Mark Scheme (Results)

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Pearson BTEC Nationals
In Applied Science (31629H)
Unit 7: Contemporary Issues in Science

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Unit 7: Contemporary Issues in Science – Sample marking grid

General Marking Guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the marking grid not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks if the learner's response is not rewardable according to the marking grid.
- Where judgment is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

Specific Marking guidance

The marking grids have been designed to assess learner work holistically.

Rows within the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

Question 1: *Discuss the implications of the scientific issue identified in the articles. (12 marks)*

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
Understanding the impact in terms of ethical/ social/ economical/ environmental	**0**	**1-3**	**4-6**	**7-9**	**10-12**
	Level of response not worthy of credit	• Demonstrates limited knowledge and understanding of the scientific issues with generalised comments made. • No or limited attempt to draw links to ethical/social/ economic/ environmental implications. • The discussion will be unstructured and limited to basic points made.	• Demonstrates adequate knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. • Attempts to draw links to ethical/social/ economic/ environmental implications. • The discussion shows some structure and coherence.	• Demonstrates good knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. • Draws some links to and between ethical/social/ economic/ environmental implications. • The discussion shows a structure that is mostly clear, coherent and logical.	• Demonstrates comprehensive knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. • Draws a wide range of links to and between ethical/social/ economic/ environmental implications • The discussion shows a well-developed structure that is clear, coherent and logical.

Indicative content for Question 1

Learners:
- **may include other valid suggestions, not listed below, which should be credited**
- **may cover a number of examples from the list below**
- **would not be expected to cover all points to get full marks.**

Scientific issue: plastic pollution
- Plastic waste is polluting the oceans / environment and is increasing, endangering life on the planet
- Reduction of plastic use is difficult as it is a versatile material and society is over-dependent on it
- Plastic is not biodegradable, persists in the environment for hundreds of years and uses non-renewable resources
- Most plastic is not being widely recycled and other disposal solutions such as export, landfill or incineration cause further pollution
- The use of reusable plastic containers is not a systematic, large-scale activity and if being used once may increase the single-use plastic waste rather than prevent it
- Substitute materials are not readily biodegradable, versatile, sustainable or scalable

Sub-issue	Implication	Factor
The use and disposal of plastic	Many uses as a material in society such as to keep food fresh, keeping medical equipment sterile, lightweight, water resistant, air tight, etc. (Article 2). Plastic used within the food and drink industry, supermarkets and grocery supply chain, and is increasing (Articles 1, 2 and 3). Most plastic is single use so is only used once and then thrown away. (Articles 1, 2 and 3)	Social Economic Environmental
	Plastics accumulate rather than decompose so build up in landfills or in the environment to create pollution (Article 3). Plastic can get into the water / countryside and can be ingested by marine life or other animals. (Articles 1, 2 and 3). Plastics are produced from fossil fuels that are mined and cause pollution. Plastics can contain or release chemicals on burning, which get into the air, water or food chain and can be toxic to humans or ecosystems. (Article 3)	Environmental Ethical Economic Social Environmental
	One main method of plastics disposal in the UK is recycling but it is estimated that two-thirds of supermarket plastic packaging cannot be recycled (Article 3), relatively little is collected and actually recycled (Article 2) and it can only be recycled a limited number of times (Article 3).	Economic Environmental
	Dealing with plastic collection and disposal or clean-up of oceans is expensive and does not deal with the majority of the pollution / waste, estimated at 8 million tonnes per year (Article 2). Much of the plastic collected in the UK for recycling is exported to South-East Asia, which only moves the problem elsewhere, e.g. pollutes the local environment, exploits a cheap workforce (Article 3).	Economic Environmental Economic Social Ethical
	There is growing public awareness and demand for changes in use of plastic packaging, consumer behaviour and disposal of plastic due to campaigns and reporting (Articles 2 and 3), but only producers with a turnover of £2 million and 50 tonnes of packaging annually are obliged to release their data (Article 1).	Social Economic Ethical
Replacement of plastic with alternative material	Plastics that are biodegradable are being used by food and drink companies as an alternative form of packaging but there is no system to deal with its disposal (Article 1). Consumers may think that it can be disposed of in the environment or home-composted to decompose naturally but it may just accumulate (Article 1).	Economic Social Environmental Ethical
	Aluminium, glass and paper are alternatives that are being used instead of plastics and can be recycled but these also have environmental impacts (mining and	Economic Environmental

