

100 minutes on Biology B2 Test on Tuesday 26th February 11 days time

Q1.

Human activity affects ecosystems.

(a) Draw **one** line from each human activity to the effect on ecosystems.

Human activity	Effect on ecosystems
Increase in rice fields	Increases the amount of methane in the atmosphere
Destruction of peat bogs	Increases the amount of carbon dioxide that is released into the atmosphere
	Reduces the rate at which carbon dioxide is locked up as wood

(2)

(b) (i) Deforestation also affects the atmosphere.

Give **two** reasons why deforestation takes place.

1. _____

2. _____

(2)

(ii) Changes in the gases in our atmosphere can cause global warming.

Give **two** possible effects of a rise in the Earth's temperature.

1. _____

2. _____

(2)

(Total 6 marks)

Q2.

Coordination of the body can be affected
by chemicals called hormones

- (a) (i) Where are hormones produced?

(1)

- (ii) How do hormones move around the body?

(1)

- (b) Insulin is a hormone.

- (i) Where is insulin produced?

(1)

- (ii) Explain the role of insulin in controlling blood sugar levels.

(4)

(Total 7 marks)

Q3.

Reflex actions are rapid and automatic.

- (a) Name the following structures in a reflex action.

- (i) The structure that detects the stimulus.

(1)

- (ii) The neurone that carries impulses to the central nervous system.

(1)

- (iii) The neurone that carries impulses away from the central nervous system.

(1)

- (iv) The structure that brings about the response.

(1)

(b) Describe what happens at a synapse when an impulse arrives.

(2)

(c) Some people have a condition in which information from the skin does not reach the brain.

Explain why this is dangerous for the person.

(2)

(Total 8 marks)

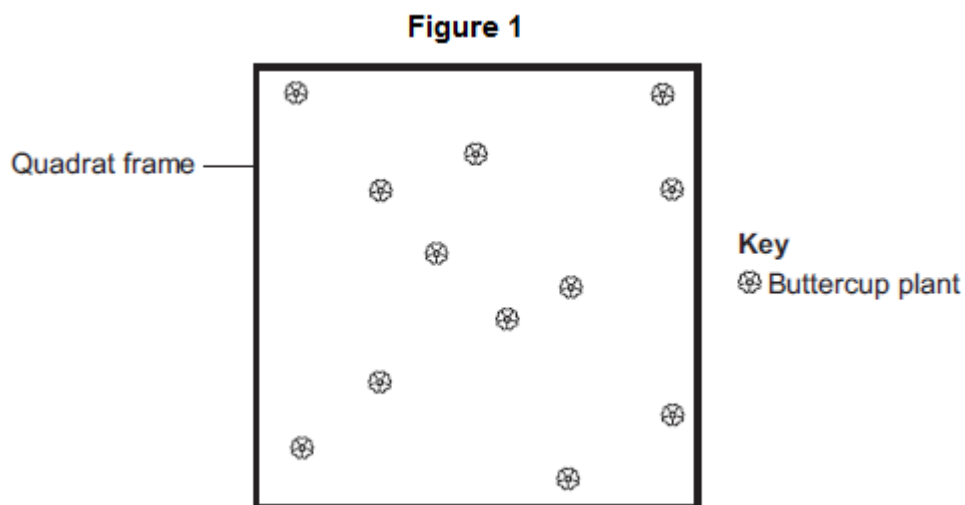
Q4.

A grassy field on a farm measured 120 metres by 80 metres.

A student wanted to estimate the number of buttercup plants growing in the field.

The student found an area where buttercup plants were growing and placed a 1 m × 1 m quadrat in one position in that area.

Figure 1 shows the buttercup plants in the quadrat.



The student said, 'This result shows that there are 115 200 buttercup plants in the field.'

- (a) (i) How did the student calculate that there were 115 200 buttercup plants in the field?

(2)

- (ii) The student's estimate of the number of buttercup plants in the field is probably not accurate. This is because the buttercup plants are not distributed evenly.

How would you improve the student's method to give a more accurate estimate?

(2)

- (b) Sunlight is one environmental factor that might affect the distribution of the buttercup plants.

- (i) Give **three other** environmental factors that might affect the distribution of the buttercup plants.

1. _____

2. _____

3. _____

(3)

- (ii) Explain how the amount of sunlight could affect the distribution of the buttercup plants.

