamarckSemmelweiss |  . |

**(1)**

|  |  |  |
| --- | --- | --- |
|  (iii)   This scientist said that all living things have evolved from | monkeysdinosaurssimple life forms |  . |

**(1)**

(d)     Many religious people oppose the theory of evolution.

          Give **one** reason why.

.....................................................................................................................................

.....................................................................................................................................

**(1)**

**(Total 8 marks)**

 **Q12.**          The photographs show two varieties of moths, **X** and **Y**. The moths belong to the same species.
The moths are resting on a tree trunk in open countryside.


Moth **X**                                                            Moth **Y**

(a)     Which variety of moth, **X** or **Y**, is more likely to be killed by insect-eating birds? Give a reason for your answer.

Variety of moth: .........................................................................................................

Reason ........................................................................................................................

.....................................................................................................................................**(1)**

(b)     In an experiment, large numbers of each variety of moth were caught in a trap.

•        They were marked with a spot of paint on the underside of one wing and then released.

•        A few days later, moths were again trapped and the number of marked moths was counted.

•        The experiment was carried out in a woodland polluted by smoke and soot, and also in an unpolluted woodland.

          The results are shown in the bar graph.

(i)      When the moths were being marked, suggest why the paint was put on the underside of the wing and not on the top.

...........................................................................................................................

**(1)**

(ii)     What percentage of moths of type **X** was recaptured in:

the polluted woodland; .....................................................................................

the unpolluted woodland? ................................................................................

**(2)**

(iii)     In each woodland, only a small number of marked moths of both varieties were recaptured. Suggest **one** reason for this.

...........................................................................................................................

...........................................................................................................................

**(1)**

(c)     (i)      The colour of the moths is controlled by a gene. The dark form was first produced by a mutation in the gene.

         What chemical, found in a gene, is changed by a mutation? Draw a ring around your answer.

**carbohydrate**         **DNA**           **fat**             **protein**

**(1)**

(ii)     Some of the offspring from the original dark moth were also dark. What caused this?

...........................................................................................................................

...........................................................................................................................

**(1)**

**(Total 7 marks)**

 **Q13.**          These young rabbits look like their parents. This is because information about characteristics such as fur colour is passed from parents to their young.



         Choose words from this list to complete the sentences below.

**body**                   **chromosomes**                **clones**               **cytoplasm**

**genes**               **nucleus**                   **sex**

          Information is passed from parents to their young in ............................................ cells.

          Each characteristic, e.g. fur colour, is controlled by .............................................. .

          The structures which carry information for a large number of characteristics are

          called ................................................ .

          The part of the cell which contains these structures is called the .................................. .

**(Total 4 marks)**

 **Q14.**          The diagram shows a human cell and some of its contents.

(a)     Choose words from this list to label the diagrams.

**chromosome**            **cytoplasm**          **gene**             **nucleus**

****

**(3)**

(b)     Choose words from this list to complete the sentence.

**a body cell**         **an egg cell**      **a gamete**           **a sperm cell**

          In the cell above, the chromosomes are found in pairs so this cell must be

.........................................................

**(1)**

**(Total 4 marks)**

 **Q15.**          The diagram shows a human cell and some of its contents.

(a)     Choose words from this list to label the diagrams.

**chromosome**            **cytoplasm**          **gene**             **nucleus**

****

**(3)**

(b)     Choose words from this list to complete the sentence.

