Conceptual Physics NAME:

Homework 2b: Solids Homeworks are due usually a day after the corresponding textbook part/lecture is completed. Due dates will be announced in class. Multiple-choice problems will all be marked. **USE** the answer table for these problems. The rest of the homeworks will be marked for apparent completeness and some full-answer problems will/may be marked in detail. Make the full-answer solutions sufficiently detailed that the grader can follow your reasoning. Solutions will be posted eventually after the due dates. The solutions are intended to be (but not necessarily are) super-perfect and often go beyond full answers. For an argument or discussion problem, there really is no single right answer. The instructor's answer reflects his long experience in physics, but there could be objections to his arguments, assumptions, nuances, style, facts, etc.

NAME:

Answer Table for the Multiple-Choice Questions

	a	b	c	d	e		a	b	c	d	e
1.	O	O	O	O	O	26.	O	O	O	O	O
2.	O	O	O	O	O	27.	O	O	O	O	O
3.	O	O	O	O	O	28.	O	O	O	O	O
4.	O	O	O	O	O	29.	O	O	O	O	O
5.	O	O	O	O	O	30.	O	O	O	O	O
6.	O	O	O	O	O	31.	O	O	O	O	O
7.	O	O	O	O	O	32.	O	O	O	O	O
8.	O	O	O	O	O	33.	O	O	O	O	O
9.	O	O	O	O	O	34.	O	O	O	O	O
10.	O	O	O	O	O	35.	O	O	O	O	O
11.	O	O	O	O	O	36.	O	O	O	O	O
12.	O	O	O	O	O	37.	O	O	O	O	O
13.	O	O	O	O	O	38.	O	O	O	O	O
14.	O	O	O	O	O	39.	O	O	O	O	O
15.	O	O	O	O	O	40.	O	O	O	O	O
16.	O	O	O	O	O	41.	O	O	O	O	O
17.	O	O	O	O	O	42.	O	O	O	O	O
18.	O	O	O	O	O	43.	O	O	O	O	O
19.	O	O	O	O	O	44.	O	O	O	O	O
20.	O	O	O	O	O	45.	O	O	O	O	O
21.	O	O	O	O	O	46.	O	O	O	O	O
22.	O	O	O	O	O	47.	O	O	O	O	O
23.	O	O	O	O	O	48.	O	O	O	O	O
24.	O	O	O	O	O	49.	O	O	O	O	O
25.	O	O	O	O	O	50.	O	O	O	O	O

1. Solids are formed by atoms or molecules held together by:

   a) external pressure. b) non-rigid chemical bonds. c) rigid chemical bonds. d) gravity.
   e) internal pressure.

2. Most macroscopic samples of crysalline solids are _____: i.e., are fused small crystals (called _____) of order a few nanometers to a few millimeters in size scale. The boundaries of the _____ can be complex.

   a) polycrystalline; crystallites or grains b) monocrystalline; crystallites or grains
   c) tricrystalline; crystallites or grains d) triglyceridic; tris or glys
   e) polycrystalline; bitty crystals

3. The quantity

$$\rho = M/V$$

   for an object of mass M and volume V is its mean _____. A homogeneous substance has nearly uniform _____: i.e., the _____ of small samples above the atomic scale is nearly constant.

   a) enthalpy b) entropy c) temperature d) pressure e) density

4. The density of liquid water at ordinary human-scale temperature and pressure conditions is nearly exactly:

   a) $1000\,\mathrm{g/cm^3}$. b) $1\,\mathrm{kg/m^3}$. c) $1\,\mathrm{g/cm^3}$. d) $22.59\,\mathrm{g/cm^3}$. e) $22.56\,\mathrm{g/cm^3}$.

5. "Let's play *Jeopardy*! For $100, the answer is: It is the property of a material that causes the material to return to its original shape after being deformed by an applied external force (which in this context is called a stress). The relative deformation is called strain."

   What is _____, Alex?

   a) plasticity b) elasticity c) masticity d) tricitity e) squishiness

6. For a material to be elastic, it must have internal restoring force on every physical bit of the sample. A restoring force is one that drives a bit back to its equilibrium position where the bit has no net internal force on it and, in particular, the restoring force is zero. For small displacements from equilibrium, the restoring force in almost all cases is linear displacement. For example for a 1-dimensional cases, linear restoring force is

$$F = -kx\ .$$

   where $x = 0$ is the equilibrium and k is a constant. This force law is called Hooke's law. A object acted only by the Hooke's law force exhibits:

   a) square wave motion. b) zero motion in all cases. c) irregular oscillations.
   d) simple harmonic motion. e) aperiodic motion.

7. The stretching deformation of a body is _____ (which is a word actually more often used to mean the restoring force magnitude of a body in _____), the squeezing deformation of a body is _____, and the deformation of parallel layers of body sliding relative to each other is _____. These three categories of deformation are the usual ones in physics for analyzing deformation.

   a) tension; shearing; compression b) stretch; squish; slide
   c) compression; tension; shearing d) tension; compression; shearing e) slide; stretch; squish

8. When a beam is bent, the convex side has parallel layers in tension and the concave side has parallel layers in compression. By continuity between the tensed and compressed layers there must must a layer that neither tensed nor compressed although it is under a shearing strain. This layer is called the:

   a) neutral zone. b) twilight zone. c) neutral layer. d) untensed-uncompressed layer.
   e) cake layer.

9. The maximum strength shape for an arch that has to support its own weight is a _____—a word apparently coined by Thomas Jefferson (1743–1826). This shape is also that of a rope or chain hanging from two points.

   a) catenation b) catenary c) catena d) cantina e) Cat-Astrophe

10. Isometric scaling (or just scaling for short) is when every length element of an object is varied by the same factor. Results that follow for isometric scaling of an object are

$$A \propto \ell^2 \ , \qquad V \propto \ell^3 \ , \qquad V^2 \propto A^3 \ , \qquad V \propto A^{3/2} \ ,$$

where ℓ is any length element, A is surface area, and V is volume. The first two formula collectively and the latter two individually are all formulations of:

a) Kleiber's law. b) the inverse-square law. c) the square-cube law. d) Hooke's law. e) Gresham's law.