

AQA GCSE

Design and
Technology **8552**

5

Composite
materials and
technical textiles

Unit 2
Energy, materials,
systems and devices



PG ONLINE

Objectives

- Understand how material properties can be enhanced by combining two or more materials
- Recognise a range of composite materials and technical textiles
- Understand how fibres can be manipulated to create technical textiles

What is a composite material?

- What materials are used to make concrete?
 - How can concrete be made even stronger to resist compressive forces?

Types of reinforced plastic

- Glass reinforced plastic (GRP)
- Carbon fibre reinforced plastic (CRP)
 - What are the main the differences between the two types of reinforced plastics?
 - For which applications might CRP function better than GRP?
 - Both methods use thermosetting resins which produce volatile organic compounds (VOCs)
 - A catalyst is added to the resin to make it harden or 'cure'
- What precautions should you take when working with VOCs?



GRP (CRP) process

- Step by step process to construct a GRP (CRP) part
 1. Prepare the mould or former
 2. Apply a release agent to the mould
 3. Apply a gel coat for GRP (or first resin coat for CRP)
 4. Apply the glass fibre matting (or woven carbon fibre)
 5. Work a second coat of resin into the material
 6. Repeat layers of matting and resin coats to achieve correct thickness for the specific application
 7. Clamp and leave a GRP workpiece to cure (Seal a CRP workpiece in a vacuum bag and heat in an oven to cure)
 8. Release from the mould, trim and finish workpiece



