Magnetic Particle Testing Method Questions & Answers Book

Second Edition

Supplement to
Recommended Practice No. SNT-TC-1A
Book B

Levels I, II and III
Review Questions

The American Society for
Nondestructive Testing, Inc.

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ASNT Mission Statement:
ASNT exists to create a safer world by promoting the profession and technologies of nondestructive testing.

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David G. Moore – Sandia National Laboratories

Recommended References
Magnetic Particle Testing Method

The following references were used in formulating the questions contained in this book.

A.* Betz, Carl E. *Principles of Magnetic Particle Testing.* Chicago, IL: Magnaflux Corporation (2000).

B.* *Magnetic Particle Testing Classroom Training Book.* Columbus, OH: The American Society for Nondestructive Testing, Inc. (2004).

C.* Moore, David G., tech. ed., and Patrick O. Moore, ed. *Nondestructive Testing Handbook*, third edition: Volume 8, *Magnetic Testing,* Columbus, OH: The American Society for Nondestructive Testing, Inc. (2008).

D.* Eick, Chuck W. *Level II Study Guide: Magnetic Particle Testing Method*, second edition, Columbus, OH: The American Society for Nondestructive Testing, Inc. (2003).

E.* Fenton, John D. *ASNT Level III Study Guide: Magnetic Particle Testing Method*, second edition, Columbus, OH: The American Society for Nondestructive Testing, Inc. (2006).

* Available from The American Society for Nondestructive Testing, Inc.

The following reference is frequently cited in contracts and may be a useful study aid. There are no questions in this book that refer to this reference.

F. ASTM E 1444, *Standard Practice for Magnetic Particle Examination*, West Conshohocken, PA: ASTM International. Current edition.

Each question found in this book is followed by letter(s) and page number(s) indicating the specific recommended reference(s) where the answer may be found. For example:

27. A metal that is difficult to magnetize is said to have:

    a. high permeability
    b. low permeability
    c. low coercive force
    d. low retentivity

C.56

In this example, the letter "C" refers to Reference C in the list above and 56 is the specific page in Reference C where the answer to the question is located.

Reference Usage

Reference A: Total =	64
Level I	10
Level II	31
Level III	23
Reference B: Total =	3
Level I	3
Level II	0
Level III	0
Reference C: Total =	161
Level I	75
Level II	46
Level III	40
Reference D: Total =	7
Level I	4
Level II	3
Level III	0
Reference E: Total =	23
Level I	14
Level II	6
Level III	3

Level I Questions
Magnetic Particle Testing Method

1. Magnetic particle is a nondestructive testing method used for:

   a. locating surface and near-surface discontinuities in aluminum
   b. locating surface and near-surface discontinuities in steel
   c. finding and measuring material separation
   d. measuring flux density

   C.2

2. Ferromagnetic material is:

   a. strongly attracted by a magnet
   b. not highly saturated by magnetic fields
   c. a material with a 0 permeability measurement
   d. not capable of being magnetized

   C.380; E.3

3. The permeability of a material describes:

   a. the ease with which it can be magnetized
   b. the depth of the magnetic field in the part
   c. the length of time required to demagnetize it
   d. the ability to retain the magnetic field

   C.385; E.6

4. The retentivity of a material describes:

   a. the ease with which it can be magnetized
   b. the depth of the magnetic field in the part
   c. the length of time required to demagnetize it
   d. the ability to retain the magnetic field

   C.387; E.4

5. Magnetic particles are available in different colors:

   a. for color contrast with the part surface thereby enhancing detection of indications
   b. to enhance the detection of indications by allowing background color matching
   c. to determine if an indication is surface or subsurface
   d. to indicate different magnetic flux values

   C.180

6. Which of the following can be magnetized?

   a. iron
   b. copper
   c. aluminum
   d. magnesium

   C.43

7. The magnetic field is strongest when:

   a. the magnetizing voltage is flowing
   b. the magnetizing current is flowing
   c. the material exhibits high coercive forces
   d. the magnetizing current is not flowing

   C.54

8. If a crack exists in a circular magnet, the attraction of magnetic particles to the crack is caused by:

   a. a coercive force
   b. a leakage field
   c. a Doppler effect
   d. a high reluctance at the crack