(3)

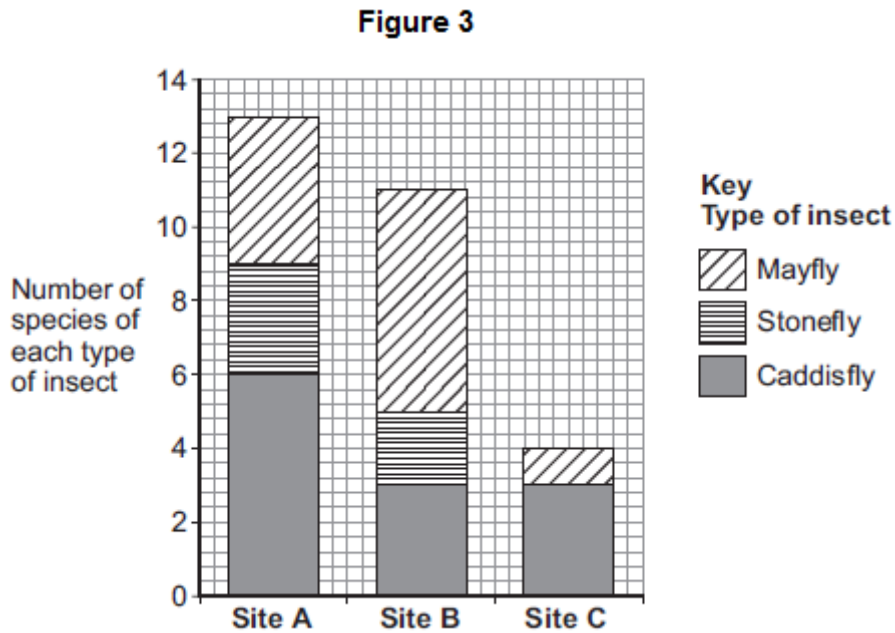
- (d) Three sites, **A**, **B** and **C**, are shown in **Figure 2**.

Scientists took many samples of river water from these sites.

The scientists found larvae of three types of insect in the water: mayfly, stonefly and caddisfly. For each type of insect the scientists found several different species.

The scientists counted the number of different species of the larvae of each of the three types of insect.

Figure 3 shows the scientists' results.



- (i) How many more species of mayfly were there at Site **B** than at Site **A**?

(1)

- (ii) Suggest what caused this increase in the number of species of mayfly.

(1)

- (iii) The scientists stated that the number of species of stonefly was the best indicator of the amount of oxygen dissolved in the water.

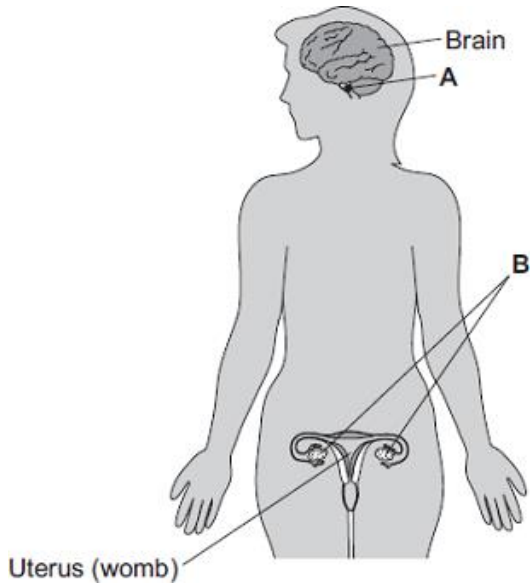
Use information from **Figure 3** to suggest why.

(1)

(Total 19 marks)

Q5.

The diagram shows the position of two glands, **A** and **B**, in a woman.



(a) (i) Name glands **A** and **B**.

A _____

B _____

(2)

(ii) Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

How does FSH move from gland **A** to gland **B**?

(1)

(b) (i) A woman is not able to become pregnant. The woman does not produce mature eggs. The woman decides to have In Vitro Fertilisation (IVF) treatment.

Which **two** hormones will help the woman produce and release mature eggs?

Tick (✓) **one** box.

FSH and Luteinising Hormone (LH)

FSH and oestrogen

Luteinising Hormone (LH) and oestrogen

(1)

- (ii) Giving these hormones to the woman helps her to produce several mature eggs. Doctors collect the mature eggs from the woman in an operation.

Describe how the mature eggs are used in IVF treatment so that the woman may become pregnant.

