

- 2 ▶ a i** A = stomach (1) because it is an acidic pH (1).
B = small intestine (1) because it is an alkaline pH (1).
- ii** Protein (1).
- b i** Liver (1).
- ii** Proteins (1).
- iii** Proteins (from the urea) are a source of nutrients for the cattle (1).
- iv** The Bowman's capsule carries out ultrafiltration of the blood (1) allowing water and small solute molecules such as urea to pass through into the kidney tubule, but holding back blood cells and large molecules (1). The loop of Henlé is involved in concentrating the fluid in the tubule (1), so that urine with a high concentration of urea is produced at the end of the tubule (1).
- 3 ▶ a** A = pulmonary vein, B = aorta, C = right atrium, D = left ventricle, E = renal vein (5).
- b** X (artery) has narrow lumen / muscular wall, Y (vein) has large lumen / little muscle (2).
- c i** Increases rate and volume of heartbeat (2).
- ii** Two from: increases breathing rate, diverts blood away from intestine to muscles, converts glycogen to glucose in the liver, dilates pupils, causes body hair to stand on end, increases mental awareness, increases rate of metabolism (2).
- d** Reflex action is automatic / involuntary (1), voluntary action is one a person chooses to carry out / is initiated by the brain (1).
- e** Lactate produced in muscles during exercise needs to be oxidised / removed / oxygen debt needs oxygen (1), oxygen is supplied by increased breathing rate and increased heartbeat (1).
- 4 ▶ a** Labels: Cell membrane (1), lobed nucleus (1), cytoplasm (1)
- b** Two from: has a nucleus, irregular shape / not biconcave, no haemoglobin (2).
- c** Two from: ingest / engulf / surround (bacteria), digest / break them down, using enzymes (2).
- d** Three from: lymphocytes, make antibodies, specific to antigens, form memory cells (3).
- 5 ▶ a** All chemical reactions taking place in cells can continue at a steady rate / metabolism doesn't slow down in cold conditions (1).
- b i** Arterioles: blood remains in core of body and doesn't lose heat (1). Sweat: no heat lost in evaporating the sweat (1). Shivering: increases heat production by respiration (1).
- ii** They have a lot of muscle fibres in their walls (1).
- c i** Antidiuretic hormone / ADH (1).
- ii** More water has been lost as sweat (1).
- iii** As concentration of water in blood decreases (1) ADH is released from the hypothalamus (1) and causes reabsorption of more water in kidney tubules (1).
- 6 ▶ a i** B **ii** C **iii** B **iv** D **v** A (5).
- b** Pregnancy is most likely to result from sexual intercourse around the time of ovulation (1), i.e. in the middle of the menstrual cycle / around day 14 (1). If a couple avoid having sexual intercourse at this time, the woman is less likely to become pregnant (1).
- 7 ▶ a** B (1). Cell division has reduced the chromosome number (1) from 46 to 23 / to the number present in gametes (1).
- b** The fertilised egg / zygote has 46 chromosomes (1). It divides by mitosis (1), so that all the cells of the body also have 46 chromosomes (1). In the sex organs, gametes are produced by meiosis (1), which halves the chromosome number to 23 (1). Fertilisation of an egg by a sperm restores the chromosome number to 46 (1).
- c** Any three for 3 marks, from:
- mitosis involves one division, meiosis involves two
 - mitosis forms two cells, meiosis forms four
 - mitosis forms cells with the same chromosome number as the parent cell / diploid, meiosis forms cells with half the chromosome number of the parent cell / haploid
 - mitosis forms body cells, meiosis forms sex cells / gametes
 - mitosis forms cells that are genetically identical, meiosis forms cells showing genetic variation.
- 8 ▶** Any six for 6 marks, from:
- rats given protein supplement / range of amounts of protein supplement, and rats given no supplement (Control)
 - rats same age / same sex / same health / same variety
 - several rats in each group (allow 6 or more per group)
 - weigh before and after treatment / take other suitable measurement before and after treatment, such as circumference of leg muscles
 - suggested time period for treatment (minimum one week)
 - calculate (mean) % change in mass
 - same diet (apart from supplement)
 - same water / same amount of exercise / other suitable controlled factor.

UNIT 3 ANSWERS

CHAPTER 10

- 1 ▶** A **2 ▶** D **3 ▶** C **4 ▶** A
- 5 ▶ a** Iodine solution, turns from yellow-orange to blue-black.
- b** Only the green areas that are not covered would contain starch.
- c** Photosynthesis needs light and chlorophyll. These are only both available in green, uncovered areas.
- d** A storage carbohydrate. It is insoluble, so can be stored in cells and has no osmotic effects.