   C.49

9. The unit usually used to denote flux density is:

   a. tesla
   b. henry
   c. farad
   d. ampere

   C.54

10. Which statement is true when related to magnetic lines of force?

    a. they are often forced to cross due to part geometry
    b. they are most dense at the poles of a magnet
    c. they seek the path of most resistance
    d. they cannot be detected

    C.44

11. Magnetic flux lines that are parallel to a discontinuity produce:

    a. strong indications
    b. weak indications
    c. no indications
    d. fuzzy indications

    C.48

12. A part is adaptable to magnetic particle inspection if:

    a. it is attached to an electrostatic field
    b. the material is ferromagnetic
    c. the material is nonferrous
    d. the material is an electric conductor

    C.43

13. What rule describes the direction of current flow (+ to –) when lines of magnetic force surround a conductor?

    a. left-hand rule
    b. right-hand rule
    c. flux rule
    d. reluctance rule

    C.50

14. The magnitude of the residual magnetic field in a specimen is dependent on:

    a. the length-to-diameter ratio (L/D)
    b. the strength of the applied magnetizing force
    c. the right-hand rule
    d. the left-hand rule

    C.54

15. The proper number of ampere-turns for a given test specimen being examined by longitudinal magnetism is determined by:

    a. its length and diameter
    b. the material
    c. the diameter and the material
    d. its diameter

    A.182

16. A circular field may be induced into a specimen by:

    a. placing the part in an energized coil
    b. passing current directly through the part
    c. passing a magnetic field through the part
    d. placing the part in a north-south orientation

    C.50

17. An electrical yoke produces:

    a. a longitudinal field
    b. a circular field
    c. alternating fields
    d. a swinging field

    C.53; E.27

18. An energized coil around the part produces:

    a. a circular field
    b. a longitudinal field
    c. an intermittent field
    d. a field dependent on the type of current applied

    C.51; E.9

19. In longitudinal magnetization the proper term for calculating magnetizing force is:

a. amperes
b. ampere-turns
c. watts
d. ohms

A.182

20. Magnetic lines of force:

a. travel in straight lines
b. form a closed loop
c. are randomly oriented
d. overlay in highly ferromagnetic materials

C.44; E.4

21. A magnetic particle buildup from a discontinuity is strongest when the discontinuity is oriented:

a. 180 degrees to the magnetic flux flow
b. 45 degrees to the magnetic flux flow
c. 90 degrees to the magnetic flux flow
d. 90 degrees to the current flow

C.48

22. A specimen may be demagnetized by which of the following methods?

a. heat treatment below the curie temperature
b. placing the part in an alternating current coil
c. placing the part in reversing and decreasing direct current fields
d. applying a direct current yoke and removing it from the part

A.66; E.54

23. Which of the following is an advantage of magnetic particle testing over penetrant testing?

a. it does not require post-cleaning of the part
b. it requires direct access to the surface of the part
c. it can detect near-surface discontinuities
d. it requires a shorter dwell time to produce results

A.66

24. The amount of amperage used for magnetic particle inspection using the prod method is determined from the:

a. type of material
b. distance between the prods
c. diameter of the part
d. total length of the part

C.113

25. The flux within and surrounding a magnetized part or around a conductor carrying a current is known as:

a. the saturation point
b. a magnetic field
c. the ferromagnetic field
d. the paramagnetic field

C.112

26. The areas on a magnetized part from which the magnetic field is leaving or returning into the part are called:

a. salient points
b. defects
c. magnetic poles
d. nodes

C.44

27. A metal that is difficult to magnetize is said to have:

a. high permeability
b. low permeability
c. low coercive force
d. low retentivity

C.56; E.44

28. The magnetism that remains in a piece of magnetizable material after the magnetizing force has been removed is called the:

    a. tramp magnetism
    b. residual magnetism
    c. damped magnetism
    d. permanent magnetism

    C.54

29. Subsurface discontinuity indications usually appear:

    a. sharp and distinct
    b. sharp and wide
    c. wide and fuzzy
    d. high and loosely held

