B1 Cells

B1.8 Microorganisms

What are microorganisms?

274 An organism that is very small and requires a microscope to view it

275 A microorganism is something we can view using a microscope, not a magnifying glass.

276 An organism made of only one cell

277 Light bulb/lamp/mirror

278 Some microorganisms are unicellular, but some are multicellular.

279 Bacteria, viruses, fungi

280

Equation	value in mm = value in cm × 10
Values	value in mm = ? value in cm = 0.056
Enter values	value in mm = 0.056 × 10
Result	value in mm = 0.56
Y(units)	value in mm = 0.56 mm

281 Some microorganisms are helpful, while some are harmful (and many do not affect us at all).

282 A sperm cell is not an organism, so it cannot be a microorganism.

283 Cell wall, cell membrane, cytoplasm, nucleus, vacuole and ribosomes

How do microorganisms grow?

284 Availability of oxygen

285 Bacteria do not grow in size; they grow in number.

286
- **a** Groups of microorganisms
- **b** Low pH
- **c** The Petri dish with a low pH had the highest number of colonies.
- **d** Availability of oxygen, availability of nutrients and temperature

287 Because the pH is not optimum for their growth

288 Because there is less oxygen for microorganisms to grow on the food when it is at the top of a mountain; also accept answers that refer to a lower temperature

289 The high temperature kills the bacteria that cause food poisoning.

290 There is little oxygen in a tightly sealed bottle, so microorganisms cannot grow as well inside it.

291 There is little oxygen in the cans, so microorganisms cannot grow well inside them.

292 Temperature

293 Some bacteria have a lower optimum pH than others.

294 Temperature, availability of oxygen and pH, because they all affect how quickly microorganisms can grow

295 Some bacteria have a higher optimum temperature than others.

296 Lowers the pH

297 Availability of oxygen and pH

How do we grow microorganisms?

298 Nutrient agar is a solid substance that microorganisms grow on.

299 It provides both nutrients and a solid surface for microorganisms to grow and form colonies.

300 A Petri dish provides a controlled, sterile environment with a nutrient agar on which microorganisms like bacteria can grow and be observed.

301 25°C because it is warm enough for microorganisms to grow, but not warm enough to encourage the growth of harmful microorganisms

302 The tape secures the lid to prevent contamination but is left slightly loose to allow oxygen to enter, which is necessary for microorganism growth.

303 An incubator maintains a constant temperature, which is essential for the proper growth of bacteria.

304 Sterilised means that all other microorganisms on the dish have been killed to ensure that only the bacteria we add will grow.

305 Microorganisms grow best at a specific temperature. If the temperature is too low or too high, the microorganisms may not grow properly or harmful bacteria might grow.

306 Temperatures above 25°C could encourage the growth of harmful microorganisms that could be dangerous to humans.

307 A different food source might not provide the right nutrients for the microorganisms to grow, which could slow their growth or stop it entirely.

308 Incubating at 35°C might encourage the growth of harmful microorganisms, which could contaminate the experiment and pose a risk to health. The microorganisms that we want to grow might also grow too quickly at this higher temperature.

What is the body's first line of defence?

309 A protein produced by white blood cells

310 A protein found on the surface of cells

311 A pathogen is a microorganism that can harm people.

312 Skin, nose hairs and mucus

313 Tears, saliva and stomach acid

314 The pathogen is likely to be caught on the nose hairs or trapped in mucus before it can reach the lungs.

315 So pathogens cannot enter the body through the cut

316 Tears in the eyes have enzymes that can break down pathogens' cell walls.

317 Different viruses have different antigens. Antibodies are specific and can attach only to certain antigens.

318 White blood cells produce specific antibodies that attach to antigens on the pathogen. This makes the pathogens clump together. Another white blood cell engulfs and digests the clumped pathogens.

319 The saliva in their mouth has enzymes that break down the cell walls of pathogens. Hydrochloric acid in the stomach kills pathogens in the food.

320 Antibodies attach to antigens on the pathogens, causing the pathogens to clump together. This makes it easier for white blood cells to engulf and digest the clumped pathogens.

How do vaccines work?

321 Vaccines contain dead or inactive pathogens, so they cannot cause illness but still have antigens.

322 After a vaccine, few antibodies are produced. However, when exposed to the same pathogen years later, the body produces a larger number of antibodies.

323 White blood cells engulf and digest the dead pathogens after producing antibodies against them.

324 Antibodies are proteins produced by white blood cells.

325 Antigens in a vaccine are important because they can be used by white blood cells to produce specific antibodies.

326 If most people are vaccinated, the pathogen struggles to spread because there are few people who can be infected.

327 This is incorrect because antibodies produced during a real infection last longer than those produced following a vaccination.

328 Antibodies are produced slowly because the white blood cells have not identified the antigens quickly enough.

329 This might not be true because some people cannot be vaccinated.

330 Because this prevents the pathogen from reproducing quickly and making the person ill

331 If herd immunity was lost, the pathogen would spread more easily, leading to more infections. People who cannot be vaccinated could become ill.

332 Vaccinating only a few people makes it possible for the pathogen to spread to the many unvaccinated people in the population.

333 They might still be protected because their white blood cells (memory cells) can recognise the antigens on the pathogen and produce antibodies quickly to kill the pathogen before it makes them ill.