Part of leaf	Function	How the part is adapted for its function
palisade mesophyll layer	(main site of photosynthesis)	(cells contain many chloroplasts for photosynthesis)
spongy mesophyll layer	gas exchange surface: uptake of CO ₂ and release of O ₂ during photosynthesis, some photosynthesis	large surface area to volume ratio; air spaces between cells; many chloroplasts in cells for photosynthesis (but fewer than in palisade layer)
stomata	pores which exchange gases (CO ₂ , O ₂ and water vapour) with the atmosphere	pores formed between two guard cells; guard cells can change shape to open and close pores
xylem	transport of water and minerals	cells consist of dead, hollow vessels, allows transport through the lumen of each vessel; lignified walls for strength, preventing cells collapsing under suction pressure
phloem	transport of products of photosynthesis	sieve tubes with sieve plates forming continuous tubes to transport solutes; cells living, so can exercise control over movement

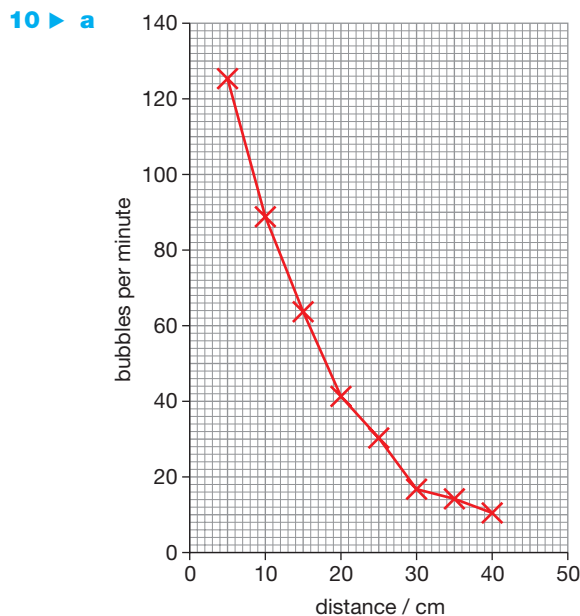
7 ▶ a At 0200 hours (night) the grass respire, producing CO₂, but there is no photosynthesis. At 1200 hours (midday) photosynthesis in the grass exceeds respiration, so CO₂ is used up.

b At 0400 hours: light intensity. At 1400 hours: the concentration of CO₂ in the air.

Substance	Use
glucose	oxidised in respiration to give energy
sucrose	main sugar transported in the phloem
starch	storage carbohydrate
cellulose	makes up plant cell walls
protein	growth and repair of cells
lipid	energy store in some plants, e.g. nuts, seeds. Part of all cell membranes.

9 ▶ a The aeration tube supplies oxygen to allow the roots to respire. The foil stops light entering the tube, preventing the growth of algae.

b Phosphate.



b About 52 bubbles per minute.

- c
- The gas is not pure oxygen, although it has a high oxygen content.
 - The bubbles may not be all the same size.
 - The water in the test tube may have increased in temperature as the lamp was brought nearer to the tube.

11 ▶ The account should include:

- Description of photosynthesis as a chemical reaction where CO₂ and water are combined using light energy trapped by chlorophyll, forming glucose and oxygen.
- Equation for the reaction.
- Leaf adaptations: details of palisade mesophyll, spongy mesophyll, stomata and epidermis, xylem and phloem (diagram needed).
- Photosynthesis supplies oxygen for respiration in animals and other organisms; it is needed at the start of food chains; how energy is harnessed by plants as the producers, and then passed to consumers (note: these topics are covered fully in Chapter 14).

CHAPTER 11

1 ▶ C 2 ▶ B 3 ▶ C 4 ▶ A

5 ▶ a Loss in mass = (8.2 – 8.0) g = 0.2 g.
Percentage change = $(-0.2/8.2) \times 100 = -2.4\%$.

b Osmosis. c Solution A.

d Solution C. e Solution B.

f It is permeable to small molecules such as water, but not permeable to large molecules such as sucrose.

6 ▶ a Long, thin extension of the cell has a large surface area for the absorption of water and minerals.

b Dead, lignified cells with hollow lumen, forming long tubes that carry water and minerals throughout the plant. The lignified walls are tough so that they don't collapse under pressure.