	deforestation) and use valuable resources (Articles 1 and 3).	
	Innovations that could replace conventional plastics involve nano-engineering, magnetic additives and other compostable materials from wood, silica or organic waste but need investment and adoption by plastics industries (Article 2). Campaign groups argue that reduction is better than replacement or recycling as they are not sustainable (Articles 1 and 3).	Economic Environmental
Reduction in use of plastic packaging by supermarkets	Supermarkets and the grocery retail sector are under pressure from campaigners and consumers to reduce or replace plastic packaging (Articles 1 and 3). Total plastic packaging in UK supermarkets has risen by about 20,000 tonnes between 2017 and 2018 (Article 3). Supermarkets are looking at ways to cut down and remove plastic packaging through schemes and targets, but may still increase their plastic footprint overall if their sales increase (Article 3).	Social Ethical Economic
	Schemes to reuse and refill packaging are in place such as "bags for life", "bottle for life", "Ecobox", etc., but may still be used only once and then disposed of, not expensive enough to discourage single use, and aren't hygienic or convenient for consumers (Articles 1, 2 and 3). In the case of "on-the-go" food, there is a £25 billion market that depends on the convenience and disposal nature of the packaging. However, a change could attract new customers and sales, or be cheaper than packaged options (Article 3).	Social Environmental Economic
	Packaging-free / "unpacked" items are being trialled in supermarkets, but this is still only small scale and limited to certain products (Article 3). Loose fruit and vegetable sales are growing at a greater rate than packaged options but this is only a small percentage of the market and some supermarkets claim that this is more expensive to provide. Customers are able to choose the quantity and quality they want, and potentially reduce food waste (Article 3).	Economic Social
	Light-weighting is a process of replacing plastic packaging with lighter materials or cutting down the amount. This may have cost benefits, but it does not solve the problem of single-use and causes different waste (Article 3).	Economic Social Ethical Environmental
	Supermarkets have more control over plastic packaging for own-brand products than for branded products. Supermarkets need to exert more pressure on their suppliers and producers to offer plastic-free or reduced plastic packaging. Also, reduction of out-of-season produce on sale and local sourcing / fewer air miles, would cut down pollution of the environment (Article 3).	Economic Social Environmental

Question 2: *Identify the different organisations and individuals mentioned in the articles and suggest how they may have an influence on the scientific issue.   (6 marks)*

Assessment focus	Band 0	Band 1	Band 2	Band 3
Understanding the influence of different organisations / individuals	**0**	**1-2**	**3-4**	**5-6**
	Level of response not worthy of credit	• Demonstrates adequate knowledge and understanding of how key organisations / individuals can influence the scientific issue by identifying different types of organisation /individual. • A basic explanation of how the organisation /individual may have an influence is given but with general statements made and limited linkages to the articles.	• Demonstrates good knowledge and understanding of how key organisations /individuals can influence the scientific issue by identifying different types of organisation /individual (including any references / acknowledgments in footnotes) from all three articles. • An explanation of how these organisations/individuals may influence the issue is given, which is occasionally supported through linkage and application to the articles.	• Demonstrates comprehensive knowledge and understanding of how key organisations/ individuals can influence the scientific issue by identifying and selecting different types of organisation/individual (including any references/ acknowledgments in footnotes) from all three articles. • An explanation of how these organisations/individuals may influence the issue is given, which is supported throughout with linkage and application to the articles.

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Indicative content for Question 2

Learners:
- **may include other valid suggestions, not listed below, which should be credited**
- **may cover a number of examples from the list below**
- **would not be expected to cover all points to get full marks.**

Government and global organisations	
Organisation	**Influence on scientific issue**
Department for Environment, Food and Rural Affairs select committee / UK Government (Articles 1 and 3)	Responsible for environmental protection, food production and standards. Committee could recommend (or government could set) legal standards, targets for use and disposal of plastics, and impose taxes. Committee could recommend (or government could impose) ban of single-use plastics or the export of plastic waste from the UK. This would influence supermarkets, retailers and the public.
United Nations (UN) (Article 1)	Promotes international cooperation and funds research into global environmental issues. Monitors single-use plastic as a pollutant in the environment. Would influence member states to introduce policies against plastic pollution.
South-East Asia Governments (Article 3)	Accept plastic waste from the UK. May recycle or dispose of it by filling landfills / incineration causing further pollution. Asian governments can stop import of UK waste and influence UK Government's schemes on plastic disposal.
Luxembourg Government (Article 3)	EcoBox initiative (reusable lunchbox deposit scheme) is supported by the Luxembourg Government. Could influence UK Government or UK supermarkets.

