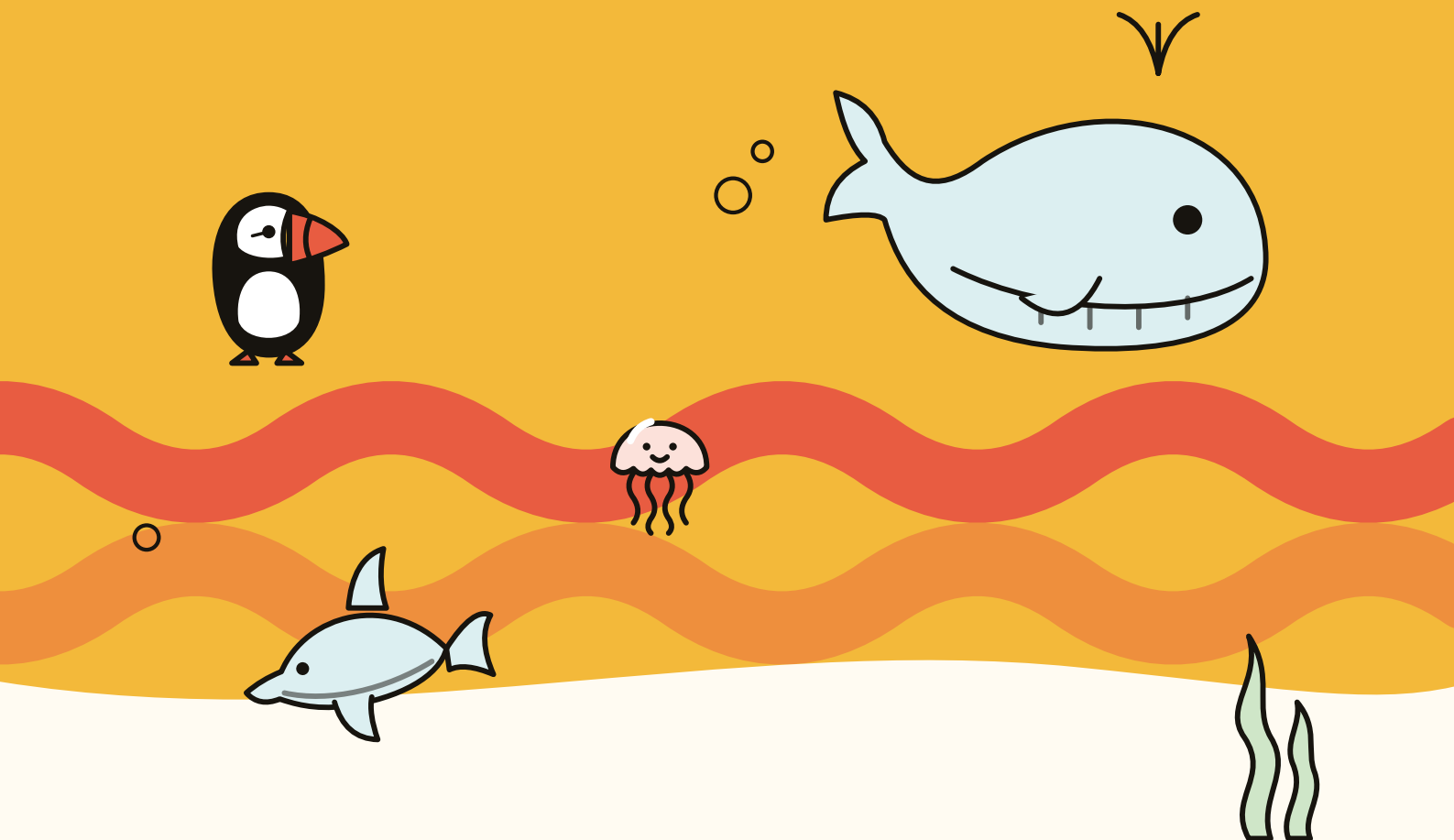


A SAVE OUR SEAS ACTIVITY BOOKLET

Ocean Advocates

Science, data, policy and campaigning — the evidence and skills to take on plastic pollution.



This booklet belongs to _____

INTRODUCTION

From awareness to action

You probably already know plastic pollution is a problem. This booklet is about going further: understanding the science, questioning the data, weighing up the trade-offs, and using that to push for change that works.

