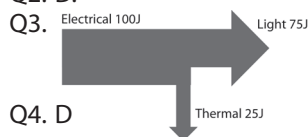


# Answers

## Energy transfer

### 3.1 Identify energy change

Q2. D.



Q4. D

### 3.2 Energy in/out

Q2. 67.5 minutes (2024 kJ / 30 kJ/min).

Q3. i) Two servings = 1800 kJ.

ii) 300 minutes (5 hours).

Q4. 300 kJ. The sum is 1800 kJ - (30 x 30) kJ - (40 x 15) kJ.

### 3.3 KE and GPE transfers

Q2. i) 0.25 J. ii) Just before the end - 0.5 J.

Q3. i) Just before it hits the ground - E. ii) A. iii) C.

Q4. i) A. ii) Just above the ground - C. iii) D. iv) B.

### 3.4 Temperature change

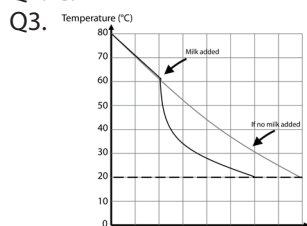
Q2. 50 °C.

Q3. 40 °C.

Q4. 100 g.

### 3.5 Temperature graphs

Q2. C.



Q4. 

### 3.6 Interpret energy diagrams

Q2. i) 100 J (5 squares from 10). ii) 20 J (1 square from 10).

Q3. At the top - C

Q4. C

### 3.7 Identify wasted energy

Q2. i) input: chemical, output: light, sound, heat (thermal). ii) useful: light, sound, wasted: heat.

Q3. i) Friction in motor/pulley. ii) Electrical -> kinetic & gravitational potential stores.

Q4. As car goes down, some energy is lost as heat and sound. On the next hill there is less in the gravitational store, so it can only climb a lower hill.

### 3.8 Calculate efficiency

Q2. i) Engine A (efficiency is 1/4 or 0.25). ii) Engine A: KE = 100kJ (0.25 x 400). Engine B: KE = 240kJ (0.6 x 400).

Q3. 1/4 or 0.25.

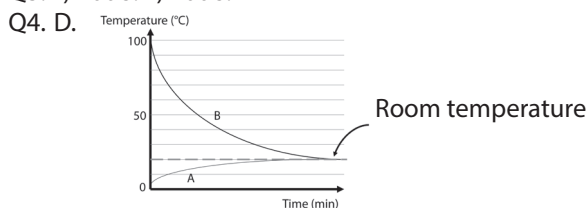
Q4. 1/10 or 0.1.

### 3.9 Mixed up problems

Q1. C

Q2. i) 50 g (for 700 kJ). ii) 30 minutes.

Q3. i) 100 J. ii) 400 J.



Q5.

Q6. i) Chemical -> potato (thermal, useful) and air/ground (thermal, wasted). ii) Less energy wasted. iii) Fire heats potato/ground/air. Oven heats only potato and air.

## Gravity

### 4.1 Gravity & distance

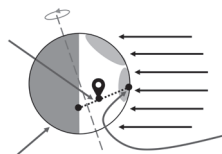
Q2. 2, 1, 3.

Q3. i) Path goes around Uranus anti-clockwise. ii) Jupiter/Saturn have greater mass and larger gravity to move comet.

Q4. A.

### 4.2 Seasons & daylight

Q2.



Q3. Pi

Q4. Panel receives less energy at Y.

### 4.3 Changing appearance

Q2. i) C. ii) B. iii) D. iv) A.

Q3. i) D. ii) C. iii) A. iv) B.

Q4. A.

### 4.4 Planetary orbits

Q2. i) d has a longer year length. ii) d has a lower temperature. iii) Neither planet has seasons.

Q3. Pluto: year length 248, temperature -218 °C. Eris: year length 560, temperature -240 °C.

Q4. A diagram (like Q1): energy or rays fan out from Sun with fewer hitting distant places.

### 4.5 Calculate weight

Q2. No, the weight on Earth = 1000 N.

