**Design & Technology** 

**Metals**

**Materials required for questions**

* Pencil
* Rubber
* Calculator

**Instructions**

* Use black ink or ball-point pen
* Try to answer all questions
* Use the space provided to answer questions
* Calculators can be used if necessary
* For the multiple choice questions, circle your answer

**Advice**

* Marks for each question are in brackets
* Read each question fully
* Don’t spend too much time on one question

**Good luck!**

**Q1.** What makes a metal a ferrous metal?

**A** It must contain carbon

**B** It must contain iron

**C** It must contain rust

**Q2.** The carbon content in ferrous metals usually ranges between what?

**A** 0.15 and 1.4%

**B** 98.3 and 100%

**C** 23.3 and 42%

**Q3.** What is a disadvantage of Cast iron?

**A** It is ductile

**B** It is soft

**C** It is brittle

**Q4.** Aluminium is ideal for aircraft due to what property?

**A** Its malleable

**B** Its lightweight

**C** Its corrosion resistant

**Q5.** What is an alloy?

**A** A mixture of two or more materials

**B** A mixture of two or more metals

**C** A mixture of a two or more polymers

**Q6.** Copper is used for wiring because of what property?

**A** It is ductile

**B** It is soft

**C** It is brittle

**Q7.** Why is brass used in gears?

**A** It casts well

**B** It is easy to machine

**C** It has a low coefficient of friction

**Q8.** What might stainless steel be used to make?

**A** Kitchen utensils

**B** Ship propellers

**C** Magnets

**Q9**. A kitchen sink has been manufactured from stainless steel.

Provide **two** **physical** and **two** **mechanical** characteristics of the metal chosen for the kitchen sink, along with an explanation for why each property is appropriate for this product **(8 marks)**

**Q10**. Die-casting is a common process used for making metal products.

Explain **one** specific characteristic of zinc that justifies its usage as a material for die-casting **(2 marks)**

**Q11**. Casting is a common process used for making metal products such as brass paperweights.

Explain **one** specific characteristic of zinc that justifies its usage as a material for casting **(2 marks)**

**Q12**. Explain **three** distinct mechanical properties of copper that render it appropriate for usage as electrical wire. **(6 marks)**

**Answers**

**Q1.** B

**Q2.** A

**Q3.** C

**Q4.** B

**Q5.** B

**Q6.** A

**Q7.** C

**Q8.** A

**Q9.**

Mechanical Properties

* Due to its hardness (1) since its surface resists scratches from cutlery, dishes, washing, etc (1)
* Toughness (1) prevents it from breaking if a pan is dropped on it (1)
* Malleability (1) means it is press-formable into the sink's shape (1)

Physical properties

* Corrosion resistance (1) won't rust or deteriorate when in contact with water (1)
* Chemical resistance (1) prevents detergent degradation (1)

**Q10.**

* When molten, zinc has good fluidity (1), so it will flow easily into the die (1)
* Zinc uses less energy to melt (1) because of its low melting point (1)

**Q11.**

* When molten, brass has good fluidity (1), so it will flow easily into the die (1)
* Brass uses less energy to melt (1) because of its low melting point (1)

**Q12.**

* Enough durability (1) to withstand breaking (1)
* Flexibility (1) allows the wire to flex without snapping (1)
* Ductility (1) to enable wire drawing (1)
* Fatigue strength (1), which enables repeated bends without fracture (1)
* Being soft (1) makes it simple to cut (1)
* Creep resistant (1), preventing deformation from repeated pressures (1)