Non-governmental organisations (NGOs)	
Organisation	**Influence on scientific issue**
Environmental Investigation Agency (EIA) (Articles 1 and 3)	International NGO that investigates and campaigns on plastic pollution of oceans. Co-author of Article 3 (Checking out Plastics II). Warns use of biodegradable plastics could be just as bad for marine life as conventional plastic and advocates move away from single-use plastic to reusable / refillable options. Can use their research and campaigns to influence government, retailers and public.
World Economic Forum (WEF)(Article 2)	International NGO made up of members from the world's largest corporations and hosts an annual meeting of business and political leaders to discuss global issues. Announce winners of the New Plastics Economy Innovation Prize (Circular Materials Challenge). Could influence businesses and governments.
Greenpeace (Article 3)	Environmental NGO that campaigns on plastic pollution of oceans. Co-author of Article 3 (Checking out Plastics II). Advocates move away from single-use plastic to

	reusable / refillable options. Can use their research and campaigns to influence government, retailers and public.

Universities and research groups	
Organisation	Influence on scientific issue
Green Alliance (Article 1)	Independent environmental think tank with membership including environmental professionals. Warns of change to biodegradable plastics or other alternatives without considering consequences on environment and sustainability. Influences / advises governments and businesses on policy on plastic waste and recycling.
University of Pittsburgh, Aronax Technologies, Full Cycle Bioplastics et al, VTT Technical Research Centre, Fraunhofer Institute for Silicate Research ISC (Article 2)	Research groups and companies that create and develop solutions to plastic packaging that is not recycled or disposed of, and joint winners of the New Plastics Economy Innovation Prize. Could have their ideas taken and scaled-up by plastics industries.

Private and multinational organisations	
Organisation	Influence on scientific issue
Vegware (Article 1)	Manufacturer of plant-based, compostable packaging. Could supply biodegradable packaging to supermarkets or other food and drink retailers.
Aldi, Asda, Co-op, Iceland, Lidl, M&S, Morrisons, Sainsbury's, Tesco, Waitrose, Ocado, etc. (Article 3)	Supermarkets and grocery retailers supplying food and other retail goods to the public in the UK. Responsible for plastic packaging totalling some 903,000 tonnes in 2018. Could influence the shopping habits and behaviours of the general public, and influence suppliers and government to reduce the amount of plastic packaging and waste.
Terracycle (Article 3) Amazon (Article 3) Ocado (Article 3)	Private company that recycles materials. Multinational tech company, online retailer. Public limited company, online retailer. Working in partnership with supermarkets to reuse packaging through online shopping. Could work with other supermarkets to recycle or produce reusable packaging more widely.
Nestle, Unilever, Proctor & Gamble (Article 3)	Fast moving consumer goods companies that supply branded goods and food products. Influence supermarkets by forcing them to accept plastic packaging of their goods.

Voluntary and pressure groups	
Organisation	**Influence on scientific issue**
Keep Britain Tidy (Article 1)	Independent environmental charity that campaigns to reduce litter and plastic waste. Warns about use of biodegradable plastics without research on whether they are better for the environment. Can use their campaigns to educate government and the public.
Ellen MacArthur Foundation (Article 2)	Independent environmental charity that raises awareness of plastic pollution and promotes movement to a circular economy. Launched the New Plastics Economy Innovation Prize in plastic packaging and waste management. Could influence entrepreneurs, businesses and government.
Prince of Wales's International Sustainability Unit / Prince of Wales (Article 2)	Charitable foundation on approaches to resolve key environmental challenges facing the world such as marine ecosystems. Launched the New Plastics Economy Innovation Prize in plastic packaging and waste management. Could have influence on UK Government, businesses and NGOs.

Journals and media	
Organisation	**Influence on scientific issue**
The Guardian (Article 1)	Newspaper, publishes articles for general public. Reported on plastic pollution and alternatives harming marine life and oceans. Influences public opinion.
BBC (Article 2)	UK television and radio broadcaster. Broadcast "Blue Planet" and other environmental programmes, which showed the effect of plastic pollution on marine life and oceans. Influences public opinion.

