

UNIVERSITY OF BOLTON

**SCHOOL OF THE BUILT ENVIRONMENT &
ENGINEERING**

BEng (Hons) in Mechanical Engineering
BEng (Hons) in Automobile Engineering
BSc (Hons) Motor Vehicle Studies

SEMESTER 2 EXAMINATIONS 2008/2009

MATERIALS AND MANUFACTURE I

MODULE NO: AME1022

Date: Friday, 29 May 2009

Time: 2.00 – 4.00 p.m.

INSTRUCTIONS TO CANDIDATES:

There are SIX questions

Answer any FOUR questions

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

Built Environment and Engineering
BEng (Hons) in Mechanical Engineering, BEng (Hons) in Automobile Engineering, BSc
(Hons) Motor Vehicle Studies
Semester 2 Examination 2008/2009
Materials and Manufacture I
Module No. AME 1022

- Q1 a) State the three classifications of plain carbon steels with their percentage of carbon. (5 marks)
- b) Explain what is meant by the term latent heat of fusion and why the temperature of a metal remains constant whilst fusion occurs. (10 marks)
- c) Define a metal and state two methods of hardening it. (5 marks)
- d) State the two main types of plastic. (5 marks)

Total 25 marks

- Q2 a) What is the difference between element, compound and a mixture? (10 marks)
- b) What is the difference between wear and erosion. (8 marks)
- c) Why are metals better conductors than ceramics? (7 marks)

Total 25 marks

- Q3 a) Define :
- (i) Yield point (2 marks)
 - (ii) Strength (2 marks)
 - (iii) Fatigue (2 marks)
 - (iv) Ductility (2 marks)
 - (v) Unit cell (2 marks)
- b) Pauli's exclusion principle states that within one atom :
- (i) No more than two electrons may have the same energy.
 - (ii) The spins of the electrons, interact so as to become parallel if possible.
 - (iii) No two electrons may have the same four quantum numbers.
 - (iv) There are only two values for the quantum number MS. (8 marks)

Question 3 continued over

Built Environment and Engineering
BEng (Hons) in Mechanical Engineering, BEng (Hons) in Automobile Engineering, BSc
(Hons) Motor Vehicle Studies
Semester 2 Examination 2008/2009
Materials and Manufacture I
Module No. AME 1022

Question 3 continued

- c) The ionic bond is formed by the mixing of electrons from two atoms :
- (i) true
 - (ii) false (3 marks)
- d) The electrostatic nature of the ionic bond makes it :
- (i) non directional
 - (ii) weak
 - (iii) applicable only to group 1 and 11 elements (4 marks)

Total 25 marks

- Q4 a) State the main property in each case by a material used in the manufacture of :
- (i) Copper Wire (3 marks)
 - (ii) A cutting tool (3 marks)
 - (iii) The front wheel axle of a car. (4 marks)
- b) Explain the difference between an amorphous and a crystalline material. (5 marks)
- c) Close-packed structures are chosen by elements in which the bonding is :
- (i) directional
 - (ii) non-directional
 - (iii) metallic (5 marks)
- d) The structure of an Ionic crystal is determined primarily by :
- (i) the relative diameters of the constituent ions
 - (ii) the nature of the chemical bond
 - (iii) the vacancy of the ions
 - (iv) the co-ordination number (5 marks)

Please turn the page

Built Environment and Engineering
BEng (Hons) in Mechanical Engineering, BEng (Hons) in Automobile Engineering, BSc
(Hons) Motor Vehicle Studies
Semester 2 Examination 2008/2009
Materials and Manufacture I
Module No. AME 1022

- Q5 a) Define a polymer and the nature of the molecular bonds. (5 marks)
- b) Provide classical definition of the term composite material. (5 marks)
- c) Explain what is meant by the term dendrite. (5 marks)
- d) Explain the following processes :
- (i) annealing (4 marks)
 - (ii) hardening (3 marks)
 - (iii) tempering (3 marks)

Total 25 marks

- Q6 a) Define the following terms :
- (i) tensile strength (2 marks)
 - (ii) yield strength (2 marks)
 - (iii) modulus of elasticity (2 marks)
 - (iv) density (2 marks)
 - (v) stress (2 marks)
- b) Explain the difference between physical and mechanical properties of substance. (5 marks)
- c) A standard mild steel tensile test specimen has a diameter of 16mm and a gauge length of 80mm. Such a specimen was tested to destruction and the following results obtained :
- load at yield point = 87 kN
extension at yield point = 173 μ m
ultimate load = 124 kN
total extension at fracture = 24mm
diameter of specimen at fracture = 9.8mm
- Calculate :
- (i) the modulus of elasticity of the steel (4 marks)
 - (ii) the ultimate tensile stress (3 marks)
 - (iii) the yield stress (3 marks)

Total 25 marks

END OF QUESTIONS