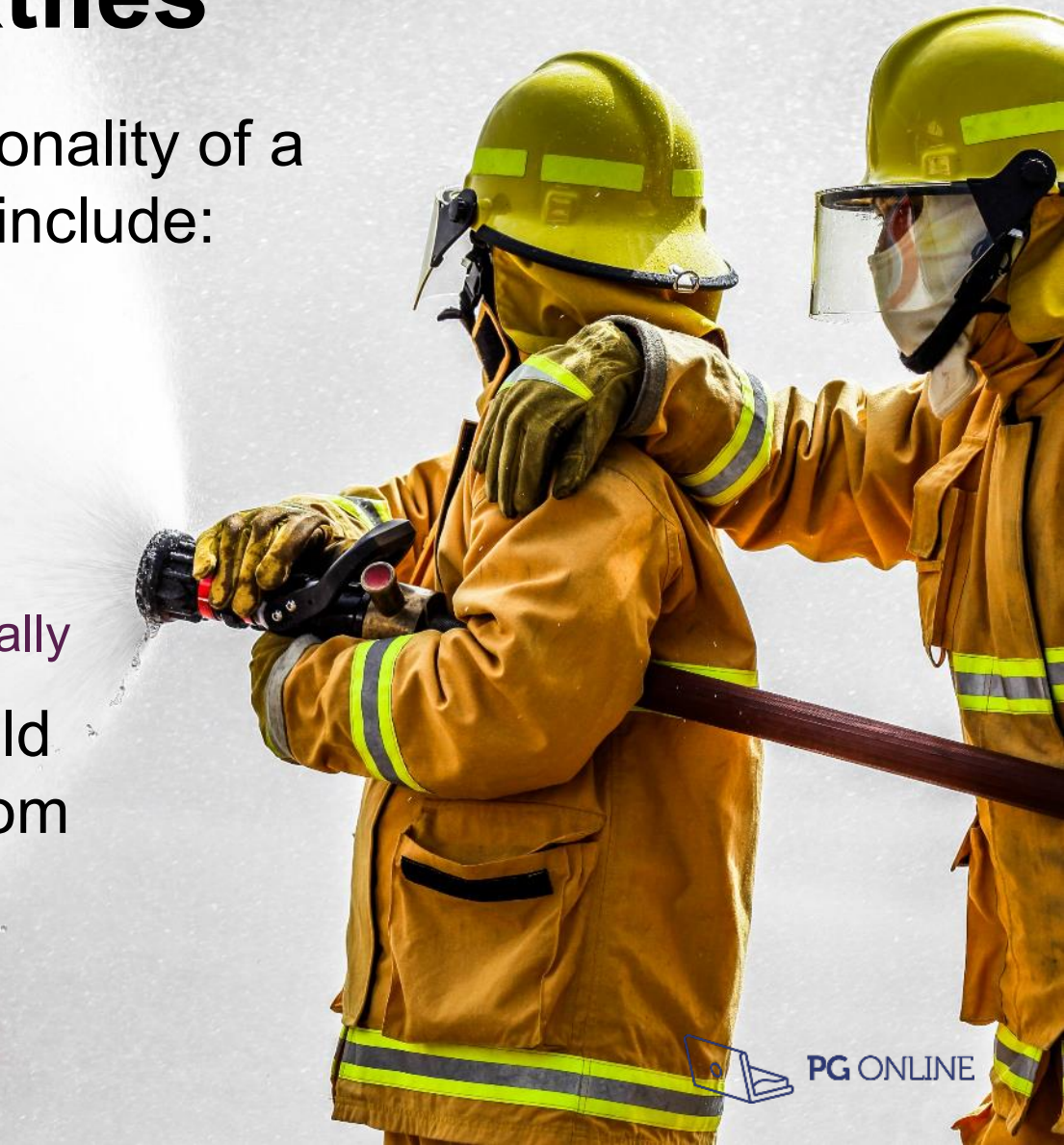
Worksheet 5

- Complete Tasks 1 and 2 of the worksheet



Technical textiles

- The increased functionality of a technical textile can include:
 - Weatherproofing
 - Strengthening
 - Adding conductivity and insulation, both thermally and electrically
- What protection would firefighters expect from their clothing?

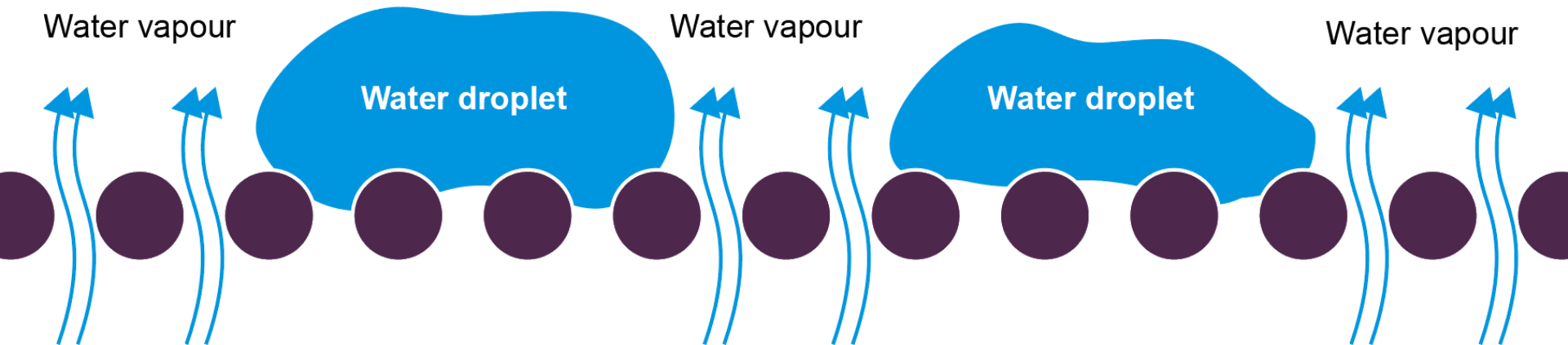


Gore-Tex®

- Gore-Tex® is a special fabric membrane that is waterproof yet breathable
 - Which types of clothing would benefit from this?