Q3. No, the weight on Mars = 10 N.

Q4. Yes, the weight = 360 N.

### 4.6 Mixed up problems

Q1. i) Earth. ii) Sun. iii) Jupiter.

Q2. i), Winter, B. ii), Summer, A.

Q3. C.

Q4. Year length.

Q5. 184 N.

Q6. i) a) K-186f has a shorter year than Earth. ii) Its surface temperature could be higher than the Earth's because it is closer to its star. iii) K-186f has no tilt so its days do not vary.

# Answers

## Changing substances

### 5.1 Chemical change evidence

- Q2. i) Chemical change. ii) No chemical change. iii) Chemical change.  
Q3. i) Chemical change. ii) No chemical change. iii) Maybe a chemical change.  
Q4. No, it was a physical change.

### 5.2 Physical change evidence

- Q2. i) and iv).  
Q3. ii) and iv).  
Q4. Experiment B.

### 5.3 Mass change

- Q2. There was a chemical reaction.  
Q3. i) The fizzing, and mass decreased. ii) One reactant was used up.  
Q4. Janine was wrong.

### 5.4 Find pH with indicator

- Q2. Peach skin  
Q3. pH 5.5-9.5.  
Q4. i) pH is 6 or below. ii) Methyl orange.

### 5.5 Make solutions neutral

- Q2. i) An acid to neutralise the soil. ii) Louis' soil needs more acid.  
Q3. i) Bicarbonate of soda. ii) Vinegar. iii) Bicarbonate of soda.  
Q4. i) An Alkali. ii) Check when the colour goes green.

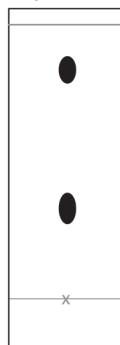
### 5.6 Mixed up problems

- Q1. Jamie, because the reaction gives out light (Or Adi, with the reason that it could just be glowing).  
Q2. No. The bubbles are likely to be water vapour coming out of solution.  
Q3. i) Colour change and mass decrease. ii) No change as all the copper had reacted.  
Q4. i) It contains alkali to neutralise some of the acid. ii) The stomach may not be acidic enough to kill bacteria.  
Q5. Red paper staying red and blue paper staying blue.  
Q6. We see leaves permanently change colour in the autumn.

## Substances & particles

### 6.1 Identify dyes

- Q2. Suspects B and C.  
Q3.



- Q4. Madder, as the dye moved 9/10 the distance of the solvent.

### 6.2 Separate two substances

- Q2. i) Filtering. ii) Evaporating.  
Q3. i) Filtering. ii) Separating funnel.  
Q4. i) The salt is dissolved in water. ii) Distillation.

### 6.3 Explain state changes

- Q2. Water particles gained energy and escaped the forces of attraction, and water turns to vapour.  
Q3. Water particles in ice gain energy, and partly overcome the forces of attraction, and ice turns to liquid.  
Q4. Experiment 2, because particles escape as the water boils.

### 6.4 Changing states

- Q2. i) Solid. ii) Liquid. iii) Gas.  
Q3. Bromine: Liquid. Chlorine: Gas. Iodine: Solid. Acetaldehyde: Solid. Formaldehyde: Gas.  
Q4. C and D.

### 6.5 Solubility data

- Q2. i) B. ii) 12 g.  
Q3. i) B. ii) 700 g.  
Q4. 9 g.

### 6.6 Solubility curves

- Q2. An answer between 15-17 g.  
Q3. i) An answer between 38-42 g. ii) An answer between 8-12 g.  
Q4. i) An answer between 53-57 g. ii) An answer between 41-45 °C.

### 6.7 Mixed up problems

- Q1. Ruth, because the spots moved the same distance as both dyes.  
Q2. i) Flavour substances and alcohol have a lower boiling point than water. ii) Distillation.  
Q3. Warmer air transfers more energy to the water particles, which overcome the forces of attraction and escape from the liquid.  
Q4. i) Lowers the freezing temperature. ii) It freezes. iii) Magnesium chloride.  
Q5. D.  
Q6. i) An answer between 76-79 g. ii) An answer between 72-75 °C. iii) An answer between 18-20 °C.

