Hints

Acceleration

1.1 Distance travelled
Q1. Draw a speed time graph and find the area
Q2. Convert speed and time into m/s and seconds.
Q3. NB. Initial/final speeds are not 0. The area is a trapezium.
Q4. Find the time: time = distance ÷ average speed.

1.2 Acceleration & gradients
Q1. Convert distances to metres and time to seconds.
Q2. Which information do you need to find acceleration?
Q3. Which shows velocity decreasing upwards and increasing downwards?
Q4. Use v - u = a x t (u=0). For C-D, use v from a) as u.

1.3 Equation of motion
Q1. The initial speed is zero.
Q2. Rearrange the equation to make 'a' the subject.
Q3. Calculate acceleration at each speed. Use correct units.
Q4. For b) use the value for speed from a) as u.

1.4 Newton's 1st law
Q1. Final velocity is lower than that before parachute opens.
Q2. Horizontal forces: engine thrust, tension in toe bar and drag. Are these forces balanced?
Q3. Horizontal forces: engine thrust and drag. Vertically: weight and upthrust.
Q4. Horizontal forces: thrust, and wind. Vertically: weight and upthrust.

1.5 Adding vectors
Q1. Combine parallel forces into one before drawing.
Q2. Use a large scale e.g. 1 cm:10 N.
Q3. Do you add or subtract the forces to combine them?
Q4. Measure to the nearest 0.1 cm (arrows) and 1° (angles).

1.6 Vector components
Q1. The girl is balanced so the vertical components of the tension acting up equal weight acting down.
Q2. How does horizontal component of pull change when angle decreases?
Q3. Vector diagrams can be used to adds speeds. Vertical component is speed and direction of river current.
Q4. To find upthrust, measure the resultant (the hypotenuse).

Heating

2.1 Particle energy transfer
Q1. For each layer, what property affects the energy transfer?
Q2. How do structure and thickness affect the energy transfer? What heat loss is needed in warm/cold water?
Q3. How do surfaces and thicknesses affect rate of energy transfer at midday?
Q4. Consider surface coating, structure and thickness.

2.2 Thermal transfer rates
Q1. a) Which cup has the higher rate of energy transfer? b) What will the final temperature of the coffee be?
Q2. Can fluffy layer offer any insulation when on the outside?
Q3. Which factor that affects energy transfer matters here?
Q4. How do the thickness and thermal conductivity of the heat sink material help?

2.3 Specific heat capacity
Q1. Use the efficiency as a decimal to find output energy. Use this to calculate specific heat capacity.
Q2. Use the equation with mass in kg.
Q3. Use the equation to find temperature difference, and add the initial temperature.
Q4. When the temperature decreases E and $\Delta\theta$ are negative.

2.4 Latent heat
Q1. a) Scale up the energy needed for 1 g. b) What is the energy transfer when the sauce sets?
Q2. a) Scale up the energy needed for 0.25 kg. b) Look at which graph has the longer flat part.
Q3. a) Scale down the energy needed for 1 kg. b) What are the state changes for i), ii) and iii)?
Q4. a) Use the equation. b) Notice the energy is for 5 seconds.

2.5 Gas pressure
Q1. There are tiny holes in the balloon skin.
Q2. How do particle move at higher temperatures?
Q3. The walls collapse if the outside pressure is much bigger than inside pressure.
Q4. When friction slows the car, where does the K.E. go?

2.6 Liquid pressures
Q1. The water from the taps should be at high pressure.
Q2. The pressure inside is atmospheric pressure at sea level.
Q3. How can the diver ensure the pressure changes slowly?
Q4. Would water at high or low pressure flow more quickly?

Sound & waves

3.1 Sound waves
Q1. The wave travels along the tube. Does Alan's hand moving the tube back and forth or at right angles?
Q2. The waves travel along the bridge. Is the vibration in that direction or at right angles?
Q3. Link high/low pressure in the wave to movement of the diaphragm and peaks/troughs on the oscilloscope.
Q4. Think about which directions the particles vibrate to cause surface ripples and underwater sound.

3.2 Wave properties
Q1. When does ball return to start position after vibration?
Q2. a) What happens to air pressure when amplitude increases? b) Recall that frequency is 1/period.
Q3. Find frequency of each motor and decide whether it is in the frequency range of reef sound.
Q4. How many wavelengths are made in the time shown? What is the time for one wavelength?

3.3 Wave speed equation
Q1. a) Find wave speed first. b) Speed changes in a new material, but what property stays the same?
Q2. a) Use the wave equation. b) What properties change or stay the same in a new material?
Q3. a) How does the pitch relate to frequency? b) Use the speed from part a).
Q4. Use the wave equation with the material where you have two values. What stays the same in a new material?

Periodic table

4.1 Represent subatomic particles
Q1. A helium nucleus contains 2 neutrons and 2 protons.
Q2. Why do atoms have no overall charge?
Q3. Find the atomic numbers of neon and argon – how are the atoms different?
Q4. How can you increase the mass number of hydrogen?

4.2 Calculate relative atomic mass
Q1. Which isotope has the highest percentage?
Q2. The ratio 1 : 3 converted into a percentage is 25% : 75%.
Q3. A_r is the average of the isotopes so what must their relative abundances be?
Q4. The abundances is a fraction. Convert into a percentage.

4.3 Periodic patterns
Q1. It does not conduct electricity, so must be a non-metal.
Q2. What happens to the number of shells down a group?
Q3. Use the data to work out if it is a solid, liquid or gas.
Q4. What are hydrogen's properties and its outer electrons?

4.4 Reactions of groups 1 & 7
Q1. Use the equations to work out the name of the products.
Q2. Consider where each element is placed in its group.
Q3. Group 1 elements react with moisture in the air.

