**Topic 1: Types of Structures Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Pg 270:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ have a definite size and shape and serve a purpose or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Every part of the structure must resist **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** that could change its shape or size.
3. The weight carried or supported by a structure is called a \_\_\_\_\_\_\_\_\_\_\_\_\_.
4. **Pg 272:** How a structure is put together, how it is shaped, and the materials making up the structure are all part of its **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
5. The three designs of structures are \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_.
6. **Pg 273:** Four main ways that a mass structure such as a sandbag wall might fail are:
   1. The wall may not be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_enough to stay in place.
   2. The wall may be so heavy that the earth beneath it is \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ unevenly (like the leaning tower of Pisa)
   3. The wall may not be thick enough or fastened tightly together, so parts of it are pushed out of place. Then the structure \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. The structure may not be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ firmly to the ground. If very large forces press against the top, the structure may tip over.
7. **Pg 273:** Frame structures, like the body of most buildings, have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of very strong materials, which supports the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the roof and covering materials.

8. **Pg 278: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are hollowobjects that use a thin, carefully shaped outer layer of material to provide their strength and rigidity.

1. The shape of a shell spreads \_\_\_\_\_\_\_\_\_\_\_\_ through the whole structure. Each part of the structure supports only a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ part of the load, and the complete structure can be amazingly strong.
2. **Pg 279:** Problems with Shell structures include:
3. Tiny weaknesses can cause the whole structure to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. If a shell is formed from hot or moist materials, uneven cooling or drying can cause some areas to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_ on nearby sections.
5. \_\_\_\_\_\_\_\_\_\_\_\_\_ materials (like plywood sheets) are not easily turned into the rounded shape of a shell structure. The cost would be \_\_\_\_\_\_\_\_\_\_\_ for a shell than for a frame.
6. Assembling \_\_\_\_\_\_\_\_\_\_\_\_materials into a shell is also tricky.

**Picture a Frame Analyzing and Interpreting**

**Procedure Pg 275**

**1.** The diagrams show a manufactured and a natural example of frame structures.

**2.** Find at least one place or part on each structure and mark it with

**(a)** rigid joint: fastens parts of the frame together so that they cannot move

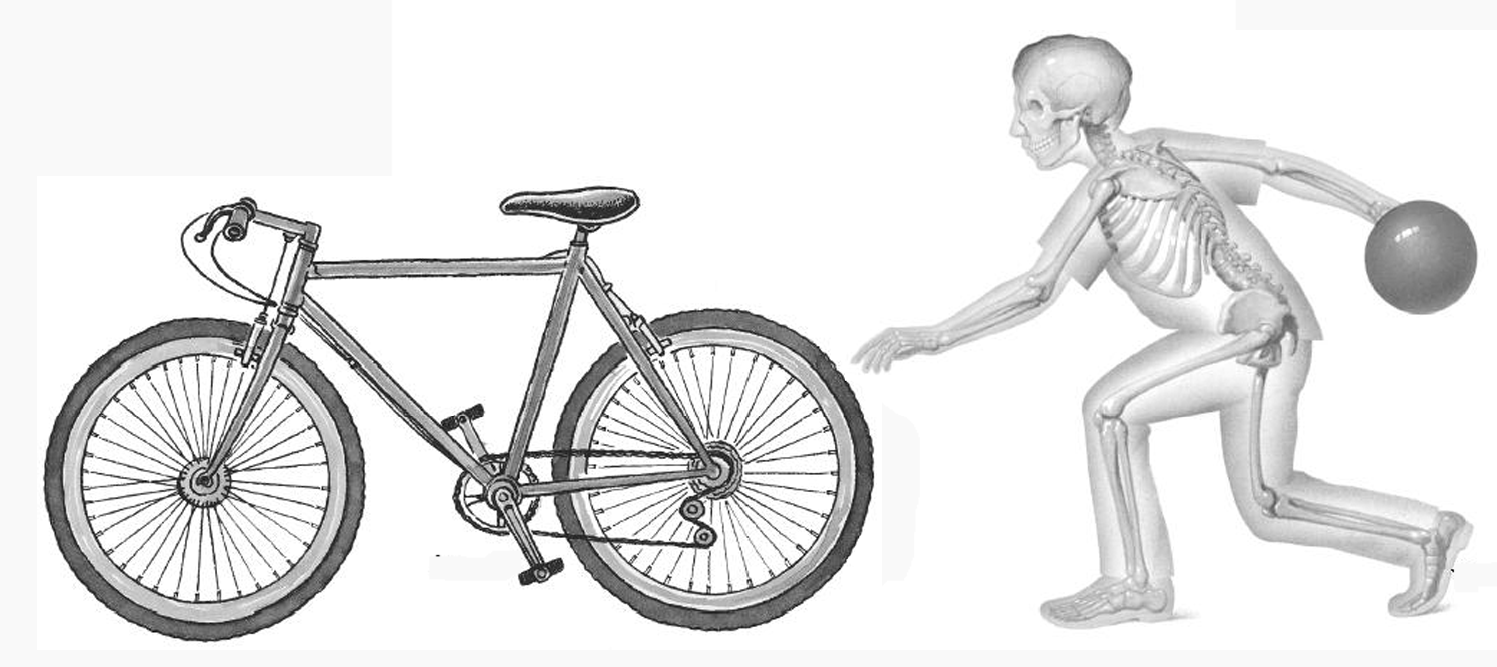
**(b)** mobile joint: holds parts of the frame together but allows them to move or turn

