NAME:_____
Partner:_____
Period:_____ Rotation: _____

Engineering & Stress Analysis

eSeries "GRADE SHEET"

MODULE GRADE: COURSE GR. _____
POST TEST _____ **MODULE AVE.= _____**

ENGR. & STRESS "WORKSHEET" "WORKSHEET" TOTAL= _____

LAB PERFORMANCE: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
(If you are absent, write ABS on the line for the day you miss and **DISCUSS** what you need to make up with the teacher) **LAB PERFORMANCE TOTAL=_____**

Extra Credit—Discuss this with the instructor before beginning!!!

WORD SEARCH	_____(5)	CHALLENGES	_____(5)
MODULE REPORT	_____(5)	**MODULE NOTES**	_____(0-10)

TOTAL EXTRA CREDIT=_____
BONUS POINTS *** _____

ENGINEERING & STRESS "WORKSHEET" V6.0

LESSON 1- On the table below, write the answers to the Activity for Lesson 1 and Lesson 2.

	1/4" THIN BEAM	½" THICKER BEAM	½" GLUED BEAM
THICKNESS			
WIDTH			
CROSS SECTIONAL AREA			

____(5)

LESSON 2- Read the posted directions on the green panel for using the SSA software, Step 9 Experiment 2. If you have questions see the teacher.

On the table below, record the beam tests.

	THIN BEAM 1	THIN BEAM 2	THICK BEAM	GLUED BEAM
Cross Section Area				
Maximum Force				
Maximum Bending				
Stress Force				

_____(5)

Show the teacher your printouts after using the SSA 1000 software. **T.I.:** _____(5)

Note: The "**Stress Force**" is equal to: "Force divided by "Cross Sectional Area".

Why was the "Glued" Beam stronger than the "Thick" beam: _____

_____. (5)
(if the thick beam is stronger than the glued beam you will have to state why you got different results than you should)

LESSON 3 HOOKE'S LAW –Write your answers in the table below.

	DISTANCE	FORCE
1ST TIME		
2ND TIME		
3RD TIME		
4TH TIME		
5TH TIME		
6TH TIME		

_____(5)

Write Hooke's Law and explain how it relates to this experiment.

_____

_____. _____(5)

LESSON 4- Stress Analyzer-Exercise 1 fill out the table below. Turn in SSA Prints.

	REINFORCED BEAM	BOX BEAM SINGLE SIDE	BOX BEAM DOUBLE SIDE
Cross Section Area			
Maximum Force (lbs.)			
Maximum Bending (in.)			

_____(5)

Explain why these "FORCES" are so high, think about the cross sectional area and reinforcement.

_____

_____. _____(5)

Impacts Video—write notes from video. **Impacts Paper:** ____(5)

LESSON 5 You will need to construct the shapes in this lesson in order to test in them in lesson 6. IF YOU ARE BEHIND IN THE LESSONS, YOU CAN SKIP THE SHAPES AND DO THEM LATER.

LESSON 6- From Experiment 1 fill out the table below. **Two of the shapes will not have an answer since you only built two (instead of 4).**

	Force (lbs.)	Deflection (in.)
Triangle		
Square		
Square with 1 diagonal		
Square with X		

____(5)

Which one of the shapes above had the most "Force"? _____

Why do you think that shape had more force than the others? _____

_____. ____(5)

(Lesson 7 Activity is on the next page)

LESSON 7- Discussion with teacher on how to build the bridge. **T.I.:** ____(5)

Complete the Bridge, **WEIGH IT**, and then **TEST IT**. Fill out the table below.
Get the "Efficiency" and the "Efficiency Point Value" from the Chart posted on the bulletin board.
Note: The "EFFICIENCY" is equal to the FORCE times 454 divided by the MASS of the bridge.

Type of Truss (see the notebooks)	Weight in grams of the Truss measured on scale	Deflection (in.)	Force or Weight the bridge Supported (lbs.)	Efficiency: see the chart on the bulletin board.	Efficiency Point Value from Chart on the bulletin board.

_____(10)

See the Chart posted on the bulletin board (by where you built your bridge). Use the space below (if needed) to do set up the formula and perform the calculations.

Below, write a paragraph describing why your bridge failed (what could you have done in the designing or the construction to increased the strength of the bridge use a separate paper if necessary).

_____

_____

_____

_____

_____.(5)

Turn in the design of your bridge (the zerox copy for 6th grade). **Design Paper:** _____(5)

Cable System Bridge- Construct a Cable System Bridge and test it. **Bridge:** ******

Turn in SSA prints for all of the lessons**.** **SSA Printouts:** _____(10)

Career Guidance Survey- **C.G. NOTES:** _____(10)

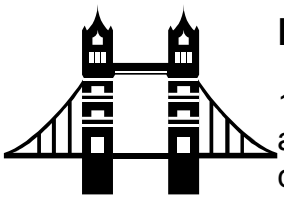
Study Guide- **Study Guide**: _____(5)

