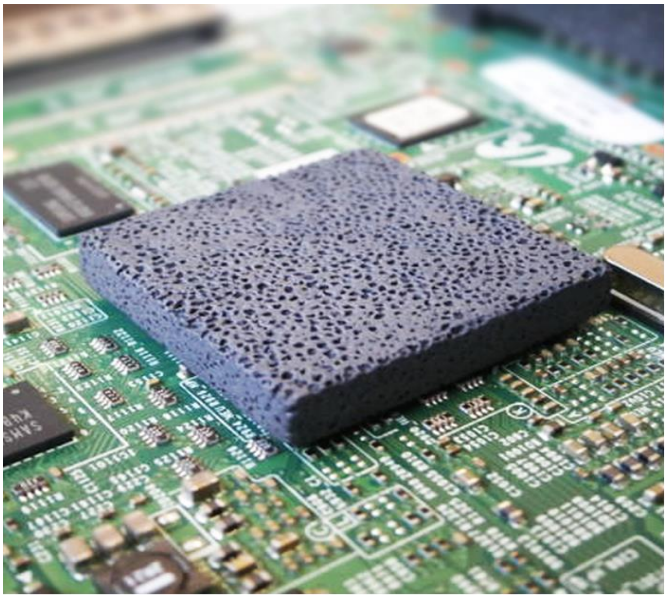


Engineering Materials

Heat Transfer Performance of Porous Metals

Key Stage 4 Programme – 2016-2017

Teacher Name: Dr. J.M. Baloyo

Pupil Name_____

Timetable and Assignment Submission

Fill this in with your teacher.

Timetable – Tutorials

Tutorial	Date	Time	Location
1			
2			
3			
4			
5			
6			

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after 4.00pm on **Put date here**	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

KS4 Programme 2016-17 – Pupil Feedback Report

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-Level
2:1	60-69	Performing to a good standard at A-Level
2:2	50-59	Performing to an excellent standard at current key stage
3rd	40-49	Performing to a good standard at current key stage
Working towards a pass	0-39	Performing below a good standard at current key stage
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of RIS Teacher			
Title of Assignment			
Name of Pupil			
Name of School			
ORIGINAL MARK / 100		**FINAL MARK / 100**	
DEDUCTED MARKS		**FINAL GRADE**	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Learning Feedback Comment 1 - *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Learning Feedback Comment 2 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Learning Feedback Comment 3 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Resilience Comment	
How you showed learning resilience during the course *Enter feedback here*	**How you could build learning resilience in the future** *Enter feedback here*

Example

Contents

Course Rationale	Page 5
Mark Scheme	Page 7
Glossary of Keywords	Page 8
Tutorial 1	Page 9
Tutorial 2	Page 10
Tutorial 3	Page 11
Tutorial 4	Page 12
Tutorial 5	Page 13
Tutorial 6	Page 14
Appendix 1: Referencing	Page 15
Appendix 2: University Application Guidance	Page 16

Course Rationale

This interdisciplinary course will provide students with knowledge of Materials Science and Engineering. The students will gain an understanding of structure-property relationships and how materials can be engineered and tailored to fit their applications. This particular course will look at the application of porous metals for thermal management applications.

The course is centred around the application of theoretical concepts though experimental science, an integral part in engineering. The students will be able to familiarise themselves with methods of data handling, data analysis and results evaluation. The final assignment is in form of a technical report (2500 words), which will include the following sections:

1) Abstract
2) Introduction
3) Results
4) Discussion
5) Conclusions
6) References

The assignment will encourage the students to participate in independent learning through wider reading, as well as think critically to provide logical reasoning to support their arguments and final conclusions.

