

**Pre Evaluation Structural Challenge 2005**

**Directions For Numbers 1-25** : Read each of the following multiple-choice items and the possible answers carefully. Mark the letter of the correct answer on your answer sheet or as instructed by your teacher. Remember: Make no marks on this test.

**1**

Which type of bridge design is **MOST** effective for a short span bridge?

- A Suspension
- B Truss
- C Arch
- D Beam

**2**

Building a prototype is done in which problem solving step?

- A Define
- B Explore
- C Act
- D Look back

**3**

In the problem solving model DEAL, criteria and constraints are **MOST** likely to be discussed in which step?

- A Define
- B Explore
- C Act
- D Look back

**4**

How do tools help humans solve their problems?

- A Tools answer the questions humans have about science.
- B Tools cause disasters to occur in structures.
- C Tools cause life to become more complex and uncertain.
- D Tools help humans control aspects of their environment.

**5**

Which type of bridge design is **MOST** effective for a long span bridge?

- A Suspension
- B Truss
- C Arch
- D Beam

**6**

In the problem solving model DEAL, brainstorming is **MOST** likely to be used in which step?

- A Define
- B Explore
- C Act
- D Look back

**7**

The three parts to a suspension bridge are the towers, the cables, and the \_\_\_\_\_?

- A Beams
- B Deck
- C Abutments
- D Gate

**8**

The force of gravity pushing down on a bridge is an example of which of Newton's laws?

- A First
- B Second
- C Third
- D Fourth

**Pre Evaluation Structural Challenge 2005****9**

The **BEST** way to start solving a problem is to:

- A Redesign the device.
- B Repair what is broken.
- C Define the problem, then decide.
- D Order a new system or device.

**10**

The foundation of a bridge pushes back on the bridge as much as the bridge pushes down on the foundation. Which of Newton's laws does this concept demonstrate?

- A First
- B Second
- C Third
- D Fourth

**11**

Troubleshooting on a completed model is **MOST** often used in which problem-solving step?

- A Define
- B Explore
- C Act
- D Look back

**12**

Simulating the design of a product on the computer to predict performance is **MOST** like:

- A Manufacturing.
- B Marketing.
- C Brainstorming.
- D Modeling.

**13**

When you create a structural challenge project, such as a balsa wood tower, why is it important to look back or reflect on the process or outcomes?

- A To improve upon future designs
- B To reduce the positive impacts
- C To increase potential problems
- D To impact society negatively

**14**

Traditional materials are used more often than composite materials in bridge constructing because:

- A Resists oxidation
- B Reduces overall bridge weight
- C Stronger than steel
- D Cost less than composites

**15**

The material used to build the lightweight bridges for competitions.

- A Basswood
- B Pine
- C Balsa
- D Oak

**16**

What is the surface area of the cross section of a  $\frac{1}{8}$  in. x  $\frac{1}{8}$  in. balsa wood beam?

- A  $\frac{1}{8}$  square inches
- B  $\frac{1}{16}$  square inches
- C  $\frac{1}{32}$  square inches
- D  $\frac{1}{64}$  square inches

**Pre Evaluation Structural Challenge 2005**

- 17** If a force is acting in tension, pulling on both ends of the  $\frac{1}{8}$  in. x  $\frac{1}{8}$  in. balsa wood beam with a 10 lb. force, approximately what is the tension stress in the beam (in psi)?
- A 0.0015625
  - B 0.015625
  - C 160
  - D 640
- 18** Buckling is the bending or bowing of a vertical member when it is compressed. If a 2 ft. vertical beam is replaced by a 4 ft. beam, its buckling strength will go down by a factor of:
- A 2.
  - B 4.
  - C 8.
  - D 16.
- 19** The amount a material will stretch before breaking is called?
- A The modulus of electricity.
  - B The modulus of plasticity.
  - C The modulus of elasticity.
  - D The modulus of conductivity.
- 20** If a force is acting in compression, pushing on both ends of the  $\frac{1}{8}$  in. x  $\frac{1}{8}$  in. balsa wood beam with a 10 lb. force, approximately what is the compression stress in the beam (in psi)?
- A 0.0015625
  - B 0.015625
  - C 160
  - D 640
- 21** Compression, or squeezing a material, always results in a material doing what?
- A Becoming longer
  - B Twisting
  - C Becoming shorter
  - D Breaking
- 22** When a chair leg pushes down on the floor, the floor pushes back up with the same force. This exemplifies which of Newton's laws?
- A First
  - B Second
  - C Third
  - D Fourth
- 23** When you are standing up with your arms hanging at your sides, your arms are in:
- A Tension.
  - B Compression.
  - C Torsion.
  - D Shear.
- 24** Tension caused by pulling on the ends of a beam always results in a material doing what?
- A Becoming longer
  - B Twisting
  - C Becoming shorter
  - D Breaking
- 25** When a horizontal beam bends down in the middle, the top of the beam is in:
- A Tension.
  - B Compression.
  - C Torsion.
  - D Shear.

# Pre Evaluation Structural Challenge 2005

?	⊙	Answer/ Scale	Objective	?	⊙	Answer/ Scale	Objective
1	1	D	SC09.03 Technology	14	14	D	SC09.03 Technology
2	2	C	SC09.03 Technology	15	15	C	SC09.03 Technology
3	3	A	SC09.03 Technology	16	16	D	SC09.01 Math
4	4	D	SC09.03 Technology	17	17	D	SC09.01 Math
5	5	A	SC09.03 Technology	18	18	B	SC09.01 Math
6	6	B	SC09.03 Technology	19	19	C	SC09.01 Math
7	7	B	SC09.03 Technology	20	20	D	SC09.01 Math
8	8	A	SC09.03 Technology	21	21	C	SC09.02 Science
9	9	C	SC09.03 Technology	22	22	C	SC09.02 Science
10	10	C	SC09.03 Technology	23	23	A	SC09.02 Science
11	11	D	SC09.03 Technology	24	24	A	SC09.02 Science
12	12	D	SC09.03 Technology	25	25	B	SC09.02 Science
13	13	A	SC09.03 Technology				

Minimum points  
required to achieve  
mastery category

Total questions on test: 25

Objectives measured: 3	Items	Points	●	◐	Questions measuring this objective
SC09.03 Technology	15	15	11	10	1 2 3 4 5 6 7 8 9 10 11
SC09.03 Technology					12 13 14 15
SC09.01 Math	5	5	4	3	16 17 18 19 20
SC09.02 Science	5	5	4	3	21 22 23 24 25
<b>Totals</b>		25	19	16	

## SC09

? = Test Question Number ⊙ = line on GP Form

# Pre Evaluation Structural Challenge 2005

## Items used in test

?	Item name	?	Item name	?	Item name
1	SC09.03.00.12	10	SC09.03.00.15	18	SC09.01.00.01
2	SC09.03.00.07	11	SC09.03.00.08	19	SC09.01.00.05
3	SC09.03.00.02	12	SC09.03.00.09	20	SC09.01.00.04
4	SC09.03.00.01	13	SC09.03.00.10	21	SC09.02.00.01
5	SC09.03.00.13	14	SC09.03.00.04	22	SC09.02.00.03
6	SC09.03.00.03	15	SC09.03.00.11	23	SC09.02.00.05
7	TC10.03.00.13	16	SC09.01.00.02	24	SC09.02.00.02
8	SC09.03.00.14	17	SC09.01.00.03	25	SC09.02.00.04
9	SC09.03.00.05				

### SC09

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