ANSWERS – BIOLOGY
FORM ONE

INTRODUCTION TO BIOLOGY

1.

Plants	Animals
- Manufacture their own food - Grow continuously throughout their life - Slow in responding to stimuli	- Cannot manufacture their own food - Stop growing when they reach maturity - Fast in responding to stimuli

2. - Growth of the organism
   - Movement of the organism
   - Maintenance of metabolic activities

3. They grow
   - They respire
   - They have gaseous exchange
   - They reproduce
   - They excrete
   - They respond to stimuli
   - They have nutrition

4. They reproduce
   They grow
   They respond to stimuli

CLASSIFICATION 1

1.

(a) Binomial nomenclature is a system of naming organisms by giving them two scientific names, the generic and the specific names.

(b) - It makes it easier to identify an organism.
- It is easier to describe an organism as it is based on characteristics of the organism

- Large number of organisms are divided into smaller groups depending on characteristics
- The whole world uses the same groupings, so everyone understands each other.

2. (a) Classification – placing of animals and plants into group according to their similarities in structure, physiological processes and ancestry.
   - Taxonomy - scientific study of classification.
   - Binomial nomenclature- system of naming using two names. The first part of the name represents the genus (generic name) while the second part refers to species or is the specific name.

3.
   (a) - Nucleus not organized
   - Organelles not bound by membrane
   - Absence of mitochondria

   (b) Class insecta

4. Genus
5. Specific name
6. Species – A species is the smallest unit of individual organisms which has hereditary distinction from that of any other group and whose members naturally interbreed to produce fertile offspring
7. Taxonomy- Scientific study of classification
8. Taxon- Each group of classification

THE CELL – ANSWERS

1. (a) - Secretion of useful substances

- Formation of secretory vesicles

2. (a) - Destroying old and worn out organelles

(b) - Secretion reticulum (rough)

- Formation of secretory vesicles

3. (a) - Mitochondrion

(b) - Chloroplast

4. - Ribosomes

- Endoplasmic reticulum (rough)

5. (a) - X- chloroplasts

- Y - Vacuole

(b) In dim light. They move to the upper part of the cell in order to receive enough sunlight for photosynthesis

6. (a) - Increase surface area for attachment of respiratory enzymes hence increasing rate of respiration.

(b) (i) Stroma

(ii) Absorb sunlight used for light stage of photosynthesis

7. (a) Drawing = Length of the drawing

Magnification Length of the object

(b) It is adding a dye to the specimen to make the features clearer and distinguishable

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8. - Form vesicles that transport materials to other parts of the cell e.g. proteins

-Transport secretions to the cell surface for secretion e.g. enzymes and mucus.

- They form lysosomes

9. - Cell wall

- Large vacuole

- Chloroplast

- Starch granules

10. (i) Reflect light from the source to the microscope/specimen

(ii) Regulate amount of light entering the microscope/reaching specimen.

(iii) Move body tube up and down in order to obtain a rough focus of the image of specimen.

11. It is the ability to differentiate two structures or organelles lying close

12. (a) A cell is structurally and physiologically modified in order to perform a particular function.

(b) (i) Presence of dendrites to receive impulses

(ii) Presence of chloroplasts to trap sunlight

(iii) Elongated and no cuticles in order to absorb water

(iv) Biconcave shape to increase surface area for diffusion of oxygen/haemoglobin.

13. 1 mm = 1000µm

3.5 mm = 3500 µm

10 cells = 3500 µm

1 cell = 3500 µm

10

1 cell = 350 µm

14. (i) Made of several specialized cells grouped together and perform particular

function.

(ii) Made of a group of specialized tissues grouped together performing a particular function

(iii) It is made of several organs that perform a particular function.

CELL PHYSIOLOGY

1. a) i) Diffusion

ii) Active transport

b) Diffusion-A concentration gradient between sodium ions in sap and those in the pond.

Active transport-energy in form of ATP must be available/Oxygen and food in the living tissue for respiration provide energy.