Course Map

Introduction to Porous Metals
Experimental Science
Heat Transfer in Porous Metals
Porous Metals for Thermal Management Applications
Science Writing
Research and Analysis

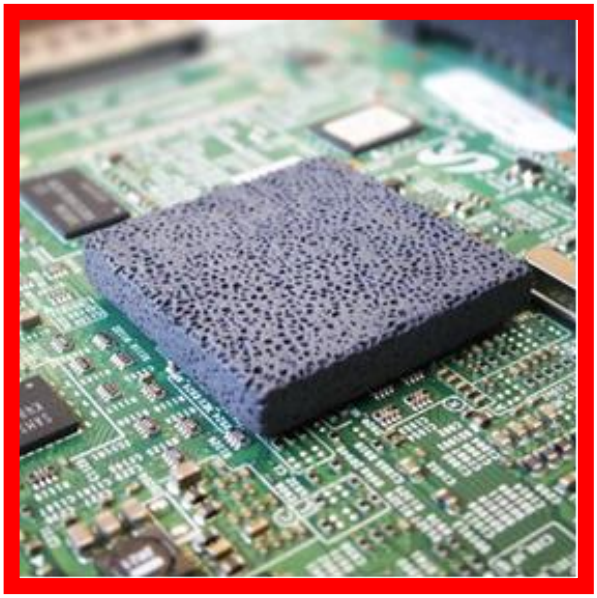
Mark Scheme

Key Skill	1st	2.1	2.2
Communication	Writing is coherent and organised following a logical sequence. Almost faultless spelling, punctuation and grammar. Writing is of an appropriate style for the scientific document and follows stylistic techniques.	Writing is slightly coherent and organise. Almost faultless spelling, punctuation and grammar. Some inconsistency in the use of writing style for scientific documents.	Writing is poorly organised with a lack of coherent structure. The spelling, punctuation and grammar are weak in places. Inconsistent use of style throughout resulting in lack of clarity.
Knowledge and Understanding	Makes links between subjects that have not previously been associated. Uses concepts from the tutorials in an unfamiliar context, and does so accurately and confidently. Avoids the use of irrelevant data, arguments or knowledge.	Needs little direction to spot links between areas that have not previously been associated. When directed, applies concepts from tutorials to unfamiliar situations, reasonably and accurately. Uses the concepts from their current key stage with confidence, but slightly struggles with new concepts introduced in the tutorials that are at the key stage above current level. Very seldom introduces irrelevant data, arguments or knowledge.	Needs direction to spot links between areas that have not previously been associated. When directed, applies concepts from tutorials to unfamiliar situations, reasonably and accurately. Confidently uses the concepts from their current key stage, but struggles with new concepts introduced in the tutorials that are at the key stage above current level. Occasionally introduces irrelevant data, arguments or knowledge.
Research Skills	All the outside sources are correctly referenced in the agreed format. Uses a purposeful but imaginative range of sources; reliable, relevant, and balanced in their choice. Comprehensive research is evidenced; sources of information go beyond the obvious choices.	Most of the sources are referenced correctly. Wide range of sources has been used, which are relevant and appropriate, but may be unreliable.	Sources are not always referenced correctly. A limited range of sources has been used. Sources that have been found outside of the course reading may be unreliable; inappropriate for the subject; or heavily biased; limited attempt made to balance these with other sources
Critical Thinking	Validity of all data is discussed without the need to be prompted to do so. Critical evaluation of the data is systematic and logical – the limitations of the data are explained clearly and most of the main points have been covered. Evaluation is consistent across the different data sets being used.	Validity of most of the data they are using is discussed. Critical evaluation of the data covers most of the main points but at times the reasoning may not be clear or lack logic. Some inconsistency in data evaluation.	Validity of some of the data they are using is discussed. Critical evaluation of the data covers some of the main points but at times the reasoning is not clear or lacks a logical progression. Can be too critical of the data (e.g. refuse to use it because of a minor flaw in the experimental design).
Logical Reasoning	Correct methods are executed for derivations, proofs and extended calculations. These are structured and easy to follow. There is a clear and structured flow of argument with when using logical reasoning. Arguments and reasoning are expressed with clarity towards an end goal or conclusion.	Some mistakes in the derivations, proofs and extended calculations. These are structured and easy to follow. The structure of arguments may be unclear in some places. There is clarity within most arguments and reasoning towards the end goal or conclusion	Derivations, proofs and extended calculations are attempted although some mistakes may be made. The structure is less easy to follow and unnecessary steps may be made. The structure of arguments may be unclear in places and difficult to follow. There is a lack of clarity within arguments and reasoning towards the end goal or conclusion

