2.6 Metallic Bonding, Alloys and Properties of Metals: 10-minute Pack

Total Marks

EDEXCEL 4CH1 · Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Describe, in the context of a metal lattice, what is meant by the term 'delocalised electron' in metallic bonding.

(Total for Question 1 is 1 mark)

2 A thin metal contact bends when a button is pressed. After the button is released, the contact returns to its original shape. Name the type of deformation shown in this test.

(Total for Question 2 is 1 mark)

3 A connector must carry at least 0.8 A in a test circuit and require at least 20 N to bend permanently. Identically sized samples are tested under the same conditions. Results are P: 1.2 A, 12 N; Q: 0.9 A, 25 N; R: 0.4 A, 30 N. State which sample meets both requirements.

(Total for Question 3 is 1 mark)

4 State two physical properties of metals that are explained by layers of ions being able to slide over each other in the metallic lattice.

(Total for Question 4 is 1 mark)

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5 Name one common alloy and state its main components, for example an alloy used in everyday objects and its constituent metals or carbon.

(Total for Question 5 is 1 mark)

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6 Equal-volume metal samples are tested at the same temperature and potential difference. Sample P has more mobile delocalised electrons than sample Q. Deduce which sample is expected to conduct electricity better, assuming other factors are equal.

(Total for Question 6 is 1 mark)

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7 A metal strip is 80 mm long before stretching and 83 mm long after the force has been removed. Calculate its permanent extension and state whether the observed deformation is elastic or plastic.

(Total for Question 7 is 2 marks)

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8 A pupil compares the electrical conductivity of a pure metal and an alloy. The pure metal wire is 10 cm long and the alloy wire is 30 cm long. Both have the same cross-sectional area and temperature, and the same potential difference is applied across each wire. The alloy carries less current. Explain why this result does not show that alloying alone reduced the conductivity, and describe one change that would make the comparison fair.

(Total for Question 8 is 2 marks)

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Mark scheme · 2.6 Metallic Bonding, Alloys and Properties of Metals: 10-minute Pack

Question 1

an electron that is free to move through the lattice and is not attached to a single atom — **B1**

Answer: An electron that is free to move through the metal lattice and is not attached to any one atom

Question 2

elastic deformation — **B1**

Answer: Elastic deformation

Question 3

Q — **B1**

Answer: Q

Question 4

malleability or ductility or both — **B1**

Answer: Malleability and ductility

Question 5

one correct alloy and components, e.g. brass = copper and zinc; bronze = copper and tin; steel = iron and carbon — **B1**

Answer: Example: Brass, made of copper and zinc

Question 6

sample P — **B1**

Answer: Sample P

Question 7

permanent extension = 83 - 80 = 3 mm — **B1**

plastic deformation — **B1**

Answer: Permanent extension = 83 - 80 = 3 mm. The deformation is plastic.

Question 8

wire length also differs, so its effect on current is confounded with the effect of material; allow longer wires have greater resistance — **B1**

repeat using wires of equal length, keeping the other stated conditions the same — **B1**

Answer: The wires have different lengths, so the lower current could be due to the longer wire rather than alloying alone. Repeat with equal wire lengths while keeping the other conditions the same.

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