Hints

Q4. Solution C and halogen D are made by displacement.

Matter & energy

5.1 Products of combustion
Q1. What type of combustion does a yellow flame indicate?
Q2. What is formed when hydrogen is oxidised?
Q3. It is not just carbon that is oxidised during combustion.
Q4. How many water (H_2O) molecules must there be on the right to balance equation?

5.2 Calculate bond energies
Q1. Negative energy means the reaction is exothermic.
Q2. Multiply the number of bonds in each substance by the number outside the bracket (where there is one).
Q3. Find the overall energy change from Emma's numbers.
Q4. If energy released when bonds are made is higher than the energy to break bonds, the reaction is endothermic.

5.3 Balance symbol equations
Q1. The word equation is: hydrogen + nitrogen → ammonia.
Q2. Do not count individual O, S and H atoms, treat them as groups OH and SO_4.
Q3. How many Fe and O atoms will balance the equation?
Q4. Write the equation - what is the ratio of H_2 : O_2?

5.4 Calculate mass in equations
Q1. 32 g (16 x 2) of oxygen is needed to completely react with 12 g of carbon. Scale this down.
Q2. Work out the formula mass of iron oxide and iron.
Q3. You do not need the equation to answer this question.
Q4. 56 g of Fe reacts with 32 g of S.

Using resources

6.1 Reactivity series
Q1. The steeper the line, the faster the metal reacts.
Q2. The liquid must be either water or acid.
Q3. Use the reactivity series to compare reactivities.
Q4. More reactive metals form positive ions more easily.

6.2 Predict displacement reactions
Q1. Copper is an unreactive metal.
Q2. The brown colour is copper.
Q3. Hydrogen is displaced from the acid during the reaction.
Q4. Carbon displaces some elements from their compounds.

6.3 Potable water
Q1. Sea water is salty - it is high in sodium chloride.
Q2. What is the name of the process shown in the graph?
Q3. Which process is expensive?
Q4. To see the dissolved substances water must be removed.

6.4 Environmental impact
Q1. What stages of the life cycle does the data show?
Q2. Consider extraction of materials, transport and disposal.
Q3. He could bin it (landfill) or trade it in (reused or recycled)
Q4. Why might the manufacturer not supply information?

Growth & differentiation

7.1 Cell magnification
Q1. To calculate the diameter of the virus use 55 ÷ 450 000.
Q2. Before calculating magnification, make units the same.
Q3. When you x 10 you increase order of magnitude by one.
Q4. The scale line gives you the diameter of cell and nucleus.

7.2 Cell cycle changes
Q1. The cytoplasm volume is the same in parent and daughter cells.
Q2. Chromosomes are copied and the copies are split apart.
Q3. If a stage is fast, will there be many cells at any one time?
Q4. What does the graph show about the amount of DNA?

7.3 Types of cell transport
Q1. Which minerals diffuse and which use active transport.
Q2. Urea only diffuses if there is a concentration difference.
Q3. Cells use oxygen in respiration.
Q4. When respiration stops, glucose is still absorbed. The cell must absorb glucose without using energy.

7.4 Predict diffusion
Q1. Count the molecules on either side of the membrane.
Q2. Which substance diffuses? How does temperature affect the rate?
Q3. How does alveoli breaking down affect diffusion?
Q4. The red colour diffuses out of the beetroot into the water.

7.5 Explain osmosis
Q1. For each concentration, work out if water entered or left.
Q2. First work out where solute concentration is the highest. Then decide which direction water particles move in.
Q3. The salt concentration is higher in the pile than in the cells.
Q4. If the mass goes up, water has gone into the egg; if it goes down, water has moved out of the egg.

7.6 Use stem cells
Q1. Adult stem cells can differentiate into skin cells.
Q2. The embryo has the same genetic material as the patient.
Q3. All Laura's cells have the mistake in the genetic material.
Q4. What are the advantages over other stem cells?

Genetics

8.1 Gene function
Q1. Compare the strands - what is different?
Q2. The deer cannot make melanin – what could cause this?
Q3. Work out the sequence of amino acids coded by strand A and then strands X and Y.
Q4. Inherited diseases are caused by mutations in genes.

8.2 Construct Punnett squares
Q1. 4935 ÷ 1645 = 3. The ratio of wrinkled-seed plants to round-seed plants is 1:3.
Q2. If the parents are both grey but some babies have white fur, which allele must be dominant?
Q3. First work out the genotypes of the parents. Remember, heterozygous genotypes have one of each allele.
Q4. If a child is without polydactyly, what is the man's genotype?

8.3 Family tree evidence
Q1. Their mother has cystic fibrosis - what must her genotype be?
Q2. In a dominant disorder, a sufferer has a copy of the dominant allele (Aa or AA)
Q3. In a recessive disorder a sufferer has two recessive alleles (nn).
Q4. Work out Craig and Kasey's genotypes and use a Punnett square.

Human interaction

9.1 Explain population distribution
Q1. Moss and grass compete for the same resources.
Q2. What abiotic factors decrease the growth of algae?
Q3. Different plants require different levels of abiotic factors.
Q4. Daisies and dandelions compete for the same resources.

9.2 Impacts on biodiversity
Q1. Use the diagram to work out the impacts of cars.
Q2. A flow diagram shows what will happen, with arrows connecting the events. Start with 'more people'.
Q3. How does water pollution affect organisms?
Q4. Both pH and trout affect the number of water beetle species - what is the relationship in each case?

9.3 Control disease
Q1. Faeces enter the water supply, so bacteria infect the water.
Q2. How does Lyme disease pass from the infected person to someone else?
Q3. Salmonella bacteria grow more quickly when it is warm.
Q4. What is the difference in the way doctors/nurses work?