Glossary of Keywords

Word	Definition	In a sentence…
Conduction		
Convection		
Flow rate		
Heat flux		
Heat transfer		
Porosity		
Porous metals		
Radiation		
Technical report		

Tutorial 1 – Introduction to Heat Transfer in Porous Metals



Today's Key Question(s):

- How is heat transferred in solids, liquids or gases?
- What are the heat transfer mechanisms in porous metals allied with fluid flow?

What is the Purpose of Tutorial 1?

- Revision of the heat transfer mechanisms in solids, liquids and gases.
- Introduce porous metals and their suitability for thermal management application.

Today's Homework is:

- Baseline Assessment

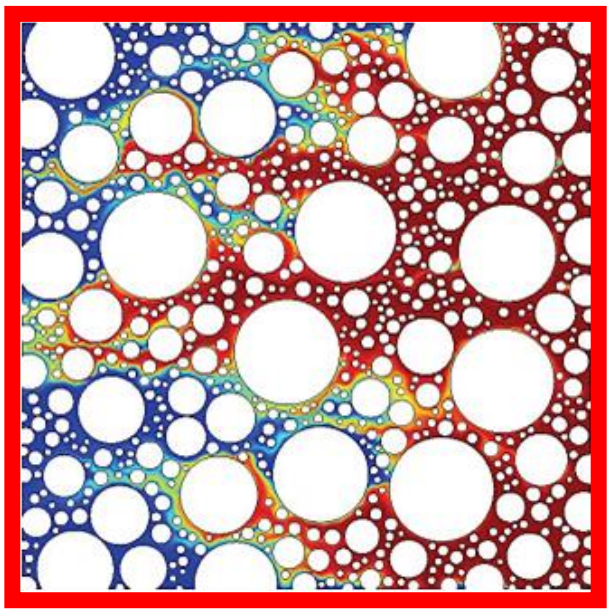
Homework 1 – Baseline Test

Write a short report (300 words) supported by schematic diagrams, to describe the heat transfer mechanisms in porous metals.

Include the following key terms:

- Heat transfer
- Conduction
- Convection
- Radiation
- Porous metals

Tutorial 2 – Factors Affecting Heat Transfer in Porous Metals



Today's Key Question(s):

- What are the factors affecting the heat transfer in porous metals?

What is the Purpose of Tutorial 2?

- Understand the structure-property relationships in porous metals
- Be able to determine the effective heat transfer performance in porous metals

Today's Homework is:

- Multiple-Choice Questions

Tutorial 3 – Experimental Science

Today's Key Question(s):

- How can heat transfer be measured experimentally?

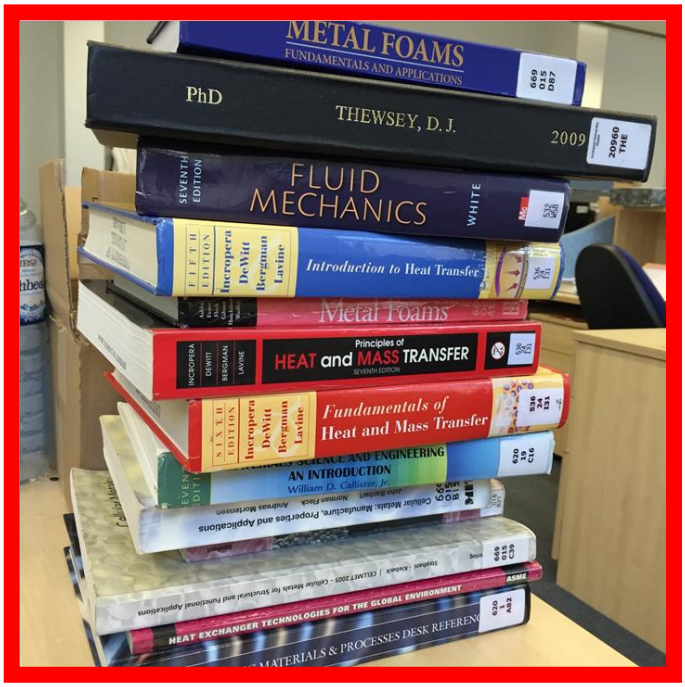
What is the Purpose of Tutorial 3?