Who it's for

Students aged 14–17 working independently, in lessons, in an eco-committee, or towards awards such as the Duke of Edinburgh's Award volunteering section or a school enrichment project.

How it works

- **UNDERSTAND** the science and the numbers.
- **ANALYSE** data, claims and policies critically.
- **ACT** through campaigns, writing and design.
- Numbers in square brackets, like **[3]**, suggest how much detail an answer needs.

A note on evidence

Plastic pollution attracts a lot of dramatic statistics, and not all of them are reliable. Sources are given throughout. Where a number is an estimate or an example, we say so — and you should hold other people's claims to the same standard.



Name

School / group

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UNDERSTAND

Briefing: the state of plastic

400+ million tonnes

of plastic are produced worldwide each year.

OECD, Global Plastics Outlook (2022)

9%

of all plastic waste ever generated is estimated to have been recycled.

Geyer, Jambeck & Law, Science Advances (2017)

~11 million tonnes

of plastic are estimated to enter the ocean each year.

UNEP / Pew Charitable Trusts, Breaking the Plastic Wave (2020)

1.7 billion

pieces of plastic packaging are thrown away by UK households every week.

Greenpeace & Everyday Plastic, The Big Plastic Count (2024)

~99%

of plastics are made from fossil fuels.

Center for International Environmental Law (2019)

< 5 mm

is the accepted size limit for a “microplastic”.

US NOAA definition, widely used

Evaluate the evidence

Pick **two** facts above. For each, rate the source out of 3 on each question: *Who* produced it (expertise)? *When* (is it current)? *Method* (measured, modelled or estimated)? *Bias* (does the source have an agenda?).

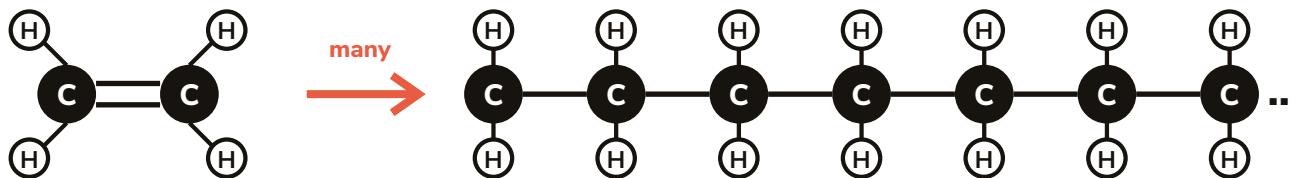
Fact	Who?	When?	Method?	Bias?	Total

1. The 11 million tonnes figure is a model estimate, not a measurement. Why is it so hard to measure how much plastic enters the ocean? [3]

2. A campaign group and an industry body might present the same data differently. Give an example of how. [2]

UNDERSTAND · CHEMISTRY

Why plastic doesn't go away



ethene (monomer)

poly(ethene) — part of a chain thousands of units long

Polymers. Plastics are polymers: very long molecules made by joining thousands of small **monomers**. In addition polymerisation, the double bond in a monomer such as ethene opens so the units link into a chain.

Built to last. The backbone of most common plastics is a chain of strong carbon–carbon bonds. Very few microorganisms have enzymes that can break these chains, so plastic is not readily **biodegraded** the way food or paper is.

Breaking up, not breaking down. Ultraviolet light, heat and waves make plastic brittle so it fragments (**photodegradation**). The pieces get smaller — eventually microplastics and even nanoplastics — but the polymer is still there.

Additives. Plastics also contain chemicals such as plasticisers, flame retardants and pigments. Scientists are studying whether these can leach out as plastic weathers.

Thermoplastic or thermoset?

Thermoplastics soften when heated and can be remoulded; thermosets set permanently. Sort: **PET bottle, polystyrene cup, epoxy resin glue, melamine plate, polypropylene tub.**

Thermoplastic	Thermoset

1. Explain why “degradable” plastic that fragments may not solve the problem. [3]

2. Why are thermoplastics generally easier to recycle than thermosets? [2]

ANALYSE

Bioplastics: solution or distraction?

Packaging labels like “eco”, “plant-based” and “biodegradable” sound reassuring. But the words mean different things — and none of them mean an item is harmless as litter.