Individuals	Influence on scientific issue
Juliet Phillips (Article 1)	Campaigner for Environmental Investigation Agency. Warns use of biodegradable plastics could be just as bad for marine life as conventional plastic. Campaigns to influence government and public.
Neil Parish (Article 1)	MP and Chair of Environment, Food and Rural Affairs Select Committee. Could recommend that government sets legal standards and targets for use and disposal of plastics.
Libby Peake (Article 1)	Senior policy adviser for Green Alliance. Warns of using biodegradable plastics without considering consequences on environment and sustainability. Influences / advises governments and businesses on policy on plastic waste and circular economy.
Wendy Schmidt (Article 2)	American businesswoman and philanthropist involved with awareness campaigns on climate change and the oceans. Funded the New Plastics Economy Innovation Prize for innovation in plastic packaging and waste

	management. Could influence entrepreneurs and businesses.
Ellen MacArthur (Article 2)	Former yachtswoman and philanthropist involved with awareness campaigns on plastic pollution of oceans. Launched the New Plastics Economy Innovation Prize for innovation in plastic packaging and waste management. Could influence entrepreneurs and businesses.

Credit reference to **public / consumers as individuals** – choosing whether to buy plastic packaged groceries and how they choose to dispose or recycle plastic waste.

Question 3: *Discuss whether Article 3 has made valid judgements. (12 marks)*

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
	0	**1-3**	**4-6**	**7-9**	**10-12**
Interpretation, analysis and evaluation of scientific information	Level of response not worthy of credit	• Vague statements about the validity of Article 3 are made with limited attempt to consider: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. • The discussion will be unstructured and limited to basic points made.	• The validity of Article 3 is discussed, which is partially supported by a consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. • The discussion shows some structure and coherence.	• The validity of Article 3 is discussed, which is mostly supported by a consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. • The discussion shows a structure, which is mostly clear, coherent and logical.	• The validity of Article 3 is discussed and is consistently supported throughout the consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. • The discussion shows a well-developed structure, which is clear, coherent and logical.

Indicative content for Question 3

Learners should consider how the article has analysed the scientific information to support the conclusions/judgements being made; the validity and reliability of data; references to other sources of information.

Learners:
- **may include other valid suggestions, not listed below, which should be credited**
- **may cover a number of examples from the list below**
- **would not be expected to cover all points to get full marks.**

General
- First comprehensive study on UK supermarkets' role in plastic pollution so there are no similar studies referenced or to compare with
- This is the second report since the study began in 2018 so there is limited data but the 2018 survey does provide a starting point of comparison
- Published by the Environmental Investigative Agency and Greenpeace - not in an independent scientific journal or necessarily peer-reviewed
- Both organisations have campaigned against pollution of the environment by plastics and have objectives to reduce plastic usage
- Supermarkets have voluntarily participated in the study and supplied data

Conclusions / judgements	Interpretation and analysis of information	Validity and reliability of data
"Top-performing" supermarkets have reduced their overall plastic footprint and have made commitments to scale-up on reducing plastic packaging, whilst those at the bottom have increased their plastic footprint and made least progress with trialling and expanding reusable and packaging-free solutions.	The main evidence is from a voluntary survey and the responses have been interpreted and analysed according to questions under five criteria. Overall results are presented as a scorecard / league table where responses are reviewed against objective criteria and given a numerical score - "top performers" do score highest in progress and future plans on reduction and reuse, whilst those lower down do not.	The survey is recent (2019) but the scorecard only reflects the 10 largest supermarkets as Ocado / some of the convenience stores gave incomplete or no responses and are not included. The scorecard system could be unreliable – detail of the scoring has not been provided, it is not clear how the overall ranking percentage is weighted or how exactly the percentages for each of the five criteria are reached. Some criteria are quantifiable (e.g. size of plastic footprint) and some are not (e.g. future plans and targets). Evidence collected is quantitative / qualitative, secondary and relies on accuracy and reliability of disclosure by the supermarkets themselves. Some responses may or may not be easy to verify, quantify or compare (e.g. data over a different time frame, different targets and plans).

