Name: _____ Class: _____ Date: _____

Linking in technical objects

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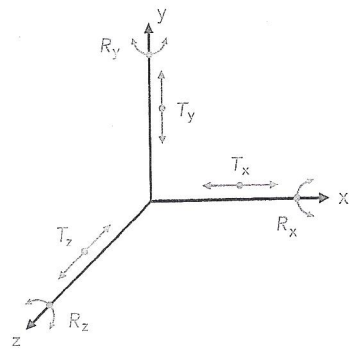
CONCEPT REVIEW 55
Complete this concept review handout and keep it as a record of what you have learned.

Definitions

- Mechanical engineering is *a branch of engineering that focuses on the design, production, analysis, working and improvement of technical objects with moving parts.*
- A link allows *the keeping together of two or more pieces in the same object.*
- In mechanics, a component is *a part or fluid that performs a mechanical function.*
- Linking is *the mechanical function performed by any component that connects different parts of a technical object.*
- The degrees of freedom are *the set of independent movements that are possible for a given part in a technical object.*

Possibilities of independent motion

Possibilities	Notation
Translational motion	
• Translation from left to right or from right to left	T_x
• *Translation from top to bottom or from bottom to top*	T_y
• *Translation from front to back or from back to front*	T_z
Rotational motion	
• *Rotation about the x axis*	R_x
• *Rotation about the y axis*	R_y
• *Rotation about the z axis*	R_z



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Characteristics of links

Characteristics	Description
Direct	• Two parts hold together without a linking component.
Indirect	• Parts require a linking component to hold them together.
Rigid	• The linking component or the surfaces of linked parts are rigid.
Flexible	• The linking component or the surfaces of linked parts can be deformed.
Removable	• Linked parts can be separated without damaging either their surfaces or the linking component (if present).
Non-removable	• Separating the linked parts damages their surfaces or the linking component.
Complete	• Linked parts are prevented from moving independently of one another.
Partial	• At least one part can move independently of the other parts.

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INTEGRATION QUESTIONS

Linking in technical objects

1. Name the linking component(s) used in the following situations.

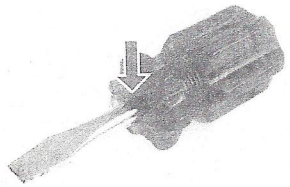
a) A cabinetmaker builds a table using a saw, hammer, wood, glue and nails. — *Glue and nails.*

b) The mechanic removes the damaged wheel by lifting the car with a jack and removing the screw and nut. — *Screw and nut.*

c) A worker installs a ceramic floor by spreading glue with a trowel and then laying tiles. — *Glue.*

d) Marvin broke his scissors while cutting a piece of cloth: both blades and the rivet fell on the workshop floor. — *Rivet.*

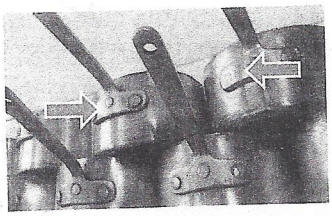
2. Give the four characteristics of each link illustrated opposite.



a)

Direct. — *Rigid.*

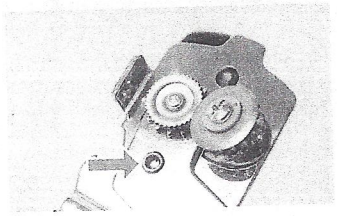
Non-removable. — *Complete.*



b)

Indirect. — *Rigid.*

Non-removable. — *Complete.*



c)

Indirect. — *Rigid.*

Non-removable. — *Partial.*

3. You have invented an object made of two pieces of rubber. One of the parts turns and the other stays immobile. The object is very practical because it can be carried in two bags. What are the characteristics of the links in this object?

Direct link. — *Flexible link.*

Removable link. — *Partial link.*

4. When a house is being built, asphalt shingles are often nailed to the roof.

a) What components are used to cover the roof? *Nails.*

b) What is the mechanical function of these components? *The function of linking.*

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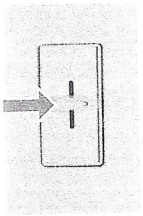
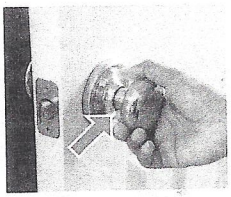
5. For each of the following technical objects, specify the possible motions and the notation for the motions.

	Possible motions	Notation
a) 	Rotation about the x axis.	R_x
b) 	Translation from top to bottom or from bottom to top.	T_y
c) 	Rotation about the z axis.	R_z

6. Identify the independent motions performed in this series of actions. Marianne turns the door handle, opens the door, then enters the room. She opens a drawer, takes out a jar and unscrews the lid.

Turns the door handle: rotation about the z axis.

Opens the door: rotation about the y axis.

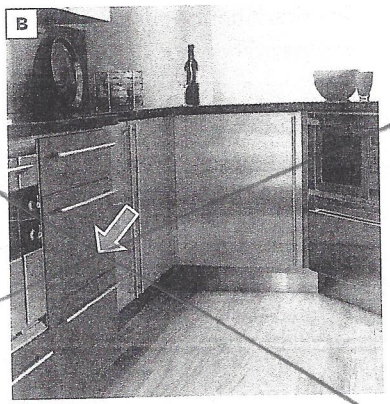
Opens a drawer: translation from back to front along the z axis.

Unscrews the lid: rotation and translation about the y axis.

7. How many degrees of freedom do the following parts have?

A 

6 degrees of freedom.
(rotation and translation)

B 

1 degree of freedom.
(translation)

C 

1 degree of freedom.
(rotation)