Bio-based

Made at least partly from plants (e.g. sugar cane) rather than fossil fuels. Says nothing about what happens at the end of its life — some bio-based plastics are chemically identical to ordinary PET or PE.

Biodegradable

Can be broken down by microorganisms — but the label rarely says how long it takes, or in what conditions. In a University of Plymouth study, “biodegradable” bags left in the sea for three years could still carry shopping.

Compostable (industrial)

Meets a standard such as EN 13432: breaks down within a set time in an **industrial** composting facility at high temperatures. Most won't break down in a home compost heap, and many UK councils don't collect it.

Home compostable

Certified to break down at the lower temperatures of a garden compost heap. Still not designed to break down as litter or in the sea.

What happens next?

For each scenario, predict the most likely outcome.

Scenario	Breaks down properly	Persists / contaminates	Recycled as normal
A “biodegradable” carrier bag is blown into the sea.	☐	☐	☐
A PLA “compostable” cup is put in the plastic recycling bin.	☐	☐	☐
A bio-based PE bottle is put in the plastic recycling bin.	☐	☐	☐
An industrially compostable cup is collected with food waste by a council that sends it to industrial composting.	☐	☐	☐

1. Why can putting compostable plastic in the recycling cause problems? [2]

2. “Switching to bioplastics will solve ocean plastic pollution.” Evaluate this statement. [6]

UNDERSTAND • PRACTICAL

Investigation: microplastics in sand

A field and lab investigation to estimate the number of microplastic particles on a beach. Carry out with a teacher or group leader.

Method

- 1 Mark out a 50 cm × 50 cm quadrat on the strandline (the line of washed-up debris) of a sandy beach.
- 2 Scoop the top 2–3 cm of sand into a labelled container. Repeat at 3 more quadrats along the beach.
- 3 Back in the lab, add a measured volume of sand to a beaker of **saturated salt solution** and stir for 2 minutes.
- 4 Leave for 10 minutes. Sand sinks; many plastics are less dense than salt water and float.
- 5 Pour the top layer through a fine sieve or filter paper. Examine it with a hand lens or microscope.
- 6 Count and record pieces that look like plastic: fragments, fibres, pellets, film, foam.

Equipment

Quadrat or tape measure • trowel • labelled containers • beakers • table salt • water • sieve or filter paper • hand lens or microscope • tweezers

Risk assessment

Check tide times and weather. Never go alone. Wear gloves; don't touch sharp objects, needles or unknown chemicals. Wash hands after handling sand. Use eye protection in the lab.

Hypothesis

Sample	Fragments	Fibres	Pellets	Film	Foam	Total
Quadrat 1						
Quadrat 2						
Quadrat 3						
Quadrat 4						
Mean						

1. Some plastics, such as PET and PVC, are denser than saturated salt water. How would this affect your results? [2]

2. How could you check that the particles you counted really are plastic, and not sand, shell or natural fibres? [2]

3. Suggest one change to improve the validity of the investigation. [2]

ANALYSE · DATA

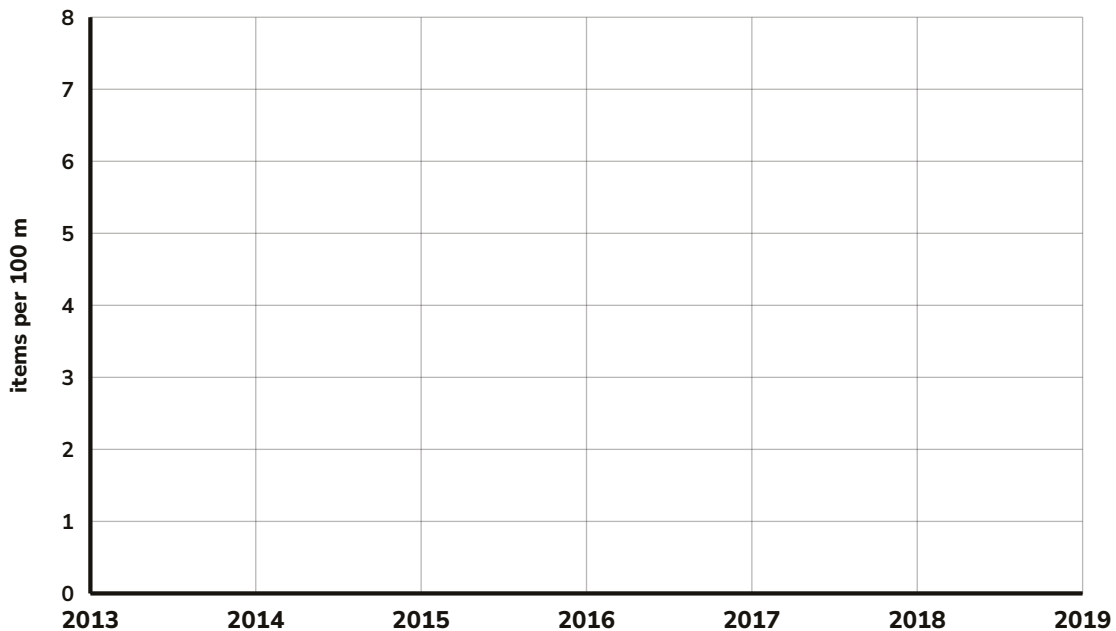
Did the bag charge work?