**a body cell**         **an egg cell**      **a gamete**           **a sperm cell**

          In the cell above, the chromosomes are found in pairs so this cell must be

......................................................... **(1)**

**(Total 4 marks)**

 **M1.**          sperms
genes

*each for 1 mark*

**[2]**

 **M2.**          (a)     chromosomes

**1**

(b)     (i)      has XY / Y

*allow female would be XX / has no Y*

**1**

(ii)     The strands are in pairs

**1**

(iii)    nucleus

**1**

**[4]**

 **M3.**         (a)      (i)      characteristic

**1**

(ii)     gene

**1**

(iii)    gamete

**1 [3]**

 **M4.**         (a)      (i)     sex cells

**1**

(ii)     chromosomes

**1**

(b)     (i)     two

**1**

(ii)     recessive

**1**

(c)     (i)      cell membrane

*allow membrane*

**1**

(ii)     cytoplasm

**1**

(d)      (i)     A

**1**

(ii)     B

**1**

**[8]**

 **M5.**          eggs

*accept gamete once*

**1**

ovaries

**1**

sperms

*accept gamete once*

**1**

testes

**1**

sexual

**1**

gametes

*allow egg* ***and*** *sperm once*

**1**

fertilisation

**1**

asexual

**1**

**[8]**

**M6.**         (a)      (i)     dominant

*allow clear indication*

**1**

(ii)     recessive

*allow clear indication*

**1**

(b)     (i)      aa

*extra ring drawn cancels the mark*

**1**

(ii)     Aa

*extra ring drawn cancels the mark*

**1**

(c)     3 purple : 1 yellow

*extra box ticked cancels the mark*

**1**

**[5]**

 **M7.**          (a)     warmer / dryer

*allow greenhouse effect / global warming*

*ignore wind*

**1**

(b)     (i)      genes / alleles / chromosomes / DNA / genetic material / genetics

*allow inheritance*

*allow nutrition / food / metabolism / growth rate*

*ignore environment*

**1**

(ii)     natural selection / evolution

*allow survival of the fittest*

**1**

**[3]**

 **M8.**          (a)     lemur(s)

**1**

          (b)     gorilla(s)

*in either order*

**1**

chimpanzee(s)

*accept chimps*

**1**

(c)     (i)      (Charles) Darwin

*accept (Alfred) Wallace*

*if first name given it must be correct*

**1**

(ii)     variation

*in this order*

**1**

environment

*allow phonetic spellings*

**1**

survive

**1**

generation

**1**

**[8]**

 **M9.**          (a)

*the shape must be (roughly) circular* ***and*** *not shaded, for the mark*

*accept the shape drawn in the key if it is not contradictory*

**1**

(b)     dominant

**1**

(c)     (i)      a half (50%)

**1**

(ii)     Some of B’s sperm cells have an X chromosome

**1**

**[4]**

 **M10.**         (a)      (i)      circle

*mark independently*

**1**

unshaded

*could be in body of script*

**1**

(ii)     (Harriet) dd

*in first box*

**1**

DD

*if another letter is chosen it must be used throughout and upper or lower case must be clear*

**1**

Dd

**1**

(b)     (i)      to check for the D allele.

**1**

(ii)     any **one** from:

•        may harm / kill foetus / embryo / baby / mother

*allow could affect the baby*

•        immoral / unethical / religion

*ignore playing God*

*ignore references to unnatural*

*ignore wrong unqualified*

*ignore expense / prejudice unqualified*

*ignore lack of permission*

*ignore results are unreliable*

**1**

**[7]**

 **M11.**          (a)     protection / defence

*ignore insulation* ***or*** *rolls into a ball*

*ignore camouflage*

**1**

          from predators / from being attacked / from being eaten

**1**

(b)     looks like snake / looks scary

**1**

          deters predators **or** has large eyes to spot predator **or**camouflage **or** warning colouration from predator or prey

*allow* ***two*** *separate adaptations for* ***2*** *marks*

**1**

(c)     (i)      natural selection

**1**

(ii)     Darwin

**1**

(iii)     simple life forms

**1**

(d)     believe that God created all organisms **or** humans there from the beginning

**1**

**[8]**

**M12.**          (a)     **X** (no mark)

**X** is more visible **or Y** is more camouflaged

**1**

(b)     (i)      so camouflage not changed **or** so not easier to see

**1**

(ii)     25

**1**

7

**1**

(iii)     any **one** from:

•        eaten (by birds) / died

•        mixed in with large number of unmarked moths

•        moved away

**1**

(c)     (i)      DNA

**1**

(ii)     the gene / allele for being dark / dominant

**1**

**[7]**

**M13.**          sex
genes
chromosomes
nucleus                   *in order*

*for 1 mark each*

**[4]**

 **M14.**          (a)     (i)      nucleus

(ii)     chromosome

(iii)     gene

*each for 1 mark*

**3**

(b)     a body cell

*for 1 mark*

**1**

**[4]**

 **M15.**          (a)     (i)      nucleus

(ii)     chromosome

(iii)     gene

*each for 1 mark*

**3**

(b)     a body cell

*for 1 mark*

**1**

**[4]**