

Student Feedback & Marking Report

Student: Georgia Cox (2510065)

Module: ACMA4000 – Materials and Introduction to Processing

Assessment: Manufacturing Processes and Defects (Report 40% + Video 10%)

REPORT MARKING (40%)

1. Engagement with Literature Skills

Mark Awarded: 18 / 20

The report demonstrates strong engagement with a wide and appropriate range of credible literature, including peer-reviewed journal articles (e.g. Martins et al., 2016; Moslemi Petrudi et al., 2020; Almoqli et al., 2023), authoritative textbooks (Shackelford, 2023), and reputable technical and industry sources (International Aluminium, 2022; McEvoy et al., 1998; Al Circle, 2025). The literature is not only cited but integrated into the analysis, for example when aluminium can forming is linked to alloy ductility and work-hardening behaviour, PET processing is connected to viscoelastic behaviour and strain-induced crystallisation, and ceramic brittleness is justified using mechanical property data from standard materials references. The environmental and lifecycle discussion is supported by multiple sources and reinforced visually through lifecycle diagrams and recycled content data, demonstrating consistent application of literature across Tasks 1–5.

A minor limitation is that, while the sources are extensive, some web-based lifecycle illustrations and market reports are used without full critical evaluation of assumptions (e.g. lifecycle diagrams sourced from industry communications rather than independent LCAs). Nonetheless, the overall quality and integration of literature is strong and consistent with upper-band performance.

To further strengthen this criterion, the student could explicitly synthesise findings across two or more lifecycle assessment studies into a single comparative statement on environmental impact per functional lifetime of cans, bottles and mugs. However, given the breadth and depth already demonstrated, this criterion is awarded a high mark.

2. Knowledge and Understanding Skills

Mark Awarded: 22 / 25

The report demonstrates very strong technical understanding of materials, processes and properties. The student correctly explains aluminium can forming via drawing and ironing and links alloy ductility and work-hardening to manufacturability and wall thinning without failure. PET processing via injection stretch blow moulding is clearly described, with explicit explanation of biaxial stretching, molecular orientation and its effect on wall strength and transparency. The ceramic mug section correctly links ceramic microstructure to compressive strength, low thermal conductivity and brittleness, and the thermal behaviour is accurately discussed in terms of conductivity, heat retention and thermal expansion.

The mechanical and thermal property comparisons are well supported by quantitative data drawn from appendices and literature tables, and the explanation of typical stress–strain behaviour across

metals, polymers and ceramics shows good conceptual understanding of structure–property relationships. The student consistently uses correct technical terminology and demonstrates clear understanding of how processing, structure and properties interact to determine product performance.

The only limitation is that, in a few places, the report could further deepen microstructural explanations, for example explicitly linking aluminium’s grain structure and rolling texture to anisotropy in forming, or expanding on porosity reduction during ceramic jollying and firing. These are refinements rather than major gaps.

To reach full marks, the student could add a short schematic linking processing to microstructure and then to properties for each material class. Nevertheless, the level of knowledge and understanding demonstrated is high.

3. Cognitive and Intellectual Skills

Mark Awarded: 17 / 20

The report shows clear evaluative and comparative thinking. The student compares aluminium, PET and ceramics across manufacturability, mechanical and thermal performance, cost, lifespan and sustainability. Trade-offs are explicitly articulated, such as aluminium’s excellent recyclability and formability versus denting risk and coating requirements, PET’s cost-effectiveness and clarity versus thermal and recycling limitations, and ceramics’ thermal stability and durability versus brittleness and poor recyclability. The alternative materials discussion is well developed, with reasoned justification for considering tin-plated steel, glass and stainless steel as alternatives and explanation of why these are not universally superior.

The evaluation is supported by quantitative property data, production rates and cost breakdowns, and is strengthened by the inclusion of comparative tables and lifecycle diagrams that support the reasoning visually. This demonstrates higher-order cognitive skills beyond description.

The analysis could be strengthened further by introducing a formalised decision-making framework, such as a weighted decision matrix, to make the trade-offs more explicit and structured. However, the current level of evaluation is strong and consistent with upper-band performance.

4. Practical Application Skills

Mark Awarded: 22 / 25

The application of materials and manufacturing theory to real-world products is a major strength of this submission. The chosen products are realistic everyday items, and the report consistently links properties to real service conditions, such as aluminium’s thermal conductivity for rapid beverage cooling, PET’s UV sensitivity and thermal softening for outdoor use, and ceramics’ low thermal conductivity for heat retention in mugs. The manufacturing process descriptions are closely tied to industrial reality, including production rates, energy intensity and cost implications for large-scale output.

The lifecycle and sustainability discussion is particularly strong, supported by multiple lifecycle diagrams (PET, aluminium and ceramic), recycled content comparisons by region, and manufacturing cost breakdowns. The inclusion of SEM/EDS images to illustrate corrosion behaviour in aluminium cans and visual evidence of PET degradation under sunlight demonstrates excellent application of materials science concepts to real degradation mechanisms. The extensive use of figures, process flows and tables significantly strengthens this criterion and justifies a generous mark in line with the stated marking approach.

To further enhance this criterion, the student could briefly discuss design-for-recycling considerations (e.g. coatings on aluminium cans and their impact on recyclability, multilayer PET structures). However, the practical application demonstrated is already strong.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 9 / 10

The report is professionally structured, with clear contents, lists of figures and tables, well-organised task-based sections, and a coherent narrative flow. The extensive and effective use of figures, process flow diagrams, lifecycle illustrations and comparative tables significantly enhances clarity and professional presentation. All figures and tables are clearly labelled and referenced, and the integration of visuals into the analytical narrative is strong. The writing is coherent, technically appropriate and professionally presented, with consistent academic tone and referencing.

Minor improvements could be made in eliminating small repetitions (e.g. duplicated figure captions) and tightening some phrasing for conciseness. However, overall presentation and communication quality is excellent and justifies a high mark.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (MP4 submitted)

Video Technical Content and Communication

Mark Awarded: 8 / 10

The video clearly introduces the three products and accurately explains their materials, manufacturing processes, and key mechanical and thermal differences. The presentation demonstrates good understanding of why each material–process combination is used in practice and clearly communicates trade-offs between performance, cost and sustainability. The structure is logical and mirrors the report, moving from product description to processes, properties and alternatives.

The video is strengthened by the student's use of visual references to manufacturing processes and lifecycle considerations, which supports clarity and technical communication. Delivery is clear and professional, and the content reflects the depth of understanding shown in the report.

To reach the highest band, the video could include more explicit on-screen diagrams or condensed comparative tables to reinforce key points visually and further emphasise trade-offs. Nonetheless, the video demonstrates strong technical content and professional communication.

Overall Summary

Report marks:

Engagement with Literature: **18/20**

Knowledge and Understanding: **22/25**

Cognitive and Intellectual Skills: **17/20**

Practical Application: **22/25**

Transferable Skills: **9/10**

Video mark: 8/10