England introduced a 5p charge on single-use carrier bags in large shops in October 2015. The table shows **example** survey data from one beach (items found per 100 m).

Item	2013	2014	2015	2016	2017	2018	2019
Plastic bags	6	6	5	4	3	3	2
Drinks bottles	4	5	4	5	5	6	5

Illustrative data for practice. In real surveys, the Marine Conservation Society's Great British Beach Clean recorded an average 80% fall in carrier bags on UK beaches over a decade — from about 5 per 100 m in 2014 to about 1 in 2023.

Plot both sets of data as line graphs on the same axes. Use a key.



1. Calculate the percentage change in plastic bags from 2013 to 2019. [2]
2. Calculate the mean number of drinks bottles per 100 m across the seven years. Give your answer to 1 d.p. [2]
3. Does this data *prove* the charge reduced bag litter? Discuss correlation, causation and the role of the bottle data as a comparison. [4]

ANALYSE · SYSTEMS

Life cycle thinking: the bag dilemma

A **life cycle assessment** (LCA) adds up the environmental impact of a product at every stage, not just when it becomes waste.



Paper bag

3x



LDPE “bag for life”

4x



Non-woven polypropylene bag

11x



Cotton tote bag

131x

How many times must each bag be used to have a lower carbon footprint than a standard single-use plastic carrier bag used once?

Source: Environment Agency, *Life cycle assessment of supermarket carrier bags* (2011). Climate impact only; assumes the single-use bag is not reused.

The catch

This study measured **global warming potential**. It didn’t measure litter, harm to wildlife, or microplastics — the problems a lightweight plastic bag is most associated with. Cotton needs lots of land, water and energy to grow and process, so a cotton tote is only the “green” choice if it is used many, many times.

1. Why is a cotton tote bag’s footprint so much higher per bag than a plastic carrier bag’s? [2]

2. Using this evidence, what is the most sustainable approach to shopping bags? Justify your answer. [3]

3. Suggest one impact an LCA like this might miss, and why it matters for ocean health. [2]

ANALYSE · POLICY

How the UK regulates plastic

Governments can change behaviour through **charges**, **bans**, **taxes** and **producer responsibility**. Here are some key UK milestones.

- 2011** ● Wales introduces a charge on single-use carrier bags.
- 2013–14** ● Northern Ireland (2013) and Scotland (2014) follow.
- 2015** ● England introduces a 5p charge in large shops.
- 2018** ● Ban on plastic microbeads in rinse-off personal care products in England, Scotland and Wales (Northern Ireland in 2019).
- 2020** ● England bans plastic straws, stirrers and plastic-stemmed cotton buds (with exemptions).
- 2021** ● England's bag charge rises to 10p and covers all shops.
- 2022** ● Plastic Packaging Tax on packaging with less than 30% recycled plastic. UN nations agree to negotiate a global plastics treaty.
- 2023** ● England bans single-use plastic plates, cutlery, balloon sticks and polystyrene cups and food containers.
- 2025** ● Packaging producers start paying fees towards the cost of dealing with packaging waste (extended producer responsibility).
- 2027** ● A deposit return scheme for drinks containers is planned to begin.

