WELDING INSPECTION TECHNOLOGY WORKBOOK

MODULE 6

METAL PROPERTIES AND DESTRUCTIVE TESTING

For conversion Factors, refer to "Conversion Chart for Common Welding Terms" on page 10-9 of the workbook and for Formulae refer to page 10-8.

Q6-1 The property of metals that describes their resistance to indentation is called:
a. strength
b. toughness
c. hardness
d. ductility
e. none of the above

Q6-2 The property of metals that describes their ability to carry a load is:
a. strength
b. toughness
c. hardness
d. ductility
e. none of the above

Q6-3 Generally, as strength increases for carbon steels, the ductility:
a. increases
b. stays the same
c. decreases
d. is not related to strength
e. none of the above

Q6-4 The property that describes the ability of a metal to deform when stressed is:
a. strength
b. toughness
c. hardness
d. ductility
e. none of the above

Q6-5 The type of strength related to a metal's behavior when the load is applied in a cyclic manner is:
a. tensile
b. compressive
c. torsional
d. impact
e. fatigue

Q6-6 The yield strength of a material is determined by:
a. impact testing
b. tensile testing
c. hardness testing
d. the offset method
e. b and d above

Q6-7 Which metal properties are directly related?
a. conductivity and strength
b. strength and ductility
c. strength and hardness
d. ductility and toughness
e. c and d above

Q6-8 The ability of a metal to absorb energy is called:
a. strength
b. ductility
c. hardness
d. toughness
e. none of the above

Q6-9 The metal property affected by the surface condition of the sample is:
a. tensile strength
b. UTS
c. hardness
d. fatigue strength
e. all of the above

Q6-10 Which alloying element is generally considered to have the most pronounced effect on the properties and performance of carbon steel?
a. aluminum
b. carbon
c. manganese
d. chromium
e. none of the above

Q6-11 Which alloying element is commonly added to steel to improve its corrosion resistance?
a. carbon
b. aluminum
c. silicon
d. chromium
e. none of the above

Q6-12 Hydrogen in the molten weld metal can cause:
a. undercut
b. overlap
c. cracking
d. porosity
e. c and d above

Q6-13 Which property cannot be determined from a tensile test?
- a. ultimate tensile strength
- b. percent elongation
- c. percent reduction of area
- d. impact strength
- e. yield strength

Q6-14 A metal's ductility can be expressed as:
- a. percent elongation
- b. percent reduction of area
- c. proportional limit
- d. a and b above
- e. b and c above

Q6-15 A tensile specimen having a cross sectional area of 0.25 square inch breaks at a load of 15,250 pounds. What is its tensile strength? (Tensile Strength = Load/Area)
- a. 3813 psi
- b. 61,000 psi
- c. 6,100 psi
- d. 58,500 psi
- e. none of the above

Q6-16 The point at which a metal's behavior changes from elastic to plastic (onset of permanent deformation) is referred to as:
- a. yield strength
- b. ultimate tensile strength
- c. modulus of elasticity
- d. Young's modulus
- e. none of the above

Q6-17 What is the percent elongation of a specimen whose original gauge length was 2 inches and final gauge length was 2.5 inches?
- a. 30%
- b. 25%
- c. 50%
- d. 40%
- e. none of the above

Q6-18 The family of hardness tests that uses both a minor and major load is called:
- a. Brinell
- b. Vickers
- c. Rockwell
- d. Knoop
- e. none of the above

Q6-19 Which of the following tests are referred to as microhardness tests?
a. Rockwell
b. Vickers
c. Knoop
d. a and b above
e. b and c above

Q6-20 What type of test uses a weighted pendulum which strikes a notched test specimen?
a. Brinell test
b. fatigue test
c. tensile test
d. microhardness test
e. Charpy impact test

Q6-21 Endurance limit is an expression used for what type of testing?
a. fatigue
b. hardness
c. soundness
d. tension
e. none of the above

Q6-22 The metal property that relates to a metal's deforming without failing is called:
a. tensile strength
b. ductility
c. hardness
d. toughness
e. none of the above

Q6-23 Which test is not considered a soundness test?
a. hardness
b. face bend
c. fillet break
d. root bend
e. nick break

Q6-24 The type of testing used to evaluate the type of microstructure present in a metal is called:
a. tensile
b. hardness
c. toughness
d. metallographic
e. none of the above

Q6-25 Which of the following tests can be used to judge the soundness of a weld?
a. nick break
b. side bend
c. face bend
d. fillet break
e. all of the above