2. A film of water surrounds the soil particle. Root hairs of the plants penetrate between the soils particles/are close to the soil particles; cell sap of the root hair cells is more concentrated in solutes/has less water than the soil solution. Thus water moves into root hair cell by osmosis i.e across the cell a wall and the semi permeable membrane.

3. The leaves expose a smaller surface area to the sun. Thus reducing transpiration/excessive water loss.

4 a) Diffusion is defined as the net movement of a substance from a region where its concentration is high to a region where its concentration is low.

b) i) Diffusion gradient-the greater the diffusion gradient, the greater the rate of diffusion

ii) Surface area to volume ratio-the greater the S.A.V.R the

higher the temperature the greater the rate of diffusion.

iii) Temperature –The higher the temperature the greater the rate of diffusion

c) i) Absorption of mineral salts from the soil by root hairs

ii) Re-absorption of glucose molecules in the kidney tubule.

iii) Absorption of digested food in the ileum e.g glucose, amino acids.

5. i) Uptake of water from the soil into root hairs of plant roots

ii) Movement of water from the veins of leaves through the leaf cells to the atmosphere during transpiration.

6. a) The visking tubing was fully filled with solution. Level of water in beaker decreased .

b) Sucrose solution in visking tubing created high concentration gradient.

-Water molecules moved from distilled water to the visking tubing by osmosis.

7. -Plant cells have cells membrane and cell wall. When the cell is placed or immersed in distilled water, the water is absorbed by osmosis. As cell becomes turgid, the cell created an inward force, wall pressure that prevents the cell from bursting.

8.

Diffusion	Osmosis
• Involves movement of particles of molecules of liquid or gas. • It may be through a membrane or in air.	• Involves movement of solvent • It takes place through a semi-permeable.

• Not affected by PH changes.	• Rate affected by pH changes.

9. a) Isotonic solution- a solution which has the same concentration as the cell sap.

   b) Hypotonic solution- a solution which is less concentrated than the cell sap.

   c) Hypertonic solution- A solution which is more concentrated than the cell sap.

10. Plants normally grow in soils whose solute concentration is lower than that of the cell sap. This enables the plants to take up water by osmosis. Addition of large amounts of salt to the soil increases the solute concentration of soil water beyond that of the cell sap. The result is that the plants lose water to the soil by osmosis. Since water is very important for maintaining the structural and metabolic activities of plants, its deficiency leads to death of the plants.

11. a) The red blood cells take in water by osmosis. They swell and exert pressure on the fragile plasma membrane which then breaks. Plant cells take in water and swell but do not burst. This is because their tough cell wall can only stretch to a limited extent. Once fully stretched, the cell wall resists further expansion of the cell and no more water is taken up.

    b) Fresh water protozoa take in water by osmosis. The excess water is then actively pumped into the contractile vacuole which discharges the water to the outside.

NUTRITION IN PLANTS

1. a) K- Enzyme , sucrose, invertase

   L- Inhibitor

   b) Additional of sucrose/substance, Addition of enzyme, Optimum

   PH, Removal of products.

   c) Complete with substrate for active site of the enzyme.

2. a) Split water molecules/photolysis

   b) Glucose

3. Yellowing of leaves/stunted growth/chlorosis/lack of chlorophyll.

4. a) i) A and B -more active sites of enzymes available for a large

   number of molecules of substrate. There is increase in rates of reaction

   ii) B-C

   - Enzyme/substance are in equilibrium. All active sites are

   occupied hence rate of reaction is constant.

   b) Raising concentration of enzymes

   c) PH, temperature, inhibitors/cofactors.

5. a) Substances that activate enzymes

   b) Iron/Magnesium/Zinc/Copper.

6. - Magnesium,

   - Nitrogen

   - Iron

7. Xylem

   - Transport water to photosynthesizing cells from stem

   - Offer support to the lamina for maximum exposure to sun-light.

Phloem

- Transport manufactured food away from the leaf to create high concentration gradient.

8. Takes place in the grana of the chloroplast. Light is absorbed and used to split water molecules into hydrogen ions and oxygen, photolysis. Energy is formed and is stored in form of ATP.

9. a) i) Light stage-grana

ii) Dark stage-stroma

b) -Uses the energy formed or produced during light stage.