How Gore-Tex[®] works

- The membrane has 150 million holes per cm²
 - This means water droplets are too big to pass through
 - Perspiration can still escape as water vapour



Aramids (Aromatic polyamide)

- Aramids are particularly tough fibres made from modified polyamide
- They offer:
 - Cut and tear resistance
 - Flame proofing
 - Thermal insulation
 - High strength
 - A hard wearing finish
- Nomex[®] and Kevlar[®] are both types of aramid



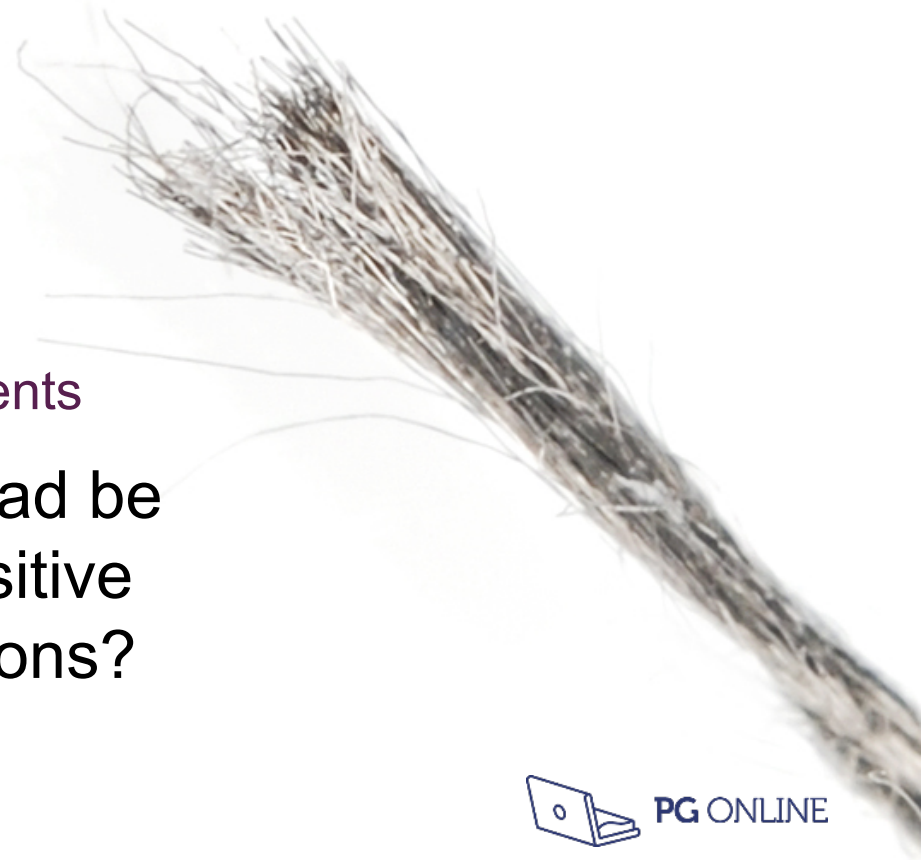
Flameproof or flame retardant

- What is the difference?
 - How are sofas and bedding protected from catching alight?



Conductive fabrics and threads

- E-textiles allow electricity to travel along special threads which are either woven or sewn into fabrics
 - Stainless steel or other conductive strands are mixed with other fibres providing flexibility
 - The thread can be soldered onto special sew-on components
- How might conductive thread be used to operate touch sensitive electronics in Arctic conditions?