Seven of the 10 biggest UK supermarkets have increased their overall single-use plastic packaging footprints (branded and own-brand) and the amount of single-use plastic packaging placed on the market, overall, has increased by almost 20,000 tonnes in a year.	Data has been collected on the amount of plastic packaging placed on the market by supermarkets for two years running, presented as bar charts, for years 2018 and 2019 and by supermarket. The data would suggest that most supermarkets have increased in their plastic footprint but three have decreased this.	The data are very current but does not provide much evidence of a trend in progress for a single supermarket as it is only over two years. It does show a supermarket's plastic packaging footprint in comparison to others. The data provided are gathered from the supermarkets and not primary research so it is difficult to substantiate.
Targets to reduce plastic use are provided by all the main supermarkets to phase out non-recyclable plastic waste by 2025 but these need improving to ensure a move away from single-use packaging across branded and own-brand ranges and other solutions, which still produce waste rather than being reusable.	Targets are shown in Table 2 that are quantifiable and time-dependent, but these are in the future so there is insufficient data to analyse whether these are realistic or will lead to more / reduced waste.	Reduction in plastic targets shown but these are aspirational and have limitations (such as being in proportion to sales or only applying to own-brand) – from the plastic packaging data, there is little evidence to support that they are on track when plastic footprints have increased for those supermarkets that have targets set in 2018.
More supermarkets are trialling reusable and refillable ranges but these are only small scale, need introducing nationwide, quantifiable targets and to be cheaper.	Supermarkets have reported schemes for recycling, refilling and removal of packaging but there are no data presented from these tests and trial runs, only case studies.	There are no data presented from these tests and trial runs to support or undermine claims such as additional sales, cost savings or food waste, but it could suggest that these are therefore significant.
By tonnage / weight, supermarket's own-brand product plastic packaging, which is classed as "widely recyclable", has not increased and slightly dropped by weight from 64.7% to 63.8% over the last year.	Data have been collected on own-brand plastic packaging classified as "widely recyclable" from 8 of the supermarkets for two years running, presented as bar charts. The data would suggest that most supermarkets have only slightly increased "widely recyclable" own-brand packaging and that three have decreased this.	The data are secondary, only covers two years and only shows 8 out of 10 supermarkets but does show a supermarket's "widely recyclable" packaging in comparison to others. Data do reflect an overall increase but could be unreliable as there have been changes in how some supermarkets report and there is ambiguity over the interpretation and implementation of "widely recyclable" / On-Pack Recyling Labelling (OPRL).

"Bags for life" sales are still increasing, which would suggest that they are being used as single-use options by the public (equivalent to 54 bags per household in the UK in the last year) and sales of these should end or see a price increase.	Reference 31 (by DEFRA) is cited as evidence of replacement of single-use plastic bags by "bags for life". Data have been collected and presented in bar charts for two years, which suggests an increase in the purchase of "bags for life" overall.	Data set is limited (two years only) and incomplete as two supermarkets have not provided data for 2018. Not all supermarkets show an increase in sales, but some have shown a large increase. It is not certain how these bags are actually being used or are being disposed of.
Branded product range sales and its single-use plastic packaging waste are increasing and supermarkets need to push suppliers for a reduction and shift into reusable systems.	Reference 35 (by BBFP) is cited as showing branded packaging being the majority of marine pollution in a recent audit. The data suggest an overall annual increase in plastic packaging for branded goods sold by supermarkets (from 349,022 to 366,937 tonnes in 2018) and that it comprises 40-60% of sales for most supermarkets, and less than 10% for a couple.	The data do not provide much evidence of a trend for a single supermarket's sale of branded products as it is only over two years but does appear to show an increase and offers comparison to others. The data provided are gathered from the supermarkets and not primary research.

References:
- No similar studies referenced or to compare with apart from the first survey
- Many sources from recent studies, within the last couple of years, so current to when the article was written, but also reveals the lack of corroborating studies
- Published by the Environmental Investigative Agency - not in an independent scientific journal or necessarily peer-reviewed
- Several references to the authors' own work or findings
- Many of the references are from environmental groups (e.g. World Wildlife Fund, Friends of the Earth) with similar objectives to the authors, so there are no conflicting viewpoints
- Some sources are more independent, impartial and recognised (DEFRA, BBC and United Nations) but will have been selected to support the argument
- Other references are from the retail industry (e.g. The Grocer, IGD) to support facts

Question 4: *Suggest potential areas for further development and/or research of the scientific issue from the three articles. (5 marks)*