Rules differ across England, Scotland, Wales and Northern Ireland. Dates for future schemes can change — check the latest on GOV.UK.

Charge

makes a choice cost more

Ban

removes a product

Tax

rewards better design

Producer responsibility

makes firms pay for waste

1. Classify each milestone as a charge, ban, tax or producer responsibility scheme. Which type appears most often? [2]

2. Bans usually include exemptions, e.g. plastic straws for people who need them for medical or disability reasons. Why are exemptions important? [2]

3. Which policy do you think has had, or will have, the biggest impact on ocean plastic? Justify your choice and identify one limitation. [6]

ANALYSE · MEDIA LITERACY

Greenwashing detector

Greenwashing is when a company makes itself or its products look more environmentally friendly than they really are. In the UK, the Competition and Markets Authority’s **Green Claims Code** (2021) says environmental claims must:

- | | |
|---|---|
| 1 be truthful and accurate | 2 be clear and unambiguous |
| 3 not omit or hide important information | 4 only make fair and meaningful comparisons |
| 5 consider the full life cycle of the product | 6 be substantiated (backed by evidence) |

Rate the claims

These are made-up examples. Decide how trustworthy each one is, and which principle(s) it might break.

Claim	Clear & honest	Needs more info	Likely green-wash	Principle(s) broken
“ECO-FRIENDLY bottle!” A water bottle label with a green leaf logo.	☐	☐	☐	
“Made with 50% recycled plastic (excluding cap and label)” A drinks bottle.	☐	☐	☐	
“100% biodegradable” Plastic cutlery, with no timescale or conditions given.	☐	☐	☐	
“Made from ocean plastic” A trainer, with no information about how much, or where it came from.	☐	☐	☐	
“Now with 30% less plastic than our 2020 pack” A shampoo bottle, with a link to data on the company website.	☐	☐	☐	

Rewrite it

Choose one weak claim and rewrite it so it meets the code.

Spot it in the wild

Find a real environmental claim on packaging or in an advert. What evidence would you want to see?

ANALYSE · SYSTEMS

Whose job is it anyway?

Plastic pollution involves consumers, manufacturers, retailers and governments. Which actions matter most — and who should take them?

