SUMMARY OF CHAPTER 12

THE HUMAN ORGANISM AND TECHNOLOGY IN ACTION

1. TECHNICAL OBJECTS

- A technical object is an object conceived and manufactured by humans (p. 368).
- A substance is considered to be a material when it is used to make one or more parts of a technical object (p. 368).

2. MATERIALS

- A mechanical constraint describes the stress produced within a material when it is subjected to external forces (p. 369).
- The five principal mechanical constraints are compression, tension, torsion, bending and shearing (p. 370).
- Constraints can have different effects on materials, from elastic deformation to plastic deformation to fracture (p. 371).
- A mechanical property determines how a material will react when it is subjected to one or more mechanical constraints (p. 371).
- There are various types of mechanical properties, including hardness, elasticity, resilience, ductility, malleability and tensile strength (p. 371).
- Wood is a material that comes from cutting and processing trees (p. 373).
- Wood is classified into two principal types: hardwood and softwood (p. 373).
- More and more products today are made of modified wood, which is treated wood or material made of wood mixed with other substances (p. 376).
- The most common types of modified wood are treated wood, laminated wood, plywood, particle board and fibreboard (p. 377).
- A metal is a material extracted from an ore (p. 378).
- Metals are often mixed with other substances to produce alloys (p. 379).
- There are two types of alloys: ferrous and non-ferrous (p. 379).
- Plastic is a manufactured material made of polymers, which are molecules made up of chains of base units called monomers. (p. 381). AST PROGRAM ONLY
- Plastics are divided into two categories: thermosetting plastics and thermoplastics (p. 381). AST PROGRAM ONLY
- Thermoplastics encompass three quarters of all plastic produced worldwide. Many thermoplastics are recyclable and thus carry a code for recycling (p. 382). AST PROGRAM ONLY

3. BASIC MECHANICAL FUNCTIONS

- Technical objects are often composed of many parts. Each part plays a specific role in the object's overall function. The role played by a part is its function (p. 383).
- A technical object's components are the parts or fluids that have a mechanical function (p. 383).
- A basic mechanical function is the role played by a component or a group of components in the function or assembly of a technical object (p. 383).
- Guiding is the basic mechanical function of any component that controls the motion of one or more moving parts (p. 383).
- The principal guiding motions performed by technical objects are rotational motions and translational motions (p. 384).
- Linking is the basic mechanical function provided by any component that links an object's parts (p. 385).
- Links are classified according to their characteristics. A link always has four characteristics, one for each of the following pairings:
  – direct or indirect (p. 385)
  – rigid or flexible (p. 386)

– removable or non-removable (p. 386)

– complete or partial (p. 386)

- There are different types of links. They include: fixed, rotating, sliding, sliding rotating, spherical and helical (p. 387).

4. COMPLEX MECHANICAL FUNCTIONS

- A complex mechanical function is the role played by a set of components in transferring motion inside a technical object (p. 389).
- The two principal complex mechanical functions are motion transmission and motion transformation (p. 389).
- All systems contain a driver, at least one driven component and possibly one or more intermediates.
  - The driver receives the power required to set the system in motion (p. 390).
  - The driven receives the motion and transmits it to another part (p. 390).
  - An intermediate is located between the driver and the driven (p. 391)
- A motion transmission system relays motion from one part to another without changing the nature of the motion (p. 391).
- Here are five motion transmission systems:
  - a friction gear system (p. 391)
  - a simple gear system (p. 392)
  - a pulley and belt system (p. 392)
  - a chain and sprocket system (p. 393)
  - a worm and worm gear system (p. 393)
- There is a speed change in a motion transmission system when the driver does not turn at the same speed as the driven (p. 394). AST PROGRAM ONLY
- In a friction gear system or a pulley and belt system, rotational speed depends on the diameter of the wheel or pulley (p. 394). AST PROGRAM ONLY
- In a gear train or a chain and sprocket system, rotational speed depends on the number of teeth on the gear or sprocket (p. 395). AST PROGRAM ONLY
- In a worm and worm gear system, rotational speed depends on the number of teeth on the gear (p. 396). AST PROGRAM ONLY
- A motion transformation system transforms the nature of a motion as it is relayed from one part to another (p. 396).
- Here are four motion transformation systems:
  - a slider-crank system (p. 397)
  - a rack and pinion system (p. 397)
  - a cam and follower system (p. 398)
  - a screw gear system (p. 398)

5. ELECTRICITY

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- Many technical objects operate because of electricity (p. 399).
- An electric current is the orderly flow of negative charges carried by electrons (p. 399).
- There are two types of electric current: direct current and alternating current.
  - A direct current is an electric current in which electrons always flow in the same direction (p. 400).
  - An alternating current is an electric current in which electrons flow in a back-and-forth motion (p. 400).
- An electrical function is the role played by a component in the control or transformation of an electric current (p. 400).
- Here are six electrical functions:
  - the power supply (p. 402)
  - conduction (p. 402)
  - insulation (p. 402)
  - the transformation of energy (p. 402)
  - control (p. 403)
  - protection (p. 404)

6. THE MANUFACTURING PROCESS

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- A technical object is usually built following three steps:
  - measuring and marking the parts (p. 405)
  - machining the parts (p. 406)
  - assembling and finishing the parts (p. 407)