

**Department of Education**

**Junior Certificate Examinations**

**2002**

**Materials and Technology**

**Metalwork**

*Higher Level*

**Marking Scheme**

**Question 1 - Section A**      **20 marks**      **Only five parts to be counted**

- (a) Karl Benz - first practical car / also engine  
Henry Ford - pioneer of mass production / Model T/(Tractor -2 marks)  
Isaac Singer - lock-stitch sewing machine      **4 marks**
- (b) Piston - to rotate the crankshaft  
Name and purpose      (2 + 2)      **4 marks**
- (c) Aluminium / aluminium alloy / cast iron  
Good sliding / wearing / dissipates heat      (2 + 2)      **4 marks**
- (d) To connect the piston to the crankshaft / converts motion      **4 marks**  
Acts as link (Naming Connecting Rod - 2 marks)
- (e) Inlet valve: Exhaust valve / Inlet: outlet      (2 + 2)      **4 marks**
- (f) Thermoplastic - a plastic that softens when heated, (named 1mark eg PVC)  
Insulator - a material that is a poor conductor of heat / electricity  
Alloy - a combination / mixture / of a metal with  
another metal /element (*Any two*)      (2 + 2)      **4 marks**
- (g) Identify and name four components - 1=Variable resistor /potentiometer,  
2=Light Dependent Resistor / LDR, 3 = Light Emitting Diode /LED  
4= Transistor. (No identification - no marks)      **4 marks**
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**Question 1 - Section B**      **20 marks**      **Only five parts to be counted**

- (a) Correct circuit diagram with correct symbols -  
battery, switch, motor, - (*3 symbols = 3 / circuit = 1*)      **4 marks**
- (b) Two correct steps - drill hole 4.2, tapping size hole, smaller hole,  
use tap-wrench and M5 tap (Drill & tap 1+1)      (2 + 2)      **4 marks**
- (c) Sketch of suitable design of steering mechanism  
Description of how it could be made      (2 + 2)      **4 marks**
- (d) Mark out, drill holes, file, etc.  
(3 parts - 4 marks, 2 parts -2 marks)      (2 + 2)      **4 marks**
- (e) (i) Sketch showing six surfaces/ general shape      (2 marks)  
(ii) Using folding bars/ vice      (2 marks)      **4 marks**
- (f) Alternative drive system named - gear / chain      **4 marks**

**Question 2 - 20 marks**

- (a) Any *two* important points /How to get information, books, shops etc  
(One point - 2 marks) **3 marks**
- (b) Any *two* important points / Stages in making, what to do first, necessary tools  
(One point - 2 marks) **3 marks**
- (c) (i) Elevation correct *2 marks*
- Two improvements - support, holes for fixing etc *(2 x 2)* **6 marks**
- (ii) Two explanations *(2 x 2)* **4 marks**
- (iii) Dipcoating / galvanising / plating - suggested  
(painting - 2 marks) **4 marks**

**Question 3 20 marks**

- (a) Name and explain of A, B, C and D **4 marks**
- (b) (i) X = Countersunk / purpose (1+1)  
Y = Counterbored / purpose (1+1) *(2 + 2)* **4 marks**
- (ii) Drill small hole - use countersunk or large drill *(2 + 2)* **4 marks**
- (c) Correct substitution in formula, correct answer *(2+2)*  
Answer 2000RPM - (If correct answer only -4 marks) **4 marks**
- (d) Sketch with description (1 for description / 1 for sketch) *(2+2)* **4 marks**

**Question 4 20 marks**

- (a) Electric Arc furnace **1 mark**
- (b) Electrodes up - lid off - charge placed **2 marks**
- (c) Scrap steel, some molten iron, lime **3 marks**
- (d) Furnace is tilted and steel poured **2 marks**
- (e) Rollers to allow the furnace to tilt **2 marks**
- (f) Melted by the heat from electrodes **2 marks**
- (g) Four alloys named - four properties **8 marks**

**Question 5 20 marks**

- (a) Mention method of forming vacuum forming / injection moulding/ blow moulding **4 marks**
- (b) Suitable material - Aluminium, Bronze, Name (2 marks) Two properties (2 x 2) **6 marks**
- (c) (i) X = 10mm,  
(ii) Y = Thread angle / 60° (2 x 3) **6 marks**
- (d) Any two actual effects (2 x 2) **4 marks**

**Question 6 20 marks**

- (a) (i) High Carbon Steel (HCS) / Tool Steel / Silver steel **2 marks**  
(ii) Annealing **2 marks**  
(iii) **Hardened** - heated to red/ loses magnetism, quenched (3 marks)  
(Heated+quenched 2 marks)  
**Tempered** -heated to colour, quenched (3 marks)  
(Heated+quenched given again 1 mark) **6 marks**  
(iv) Any two - Wear goggles, gloves, protective clothing, use air extractor, care in lighting torch / forge (1 + 1) **2 marks**
- (b) Two descriptions (2 x 3) **6 marks**
- (c) More accurate / can measure to 0.02mm **2 marks**

**Question 7 20 marks**

- (a) Any **three** parts correctly named A - Lamp, B - Control panel, C - Emergency stop, D - Cutting tool. (Three names correct - 3 marks, Three descriptions - 3 marks) **6 marks**
- (b) (i) Two advantages of CNC machines **4 marks**  
(ii) Function of stepper motor - to move cutting tool according to the program **4 marks**
- (c) CAM - Computer Aided Manufacture, CNC - Computer Numerical Control, RAM - Random Access Memory, WWW - World Wide Web **4 marks**
- (d) Any **two** correct advantages **2 marks**