    D.35

30. Which residual field is most difficult to demagnetize?

    a. longitudinal
    b. circular
    c. vector
    d. binodal

    C.281

31. Which magnetic particle application technique is the most sensitive?

    a. continuous
    b. residual
    c. interrupted
    d. counter-current

    C.64

32. Fluorescent magnetic particle indications should be inspected under:

    a. any light
    b. a neon light
    c. an ultraviolet light
    d. a fluorescent light

    C.62; E.39

33. Inspecting a part by magnetizing, removing the current flow, then applying the medium is called the:

    a. continuous method
    b. wet method
    c. residual method
    d. dry method

    C.63

34. Which of the following is the most effective method for the detection of near-surface defects?

    a. dry residual method using DC with surge
    b. wet continuous method using half-wave rectified current
    c. wet residual method
    d. dry continuous method using half-wave rectified current with prods

    C.117

35. A curve is sometimes drawn to show graphically the relation of the magnetizing force to the strength of the magnetic field produced in a certain material. This curve is known as the:

    a. magnetic force curve
    b. hysteresis curve
    c. saturation curve
    d. induction curve

    C.54; E.6

36. What method of applying particles provides greater sensitivity in locating subsurface weld discontinuities?

    a. continuous
    b. residual
    c. circular
    d. longitudinal

    C.180

28b 29c 30b 31a 32c 33c 34d 35b 36a

37. When magnetizing a weld in two directions, and if the current used in the first direction is 750 A and the current in the second direction is 400 A, which of the following is true?

a. the part should be checked to see if demagnetization between operations is necessary
b. no precautions should be taken before the second operation
c. this is not a valid technique
d. there is no need to magnetize a weld in two directions

C.278

38. When there is absolutely no pattern or distribution of magnetic particles on the part, the possible cause is that:

a. the amperage setting is too high
b. the amperage setting is too low
c. the particle bath strength is too high
d. the part is made of steel with high retentivity

A.64

39. What are three causes of nonrelevant indications?

a. lack of fusion, change of section thickness, grinding cracks
b. change of section thickness, heat affected zones, drilled hole near surface
c. very high amperage, drilled hole near surface, blowholes
d. drilled hole near surface, very high amperage, lack of fusion

C.217

40. Using the residual test method, a number of parts are magnetized and laid on a rack prior to application of magnetic particles. Why is it important that they do not rub or touch each other?

a. there is a possible loss of the magnetic field
b. it may cause magnetic writing
c. it may damage the part
d. it makes parts hard to handle

C.217

41. The point at which the magnetism in a material cannot be increased even though the magnetizing force continues to increase is known as the:

a. salient pole
b. saturation point
c. residual point
d. remnant point

C.54

42. Which type of current produces a skin effect on the surface of the part?

a. alternating current
b. direct current
c. half-wave rectified
d. full-wave rectified

C.57; E.13

43. When using the wet method, why should a high velocity flow of wet method bath over surfaces following removal of the magnetizing current not be used?

a. it may wash away a fine or weakly held indication
b. this is not a problem
c. it may splash particles into eyes
d. none of the above is correct

D.23

44. Residual magnetic particle inspection may be used when:

a. parts are irregular in shape
b. parts are highly retentive
c. parts are highly stressed
d. evaluating continuous method indications

C.63

45. Magnetic particle inspection is not a reliable method of detecting:

a. laps
b. deep internal cavities
c. cracks
d. seams

C.28

46. The wet fluorescent magnetic particle inspection method is the same as the visible wet magnetic particle method except that the fluorescent magnetic particle inspection method requires:

a. an ultraviolet light
b. a higher current
c. a different machine
d. alternating current

C.62

47. A discontinuity open to the surface produces an indication which is:

a. sharp and distinct
b. wide and indefinite
c. crisscrossed
d. high and fuzzy

D.35; E.2

48. Which of the following will produce circular magnetism?

a. passing current through a coil
b. placing the test part in a solenoid
c. yokes
d. passing current through prods

B.11

49. When using the wet continuous method, the flow of suspension from the hose should be shut off:

a. immediately after applying the current
b. immediately before applying the current
c. while the current is flowing
d. 30 seconds before applying the current

B.52

50. The strongest magnetic field in a coil is at the:

a. outside edge
b. inside edge
c. center
d. end

B.17

51. To detect lengthwise discontinuities on the inside diameter of hollow parts, you should:

a. pass current through it
b. magnetize with a coil
c. pass current through a central conductor
d. increase the amperage used