(3)

- (iii) IVF clinics have been set a target to reduce multiple births.

At least 76% of IVF treatments should result in single babies and a maximum of 24% of treatments should result in multiple births.

Suggest **one** reason why the clinics have been set this target to reduce multiple births.

(1)

- (c) Two clinics, **R** and **S**, used IVF treatment on women in 2007. Doctors at each clinic used the results of the treatments to predict the success rate of treatments in 2008.

The table shows the information.

	Total number of IVF treatments in 2007	Number of IVF treatments resulting in pregnancy in 2007	Predicted percentage success rate in 2008
Clinic R	1004	200	18–23
Clinic S	98	20	3–56

- (i) Compare the success rates of the two clinics in 2007.

(1)

- (ii) The range of the predicted success rate in 2008 for clinic **R** is much smaller than the range of the predicted success rate for clinic **S**.

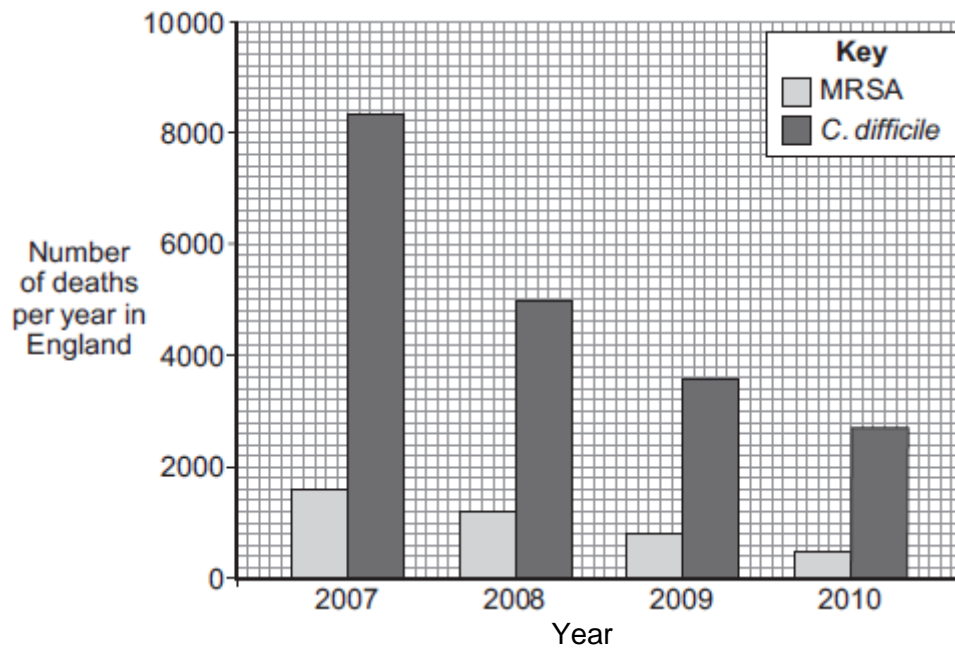
Suggest why.

(2)
(Total 11 marks)

Q6.

Infections by antibiotic resistant bacteria cause many deaths.

The bar chart below shows information about the number of deaths per year in England from *Methicillin-resistant Staphylococcus aureus* (MRSA) and from *Clostridium difficile* (*C.difficile*) over 4 years.



- (a) (i) Describe the trend for deaths caused by *C. difficile*.

(2)

(ii) Suggest a reason for the trend you have described in part **(a)(i)**.

Explain your answer.

(2)

(iii) Calculate the percentage change in deaths caused by MRSA from 2009 to 2010.

Percentage change in deaths caused by MRSA = _____ %

(2)

(iv) Numbers have not yet been published for 2011.

When the numbers are published, scientists do **not** expect to see such a large percentage change from 2010 to 2011 as the one you have calculated for 2009 to 2010.

Suggest **one** reason why.

(1)

(b) Before 2007 there was a rapid increase in the number of deaths caused by MRSA.

Describe how the overuse of the antibiotic methicillin led to this increase.

(3)

(Total 10 marks)

Q7.

Moose are animals that eat grass.

Figure 1 shows a moose.

Figure 1



© Wildnerdpix/iStock/Thinkstock

Figure 2 shows a food chain.