-Uses the hydrogen ions produced in light stage for carbon dioxide fixation.

10. i) Cuticle -Transparent allowing light to penetrate.

ii) Veins –Xylem vessel transport water to the photosynthesizing cells as it is a raw material

Phloem - Transport manufactured food out of the leaf to create high concentration gradient.

11. a) To hydrolyse/break down the disaccharide (non-reducing sugar).

b) Non-reducing sugar

c) i) Condensation,

ii) Hydrolysis

d) i) Starch,

ii) Glycogen

12. i) Fatty acids and glycerol

ii) Form part of the cell membrane

- Provide insulation of bodies of animals
- A source of metabolic water.
- Provide energy in absence of carbohydrates

13. a) L - Blue-black

M -Yellow

N - Blue Black

b) Absorb carbon (IV) oxide in the jar.

NUTRITION IN ANIMALS

1. a) Rhizobium

b) Symbiosis

2. a) Activate enzymes

b) Magnesium/zinc

3. Scuvy

4. - Rickets

- Goitre

5. Sharp/ hooked/ strong beaks for killing/ripping off flesh from bones, sharp claws for grabbing/holding prey.

6. i) Salting -This removes / absorbs water by osmosis from micro-organism cell. Which then die due to dehydration. Meat also becomes dehydrated and thus unsuitable for microbial growth.

ii) Refrigeration –Low temperature renders the micro-organism inactive (Enzymes do not work at low temperature).

iii) Canning –Boiling kills all micro-organism in the food. Sealing

under pressure excludes all micro-organisms and ensures that growth takes place.

7. Similarity: Both are heterotrophic.

Difference: Predators kill to get food while parasites obtain foods without killing the host.

8. Pancreatic juice containing digestive enzymes is prevented from reaching food. Insulin and glycogen hormones which regulate sugar are released directly into the blood stream.

9. Roughage provide grip needed for peristalsis/lack of roughage results in slow/no movement of food leading to constipation. (Accept: add bulk to peristalsis to take place)

10. a) Breakdown of (complex) food substance by enzymes to simpler compounds which can be absorbed.

b) - Small intestine is long/coiled to offer large surface area for digestion and absorption.

- The walls are muscular for peristalsis.
- Inner walls posses mucus glands, goblet cell; that secret mucus for lubrication and protection of the walls from digestive enzymes.
- The inner walls have digestive glands that secrete digestives enzymes.
- The inner walls has villi to increase surface area for absorption.
- The villi have numerous blood vessels for transport of the end products of digestion.
- The villi also have lacteal vessels, for transport of fats/lipids.

11. - Quicken healing of wounds

- Forms connective tissues of the teeth and jaws.

- Provides resistance to body infections

12. a) Homodont-Organism has same number of teeth, type of teeth and the same size.

b) Slice fish and crush bones

c) I=0, C =0, PM = 3, M 3

3 3 3 3

13.

a) -Has alkaline salts that help create alkaline media to neutralize acidic food from stomach.

-Enhance emulsification of fats into droplets

b) As the substance concentration decreases the rate of enzyme action decreases.

14. -Hydrogen ions, ATP molecules

-Oxygen gas

15. a) i) - Premolar tooth

ii) - Presence of two roots

- Presence of cusps on the crown.

b) Has a blood vessel that provides nourishment to the tooth and remove waste products.

16. a) Vitamin D, Vitamin K

b) - Transmission of nerve impulses.

- Ionic balance/osmotic balance

- Contraction of muscles.

17. a) In the stomach there is acid medium and ptyalin only acts at slightly alkaline medium.

b) High temperatures above 40^0C.

c) -Villi

- Microvilli

18. a) Ingestion is the taking of food into the body.

b) Digestion is the breakdown of large and insoluble molecules that can be absorbed.

c) Absorption is the uptake of soluble food materials from lumen of digestive tract across the epithelial lining of the gut into blood stream.

d) Assimilation is the utilization of absorbed food molecules by the body to provide energy or the materials necessary for growth, repair and reproduction.

e) Egestion in the elimination of undigested waste food materials from the body.

