18 Option F Microorganisms and biotechnology

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Forms of RNA	Role in protein synthesis
messenger RNA (mRNA)	single-stranded RNA that is formed by the process of transcription of the genetic code in the nucleus, and then moves to the ribosomes in the cytoplasm
transfer RNA (tRNA)	short lengths of specific RNA that combine with specific amino acids prior to protein synthesis
ribosomal RNA	component of the ribosomes, site where mRNA is 'read' and amino acid condensation to form protein occurs

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2 See **Table 1.4**, page 17.

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3 The information required for replication of a virus is present as the genetic code in the nucleic acid (DNA or RNA) at the centre of the virus particle. If this reaches the interior of a host cell, it takes over the replication machinery and engineers replication of the viruses – very many are produced. The protein coat (capsid) contains no genetic information (and typically remains outside the host cell).

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4 *Rhizobium* respires glucose. From the cell respiration process it obtains reducing power ($NADH_2$) and metabolic energy in the form of ATP – used, among other things, in nitrogen fixation. *Rhizobium* present in root nodules obtains glucose to respire from the leguminous plant in which it lives.

5 See **Cycling of nutrients** and **Figure 6.10**, page 146.

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6 See **Cycling of nutrients** and **Figure 6.10**, page 146, and **Figure 18.19**, page 570.

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7 See **The central dogma** and **Figure 8.16**, page 252. Genes exist as alleles that may be dominant or recessive, and so be expressed or not in any generation, but which are unchanging as the environment and conditions in cells change. Reverse transcriptase apparently contradicts this one-way flow of influence of the DNA of genes.

(An alternative, **discredited view** of inheritance, known as Lamarkian inheritance, suggested that the environment experienced might change the organism's genes and that these changes could be inherited.) According to Mendel and Darwin, the role of the environment is as a selection force, influencing which genes are effective, but not changing genes themselves.

8 This observation suggests that issues which become news are better funded than those which quietly bring about effective change and improvement without attracting publicity. Also, if expensive drugs or equipment are not central to the innovation, then the innovation does not get the same degree of commercial or industrial support. Meanwhile, clean water, healthy living conditions, a good diet and a supportive community working in a peaceful environment may contribute the most to good health. What do you think? Does this situation arise in your country?

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9 The gene that is introduced is added to ordinary body cells but not to the germinal epithelium in the testes or to the oocytes in the ovaries. The affected individual's body (soma) is treated, but not his or her germ line.

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10 Yeast does not produce hydrolysing enzymes that break down insoluble food reserves (mainly starch) in the grain. The starch must first be hydrolysed into sugar (mainly sucrose and maltose) by some other process, before the yeast can ferment the sugar to alcohol.

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11 Sugar: see **Health consequences of energy-rich diets; Excess carbohydrates**, page 408.
Salt: a high salt concentration alters the osmotic concentration of body fluids. See **Osmosis – a special case of diffusion**, page 26.
Organic acid (ethanoic acid – vinegar), see answers to SAQ4, Chapter 13; SAQ3, Chapter 14.

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12 See **Treatment of food poisoning**, page.

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13 If you have difficulty with this, seek advice from your teacher or tutor.

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14 See **Pasteur's experiment** in **Figure 1.2**, page 3. Can a similar experiment be devised easily, using simple apparatus available in the laboratory you study in?

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15 **a** Antibiotics and vaccines:
antibiotics – organic compounds produced by microorganisms which selectively inhibit or kill other microorganisms
vaccines – preparations of attenuated microorganisms or inactivated components that confer immunity from a disease when injected.

b Inflammation and immunity:
inflammation – painful swelling caused in response to infection
immunity – resistance to the onset of disease after infection or vaccination.

c Vector and host:
vector – an agent that acts as an intermediate carrier or alternative host
host – any organism in which another spends part or all of its life.