Figure 2

Grass → Moose → Wolves

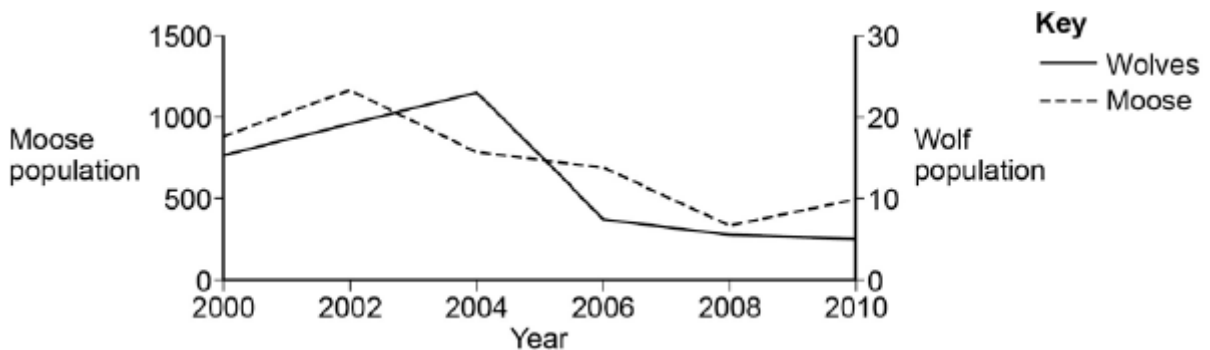
(a) Name the secondary consumer shown in **Figure 2**.

(1)

(b) **Figure 3** shows how the moose population and wolf population have changed in one area.

This is a predator-prey cycle.

Figure 3

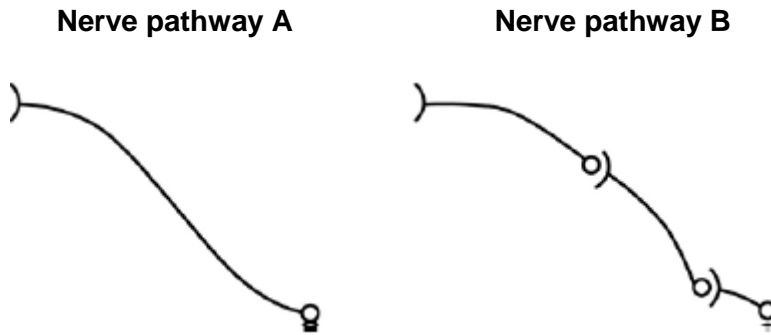


In 2004 the line on **Figure 3** for wolves is above the line for moose.

Q8.

The nervous system allows humans to respond to their surroundings.

The figure below shows two nerve pathways.



(a) Nerve pathway **A** is 92 cm long.

A nerve impulse travels along pathway **A** at 76.2 m / s.

Calculate how long it takes for the nerve impulse to travel the length of the pathway.

Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

Time = _____ s

(3)

(b) Nerve pathways **A** and **B** are the same length.

The nerve impulse takes longer to travel along pathway **A** than along pathway **B**.

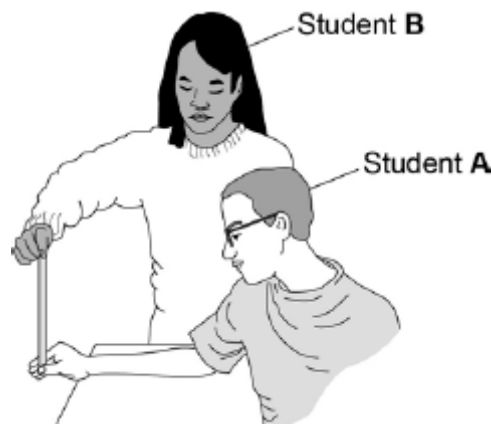
Use the figure above to explain why.

(3)

(c) Two students compare their reactions using a ruler.

This is the method used.

1. Student **A** sits with his elbow on a table top.
2. Student **B** holds the ruler so the bottom of the ruler is level with the top of student **A**'s thumb.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler.
5. Record the drop distance.
6. Repeat steps 1 to 5 four more times.
7. Repeat the whole experiment with student **A** dropping the ruler and student **B** catching it.



Both students are right-handed.

Student **A** uses his right hand to catch the ruler.

Student **B** uses her left hand to catch the ruler.

The table below shows the students' results.

Student	Drop distance in mm				
	Test 1	Test 2	Test 3	Test 4	Test 5
Student A – right hand	203	167	140	156	163
Student B – left hand	230	211	279	215	264

What is the range of student **A**'s results?

