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Maths 20% of assessment marks require the use of Level 2 mathematical skills	→	Test and build mathematical skills with signposted Assignments throughout
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- Help students build knowledge, application and evaluation skills through clear explanations set in real-life contexts supported by skills-focused assignments
- Prepare for the new practical assessment with comprehensive Required Practical sections that advise on apparatus, techniques and best practice to help develop students' theoretical understanding
- Build confidence across the linear course with extensive practice questions integrated throughout to check knowledge, test skills and consolidate learning
- Extend students' understanding and prepare them for further study and scientific careers with plenty of stretch and challenge questions that develop higher-order thinking skills
- Develop students' confidence in tackling the maths requirements of the specification with step-by-step worked examples and plenty of maths practice questions

In text questions provide opportunities to check understanding and progress, whether learning a topic for the first time or revisiting it as part of revision

2.1 RELATIVE MASSES

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Worked example 1

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ASSIGNMENT 2: THE BOMB CALORIMETER

vessel ('bomb')

xyger

fuel sample

(MS 0.0, 0.1, 0.2, 2.1, 2.3, 2.4; PS 1.1, 1.2, 3.2)

-0-0-

Figure A1



WATCH THE TH ADDRESS

Relative formula mase, M.

ve formula mana, ing emini-uta mana papiers to existención venon, control secultor Many el tra formadar hal qua resolución de la gala partera y amonte en encontro de las agrecuentes el sobre en encontro encontro de las agrecuentes el sobre en encontro e una numbro el includor sen las transmismos. Into someth of a larger worker, of work and an expansion using movement of initiative university bargeton is a lattice by electrostation impages. The formula babble is allotted for the formulas and and down the impact of the super-thickness and a super-thickness babble is allowed bargetone and a movement and the impact of the initiative transmission and a movement in the initiative transmission and the initiative and an initiative transmission. The formula keep scalarship transmission the movement the initiative scalarship in the same weak and the initiative initiative transmission for same when the MC is resulted as the initiative for same when the MC is resulted as the initiative for same weak as their relative profession main. Many

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Worked example 2

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Measuring

mathematical skills with worked maths examples



Figure A1 A bonk calorimeter The bomb calorimeter is used to calculate enthalpies of combustion. An electric current is used to ignite the fuel sample in a pressure vessel (the bomb). The burning fuel transfers energy to the air around it, which in turn transfers energy to the vater that surrounds the bomb. In some models, the heated air escapes through a colled copper tube submerged in water, warming the water. The temperature rise in the water is used to calculate the enthalpy change of the fuel. The air-filled insulation jacket reduces heat loss. In more modern bomb calorimeters, the whole calorimeter is submerged in a known volume of water, the temperature of which is monitored and the change used to produce a more accurate enthalpy value.

- Cauestions
 A1. 0.86 g of hexane was completely burnt in a bomb calorimeter. A temperature rise of 19.4 K was recorded. The bomb calorimeter contained 500 g of water. The specific heat capacity of water is 4.2 J g⁻¹ K⁻¹.
 a. Calculate the energy released (kJ) from the burning fuel.
 b. How many noles of hexane were burnt?
 c. Calculate the enthpy change of combustion of hexane.
- A2. A breakfast cereal contains 13.4 g glucose per 100 g cereal.
- Stretch and challenge
- A3. Explain why a bomb calorimeter will provide a more accurate measurement of the energy transferred than burning hexane in the type of calorimeter shown in Figure 6.



Figure A2

calorimeter dietary fibre is burnt along with other digestible carbohydrates, and the energy released is included in the measurement of food energy.

0

- $\Delta_c H^{\Theta}[C_6H_{12}O_6(s)] = -2802.5 \text{ kJ mol}^{-1}$
- How much energy can be obtained from the glucose in a 50 g helping?

Required practicals pages provide comprehensive guidance on apparatus, experimental techniques and how best

1400

REQUIRED PRACTICAL APPARATUS AND **TECHNIQUES (PART 2)**

(Practicals Skill 4-1, Apparatus and Techniques a. d. e. k)

Carry out a simple acid-base titration

- This is the record part of the second process is appro-Mercipic according to the second process is appro-antly losse that both is given pointing opportunity to show that exacting
- use appropriate application to recard the using a of liquids see toboratory appointes for a transition using burette and popette
- saliny and carefully hardpe loads and black including tormake, andars, flamouble and tool; subjusters

Apparatus

A popette (Figure PA) is used to transfer as accurately relatived volume of liquid, A burrier (Figure PS) is used minister accurately any origine with in its capacity.

Technique

- Unite a piper
 - The piperts must be crean and dry and same of the solution to be invested should be pound into a must, by page. This works possible concentration of the rest of the upiption.
 - A safety filter stand for incide in drive the solution only the papette Network was it is the result. The sais of the papette marks to below the surface of the solution being pipetterf at all times.



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Louis & Lanto-

- The barretter must be cause and day and champs vertically. Before use it should be renied with three loss of about 10 cm² to 15 cm² of the industrier leasten.
- If the volumetric solution is pound in thread is family until it is 3 on to 6 on accel the tern graduat

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2.7

ELAM PRACTICE QUESTIONS

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Extensive end of chapter practice questions help prepare for final

Stretch and challenge

questions and activities encourage stronger students to move beyond the specification

used to produce a more accurate enthalpy value Bomb calorimeters can be used to measure the energy contents of foods. The food industry cliss the energy content of a food its energy value. In our body cells, energy is produced from gil cose in respiration. Glucose is the product of carl ohydrate digestion. Respiration is a similar chemi al process to combustion, but the rate is controlle by enzymes and is much slower. The problem with sing the bomb calorimeter to measure food values is that it tends to overestimate the amount of energy the human digestive system can extract if om foods. We cannot digest fibre in our diets, but i the bomb

Signposted assignments throughout build confidence in Maths skills, practical skills, extended writing, AO2 and AO3

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Boost understanding and

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Planning support

To support you in your planning, a free scheme of work for each subject is available. These editable schemes of work cover learning outcomes, number of hours' teaching, specification references, the skills covered, and where the practicals fit in, and are designed to help you get the most from our AQA-approved student books.

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