C.120

52. What equipment is used to determine if a part has been demagnetized?

a. a magnet on the part
b. a field indicator
c. a survey meter
d. careful observation for clinging magnetic particles

C.289

53. Which of the following is most often used for dry magnetic particle inspection?

a. full cycle direct current
b. half-wave direct current
c. high voltage, low amperage current
d. direct current from electrolytic cells

C.57

54. An electric current through a copper wire:

a. creates a magnetic field around the wire
b. creates magnetic poles in the wire
c. magnetizes the wire
d. does not create a magnetic field

C.50

55. Parts should be cleaned after demagnetization:

a. to ensure that the magnetic particles are removed
b. to prevent false indications
c. to save the solids of the suspension
d. to prevent cracking during heat treatment

C.278

56. In circular magnetization, the magnetizing force is expressed in *amperes*. What term is used to express magnetizing force in longitudinal magnetization?

a. amperes
b. ampere-turns
c. consequent poles
d. volts

D.18

57. A longitudinal surface crack in a circularly magnetized part will cause:

a. the magnetic field to die out
b. a decrease in permeability
c. a magnetic leakage field
d. a current to flow

C.49

58. In a magnetic particle test, assuming that all of the following are in the same relative position in a small part, which would be the hardest to detect?

a. a surface crack
b. a near-surface crack
c. a scratch
d. a seam

A.62

59. If wet magnetic particle suspension is <u>not</u> uniform, then:

a. the strength of an indication may vary, and the interpretation of the indication may be erroneous
b. the magnetic flux would not be uniform
c. greater mobility would be required
d. the part cannot be magnetized

A.261

60. Which of the following currents will best define surface cracks?

a. half-wave rectified alternating current
b. direct current
c. alternating current
d. surge current

A.232

61. When a magnetic field is induced in a part with prods spaced 152 mm (6 in.) apart, the field is:

a. solenoidal
b. circular
c. longitudinal
d. distorted trapezoidal

C.53

62. Applying the theory of the right-hand rule, a longitudinal surface defect in a round bar is detected by "current passing in a direction parallel to the direction of expected defects" because:

a. the current direction is in line with the defect
b. the magnetic field is at right angles to the defect
c. it makes no difference
d. the magnetic field is parallel to the defect

C.50

63. If a current is passed through an electrical conductor, what will surround the conductor?

a. eddy current field
b. current
c. magnetic field
d. residual field

C.50

64. With current flowing from + to – in a coil, a longitudinal field is created. Which of the following may be used to establish the direction of the magnetic field?

a. left-hand rule
b. right-hand rule
c. Ohm's law
d. Newton's law

C.50

64b 63c 62b 61b 60c 59a 58c 57c 56b

65. When magnetic material is placed into a coil, the magnetic lines of flux concentrate themselves in the material and:

a. create a longitudinal magnetic field
b. create a circular magnetic field
c. create a longitudinal circular field
d. have no effect

C.51

66. Which form of magnetization is easiest to detect in most parts?

a. longitudinal magnetization
b. permanent magnetism
c. circular magnetization
d. parallel magnetization

C.280

67. The best type of magnetic field to use to inspect a tubular product for surface defects along its length is a:

a. longitudinal field
b. circular field
c. swinging field
d. yoke magnetization

C.112

68. The area of maximum induced field strength using a yoke is:

a. at the north pole of the yoke
b. at the south pole of the yoke
c. the area directly between the poles
d. on the outside of pole pieces

C.53

69. The strength of the magnetic field induced in a part is often referred to as:

a. current density
b. voltage
c. flux density
d. retentivity

C.47, 383

70. A major factor that determines the success of magnetic particle inspection is the:

a. field strength
b. voltage on magnetizing coil
c. current through the coil
d. time of magnetization

C.48-49

71. What type of current is best suited to detect surface discontinuities?

a. direct current
b. alternating current
c. pulsating direct current
d. half wave

C.57

72. When preparing a magnetic particle bath, it is important to have the bath strength at a proper level, as too many particles can result in:

a. lowering the test amperage
b. having to increase the magnetizing current
c. masking the indications
d. none of the above