(1)

(d) The students are testing the hypothesis:

The drop distance of the ruler is smaller when a right-handed person uses their right hand to catch the ruler.

The students' results in the table above are not a good test of the hypothesis.

Suggest what the students should have done to test the hypothesis.

(3)

(e) Student **A**'s mean reaction time was 0.19 s.

Mean reaction time can be calculated using the equation:

$$\text{Mean reaction time} = \sqrt{\frac{2 \times \text{mean drop distance in m}}{9.8 \text{ m/s}^2}}$$

Calculate the mean reaction time for Student **B**.

Give your answer to two significant figures.

Student **B**'s results are repeated here to help you answer the question.

	Drop distance in mm				
	Test 1	Test 2	Test 3	Test 4	Test 5
Student B – left hand	230	211	279	215	264

Mean reaction time = _____ s

(4)

(Total 14 marks)

A man has polydactyly. His wife does not have polydactyly.

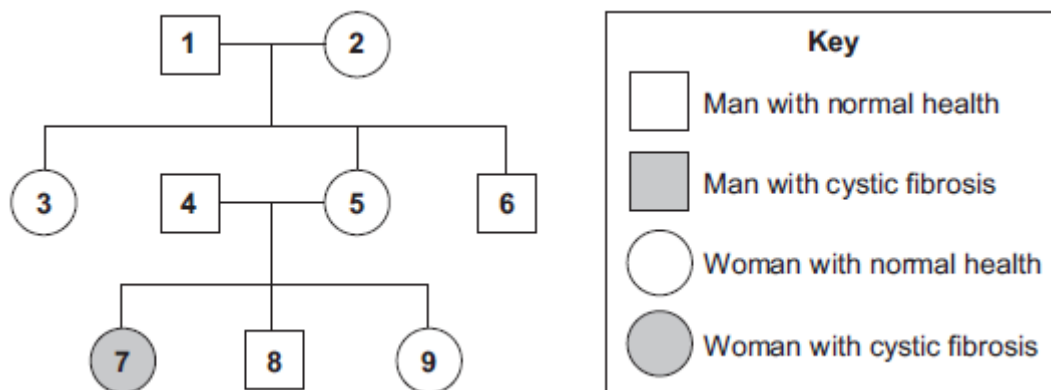
This couple's children have a 50% chance of having polydactyly.

Draw a genetic diagram to explain why.

(3)

(d) Cystic fibrosis is another genetic disorder. It is caused by a recessive allele.

The diagram shows the inheritance of cystic fibrosis in one family.



Woman 5 is pregnant with her fourth child.

What is the probability that this child will have cystic fibrosis?

Draw a genetic diagram to explain your answer.

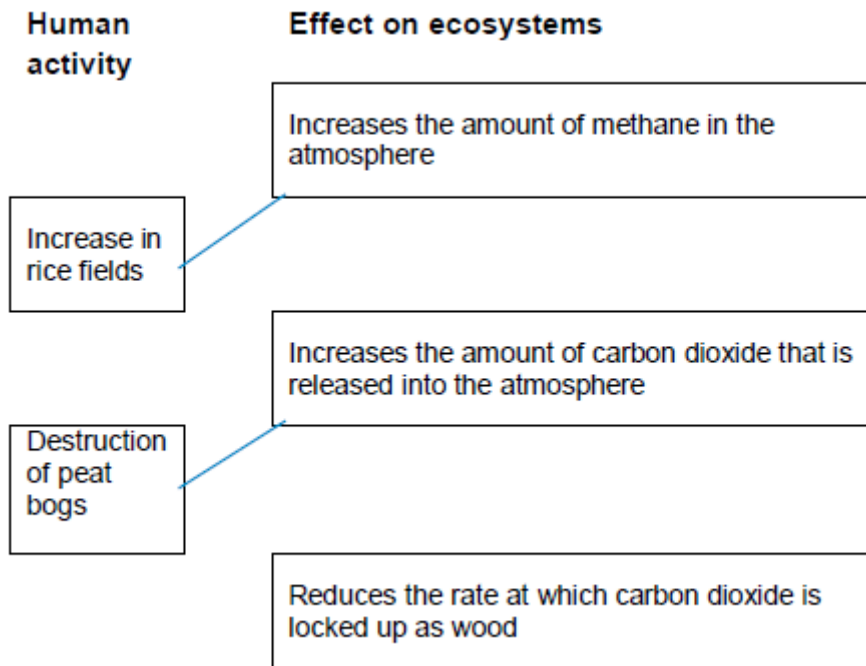
Use the following symbols.