A · Carry a reusable bottle

B · Ban single-use cutlery

C · Redesign packaging to use less plastic

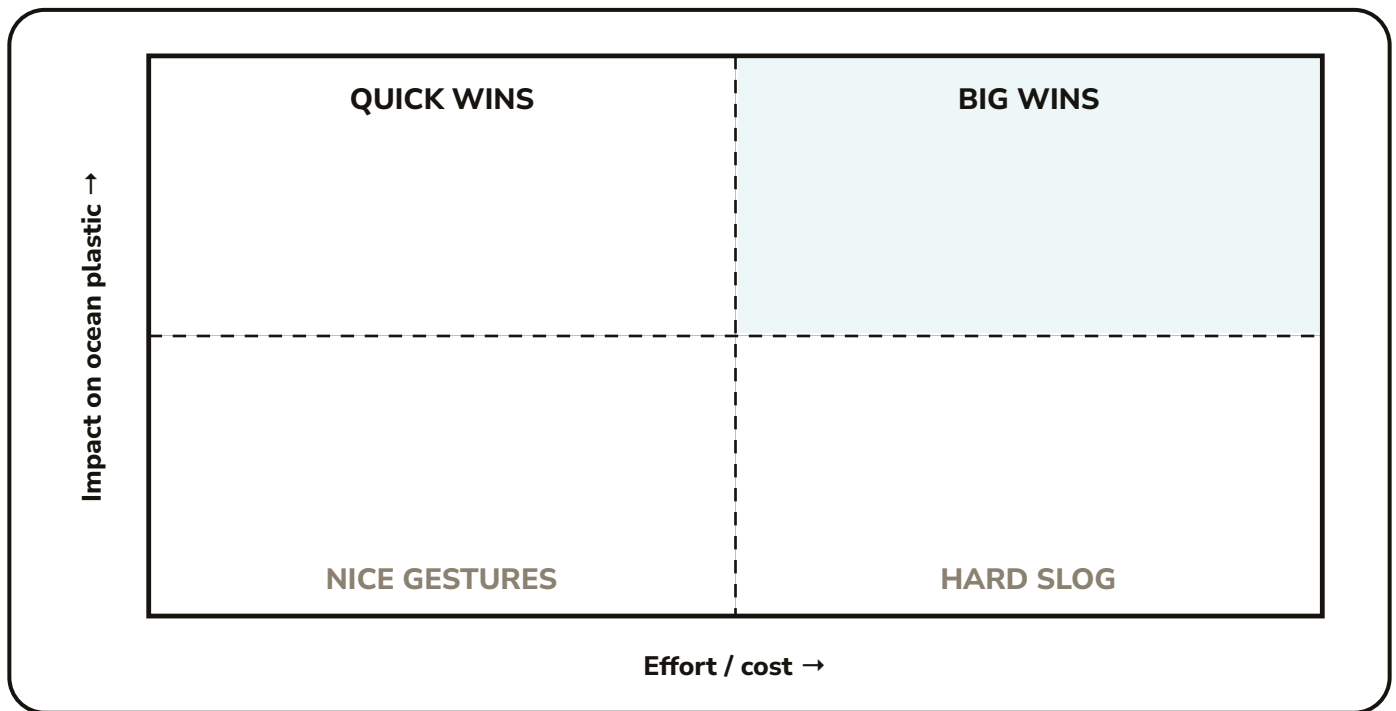
D · Join a beach clean

E · Introduce a deposit return scheme

F · Offer refill stations in shops

G · Write to your MP

H · Fund better waste collection abroad



Write each letter where you think it belongs. Compare with a partner: where did you disagree, and why?

Actions, by who can take them	Individuals	Businesses	Government
Letters			

1. "Individual action is pointless — only governments and companies can fix plastic pollution." To what extent do you agree? Use examples from this booklet. [8]

ACT

Personal plastic footprint

For seven days, record every piece of single-use plastic **you personally** use. Then look for patterns and set a realistic target.

Category	M	T	W	T	F	S	S	Total	Avoidable?
Drinks bottles & cups									
Food packaging									
Bags & film									
Toiletries & cleaning									
Other									

1. What were your three biggest sources of single-use plastic? [2]

2. Which uses were genuinely hard to avoid? What stopped you (cost, convenience, choice, habit)? [3]

My 30-day challenge

I will cut _____

by _____

Baseline _____ per week → Target _____

Barrier I expect _____

How I'll get round it _____

Result after 30 days

Teachers: Access to plastic-free options varies with income, location, disability and time. Encourage students to focus on patterns and realistic change — and on which barriers need action from businesses and government, not just individuals.

ACT · CAMPAIGNING

Plan a campaign that works

Save Our Seas started in 2022 with one idea: cut single-use plastic from schools and homes. Big campaigns start small — plan yours.

1 The problem

What specific plastic problem will you tackle, in your school or community?

2 The goal

What will be different if you succeed? Make it SMART.

3 The audience

Who has the power to make this change? Who influences them?

4 The message

What one sentence will persuade them? What evidence backs it up?

5 The tactics

Petition, assembly, social media, survey, meeting, stall, letter...

6 Measuring impact

What will you count before and after to prove it worked?

Timeline

When	What	Who

Tell us: Want support or to share what you did? Email info@saveourseas.org.uk or visit saveourseas.org.uk.



ACT · CITIZENSHIP

Write to your MP

MPs are elected to represent everyone in their area — including people too young to vote. A clear, personal letter is one of the most effective ways to be heard.

Find your MP

Search your postcode at **members.parliament.uk**. You can write to them at the House of Commons, London SW1A 0AA, or by email.

My MP is _____

Constituency _____



Opening

Say who you are, that you're a constituent, and what you're asking for — in the first two sentences.

Why it matters

One or two strong, sourced facts. A local angle (a nearby beach, river or school) makes it far more powerful.

Your ask

Be specific: ask them to support a named policy, raise a question, or meet your group.

Close

Thank them and ask for a reply. Keep the whole letter to one page.

Do

- Write in your own words — template letters get less attention.
- Be polite, even if you disagree with them.
- Include your address so they know you're a constituent.

Don't

- Try to cover every environmental issue at once.
- Use statistics you can't source.
- Forget to follow up if you don't hear back in a few weeks.