- Introduction to experimental science
- Heat transfer experiment
- Calculation of heat transfer coefficient

Today's Homework is:

- Results and Data Analysis

Tutorial 4 – Introduction of the Final Assessment



Today's Key Question(s):

- How to write a good technical report

What is the Purpose of Tutorial 4?

- Understand how to write a technical report
- Components of a good technical report:
    1) Abstract
    2) Introduction
    3) Results and discussion
    4) Conclusions
    5) References

Today's Homework is:

- Write an abstract (100-200wrds) to summarise the key concepts you have learned so far from the course.

Tutorial 5 – Final Assessment

Today's Key Question(s):

- How can we effectively present our experimental results?
- Assess the suitability of porous metals for thermal management applications

What is the Purpose of Tutorial 5?

- This session will bring together everything that has been learnt from the course so far.
- Each section in the final report will be discussed.
- The mark scheme for the final assessment will also be explored.

Today's Homework is:

- Final Assignment

The Deadline is:

To be confirmed

Tutorial 6 – Feedback

What is the Purpose of Tutorial 6?

- Reflect on skills learned on the programme with a view to encouraging resilience
- Receive feedback on final assignment

What are the key questions?

- What strengths have I demonstrated in my work and what areas of development are there left for me to address?
- What steps do I need to take to improve my academic output?

Activity 1 – Marking your own

Using the mark scheme, identify three things you did well and three things you could improve.

What went well?

1.

2.

3.

What could be improved?

1.

2.

3.

Activity 2 – Responding to feedback

Read through your feedback sheet and highlight on your assignment where you received positive feedback (one colour) and areas for improvement (different colour). You might find it helpful to annotate this with a brief comment or two.

Activity 3 – Looking Forwards: Think, Pair Share

1. Think about how you can use this feedback in your future school work.
2. Talk to your partner about how you both plan to make changes to your school work in the future as result of this feedback
3. Share your ideas as a group.

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

A marker in your assignment: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].

Bibliography: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

Websites – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

Books – Author, date published, title of book (in italics), pages where the information came from.

E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

Articles – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', *Guardian*, 10 July 2014.

Appendix 2 – University Applications Guidance

For course choices and careers information: www.brightknowledge.org.uk

For information and statistics on universities and course: www.unistats.direct.gov.uk

For comprehensive information on universities, including rankings: www.thecompleteuniversityguide.co.uk

PLEASE NOTE – The Researchers in Schools programme is designed to support the university applications process at your school. The work you complete for the programme should add to your schoolwork rather than detract from it. Please be aware of deadlines and try to manage your workload appropriately. If you are worried about the programme interfering with your schoolwork then please speak to your teacher.

Subject Specific Top Tips for Strengthening an application?

Tips for writing personal statements

http://www.thecompleteuniversityguide.co.uk/universities/applying-to-university-and-ucas-deadlines/top-tips-for-writing-the-perfect-personal-statement/

https://www.ucas.com/ucas/undergraduate/getting-started/when-apply/writing-ucas-undergraduate-personal-statement

University League Table

http://www.thecompleteuniversityguide.co.uk/

University of Liverpool: School of Engineering

https://www.liverpool.ac.uk/engineering/

Websites for top engineering institutions:

The Institution of Engineering and Technology (The IET)

http://www.theiet.org/

Royal Academy of Engineering

http://www.raeng.org.uk/