1 In May 2011, the Food Standards Agency stated that meat and milk produced from cloned animals should be allowed to go on sale to the public.

(a) (i) Describe the risks associated with cloning mammals.

(3)

*(ii) A cloned animal contains genetic information that is identical to its parent.

Describe the stages in the production of a cloned mammal.

(6)

(b) (i) Fertilisation takes place during sexual reproduction to produce genetically different offspring.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Fertilisation occurs when

(1)

- ☐ **A** diploid gametes combine to produce a diploid zygote
- ☐ **B** diploid gametes combine to produce a haploid zygote
- ☐ **C** haploid gametes combine to produce a diploid zygote
- ☐ **D** haploid gametes combine to produce a haploid zygote

(ii) Genetically different organisms contain different DNA codes that produce different proteins.

Describe the process that takes place in the nucleus during the first stage of protein synthesis.

(2)

.....

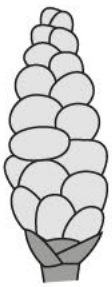
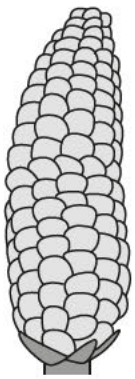
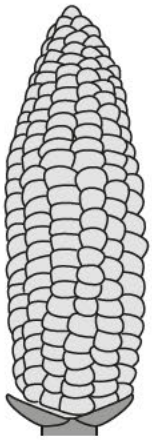
.....

.....

.....

(Total for Question 1 = 12 marks)

2 The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			resent

(a) Describe how scientists can use plant breeding programmes to produce maize plants with larger cobs.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

(b) There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

(c) Maize plants can be used in the production of biofuel.

Discuss the advantages and disadvantages of the use of biofuel.

(4)

(d) Plants grown for biofuel could be genetically modified.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The microorganism used as a vector to produce transgenic plants is

(1)

- ☐ **A** *Agrobacterium tumefaciens*
- ☐ **B** *Bacillus thuringiensis*
- ☐ **C** *Fusarium venenatum*
- ☐ **D** *Saccharomyces cerevisiae*

(Total for Question 2 = 10 marks)

3 When bacteria divide they replicate their genome and synthesise their cell wall.

Figure 12 outlines the stages of bacterial replication.

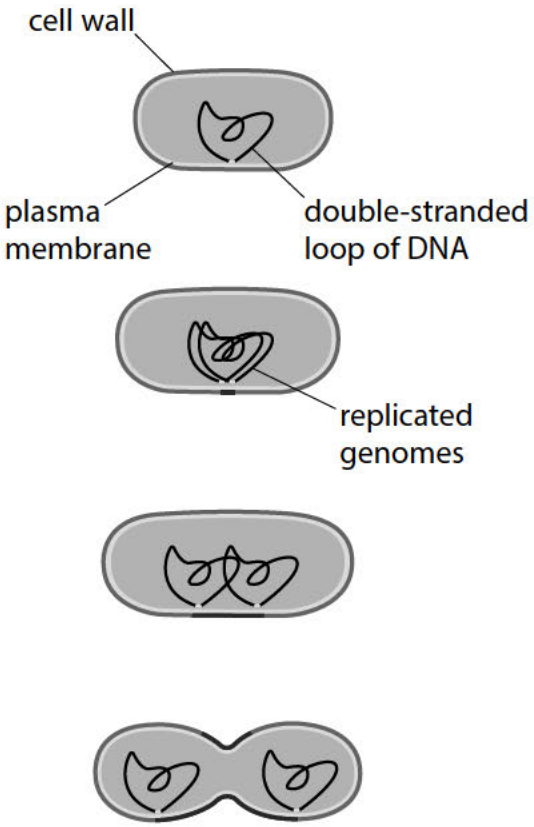


Figure 12

(a) Penicillin inhibits the synthesis of the cell wall in bacteria.

Explain the effect of penicillin on bacterial and human cells.

(3)

(b) Penicillin, isolated from a fungus, was the first antibiotic used to treat bacterial infections and is still widely used today.

Scientists have genetically engineered bacteria to produce large amounts of penicillin.

Describe how scientists would produce a genetically modified bacterium that produces penicillin.

(4)

*(c) MRSA is a bacterium that has evolved to become resistant to antibiotics.

With reference to Darwin's theory of evolution by natural selection, explain how MRSA bacteria have evolved to become resistant to antibiotics.

(6)

(Total for Question 3 = 13 marks)