

- 6 ▶** (One mark for each correct underlined term)
A gene is a section of a molecule known as DNA / deoxyribonucleic acid. The molecule is found within the nucleus of a cell, within thread-like structures called chromosomes. The strands of the molecule form a double helix joined by paired bases. The base adenine is always paired with its complementary base thymine, and the base cytosine is paired with guanine. During the process of transcription, the order of bases in one strand of the molecule is used to form messenger RNA / mRNA which carries the code for making proteins out to the cytoplasm.
- 7 ▶** 50 base pairs (1)
- 30 (G) bases (1) (*numbers of C and G must be the same*)
 - 20 (T) bases (1) (*C+G = 60, rest = 40. T must be half the 40*)
 - 20 (A) bases (1) (*numbers of T and A must be the same*)
 - 100 deoxyribose sugar groups (1) (*the same as the number of bases*)

UNIT 6 ANSWERS

CHAPTER 21

- 1 ▶** A **2 ▶** B **3 ▶** C **4 ▶** D
- 5 ▶ a** Using (hot) steam under high pressure.
b The air is needed to supply oxygen for aerobic respiration of the microorganisms. It is filtered to prevent contamination by unwanted microorganisms.
c Microorganisms produce metabolic heat that could overheat the culture. The water jacket contains circulating cold water to cool the contents of the fermenter and maintain a constant temperature.
d Nutrients.
e Growth would be reduced. The paddles mix the contents, so that the *Penicillium* cells are exposed to more nutrients, achieving a faster rate of growth.
- 6 ▶ a** glucose → ethanol + carbon dioxide
b The fermentation air lock allows carbon dioxide to escape from the jar but prevents air from entering.
c To raise the temperature of fermentation. Enzymes in the yeast will work more quickly if they are near their optimum temperature.
d High concentrations of ethanol kill the yeast cells.
- 7 ▶ a** To kill any natural bacteria in the milk.
b It is the optimum temperature for growth and activity of the yoghurt bacteria.
c Proteins in the milk coagulate due to the fall in pH.
d The drop in pH reduces the growth of the lactic acid bacteria.
e The low pH helps to prevent the growth of other spoiling microorganisms.

CHAPTER 22

- 1 ▶** B **2 ▶** C **3 ▶** D **4 ▶** A
- 5 ▶ a** 1 = restriction endonuclease / restriction enzyme; 2 = (DNA) ligase.
b It is a vector, used to transfer the gene into the bacterium.
c They are cultured in fermenters.
d It is identical to human insulin and gives better control of blood glucose levels.
- 6 ▶** The account should discuss how far xenotransplantation has been developed and what advantages have been suggested for it. It should look at what the biological problems might be, and the ethical objections. It should be a balanced account.
- 7 ▶ a** Use *Agrobacterium* to insert plasmids containing the required gene into plant cells or use a gene gun – firing a pellet of gold coated with DNA containing the required gene.
b The plants are grown by micropropagation.
c Egg cell.
- 8 ▶** Essay should describe a range of genetically engineered products, such as:
- products from bacteria: human insulin, enzymes, human growth hormone, etc
 - genetically modified plants, such as ‘golden rice’ and crops resistant to herbicide
 - genetically modified animals, e.g. sheep used to produce human proteins, xenotransplantation.
- The benefits of each example should be discussed. The risks from genetic engineering should also be discussed, such as:
- ‘escape’ of genes from crop plants into natural plant populations
 - transfer of ‘hidden’ pathogens in xenotransplanted organs.

END OF UNIT 6 QUESTIONS

- 1 ▶ a** Restriction endonuclease / restriction enzyme (1).
b An egg cell / egg (1), with its nucleus removed (1).
c An organism containing a gene / DNA / an allele from a different species (1).
d Any three points for 3 marks:
- all sheep will be genetically identical / have same genes / have same DNA
 - all sheep will produce Factor IX
 - could be used to make more Factor IX
 - faster reproduction of sheep
 - only need to genetically modify the sheep once.
- e** Prevents blood loss (1); prevents entry of pathogens / bacteria / microorganisms (1).
f Plasma and platelets (2).
- 2 ▶ a** It would not be possible to destroy these plants (1), and the genes could jump to other species so that they would also not be able to be destroyed (1).