

Student Feedback & Marking Report

Student: Connor Hooper (2418021)

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: 17 / 20

The report demonstrates strong engagement with appropriate academic literature for Level 4. Core materials science texts (Ashby, 2019; Callister, 2020; Kingery et al., 2018; Strong, 2018) are used effectively to underpin discussion of metals, polymers and ceramics. The literature is clearly integrated into the technical narrative, for example when linking graphite flake microstructures in cast iron to brittleness and compressive strength, polymer chain orientation in PET to improved stiffness and impact resistance, and ionic/covalent bonding in ceramics to hardness and brittleness. This shows correct use of authoritative sources to support material behaviour, processing routes and property–performance relationships.

The sustainability discussion is supported by PlasticsEurope (2022), which provides relevant industry-level context for plastics production and waste. However, the environmental analysis would be strengthened by inclusion of at least one independent peer-reviewed lifecycle assessment (LCA) study to complement industry reports and to provide a more critical evidence base for sustainability claims. While the literature is used well to support individual claims, there is limited synthesis across sources to form a comparative lifecycle argument between metals, polymers and ceramics.

To improve this criterion further, the student could integrate one peer-reviewed LCA study comparing PET, metals and ceramics and synthesise findings into a short comparative paragraph or table. Overall, the engagement with literature is strong and academically appropriate.

2. Knowledge and Understanding Skills

Mark Awarded: 21 / 25

The submission demonstrates strong technical understanding of material classes, manufacturing processes and structure–property–performance relationships. The explanation of grey cast iron correctly identifies graphite flake morphology and links this microstructure to high compressive strength but low tensile strength and impact resistance, showing good understanding of microstructural effects on performance. The PET section accurately explains molecular orientation during injection stretch blow moulding and correctly links this to improved stiffness and impact resistance, demonstrating sound process–property understanding. The porcelain section correctly describes vitrification, glaze formation and the resulting hardness, chemical resistance and thermal stability, while acknowledging brittleness as a key limitation.

Manufacturing processes are described accurately and appropriately matched to each material class. Sand casting is correctly characterised as economical but surface-finish-limited, ISBM is correctly

described as high-throughput and chain-orienting, and slip casting is accurately linked to ceramic shrinkage and shape control. The mechanical and thermal comparisons are technically sound, and the distinctions between ductility, brittleness, thermal conductivity and thermal shock resistance are well articulated.

Minor scope for improvement lies in expanding discussion of thermal shock resistance in ceramics (e.g. linking thermal gradients to crack initiation) and corrosion mechanisms in cast iron (e.g. oxide formation and protective coatings). These are refinements rather than gaps. Overall, the level of knowledge and understanding is high for Level 4.

3. Cognitive and Intellectual Skills

Mark Awarded: 16 / 20

The report demonstrates clear evaluative reasoning in material selection and alternative choices. The comparison of cast iron with forged steel for wrenches is well justified, correctly identifying the trade-off between low cost and castability versus superior toughness and grain refinement through forging. The evaluation of aluminium as an alternative to PET bottles demonstrates sound understanding of recyclability, deep drawing and ironing as a viable manufacturing route, and lifecycle benefits associated with aluminium's circular economy potential. The comparison of porcelain with stainless steel mugs appropriately balances aesthetic and thermal performance against impact resistance and durability.

These comparisons show that the student understands engineering design as a process of managing trade-offs between performance, cost, manufacturability and sustainability. The reasoning is coherent and technically grounded.

To further strengthen this criterion, the analysis could be structured using a simple decision matrix to make prioritisation of criteria more explicit (e.g. weighting durability versus sustainability for each product). Nonetheless, the evaluative judgement demonstrated is strong.

4. Practical Application Skills

Mark Awarded: 22 / 25

The application of materials and manufacturing theory to real-world products is a clear strength. The chosen objects are appropriate everyday items and the report consistently links material behaviour to functional requirements and service environments, such as brittle fracture risk in cast iron tools, thermal softening and UV degradation in PET bottles, and thermal stability but impact sensitivity in porcelain mugs. The manufacturing process descriptions are realistic and aligned with industrial practice, and the comparison of sand casting, ISBM and slip casting demonstrates clear understanding of production scale, surface finish and energy intensity.

The report includes multiple well-chosen figures and tables, including process schematics and comparative property tables, which significantly enhance practical understanding. In line with the marking approach, the strong use of photos, diagrams and tables justifies a generous mark in this

criterion. The lifespan and degradation discussion is well contextualised, particularly the contrast between short functional life of PET bottles and long environmental persistence.

To reach the very highest band, the report could include a consolidated lifecycle flow diagram for each product showing raw material extraction → manufacturing → use → end-of-life pathways. However, the current level of practical application is strong.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 9 / 10

The report is professionally structured with a clear abstract, contents page, list of figures and tables, logical sectioning aligned with the coursework brief, and a coherent concluding synthesis. Academic writing is clear, technically appropriate and well referenced using authoritative texts. Figures and tables are appropriately labelled and integrated into the narrative, supporting professional communication of engineering information. The presentation demonstrates strong organisational and communication skills expected at Level 4.

Minor improvements could be made in formatting consistency (e.g. uniform figure caption style) and in tightening phrasing in a few sections. Overall, the transferable skills demonstrated are excellent.

VIDEO PRESENTATION MARKING (10%)

Video submitted: No

Mark Awarded: 0 / 10

No video presentation was submitted. In line with the assessment brief, the video component cannot be awarded marks in the absence of a submission.

Overall Summary

Report marks:

Engagement with Literature: 17/20

Knowledge and Understanding: 21/25

Cognitive and Intellectual Skills: 16/20

Practical Application: 22/25

Transferable Skills: 9/10

Video mark: 0/10 (not submitted)