N = allele for normal health

n = allele for cystic fibrosis

Mark schemes

Q1.



(a)

extra lines from left cancels mark

2

(b) (i)

- any **two** from:
- (to provide land) for farming / agriculture
 - (to provide land) for quarrying
 - (to provide land) for building
 - to provide wood for building materials
 - to provide fuel
 - to provide paper

2

(ii)

- any **two** from:
- changes in earth's climate, ie droughts, flooding, hurricanes
ignore temperature rise
allow ice caps melt
 - rise in sea levels
 - reduce biodiversity
 - change in migration patterns
 - may change distribution of species
- ignore acid rain **and** the ozone layer **and** forest fires*

2

[6]

Q2.

- (a) (i) endocrine glands **or** endocrine system
allow a specific named gland

1

- (ii) (dissolved) in the blood(stream) **or** plasma 1
- (b) (i) pancreas **or** islets of Langerhans 1
- (ii) (it **or** insulin) lowers blood sugar level [1]
- (by) (speeding up **or** increasing)
conversion of glucose to glycogen [1]
- in the liver [1]
- (and) speeding up **or** increasing uptake of glucose by body cells [1] 4

[7]

Q3.

- (a) (i) receptor
allow named receptor eg light receptor
ignore sensory neurone
allow sense organ / named sensory organ eg skin / eye 1
- (ii) sensory (neurone)
allow afferent 1
- (iii) motor (neurone)
allow efferent 1
- (iv) effector / muscle / gland / named 1
- (b) any **two** from:
- impulse / information passes from one neurone to another
or impulse / information passes across gap
 - chemical / transmitter involved
 - diffusion (across gap)
- 2
- (c) brain / person not aware of pain / stimulus / can't feel
allow brain/ person doesn't know / realise / unable to coordinate
ignore reflex
ignore information 1
- possibility of (permanent / serious) damage / eg burning
ignore danger

Q4.

- (a) (i) counts / 12 1
- × 120 × 80 / × 9600
or
× area of field 1
- (ii) (more) quadrats / repeats 1
- placed randomly
ignore method of achieving randomness 1
- (b) (i) any **three** from:
- temperature / warmth / heat
 - water / rain
 - minerals / ions / salts (in soil)
allow nutrients / fertiliser / soil fertility
ignore food
 - pH (of soil)
 - trampling
 - herbivores
ignore predators
 - competition (with other species)
 - pollution qualified e.g. SO₂ / herbicide
 - wind (related to seed dispersal).
ignore space / oxygen / CO₂ / soil unqualified 3
- (ii) light needed for photosynthesis 1
- for making food / sugar / etc. 1
- effect on buttercup distribution eg more plants in sunny areas / fewer plants in shady areas 1
- (c) (i) fertiliser / ions / salts cause growth of algae / plants 1
- (algae / plants) block light 1
- (low light) causes algae / plants to die 1
- microorganisms / bacteria feed on / break down / cause decay of organic matter / of dead plants
do not allow germs / viruses

- 1
- (aerobic) respiration (by microbes) uses O₂
do **not** allow anaerobic
- 1
- (ii) sewage / toxic chemicals / correct named example eg metals / bleach / disinfectant / detergent etc
allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO₂ / acid rain / pesticides / litter
ignore chemicals unqualified
ignore waste unqualified
ignore human waste / domestic waste / industrial waste unqualified
- 1
- (d) (i) 2
- 1
- (ii) more food
allow other sensible suggestion eg more species colonise from tributary streams after forest
- 1
- (iii) number of stonefly species decreases (from **A** to **B** / **B** to **C** / **A** to **C**) as more pollution enters river / less oxygen
allow fewer species in more polluted water
ignore none are found at site C
- 1

[19]

Q5.