Q6-26 Which of the following tests will generally be used to determine the behavior of a metal at a specific temperature?
a. guided-bend test
b. root-bend test
c. Charpy impact test
d. transverse fillet weld shear test
e. all of the above

Q6-27 With respect to the rolling direction of steel plate manufacture, which statement is true?
a. The strength is highest in the 'Z'direction.
b. The strength is lowest in the 'X' direction.
c. The strength is highest in the 'X' direction.
d. The strength is highest in the 'Y' direction.
e. The strength is lowest in the 'Y' direction

Q6-28 The fillet weld break test is used to evaluate the:
a. quality of the fractured weld
b. ductility of the weld metal
c. impact strength of the weld
d. tensile strength of the base metal
e. none of the above

Q6-29 The welding inspector is not concerned with the mechanical and chemical properties of metals.
a. true
b. false

Q6-30 For plain carbon steels, their approximate tensile strength can be estimated by multiplying their BHN by:
a. 400
b. 300
c. 100
d. 200
e. 500

Q6-31 Notch toughness and impact strength are not synonymous.
a. true
b. false

Q6-32 Phosphorus and sulfur are added to carbon steel to improve:
a. ductility
b. toughness
c. weldability
d. impact strength
e. none of the above

Q6-33 To improve the low temperature properties of carbon steels, the most likely alloy addition would be:
a. manganese
b. carbon
c. nickel
d. chromium
e. none of the above

Q6-34 Hydrogen, oxygen, and nitrogen can all cause embrittlement in carbon steels.
a. true
b. false

Q6-35 Gauge marks on a tensile specimen are:
a. scratches caused by improper handling
b. marks caused by using a gage to measure sample area
c. spaced a set distance apart
d. used for calculating percent elongation
e. c and d above

Q6-36 The 'offset method' is used for determining which property?
a. yield strength
b. tensile strength
c. hardness
d. fatigue strength
e. impact strength

Q6-37 Surface preparation is not an important step in destructive testing.
a. true
b. false

Q6-38 The Brinell hardness test is always a destructive test.
a. true
b. false

Q6-39 In Charpy testing, the test temperature is:

a. not important
b. very important
c. not considered
d. never reported
e. none of the above

Q6-40 In Charpy testing, the test data can be reported as:

a. foot pounds energy absorbed
b. lateral expansion
c. percent shear
d. all of the above
e. offset data

Q6-41 The objective of the guided bend test is to break the sample.

a. true
b. false

ANSWER KEY—MODULE 6

Q6-1	c	(pg. 6-5)
Q6-2	a	(pg. 6-1, 2)
Q6-3	c	(pg. 6-1–4)
Q6-4	d	(pg. 6-3)
Q6-5	e	(pg. 6-6, 7)
Q6-6	e	(pg. 6-14, 18, 19)
Q6-7	e	(pg. 6-3–5)
Q6-8	d	(pg. 6-5)
Q6-9	e	(pg. 6-1–7)
Q6-10	b	(pg. 6-9)
Q6-11	d	(pg. 6-10)
Q6-12	e	(pg. 6-12)
Q6-13	d	(pg. 6-14)
Q6-14	d	(pg. 6-20)
Q6-15	b	(pg. 6-15)
Q6-16	a	(pg. 6-2)
Q6-17	b	(pg. 6-19)
Q6-18	c	(pg. 6-22)
Q6-19	e	(pg. 6-23)
Q6-20	e	(pg. 6-27)
Q6-21	a	(pg. 6-31)
Q6-22	b	(pg. 6-3)
Q6-23	a	(pg. 6-28)
Q6-24	d	(pg. 6-32)
Q6-25	e	(pg. 6-28–31)
Q6-26	c	(pg. 6-26–28)
Q6-27	c	(pg. 6-4)
Q6-28	a	(pg. 6-30, 31)
Q6-29	b	(pg. 6-32)
Q6-30	e	(pg. 6-20)
Q6-31	b	(pg. 6-4, 5)
Q6-32	e	(pg. 6-8)
Q6-33	c	(pg. 6-11)
Q6-34	a	(pg. 6-12)
Q6-35	e	(pg. 6-15)
Q6-36	a	(pg. 6-18)
Q6-37	b	(pg. 6-14)
Q6-38	b	(pg. 6-20)
Q6-39	b	(pg. 6-27, 28)
Q6-40	d	(pg. 6-27)
Q6-41	b	(pg. 6-28, 29)