

Review the Technological World - Science and Technology (ST)

This summary provides a quick overview of all the concepts covered in the Technological World that can be assessed during the ST ministry exam. To explore a topic in more detail, scan its QR code.

To see the summary of Earth and space and the material world, scan the large QR code at the bottom left.

Caution!

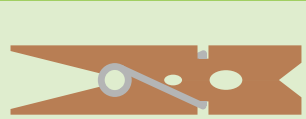
When performing a technological analysis of an object, it's important to use the appropriate technological vocabulary.



Linking

A link always has 4 of 8 possible characteristics. Here are 2 examples.

Two-Piece Wooden Clothespin



- Indirect
- Flexible
- Removable
- Partial

Screwdriver Handle and Shaft



- Direct
- Rigid
- Non-removable
- Complete



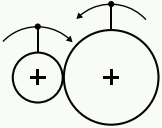
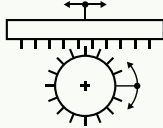
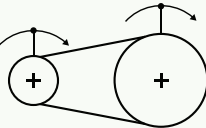
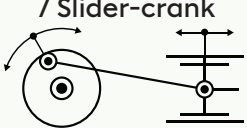
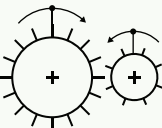
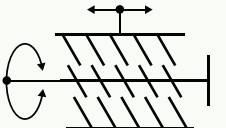
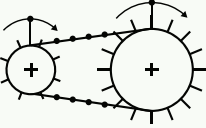
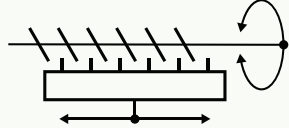
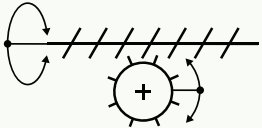
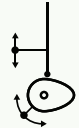


Guiding Control

| Types of Guiding Control | Symbol |
|--------------------------|--------|
| Rotational | |
| Helical | |
| Translational | |



Mechanisms

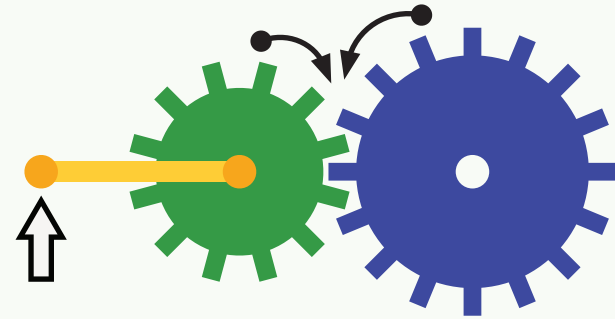
|  Motion Transmission |  Motion Transformation |
|---|---|
| Friction gears (R)  | Rack and pinion (R)  |
| Belt and pulley (R)  | Connecting rod and crank / Slider-crank (R)  |
| Gears (R)  | Screw gear (R)  |
| Chain and sprocket wheels (R)  | Worm and rack (R)  |
| Wheel and worm gear (R)  | Cam and roller (R)  |

Caption

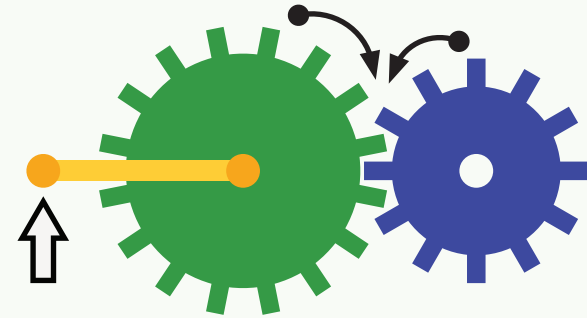
(R) Reversible (R) Irreversible

Speed Changes

There is a **decrease** in speed if the movement is transmitted from a small wheel to a large wheel (Ratio < 1).



There is an **increase** in speed if the movement is transmitted from a large wheel to a small wheel (Ratio > 1).



$$\text{Gear ratio} = \frac{\text{Number of teeth on the driver gear}}{\text{Number of teeth on the driven gear}}$$




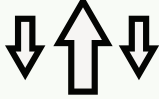

$$\text{Diameter ratio} = \frac{\text{Driver wheel diameter}}{\text{Driven wheel diameter}}$$

A **wheel and worm gear** mechanism always results in a **decrease** in speed.

$$\text{Speed ratio} = \frac{1}{\text{Number of teeth on the driven wheel}}$$



Constraints

| Constraint | Effect on the Material | Symbol |
|-------------|------------------------|---|
| Compression | Crushing |  |
| Tension | Stretching |  |
| Torsion | Twisting |  |
| Deflection | Folding or bending |  |
| Shearing | Tearing or splitting |  |



Non-Mechanical Properties of Materials

- Electrical conductivity
- Thermal conductivity
- Lightness (low density)
- Chemical neutrality
- Heat resistance
- Corrosion resistance



Mechanical Properties of Materials

Hardness: resistant to indentation and scratching

Elasticity: deforms, then returns to its original shape

Resilience: resists shocks

Fragility: easily broken

Stiffness: resists deformation

Metals

Ductility: stretches without breaking and retains its new shape

Malleability: can be flattened or bent without breaking and retain its new shape



Protection of Materials

Some **treatments** slow down or prevent the degradation of materials.

- Galvanization (zinc plating)
- Application of paint, varnish or oil-based rust inhibitor
- Addition of pigments capable of reflecting UV rays
- Antioxidant additives
- Waterproof treatment

Types of Materials

Ceramics

Recognised for the following properties:

- Hardness
- Stiffness
- Fragility (low resilience)
- Chemical neutrality
- Heat resistance
- Corrosion resistance

Thermoplastics

Recognised for the following properties:








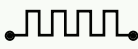




- Resilience
- Elasticity
- Chemical neutrality
- Corrosion resistance
- Remouldable under the effect of heat

Thermosets

Recognised for the following properties:

- Hardness
- Stiffness
- Resilience
- Corrosion resistance
- Heat resistance
- Maintains stiffness under heat (Cannot be remoulded!)

Electrical Functions

| Function | Example and Symbol |
|-----------------------|---|
| Power supply | Battery  |
| | Electrical outlet  |
| Conduction | Electric wire  |
| Insulation | Plastic sheathing |
| Protection | Fuse  |
| | Circuit breaker |
| Control | Rocker switch  |
| | Push-button switch  |
| Energy transformation | Light bulb (Electrical → Radiant)  |
| | Heating element (Electrical → Thermal)  |
| | Motor (Electrical → Mechanical)  |
| | Indicator light (Electrical → Radiant)  |
| | Audible warning device (Electrical → Mechanical)  |
| | Speaker or alarm (Electrical → Mechanical)  |