Worksheet Total: _____

DIRECTIONS FOR THE STRESS ANALYZER

Turn on the Power Strip to the right of the monitor.
If you haven't already launched the SSA 1000 software, go to the desktop and click on the "**SSA 1000 software**".
At the **top**, click on "**Machine**", then "**SSA Control Panel**".
In the SSA Control Panel box, in the "**Status**" line it should say: "Continuous **Mode**". If it doesn't, did you remember to do step 8 of the directions. If you did and it still does not say: "Continuous", you will need to see the teacher.
In the "SSA Control Panel" box, click on the "**TEST**" button. The machine will start to pull down on the wood and break it.
When the test is done, it will ask you to name the file. As an example, if you tested the thin beam, type in Thin Beam. Whatever you are testing describe it with a name and click O.K. You will see a larger graph in the back of the Control Panel box.
Click on the "**HOME**" button and it will move back to the home position.
At the bottom left of the "**Control Panel box**", click the **Close** bottom (but **DON'T** close the SSA 1000 software).
Click on "**File**" then "**Printer Setup**". In the "**Name**" part of the Print Setup box, check to make sure it is printing to the "**Techlab**" printer. Click **O.K**.
Then, at the top menu, click on **File**, then **print**. You can pick up your printout from the Techlab printer.
Close the "**Unsaved Graph**" box. It says "**Alert Message**: Test data has NOT been saved", Click "**OK**" to close panel..... Click the **O.K**. Button.
If you have more pieces to test (as in lessons 2,4 and 6) put the next piece in and test it the same way.
Always make sure the machine has been returned to the home position. Take out your piece and then turn the power switch off.

Good Luck!!!



Engineering & Stress Analysis Study Guide for Post Test

1. If the forces acting on an object are equal in all directions, then the forces are said to be in _____.
control line sync equilibrium

2. Forces are also called _____.
loads pressure weights influences

3. _____ is when a material tolerates stress and returns to its original shape once the force is removed.
Flexibility Elasticity Bouncing back None of the above is correct.

4. When a force is applied to a material, its molecules will _____.
evaporate run away change position turn into atoms

5. Measuring the force it takes to dent a material tests its _____.
stubbornness hardness toughness surface strength

6. If a material is to be used as a foundation it will need _____.
buckling strength compression strength lots of concrete All of the above are correct.

7. _____ is measured by the force required to break the object and the amount it stretches.
Tensile strength Elasticity Resistance Solidity

8. All of the following are naturally occurring materials that are used in construction, except _____.
lead copper zinc steel

9. Being ductile, malleable, high in strength, and having the ability to conduct electricity are all properties of _____.
synthetic materials metals stone and brick concrete

10. Dividing a rectangular space into _____ using support materials creates a stronger structure.
squares little pieces triangles smaller rectangular spaces

11. By alternating bricks, the overlap prevents bricks from falling in columns. This also increases the _____ forces that the wall can carry.
tension compression stress impact

12. A _____ bridge is a beam bridge that has one unsupported end.
suspension leaning arch cantilever

13. An arch bridge uses a series of arches to support the roadway of the bridge. The arch adds ____.
compression strength strain tension strength half-circles to the look

14. The major types of _____ are cables, beams, trusses, frames, and arches.
building parts bridges structural systems gymnastic equipment

15. A beam must be in _____ as it supports its loads.
motion one place equilibrium a state of tension

16. When a bar is loaded lengthwise, or a force acts on it when it's in tension, the bar will lengthen. This is called _____.
lengthening elongation stretching compression

17. _____ stress occurs when a load is parallel to the surface.
Normal Shearing Bearing Torsional

18. _____ stress is the stress measured when two parts of a structure come together, like when a beam rests on a column.
Normal Shearing Bearing Torsional

19. ____ is the study of objects in motion.
Physics Statics Dynamics Aerodynamics

20. Engineers draw a _____ to show all the forces that will act on a structure.
blueprint free-body diagram thumbnail sketch comp

21. _____ is used to describe objects at rest and also describes forces that balance each other.
Physics Statics Dynamics Aerodynamics

22. _____ is weakness in a material caused by the repeated loading, unloading, and reloading of a structure.
Fatigue Strain Wear Stress

23. Unlike the gradual shrinking action of compression, _____ happens suddenly.
tension statics crushing buckling

24. Most roads and bridges are designed with a(n) _____ of ten or more.
tolerance factor of safety team audience

25. The computer uses Finite Element Analysis, a system of _____, to develop relationships between force and displacement for small sections of a structure.
algebraic equations checks and balances numbers and letters linear measurements

Engineering & Stress Analysis

Circle the correct answers to these questions as you come upon them during your next seven lessons. **The lessons that the answers may not be accurate**, however the questions are correct. This study guide can then be used as a resource for your final test!