19. a) They produce saliva. Saliva contains the enzyme salivary amylase (ptyalin) which begins the digestion of starch breaking it to maltose. It also lubricates food making it suitable for swallowing.

b) It produces pancreatic juice. Contains $NaHCI_3$ which neutralizes the acid of chime and creates a PH of 7-8 which is the Optimum PH for the action of pancreatic juice are;-

- Trypsin which digests protein to peptides.
- Amylase which digests starch to maltose
- Lipase which digests fats to fatty acids and glycerol

c) It produces bile. Bile salts droplets a process called emulsification. This increases the surface area of the fat enhancing the action of pancreatic lipase.

20. i) It lubricates food

ii) It prevents digestion of the gut wall by proteolytic enzymes

iii) It makes food particles to adhere to one another during swallowing and during gestation.

21. Hydrochloric acid in the stomach denatures salivary amylase stopping its activity.

22. A sheep has the following herbivorous adaptations.

- It has a thick horny pad on the upper jaw over which vegetation is pressed by chisel-like incisors and canines on the lower jaw during feedings.
- If has a diastema which provides space for tongue movements that separate grass which is being chewed by check teeth and grass that is newly gathered by front teeth.
- Its premolars and molars have large top surface, which is worn out unevenly forming cusps which help in crushing and grinding of vegetation.
- The joints of the jawbones are loose allowing up and down as well as sideways movement of the lower jaw, which aids in the grinding of vegetation.
- Its rumen contains microorganisms that ferment cellulose releasing simple fatty acids that are absorbed by the animal.

23. i) Pepsin-digests proteins to peptides

ii) Rennin-Coagulation of milk proteins to peptides

iii) - Hcl-converts pepsinogen to pepsin

- Kills bacteria in food

- Provides an acidic pH (pH 1.5-2.5) which is the optimum pH for action of Pepsin

- Unfolds proteins enabling pepsin to work on them.

24. This leads to lack of bile salts, which emulsify fats.

25.

	Nutrient	Food Source	Role in the body
	Vitamin A	Carrots, Liver, Egg yolk	Synthesis of rhodopsin (for proper function of retinal).
	Iron	Liver	Manufacture of hemoglobin
	Iodine	Iodized salt, sea food	Manufacture thyroxin
	Vitamin D	Fish, liver, plant oil, egg yolk	Aids assimilation of calcium phosphate for making teeth and bones.
	Protein	Meat, milk seed of legumes, fish	Making new cells/growth and repair of tissues.

The Chemicals of living cells - *answers*

1 Cells need to take in water and salts, in addition to food.

2 (a) A high thermal capacity means that any temperature rise is small in comparison with the amount of heat absorbed. This helps to protect the cell against extremes of temperature.

3 (a) Cytoplasm, the cell membrane, membrane systems in the cell, the nucleus and mitochondria all contain structural proteins.
(b) Enzymes are the other type of cell proteins.

4 Proteins contain the elements carbon, hydrogen, oxygen, nitrogen and sulphur.

5 All proteins are composed of sub-units called amino acids.

6 (b) A protein which is denatured has changed its shape.

7 A lipid is a fat or oil. It may be combined with other substances, e.g. phospho-lipid or lipo-protein.

8 Lipids are found in cell membranes and other membrane systems in the cell. Some cells may have food reserves in the form of lipid droplets.

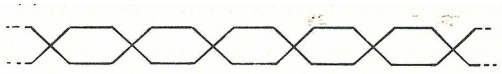
9 (a) lipids are formed from the combination of fatty acids with glycerol.
(b) lipids contain the elements carbon, hydrogen and oxygen.

10 (a) Sugars (glucose, fructose, maltose, sucrose), starch, glycogen and cellulose are examples of carbohydrates.
(b) Carbohydrates contain the elements carbon, hydrogen and oxygen.

11 The formula for glucose is $C_6H_{12}O_6$

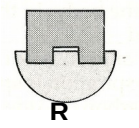
12 (a) Maltose 

(b) Part of a starch molecule



13 All cells contain *enzymes* which are *proteins* and act as *catalysts* which *speed up* chemical reactions. The reaction does not *use up* the *enzymes*, which can take part in further reactions.