**(c)** brace: strengthens a joint or another part that must support a heavy load

**(d)** rigid shape: will not collapse or change shape even when large forces push or pull on it

**(e)** thin, lightweight material: does not have to be an especially strong part or place

**(f )** part that uses extra material for strength



**3.** Describe the primary purpose or function of each frame and the primary materials from which it is made. Explain why each material is well suited for the function it is intended to carry out.

**Topic 2: Describing Structures Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Pg 283: Many structures have more than one \_\_\_\_\_\_\_\_\_\_\_\_\_\_. Designers have a hard time creating structures that perform all of their functions \_\_\_\_\_\_\_\_\_\_\_\_ well.

2. Pg 284: Designers work to a set of specifications that give \_\_\_\_\_\_\_\_\_, measurable \_\_\_\_\_\_\_\_\_\_\_\_\_\_ their structure must meet.

3. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the study of beauty in art and nature.

4. Above all, architects and engineers try to keep their designs \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. Pg 285: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** means a structure has **extra** strength that allows it to withstand much larger loads than it would **normally** need to carry.

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ is a compromise between a reasonable margin of safety and reasonable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

7. Pg 286: The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or characteristics of the materials must match the purpose of the structure.

8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ materialsmade from more than one kind of material.

9. Layers of different materials, pressed and glued together, to produce useful combinations of properties are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Plywood is an example.

10. Pg. 287: No matter how they are made, flexible materials that can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are extremely useful for lightweight structures

11. Pg 288-9: To pick the most suitable materials for a structure, architects, engineers, and designers consider \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, environmental impact, energy efficiency.

12. Pg 290: Structures are often \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ where their parts are joined together.

13. Joints that allow movement, like door hinges or your elbows are called \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. Pg 290-293: List the five types of rigid joints and give an example of each.

|  |  |
| --- | --- |
| **Category of RIGID JOINT** | **Example** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Name the type or types of joint described in the picture

|  |  |
| --- | --- |
|  |  |
|  |  |

2. Indicate whether each joint is rigid (R) or mobile (M).

\_\_\_\_(a) door hinge

\_\_\_\_ (b) nut and bolt holding a wheel on a car

\_\_\_\_(c) ball and socket in your shoulder

\_\_\_\_(d) joint where the leg of a chair is fastened to the seat

\_\_\_\_(e) ball at the end of a ballpoint pen

\_\_\_\_(Í) joint created where the handle is fastened to a pencil Sharpener

\_\_\_\_(g) joint created where the handlebars of a bicycle are fastened to the frame

\_\_\_\_(h) joint created where the pages are fastened in a notebook

\_\_\_\_(i) joint where a computer monitor is fastened to its base