ACT · DESIGN

Innovation challenge

The best solutions often aren't new materials but new **systems**: refill and return, reuse schemes, smarter design. Design a solution to a plastic problem at your school or in your town.

Refill

bring your own container

Returncontainers collected, cleaned,
reused**Redesign**less material, one polymer, no
plastic at all**Problem**What exactly is going wrong,
and for whom?**Users**Who will use your solution?
What do they need?**Idea**Describe your solution in one
sentence.**How it works**Materials, system or business
model.**Trade-offs**New impacts it could create
(energy, cost, access).**Test it**How would you prototype and
measure success?**SKETCH OR STORYBOARD**

FUTURES

Careers that protect the ocean

Tackling plastic pollution needs scientists, engineers, designers, lawyers, communicators and entrepreneurs. Ocean conservation isn't one job — it's part of hundreds.



Marine biologist

Studies ocean life and how pollution affects it.

Useful subjects: Biology, chemistry, maths



Polymer / materials scientist

Develops materials that are safer, recyclable or reusable.

Useful subjects: Chemistry, physics, maths



Waste & resources manager

Runs systems that collect, sort and recycle materials.

Useful subjects: Geography, business, science



Environmental journalist

Investigates and explains environmental stories.

Useful subjects: English, media, politics



Sustainability manager

Helps companies cut waste and carbon from what they make.

Useful subjects: Business, geography, science



Policy adviser

Uses evidence to shape laws and government plans.

Useful subjects: Politics, economics, geography

1. Which role interests you most, and why?

[2]

2. What skills from this booklet would be useful in that job? [2]

Get experience now

- Volunteer at a beach or river clean.
- Take part in citizen science surveys.
- Start or join your school eco-committee.
- Use this work towards volunteering or skills awards.
- Ask a professional for a short careers chat.

My next step

ACT · RECORD

Action log

Keep a record of the action you take — beach cleans, surveys, campaign meetings, letters, assemblies. It's useful evidence for volunteering awards, personal statements and CVs.

Date	What I did	Hours	Result or impact	Checked by

Total hours

Pieces of litter removed

People reached

What skills have I developed?

e.g. teamwork, public speaking, data analysis, persuasion

What would I do differently next time?

REVIEW

Knowledge check

Test yourself on what you've learned. Tick one answer for each question.

1. What is the accepted upper size limit for a microplastic?

- ☐ a) 1 mm ☐ b) 5 mm ☐ c) 1 cm ☐ d) 5 cm

2. Roughly what percentage of all plastic waste has ever been recycled?

- ☐ a) 9% ☐ b) 25% ☐ c) 50% ☐ d) 75%

3. Plastics are made of long-chain molecules called...

- ☐ a) proteins ☐ b) polymers ☐ c) isotopes ☐ d) alloys

4. Photodegradation makes plastic...

- ☐ a) fully biodegrade ☐ b) fragment into smaller pieces ☐ c) dissolve ☐ d) turn into oil

5. "Industrially compostable" plastic is designed to break down...

- ☐ a) in seawater ☐ b) in landfill ☐ c) in high-temperature composting facilities
☐ d) in any garden

6. In the Environment Agency's 2011 study, a cotton bag needed to be used about how many times to beat a single-use bag on carbon?

- ☐ a) 3 ☐ b) 11 ☐ c) 131 ☐ d) 1,000

7. When did England introduce its carrier bag charge?

- ☐ a) 2011 ☐ b) 2013 ☐ c) 2015 ☐ d) 2021

8. The UK body that published the Green Claims Code is the...

- ☐ a) CMA ☐ b) BBC ☐ c) NHS ☐ d) MET Office

9. Which of these is most likely to be a *primary* microplastic?

- ☐ a) A fragment of a bottle ☐ b) A plastic pellet (nurdle) ☐ c) A shred of carrier bag
☐ d) A piece of rope

10. Most plastic entering the ocean is thought to come from...

- ☐ a) land-based sources ☐ b) ships only ☐ c) fishing only ☐ d) volcanoes

11. The Plastic Packaging Tax applies to packaging with less than what share of recycled plastic?

- ☐ a) 10% ☐ b) 30% ☐ c) 50% ☐ d) 90%

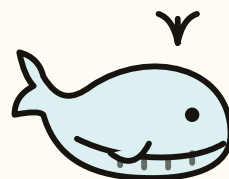
12. Which action is highest on the waste hierarchy?