14 Using the lock and key model, enzyme A is most likely to react with substance R.



15 If an enzyme normally works at 10°C, then
(a) a fall in temperature to 2°C will slow down the reaction
(b) a rise in temperature to 20°C will speed up the reaction (by x2)
(c) a rise in temperature to 65°C will denature the enzyme and stop it working (though the reaction may speed up at first).

16 An enzyme which has been denatured has changed its shape and will no longer combine with its substrate (the substance it acts on).

17 (b) The optimum pH is 7 because the rate of reaction is greatest at this pH.

18 (a) A protein-digesting enzyme would have no effect on starch.

19 All enzymes are produced inside *cells*. Enzymes which do their work outside cells are called *extra-cellular*. Enzymes which do their work inside cells are called *intra-cellular* Most of our digestive enzymes are examples of *extra-cellular* enzymes.

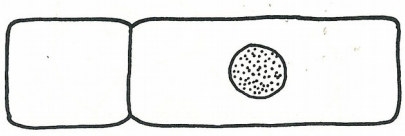
20 In the course of brewing, enzymes in the grain catalyse the conversion of starch to maltose; enzymes in yeast catalyse the conversion of maltose to alcohol.

21 Catalase speeds up the breakdown of hydrogen peroxide to water and oxygen.

22 (a) Boiling denatures enzymes. If a substance still works after boiling, it cannot be an enzyme.
(b) If the reaction still worked after A had been boiled, either A is not an enzyme or, if it is, it is not necessary for the reaction.

23 (a) The test for starch is iodine solution, which goes blue.
(b) When no blue colour appears after adding iodine, all the starch has gone and the reaction is complete.

Cells and tissues - *answers*

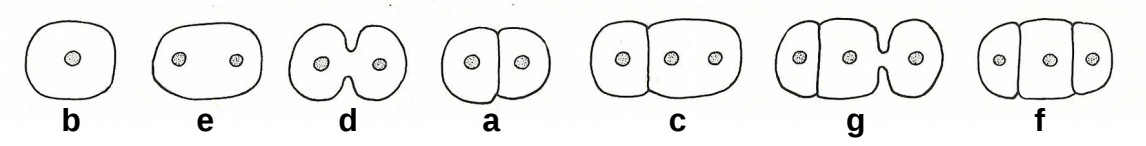
1 The section would appear like this 

2 The magnification at which plant cells could be seen would be about x 100.

3 Of the choices offered, (b) is the best description of a cell membrane's function: it controls the substances entering and leaving the cell.

4 (a) Plant and animal cells have cytoplasm, cell membrane, mitochondria, nucleus and chromosomes.
(b) Only plant cells have a cell wall, central vacuole and cell sap.

5 The most likely sequence is as shown below.



6 If a cell develops in such a way that it does one particular job very efficiently, it is said to be *specialised*. Such a cell is also said to be *adapted* to its function. A nerve cell is *specialised* for conducting impulses. It can do this efficiently because of its *shape* and the chemical reactions in its *cytoplasm*.

7 Cell structure: *nucleus, mitochondrion, cytoplasm*.
Tissue: *bone, nerve, muscle, epithelium*.
Organ: *brain, stomach, lung*.
System: *skeleton, heart and blood vessels, alimentary canal, lungs and windpipe.*

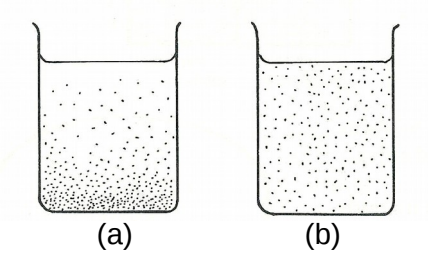
Note: You could reasonably argue that the digestive system includes salivary glands, pancreas and liver, and therefore the alimentary canal is an organ, not a system.

How substances get in and out of cells - answers

1 (a) The gas will diffuse from Y to X (i.e. from the region of higher concentration to the region of lower concentration).

(b) Eventually, the gas will be evenly distributed between the two containers so each one will contain 0.5g per litre.