# Answers

## Cells

### 7.1 Functions of cell parts

- Q2. There is not enough water in the vacuole. The empty vacuole cannot push against the cell wall. The cell collapses.
- Q3. If ribosomes are destroyed, the bacteria cannot make proteins and cannot carry out chemical reactions to keep it alive.
- Q4. The more mitochondria a cell has, the more energy it releases. Muscle cells need energy for movement.

### 7.2 Using a microscope

- Q2. Choose an objective lens with a higher magnification. This increases the total magnification to see smaller structures.
- Q3. The mirror is pointing in the wrong direction. Move the mirror so light reflects up through the slide.
- Q4. The total magnification is 40 X, not 4 X.

### 7.3 Identify cells

- Q2. It is a plant cell because it has chloroplasts and vacuoles. Animal cells do not have these parts.
- Q3. It is an animal cell (nerve cell or neurone). It has a cell membrane and nucleus but no features of a plant cell, e.g. cell wall or chloroplasts.
- Q4. A and C could be plant cells. They have a nucleus and a cell wall outside the cell membrane. Cell walls only appear in plant cells.

### 7.4 Functions of specialised cells

- Q2. B - muscle cell. The cell can change its length. Muscles do this to cause movement.
- Q3. B - to form the outer covering of seeds. The thick cell makes a sclerid cell strong and tough, to protect seeds before they germinate.
- Q4. The cells act as a barrier between outside and inside the body. They are tightly packed so there are no gaps. This prevents microorganisms from entering.

### 7.5 How cells are specialised

- Q2. White blood cells change shape and 'eat' (destroy) the bacterial cell.
- Q3. The cilia move back and forth to remove any particles and microorganisms in the airways from the lungs.
- Q4. The cell walls between the phloem cells contain tiny holes to allow sap to pass through.

### 7.6 Mixed up problems

- Q1. The chloroplast. Photosynthesis takes place in chloroplasts.
- Q2. C ( $10 \times 5 = 50$ ).
- Q3. This cell does not have a nucleus. It is a bacterial cell. Its DNA floats in the cytoplasm. In plant and animal cells, DNA is found inside a nucleus.
- Q4. The guard cells control the opening and closing of the stoma.
- Q5. White blood cells change shape to squeeze through gaps in the walls of the blood vessels. This lets them travel to wherever microorganisms are.
- Q6. Some of his mitochondria are not working and not releasing energy from food. Building new tissue for growth requires energy, so Pryesh is less able to grow.

## Interdependence

### 8.1 Interpret food webs

- Q2. Producers store energy from sunlight. When eaten, energy moves to the snail, which is eaten by the frog.
- Q3. Manure is animal waste, and stores energy. Decomposers decay the manure and release energy as heat.
- Q4. Plants are producers, storing energy. It moves to animals (and humans) who store it in cells and tissues.

### 8.2 Change in population

- Q2. More snails reduces the number of dandelions. Slugs eat dandelions so this means fewer slugs.
- Q3. Squid and fish eat krill. Fewer fish means more krill for the squid, so their numbers could increase.
- Q4. Fewer shrews means lions have 3 organisms to eat. Hawks rely on squirrels and might not get enough.

### 8.3 Explain resources

- Q2. Plants get more water, warmth and light. This means more food for mice, and then more food for owls.
- Q3. Ring A is thicker so the tree grew more. This might be due to more rain, warmth, light or minerals.
- Q4. Cacti need water and there isn't much in the desert. Plants need long roots to get as much as they can.

### 8.4 Effect on population

- Q2. The number of daisy plants was lower near the tree. It blocks light and reduces the number of plants.
- Q3. Butterflies have fewer places to lay eggs, which means fewer caterpillars, and butterflies).
- Q4. The number of rabbits increases, then the number of foxes. More rabbits means more food for foxes.