C.188

73. One advantage of using fluorescent particles is:

a. that less equipment is required
b. the high speed of inspection
c. the cost
d. that they are more readily attracted than other particles

A.275-276

74. When using a dry magnetic particle powder, the proper way to apply it to the part is to:

a. forcibly apply it with air
b. roll the material in the container of powder
c. apply it from the bottom of the part
d. float the particles to the inspection surface as gently as possible

C.181

75. When using wet particles in water suspension, wetting agents are added to:

a. prevent freezing
b. prevent corrosion of inspection equipment
c. ensure the proper wetting of the part
d. decrease the amount of water needed

C.186

76. When preparing an inspection bath, the amount of magnetic particles per gallon of fluid is called its:

a. measuring scale
b. particle number
c. strength or concentration
d. usable limits

C.188

77. Coercive force:

a. describes the means by which the magnetic particles are suspended in the liquid when using the wet method
b. describes the magnetizing force used with the continuous method
c. represents the reverse magnetizing force necessary to remove the residual magnetism in a material
d. is not a term used in magnetic particle testing

C.54

78. Demagnetization:

a. may be accomplished by heating a material above its curie point
b. is always necessary
c. can be performed only with alternating current
d. can be performed only with direct current

C.278; E.6

79. Resistance to demagnetization:

a. is greater in hard materials than soft materials
b. is greater in soft materials than hard materials
c. is the same for both hard and soft materials
d. is nonexistent

C.282

80. Demagnetization:

a. may be easy or difficult depending on the type of material
b. is easy for materials having a high coercive force
c. is always most difficult in materials retaining a high residual field
d. all of the above answers are correct

C.282

81. The strength of the wet suspension should be maintained at a given level because:

a. a low level may give weak indications
b. a high level may give heavy background
c. both A and B
d. none of the above

C.188

82. Indications such as those at local external poles, sharp fillets or thread roots are called:

a. fake indications
b. relevant indications
c. nonrelevant indications
d. magnetic writing indications

C.216-217

83. Magnetic particle testing will reveal discontinuities in which one of the following materials?

a. bronze
b. carbon steel
c. aluminum castings
d. austenitic stainless steel

C.8

84. Magnetic particle testing is a nondestructive testing method for detecting discontinuities in magnetizable material. This method can detect:

    a. surface discontinuities only
    b. subsurface discontinuities only
    c. surface and near-surface discontinuities
    d. discontinuities at surface and subsurface of any depth

    C.8; E.2, 49

85. Which of the following statements is true of magnetic particle testing?

    a. it cannot be utilized to inspect through coatings
    b. it can be applied only to detect surface defects
    c. it can be applied only to detect subsurface defects
    d. it can be applied to detect surface and near-surface discontinuities in ferromagnetic material

    A.66-68; C.8

86. Which one of following magnetic particles will be most sensitive to small surface discontinuities such as fatigue cracks?

    a. dry powder
    b. fluorescent particle
    c. visible particle using oil as carrier (vehicle)
    d. visible particle using water as carrier (vehicle)

    C.222

87. Magnetic particles should have the:

    a. highest possible retentivity
    b. lowest possible permeability
    c. highest possible permeability
    d. highest possible permeability and lowest possible retentivity

    C.60

88. Nonrelevant indications can be caused by the following, except:

    a. excessive magnetizing current
    b. inadequate magnetizing current
    c. structural design of the test specimen
    d. variance of permeability within the test specimen

    C.216-217

89. A material with magnetic permeability less than 1 is known as:

    a. diamagnetic
    b. paramagnetic
    c. ferromagnetic
    d. panamagnetic

    C.45

90. A small device, generally a metal strip or disk, containing an artificial discontinuity used to determine when the correct magnetizing condition or magnetic field direction has been achieved is:

    a. an ohmmeter
    b. a gauss meter
    c. a flux indicator
    d. a field indicator

    C.345, 388

91. The direction of magnetic line of force is _____ degrees from the direction of current flow.

    a. 45
    b. 90
    c. 180
    d. 220

    C.50

Level II Questions
Magnetic Particle Testing Method

1. The interpretation of magnetic particle indications may be aided by:

   a. observing with a magnifying glass
   b. reproducing the indication after demagnetization
   c. observing the indications after the part is pre-cleaned
   d. observing the indications after the part is post-cleaned