- (a) (i) **A** – pituitary
allow hypothalamus
- 1
- B** – ovary / ovaries
- 1
- (ii) in blood (stream)
accept in plasma
ignore dissolved
- 1
- (b) (i) FSH and Luteinising Hormone (LH)
- 1
- (ii) fertilised
OR
reference to sperm
- 1
- form embryos / ball of cells or cell division
- 1
- (embryo) inserted into mother's womb / uterus

allow (fertilised egg) is inserted into mother's womb / uterus

1

(iii) any **one** from:

- multiple births lead to low birth weight
- multiple births cause possible harm to mother / fetus / embryo / baby / miscarriages
allow premature
ignore reference to cost / ethics / population

1

(c) (i) any **one** from:

- almost identical
allow S (slightly) more successful
- both approximately 20%

1

(ii) larger numbers (in clinic R) (in 2007)

allow only 98 (in S) (compared to 1004 (in R))

1

results likely to be more repeatable (in 2008)

allow more reliable

*do **not** accept more reproducible / accurate / precise*

1

[11]

Q6.

(a) (i) decrease

1

rate of decrease slows

1

(ii) any **one** from:

- more use of disinfectant
allow any reasonable increase in hygiene or sterilisation precautions
- more use of hand washing
- more careful / more often cleaning of patient facilities
- raised awareness / education about hygiene

1

Explanation:

stops / reduces the bacteria being transferred / spreading

1

(iii) $800 - 500 / 800 \times 100 =$

1

37.5 (%)

correct answer with or without working gains 2 marks

(iv) any **one** from:

- numbers quite low now so hard to reduce further
- was a big campaign / much publicity (in 2009) so more people already doing it
- hygiene / cleaning now good so hard to improve
- hospitals short of money so less staff to clean

1

(b) mutation occurred giving resistance (to methicillin)

*do **not** accept overuse caused mutation*

1

resistant bacteria not able to be treated / not killed

1

these bacteria multiplied / reproduced / spread quickly

1

[10]

Q7.

(a) wolves

1

(b) moose and wolves are on different scales

1

(c) wolf population has increased so more moose are eaten

*do **not** accept there are more wolves than moose*

1

(d) any **two** from:

- (other) predators
allow correct examples
allow 'humans hunting moose'
- (new) pathogens
allow diseases
- competition

2

(e) any **four** from:

- variation (within species) of antler size
allow description relating to antlers
- (caused by) different genes
- as a result of sexual reproduction / process of meiosis / mutation
- (phenotype) most suited to environment most likely to survive and breed
ignore natural selection unqualified
- genes for large antlers (more likely to be) passed on to next generation

4

reference to mate selection

or

fighting
or
gaining territory
or
competition for mates
or
avoiding predation

1
[10]

Q8.

(a) $0.92 = 76.2 \times \text{time}$

1

$\text{time} = 0.92 \div 76.2$

1

$= 0.012$

allow 0.012 with no working shown for 3 marks

1

(b) pathway **B** has two synapses

allow converse for pathway A

1

chemicals diffuse across each synapse

1

which slows down the impulse

1

(c) 140–203

1

(d) use the same person for each test

1

use left hand **and** right hand

1

use a bigger sample size **or** more people

allow take more readings with each person

1

(e) mean drop distance = $(230 + 211 + 279 + 215 + 264) \div 5 = 239.8$

1

$239.8 \text{ mm} = 0.2398 \text{ m}$

1

mean reaction time = $\sqrt{\frac{2 \times 0.2398}{9.8}}$

1

$= 0.221$

incorrect sig. figs max. 3 marks

1

allow 0.221 with no working shown for 4 marks

Q9.

- (a) (different / alternative) forms of a gene
do not accept types of genes 1

- (b) DNA isolated from embryo 1

- (fluorescent) probe mixed with embryo DNA 1

- probe (then) binds with embryo DNA 1

- (UV light) to show alleles / gene for disorder 1

- (c) genotypes of parents and gametes correct (Man **D** and **d**, Wife **d** and **d**)
*allow half-size genetic diagram with only one **d** from wife* 1

- offspring genotypes correct ($\frac{1}{2} = \mathbf{Dd}$ and $\frac{1}{2} = \mathbf{dd}$)
allow ecf if parental genotypes are wrong 1

- offspring phenotypes correctly assigned to genotypes 1

- (d) genotypes of parents and gametes correct (**N** and **n**)
allow ecf if parental genotypes are wrong 1

- offspring genotypes correct (**NN**, 2 x **Nn**, and **nn**) 1

- offspring phenotypes correctly assigned to genotypes; 1

- correct probability = 0.25 / $\frac{1}{4}$ / 25% / 1 in 4 / 1:3, only;
do not allow '3:1' / '1:4' 1