### 8.5 Explain competition

- Q2. Soy and weeds compete for water and minerals. Removing weeds gives soy access to more resources.
- Q3. Cheetahs eat deer. The faster the cheetah the more deer it will catch and increases its survival chances.
- Q4. There were more weasels with fewer stoats to compete with. Then with more stoats, competition grew.

### 8.6 Mixed up problems

- Q1. Grass stores energy. When eaten, energy moves to the rabbit. The owl eats the rabbit and gains its energy.
- Q2. i) Kites only eat snakes so fewer snakes means fewer kites. ii) Owls and snakes eat mice. Fewer snakes means more mice and more food for owls.
- Q3. Fertilisers add minerals to soil. Plants can make more proteins and grow better. The farmer earns more.
- Q4. The number of hawks dropped, most in 2006. This is because of fewer mice and so less food.
- Q5. Rhododendron compete for water, light and minerals. Their poison kills other plants, reducing competition.
- Q6. Heavy metals pass up the food chain from phytoplankton, to the fish and eventually to humans.

# Answers

## Reproduction

### 9.1 Sexual vs asexual

- Q2. It was sexual reproduction. Genetic material from the ovule combined with material from the pollen.
- Q3. i) All have identical characteristics. ii) B and C were from asexual reproduction from parent A.
- Q4. Kerry and Tom. The baby will have half Kerry's genetic material and half Tom's.

### 9.2 Human reproductive organs

- Q2. An egg is released but stopped by the blockage. It prevent the sperm meeting the egg and fertilising it.
- Q3. So many sperm are released to increase the chance that at least one will find the egg and fertilise it.
- Q4. The egg sticks to the mucus. The cilia sweep the mucus and egg along the oviduct away from the ovary.

### 9.3 Menstrual cycle

- Q2. The lining gets thicker. It needs to be thick so a fertilised egg can settle into it and grow into a foetus.
- Q3. Y: just after ovulation.
- Q4. B.

### 9.4 Pregnancy time

- Q2. The earliest date on a live egg and sperm could meet is the 21st. The latest is the 26th.
- Q3. The woman should have sex either on the same day as the temperature rise or on the day after.
- Q4. The egg will die on day 15/16 so fertilisation will not take place even if sexual intercourse occurs.

### 9.5 Supporting the foetus

- Q2. Twins share oxygen/food and get half that of a single pregnancy. They make fewer new cells and grow less.
- Q3. A foetus needs food/oxygen to make new cells. It gets these from mother's blood so her heart pumps more.
- Q4. Squashing the cord means squashing blood vessels and so less blood will be reaching the baby.

### 9.6 Mixed up problems

- Q1. Asexual reproduction because there is only one parent, and the offspring look identical to the parent.
- Q2. Sperm with shorter tails do not swim as well. If all are like this then, it is likely none will reach the egg.
- Q3. C. This is when the lining of the uterus thins as it breaks down.
- Q4. A woman can ovulate at any point in the cycle. For some women this can change from month to month
- Q5. The foetus gets less oxygen because the mother's blood is carrying less oxygen. Growth slows.
- Q6. Stage 1 is asexual, creating copies. Then one joins with a different alga and genetic material combines.

## Watch out

### 10.1 Contact forces

- Q2. C.

### 10.2 Electric circuits

- Q2. A, B, E.

### 10.3 Energy transfer

- Q2. D. Energy moves from kinetic to gravitational potential store.

### 10.4 Gravity

- Q2. D. Weight depends on gravity.

### 10.5 Chemical change

- Q2. Physical change. No new substance is made. Adding beetroot juice only makes a mixture.

### 10.6 Substances & particles

- Q2. 200 g (100 g dissolves in 100 g of water).

### 10.7 Cells

- Q2. B. It isn't an animal cell because it has a cell wall. It isn't a plant cell because it doesn't have a nucleus.

### 10.8 Interdependence

- Q2. It decreases. Less grain means mice and grasshoppers eat less. Their numbers drop, meaning less food for owls.

### 10.9 Reproduction

- Q2. Menstruation should start on 18th of February as it begins approximately 7 days after ovulation (day 21).