Assessment focus	Band 0	Band 1	Band 2	Band 3
Interprets, analyses and evaluates articles to identify potential areas for further development and/or research	**0** Level of response not worthy of credit	**1** • Areas for further development and/or research of the scientific issue are identified but these are usually vague descriptions with limited analysis/evaluation of the articles to support the statements being made.	**2-3** • A description for further areas of development and/or research of the scientific issue is given. • Provides occasional evidence from the analysis/evaluation of the articles and attempts to synthesise and integrate relevant knowledge.	**4-5** • A description for further areas of development and/or research of the scientific issue is given. • Consistently provides evidence from the analysis/evaluation of the articles and demonstrates throughout the skills of synthesising and integrating relevant knowledge.

Indicative content for Question 4

Learners:
- **may include other valid suggestions, not listed below, which should be credited**
- **may cover a number of examples from the list below**
- **would not be expected to cover all points to get full marks.**

Area	Further research or development
Effect of plastic on the environment (all articles)	• amount of microplastics in the air and water • studies to determine quantities of plastic particles in marine life, humans, and long-term health effects on humans • studies on effect of microplastics on an ecosystem • if compostable plastics cause more environmental damage than conventional plastics (Article 1)
Removal of plastic from oceans / environment (all articles)	• industrial / engineering solutions to scoop up plastic waste more efficiently • chemical / biological methods to dissolve or degrade the waste without harming the environment
Development of alternative materials to plastics (Articles 1 and 2)	• scale-up commercial viability and sustainability of the materials • nano-engineering to produce materials that are 100% recyclable and can be used again without degrading (Article 2)

	• magnetic additives in materials to protect products. which would degrade on exposure to air or moisture and can be resealed (Article 2) • food waste, organic by-products and silicate materials that are compostable and do not pollute the natural environment (Article 2) • national scale infrastructure or individual home-composting for biodegradable plastics (Article 1)
Improvements in recycling of plastic (Article 3)	• move to use of packaging that is 100% recyclable (Article 3) • higher / faster targets for retail users / suppliers of plastic packaging to make it recyclable (Article 3) • governmental legislation and taxation on plastic types (Article 3) • clearer definitions of On Pack Recycling Labelling (OPRL) (Article 3) • more efficient and transparent systems for recycling (Article 3)
Promotion of reusable, refillable and no-packaging schemes (Article 3)	• wider implementation of reusable and refillable packaging within the retail sector (e.g. ecobox, bottle for life) (Article 3) • better infrastructure and systems (e.g. charging a premium for use, deposit or refund system) (Article 3) • wide scale option of packaging-free on goods, e.g. fruit, vegetables, with parity in pricing (or cheaper) with the pre-packed option (Article 3)
Legal, financial and education developments (all articles)	• companies using / producing single-use plastic packaging to make public the quantities rather than having this as a voluntary process (Articles 1 and 3) • making producers and retailers financially responsible for the plastic waste arising from their products (Article 3) • making the use or supply of single-use plastic packaging and products illegal or carry penalties (Article 3) • educating the public on the implications of plastic packaging (e.g. waste, pollution and effects, recycling and biodegradability) (Articles 1, 2 and 3) • encouraging public to make responsible choices (e.g. selecting seasonal produce, using reusable / refillable containers) (Article 3)

Question 5

You are working as a technician for a food manufacturing company.

The company would like to reduce the amount of plastic in its food packaging by 2025 and is exploring packaging alternatives.

You have been asked to write a report on plant-based packaging for food.

Your report needs to summarise the issues surrounding the use and disposal of plastic and promote plant-based packaging for food. (15 marks)

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
Synthesises content ideas and demonstrates an understanding of scientific reporting and its relationship with reporting medium and target audience	**0** Level of response not worthy of credit	**1-4** • Identifies some of the main points and evidence from the three articles with limited attempt to summarise these. • Shows little awareness of audience or purpose. • The article will be unstructured and limited to basic points made.	**5-8** • Summarises the main points and evidence including any supporting and conflicting statements from the three articles. • Shows an awareness of audience and purpose. • The article shows some structure and coherence.	**9-12** • Summarises and attempts to synthesise the main points and evidence including any supporting and conflicting statements from the three articles. • Selects material to suit audience and purpose, with appropriate use of tone, style and scientific terminology. • The article shows a structure that is mostly clear, coherent and logical.	**13-15** • Summarises and synthesises the main points and evidence including any supporting and conflicting statements consistently from the three articles. • Consistently selects and organises material for particular effect, with effective use of tone, style and scientific terminology. • The article shows a well-developed structure, which is clear, coherent and logical.