2 The salt molecules will move by diffusion till they are evenly distributed.



3 When a cell is respiring aerobically, oxygen will be diffusing into the cell and carbon dioxide will be diffusing out.

4 (a) (i) Inside the cell the substance will diffuse from B to C (i.e. down the concentration gradient).

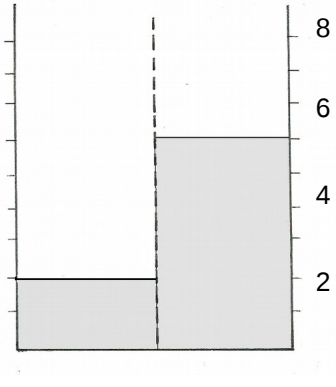
(ii) If the cell membrane were freely permeable, the substance would diffuse out of the cell, from B to A, because its concentration inside is greater than that outside.

(b) If there is no change in the concentration, you might assume that the substance was not free to diffuse across the cell membrane and was being taken up by active transport and diffusing across the cytoplasm by passive diffusion.

5 (a) The best definition of osmosis is (iii) 'The movement of water from a dilute solution to a concentrated solution across a partially permeable membrane'.

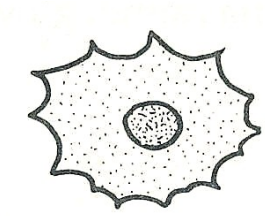
(b) An acceptable description of diffusion (at least in solutions) is (ii) 'The movement of a substance from a concentrated solution to a dilute solution'. (The partially permeable membrane is not essential for diffusion to occur.)

6 There will be a rise in level on the right and a corresponding fall on the left as water passes from the dilute to the concentrated solution by osmosis. (The figures need not be the same as shown here.)



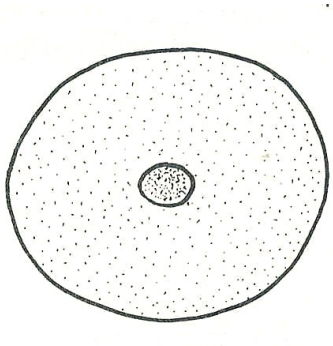
7 (b) A concentrated solution has a low osmotic potential (because it contains effectively fewer free water molecules than a dilute solution).

8 (**a**) Lower osmotic potential (water potential)



(cell loses water to more concentrated solution)

(b) Higher osmotic potential (water potential)



(cell gains water from more dilute solution)

9 If the cell membrane were freely permeable, harmful substances could diffuse in and useful substances could diffuse out.

10 If the tissue fluid became more dilute, the cells would absorb water by osmosis and swell up. If the tissue fluid became more concentrated, the cells would lose water by osmosis, shrink and become dehydrated, possibly to a point where metabolism was no longer possible.

11 *The salt lowers the meat's osmotic potential so that water is withdrawn, by osmosis, from bacterial cytoplasm and so kills the bacteria.*

Photosynthesis and nutrition in plants - answers

1 A green plant can make all the substances it needs. It builds up carbohydrates by the process of *photosynthesis*. In this process it combines *water* from the *soil* with *carbon dioxide* from the *air* to form *glucose*. The *energy* needed for this process comes from *sunlight* which is absorbed by the *chlorophyll* in the *chloroplasts* of leaf cells. The waste product of the process is *oxygen.* .

2 $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

3 (a) In low light intensities a green plant will be taking in oxygen and giving out carbon dioxide
(b) In bright sunlight a green plant will be taking in carbon dioxide and giving out oxygen.
Note: Water vapour will also be escaping from the leaf; more so in sunlight.

4 A plant respires all the time. During daylight photosynthesis and respiration will be going on at the same time.

5 (a) From glucose, a plant makes the carbohydrates sucrose, starch and cellulose.
(b) Carbohydrate is transported round the plant as sucrose.
(c) The main storage carbohydrate in plants is starch.

6 (a) To make amino acids and proteins from glucose, a plant needs a supply of nitrate (for nitrogen) and sulphate (for sulphur).

(b) These substances come from the soil.