1. Force is the __(1- FORCE)__ on an object in any direction.
   squeezing - push or pull - striking - stress

2. __(1- FORCE)__ is one of the most common forces.
   space - air - gravity - water

3. There are three types of loads on structures: dead loads, live loads, and __(1- LOADS)__ loads.
   dynamic - spontaneous - designated - specific

4. A truck crossing a bridge is an example of a __(1- LOADS)__ load.
   dead - live - medium - heavy

5. The measurement of an object's surface is its __(1- AREA)__.
   volume - circumference - diameter - area

6. Surface area is the area around the __(1- AREA)__ of an object.
   outside - inside - top - bottom

7. The cross-sectional area of an object is its (1- AREA) area.
   outside - inside - top - bottom

8. Balanced forces are said to be in __(1- EQUILIBRIUM)__.
   position - stress - tune - equilibrium

9. A system is in equilibrium when all its parts are __(1- EQUILIBRIUM)__.
   stationary - moving - compressed - volatile

10. Rain, wind, and snow are examples of __(1-Loads:screen #3)__ that can affect equilibrium.
    stresses - forces - areas - cross sections

11. An object can be in tension or compression depending on the __(1- COMPRESSION & TENSION)__ of the force. ***movement - size - type - direction***

12. The force that pulls an object apart is ___(1- COMPRESSION & TENSION)__ .
    Stress - Tension - Compression - Strain

13. The force that is likened to squeezing an object is __(1- COMPRESSION & TENSION)__.
    compression - tension - strain - stress

14. Stress equals Force divided by __(2- STRESS)__ .
    area - weight - length - cross sectional area

15. Given a constant force, you can reduce stress by _ (2- STRESS) _ the cross-sectional area.
    reducing - maintaining - increasing - alternating

16. A properly designed building will ___(3-Physical Properties)___ the maximum stress it is able to carry. ***never undergo - marginally withstand - try to reduce - exaggerate***

17. The amount that a material changes shape (stretches or shortens) due to an applied force is ___(2- DEFLECTION & TORSION) ___ . ***Length - Area - Strain - Volume***

18. The amount a material moves from its original position due to an applied force is ___(2- DEFLECTION & TORSION) __ . ***Deflection - Cross section - Volume - Surface area***

19. The point at which a material has moved the most from its original position due to a force is called ___(2-DEFLECTION & TORSION) __.

strain point - maximum deflection - optimum - tear point

20. A feature common to stress, strain, and deflection is that they ___ (2- STRESS)____.

are theoretical - can't stand alone - have little value - can be calculated

21. Every material experiences strain and deflection when exposed to ___ (2- STRESS)____.

weight - wind - snow - stress

22. The relationship between the force applied to an object and the amount that the object stretches or shortens due to the force is _ (3- HOOKE'S LAW)_ .

Ohm's law - Bernoulli's Principle – Hooke's Law - Newton's Third Law of Thermodynamics

23. As stress increases on a material, strain __(3- HOOKE'S LAW)__ .

increases - decreases - is not affected - enhances the material

24. As a material is pulled with a larger force (more stress), it __(3- HOOKE'S LAW)__(more strain).

compresses more - shortens more - stretches more - stays the same

25. The amount that a band will stretch __(3- HOOKE'S LAW)__ the material it is made of.

changes - depends on - compresses - does not depend on

26. A long, thin bar will stretch __(3- HOOKE'S LAW)__ a short, fat bar.

less than - the same amount as - more than - as much as

27. The two different type of materials are ___(4- BOOK READING) __ .

Synthetic and alloys - Natural and synthetic - Natural and metal - Synthetic and composite

28. Alloys are combinations of __(4- OTHER METALS & ALLOYS)__ .

synthetics - composites - metals - polymers

29. Materials that are made of long chains of molecules are __(4- SYNTHETIC MATERIALS)__.

metallic - natural - composite - polymers

30. Composites are combinations of materials but differ from alloys in that they __(4- COMPOSITES).

are not just metal - can be natural or synthetic - can be non metallic and synthetic - all of the answers

ENGINEERING & STRESS

WORD SEARCH

V Y U S T M N P O L Y M E R S Y A
O I C O M P O S I T E S E Z T E T
E L V J D U Y D H F M Z R I R U M
Q I A G L I E E F O Y G V A A Y X
I V D Y N A M I C L O A D T I H I
T E O X D I C U A A R K C T N V O
F L F L T I R N I G F O E C O Y N
J O O P E R A E M R N R S S T P U
Q A R N H S I U E S B Z U I L T N
D D C O S Y R A T N Q I C S B A E
K Y E E L C S R N C I I L Z D T W
H C R A L X U I O G T G Z I E B T
S T P U S C F R C S L F N N U R O
S A F E T Y G L A S S E S E H Q N
U N O I T C E L F E D I U C R Q E
R C O M P R E S S I O N Z Y X R U
T N U T O R S I O N S M Y C Z M T

ARCH
AREA
COMPOSITES
COMPRESSION
CONSTRUCTION
DEADLOAD
DEFLECTION
DYNAMIC-LOAD
EFFICIENCY
ELASTICITY
ENGINEERING
EQUILIBRIUM
FORCE
FULCRUM
GRAVITY
HOOKES-LAW
LIVE-LOAD
NEWTON
PHYSICS
POLYMERS
SAFETY-GLASSES
STRAIN
STRESS
STRESS-ANALYZER
SURFACE
TENSION
TORSION
TRIANGLE
TRUSS