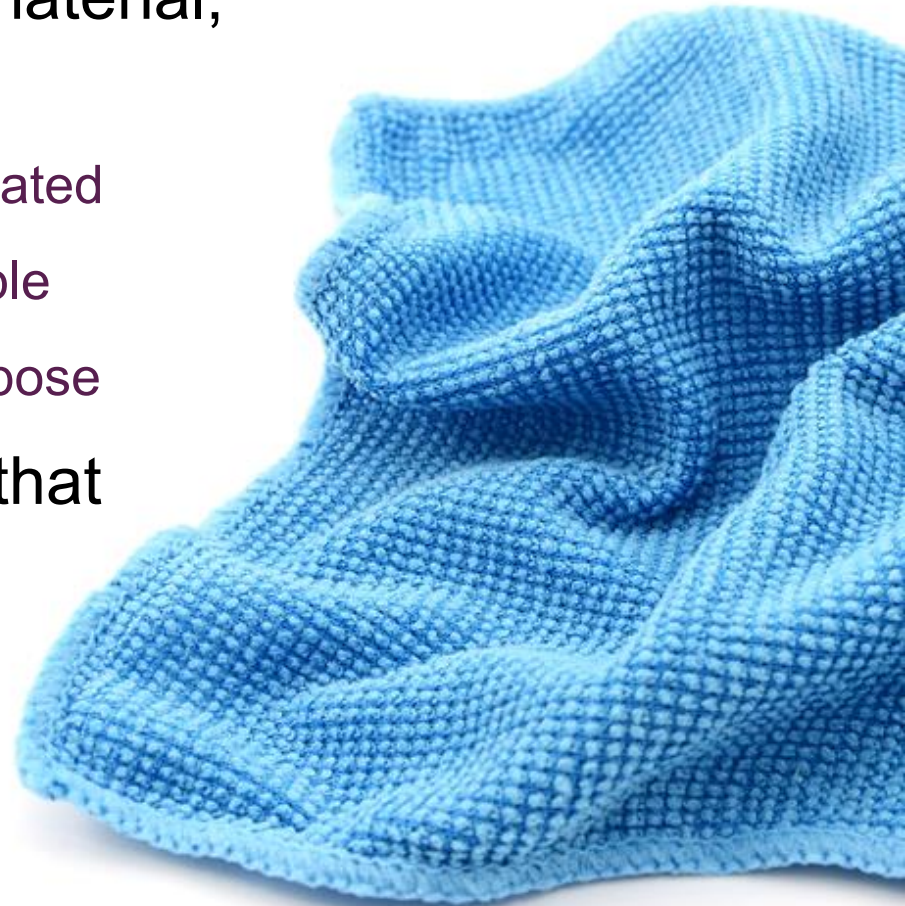
Microfibres

- Microfibres are less than one denier thick - that's one fifth the width of a human hair
 - They create an electrostatic charge that attracts particles of dust
 - Usually made from polyester and polyamide
- Which common products contain microfibres?



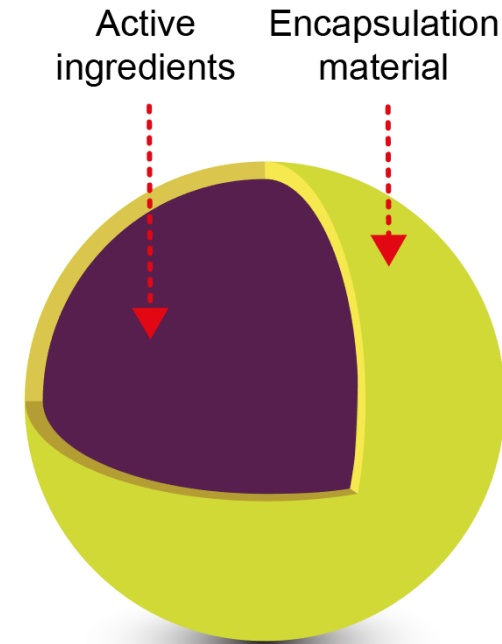
Microfibre: good or bad?

- Microfibre is a very useful material, however:
 - It can be flammable unless treated
 - It is synthetic and not renewable
 - It takes many years to decompose
- There is growing evidence that microfibrils are causing oceanic pollution and entering our food chain



Microencapsulation

- Solids, liquids or gasses are sealed in tiny capsules
 - These active ingredients can be released at controlled rates and under controlled conditions
- Active ingredients include:
 - Thermochromic dyes
 - Antibacterial material
 - Pesticides
 - Perfumes
 - Pharmaceuticals



Plenary

- Using your knowledge of composite materials and technical textiles, complete **Task 3** of the worksheet

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