Indicative content for Question 5
Learners:
- **may include other valid suggestions, not listed below, which should be credited**
- **may cover a number of examples from the list below**
- **would not be expected to cover all points to get full marks.**

Tone and style show awareness of audience
- Authoring needs to be from the perspective of a science technician and would:
    - be knowledgeable and scientific
    - communicate professionally and demonstrate corporate responsibility
    - aim to be accurate and verifiable
    - promote plant-based packaging
    - highlight innovative solutions, referring to work in development
- Audience is the company's Director of Environmental Sustainability and would:
    - have a high level of education and reading ability
    - have a reasonable scientific understanding, understand technical language
    - be interested in protecting the environment while still maintaining convenience and quality
    - want a sustainable and economic solution to reduce plastic waste to meet company targets
- Evidence format is a report so will:
    - be designed to influence policy decisions
    - be structured in short sections for ease of reading / no lengthy paragraphs
    - present information / facts succinctly and accurately, without repetition
    - use scientific and retail terminology sparingly but accurately, with explanation of meaning where necessary
    - **not** extensively reference but should point to supporting sources of information / further reading

Issues of use and disposal of plastic
- Key terms that may require definition / explanation:
    - plastic / polymer
    - biodegradable (plastic) / bioplastic / compostable plastic
    - PET (polyethylene terephthalate), PVC (polyvinyl chloride)
    - sustainable / renewable
    - single use / reusable
    - "widely recycled" / On-Pack Recycling Labelling (OPRL)
    - difference between recycle and reuse
    - circular economy / zero-waste economy
    - primary / secondary / tertiary packaging
- Benefits of plastics
    - can be manufactured to be flexible, rigid or to required shape and size
    - can be manufactured in quantity, relatively cheaply to other materials
    - lightweight, hygienic and sterile
    - can be designed to be recycled, reused or biodegradable
- Problems of plastics
    - increasing use, specifically as single-use and packaging with relatively little being recycled or reused and most is non-biodegradable
    - methods of disposal (i.e. land-fill or incineration) either release plastic or toxic chemicals / pollutants into the natural environment
    - 8 million tonnes per year is accumulating in the world's oceans and getting into ecosystems / food chain
    - main raw material for conventional plastics are fossil fuels, which are non-renewable and also cause pollution
    - traditional alternative materials (e.g. aluminium, paper, glass) also use up natural resources and impact the environment

Promotion of plant-based packaging as an alternative to single-use plastic
- Advantages that may be promoted include:
    - compostable / biodegradable packaging
    - potential natural materials include plant / wood / food waste / seaweed / cellulose-based packaging
    - no large-scale infrastructure required for collection and disposal
    - raw materials are returned to the earth and can be grown again
    - do not pollute the environment
    - would not contaminate food contents / could be designed to be consumable
    - would reduce need for multi-layers of plastic
    - protects the food or contents within the packaging from moisture / oxygen
    - examples - Vegware in Article 1, Full Cycle Bioplastics / VTT Research Centre in Article 2

- Proposal will promote plant-based packaging as an alternative to single-use plastic but considers obstacles to doing this (eg consumer confusion over bioplastic and biodegradable, consumers need a special home composting, little regulation at present for these products, unknown long term effects on ecosystems)

Reference to other company targets to reduce plastic packaging
- Learner may refer to the food manufacturing company working with supermarkets to meet their own plastic packaging reduction targets
- Key areas that may be referenced include:
    - percentage reduction in plastic packaging on the market from 2018 to 2019 (Waitrose by 2.1%, Tesco by 0.7%, Sainsbury's by 0.6%) or keeping percentage low (eg Co-op at 0.9%)
    - reduction targets (eg Waitrose - 20% reduction in single-use plastic in own brand packaging by end of 2021, Morrisons – phase out coloured PET from 2022)
    - substitution of plastic (eg Morrisons switching 269 tonnes of plastic produce bags with paper-based alternatives, Tesco replacing 113 tonnes of plastic trays with pulp-based trays)

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Rewarding Learning