7 (a) To make ATP (adenosine triphosphate) a plant needs a supply of phosphate ions.
(b) To make chlorophyll a plant needs a supply of magnesium ions.

8 NPK compound fertiliser contains nitrogen (N) as nitrate, phosphorus (P) as phosphate and potassium (K) in suitable proportions. Alternatively, ammonium nitrate (NH_4NO_3) may be used as a source of nitrogen, and superphosphates as a source of phosphorus.

9 (a) If a potted plant is kept in darkness for 48 hours, all starch in its leaves should have been converted to sugars and conducted out of the leaves. This is destarching.
(b) To check on the destarching, one of the leaves or part of a leaf should be tested with iodine to make sure the leaf is free from starch.

10 The accumulation of starch in a previously destarched leaf is accepted as evidence that photosynthesis has occurred.

11 (a) In an experiment to find out whether light is needed for photosynthesis, light should be excluded from a destarched leaf or part of a destarched leaf. After a few hours of sunlight the covered leaf and an exposed leaf (or simply the partly covered leaf) should be tested for starch. Only the parts which received light should go blue with iodine.
(b) The control is the leaf, or part of the leaf, which has not been exposed to light and does not contain starch. Alternatively, if the exclusion of light from the leaf is thought to be the experiment, the parts of the leaf exposed to light constitute the control.

12 (a) If a (suitably prepared) leaf goes blue with iodine, it tells you that starch is present.

(b) Unless the leaf is known to have been free from starch at the beginning of the experiment you cannot conclude that photosynthesis has occurred. The starch might be permanently present in this leaf. Also, in the absence of an experimental design (with a control), there is no telling where the starch has come from. It might have been produced fromsucrose which was transported to the leaf from another part of the plant.

Energy from respiration - *answers*

1 Respiration is the release of *energy* from *food* and takes place in all *cells* of the body. In the course of respiration, *food* is broken down to *carbon dioxide* and *water.* If oxygen is used for this process, the respiration is called *aerobic*. If oxygen is not used in the process, the respiration is called *anaerobic*. Each stage of respiration is speeded up by a particular *enzyme.*

2 $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 2830\ kJ$

3 The products of alcoholic fermentation are alcohol and carbon dioxide.

4 Respiration in cells takes place mainly in the mitochondria.

5 A person lying quite still needs energy for breathing movements (rib muscles and diaphragm), circulation of blood (heart contraction), temperature maintenance, nerve impulses in the brain and nervous system.

6 Aerobic respiration provides more energy than anaerobic respiration given the same quantity of food.

7 (a) In an active muscle, the intermediate products of anaerobic respiration are pyruvic acid and lactic acid.
(b) lactic acid is associated with oxygen debt.
(c) lactic acid which accumulates in the muscles has to be taken to the liver and oxidised even after the exercise has finished.

8 Statements (a) and (b) are incorrect.
(a) Anaerobic respiration does not use oxygen.
(b) Neither form of respiration produces oxygen.

9 (a) (i) Oxygen being taken up is acceptable evidence of respiration.
(b) (ii) Oxygen is not given out during respiration.
(iii) Water vapour is given off by non-living systems, e.g. wet washing.
(iv) Using up food could be evidence for respiration but the food could be used for growth rather than for energy. Nevertheless, any growth process will almost certainly need energy from respiration, so (iv) is acceptable evidence in most cases.

10 A temperature of 65°C for 10 minutes would denature the enzymes in most tissues, so respiration would cease. Structural proteins in the cell membranes would also be denatured.
In short, the tissue would be killed by this temperature.

11 (a) Basal metabolism refers to the range of chemical activities needed to maintain basic body functions, e.g. during sleep.

12 (a) Lime water is used to test for carbon dioxide.
(b) If carbon dioxide is present, the lime water goes ‘milky'.
Note: pH indicators, such as hydrogencarbonate indicator are sometimes used to detect carbon dioxide, but they are not specific for this gas. Anything which increased the acidity of the indicator would produce a colour change.

13 At 4 °C, enzyme activity is slowed down, so the rate of respiration (and hence usage of food and oxygen) in the blood cells is slowed down. This increases the possible storage time.