- ☐ a) Recycle ☐ b) Recover energy ☐ c) Reduce ☐ d) Landfill

Score

____ / 12

The one thing I'll remember

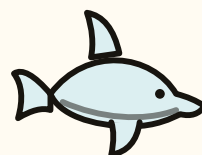


SAVE OUR SEAS CERTIFICATE

Ocean Advocate

This certificate is proudly awarded to

for building the knowledge, critical thinking and action needed
to protect our seas from plastic pollution.



Signed

Date



FOR TEACHERS

Answers, mark guidance & notes

Briefing (p.3)

1) Plastic is dispersed across huge areas and depths, sinks or fragments, moves with currents, and inputs from rivers, litter and fishing vary hugely; figures rely on models. 2) e.g. one emphasises the 9% recycling rate, the other absolute tonnes recycled or growth in recycling.

Chemistry (p.4)

Thermoplastic: PET bottle, polystyrene cup, polypropylene tub. Thermoset: epoxy resin glue, melamine plate. 1) Fragments persist as micro/nanoplastics; polymer isn't mineralised; smaller pieces are ingested by more organisms and are harder to remove. 2) They can be melted and reshaped; thermosets have cross-links that don't melt.

Bioplastics (p.5)

Scenarios: 1) persists; 2) contaminates the recycling stream; 3) recycled as normal (chemically the same as PE); 4) breaks down properly. Evaluation: credit discussion of end-of-life conditions, labelling confusion, land use, and that reduction/reuse tackles the cause.

Practical (p.6)

1) Denser plastics sink with the sand, so counts are underestimates. 2) e.g. hot needle test (plastic melts), microscopy, checking with spectroscopy if available. 3) More quadrats, random sampling, controls against airborne fibre contamination, repeat surveys.

Data (p.7)

1) $(2 - 6) \div 6 \times 100 = -66.7\%$. 2) $34 \div 7 = 4.9$. 3) Correlation, not proof: other factors (awareness, beach cleans, weather, survey effort); bottles didn't fall, which supports a bag-specific effect but one beach is a small sample.

Life cycle (p.8)

1) Growing cotton needs land, water, fertiliser and energy; the bag is heavier. 2) Reuse whatever bag you already own as many times as possible. 3) e.g. litter and wildlife harm, microplastics, water use, toxicity.

Policy (p.9)

Charges: 2011, 2013–14, 2015, 2021. Bans: 2018, 2020, 2023. Tax: 2022. Producer responsibility: 2025, 2027 (a deposit return scheme is run by drinks producers — also accept “charge”, since shoppers pay a refundable 20p deposit). 2022 also includes treaty negotiations. Charges appear most often (4), then bans (3). 2) Protect disabled people and medical needs; avoid unfair or unsafe outcomes.

Greenwashing (p.10)

1) Vague, unsubstantiated (principles 1, 2, 6). 2) Largely clear and specific (discuss whether the exclusions are prominent). 3) Omits conditions/timescale (2, 3, 6). 4) Vague, no evidence (2, 3, 6). 5) Fair comparison with evidence — broadly clear & honest.

Extended answers (pp.5, 9, 11)

Top marks: a clear judgement, evidence from more than one page, both sides considered, and a conclusion that follows from the argument. Recognise answers that see individual, business and government action as complementary.

Knowledge check (p.18)

1 b · 2 a · 3 b · 4 b · 5 c · 6 c · 7 c · 8 a · 9 b · 10 a · 11 b · 12 c

Curriculum links

- **Chemistry:** polymers, addition polymerisation, life cycle assessment.
- **Biology:** ecosystems, food chains, human impacts; sampling techniques.
- **Geography:** marine environments, sustainability, policy.
- **Maths:** percentage change, means, graphs.
- **English & citizenship:** persuasive writing, media literacy, democracy.

Facts checked against the named sources at the time of writing (2026). Policy dates can change; ocean input figures are estimates.

About Save Our Seas

A UK campaign started in 2022 to cut single-use plastic from schools and homes before it reaches our seas. saveourseas.org.uk · info@saveourseas.org.uk