   C.218

2. Residual magnetism may be beneficial as an aid:

   a. in demagnetization
   b. in proper heat treating
   c. in the deposition of weld metal
   d. in interpretation and evaluation of indications

   A.397

3. An interruption in the normal physical structure or configuration of a part which produces a magnetic particle testing indication is called:

   a. a defect
   b. an indication
   c. a deformation
   d. a discontinuity

   C.216-217

4. Comparing parts that have been circularly magnetized and those that have been longitudinally magnetized, which retain the most objectionable residual field if not demagnetized?

   a. circular
   b. vectored
   c. remnant
   d. longitudinal

   A.313

5. What type of magnetization uses the formula: Ampere-turns = 45 000/(L/D)?

   a. circular
   b. parallel
   c. vectored
   d. longitudinal

   A.182; E.18

6. Why are large soft contact pads such as lead or copper braid used for surfaces or headstocks?

   a. to increase the contact area and reduce the possibility of burning the part
   b. because they help heat metal, thus facilitating magnetic induction
   c. to increase the contact area and flux density
   d. because of their low melting points

   C.142

7. A rough forging that has received no further processing is magnetic particle tested. An indication is observed to run in every direction and appears to extend deeply into the part and perpendicular to the surface. It is very sharp. What is the probable identity of the indication?

   a. forging burst
   b. flake
   c. seam
   d. lap

   A.85-86

8. A gear with case-hardened ground teeth and hub ends is magnetic particle tested. Individual indications are detected on five teeth and one end surface of the hub. The indications do not break over the part edges. What is the probable identity of the indication?

   a. grinding cracks
   b. quench cracks
   c. inclusions
   d. porosity

   A.90-91

9. If an overall pattern (sometimes circular lines) appears on the test surfaces, how should the inspector reprocess the test piece?

   a. demagnetize the piece
   b. retest at a higher amperage
   c. retest at lower amperage
   d. part is not testable

   A.383

10. A prime consideration when selecting a powder to be used as a magnetic particle medium is to select a powder that:

    a. will adhere to the surface being tested
    b. provides a low contrast to the surface being tested
    c. provides a high contrast to the surface being tested
    d. requires a high demagnetization current to remove it

    C.180

11. When testing for fine shallow surface cracks, the preferred magnetic particle test method should be:

    a. dry alternating current
    b. dry direct current
    c. wet alternating current
    d. wet direct current

    C.57, 63

12. Which of the following is an advantage of the dry method over the wet method?

    a. it is more sensitive to fine surface cracks
    b. it is easier to use for field inspection with portable equipment
    c. it is faster than the wet method when testing a number of small parts
    d. it is more capable of providing full surface coverage on irregularly shaped parts

    C.63

13. When testing a bar with a length-to-diameter ratio of 4 in a 10-turn coil, the required current would be:

    a. 45 000 A
    b. 18 000 A
    c. 1125 A
    d. unknown; more information is needed

    A.208

14. Internal splines and holes drilled parallel to, or near, test surfaces will cause:

    a. sharp, well-defined indications directly aligned with the part's internal contours
    b. broad, fuzzy indications directly aligned with the part's internal contours
    c. distinct indications not aligned with any internal contours
    d. no indications

    C.216-217

7a 8a 9c 10c 11c 12b 13c 14b

15. A limitation of coil magnetization techniques is that:

    a. regardless of part size, the part cannot be painted
    b. the coil must be of maximum diameter in relation to the part
    c. the effective field is generally limited on either side of the coil
    d. small diameter parts must be placed close to the center of the coil

    A.146

16. Which of the following casting discontinuities is caused by nonuniform cooling resulting in stresses that rupture the surface of the metal?

    a. hot tears
    b. porosity
    c. dross
    d. shrinkage

    C.78

17. The term used to refer to the total opposition to flow of current represented by the combined effect of resistance, inductance and capacitance of a circuit is:

    a. inductive reactance
    b. impedance
    c. reluctance
    d. decay

    A.122

18. A desirable property of magnetic particles used for either the dry or wet method is that they:

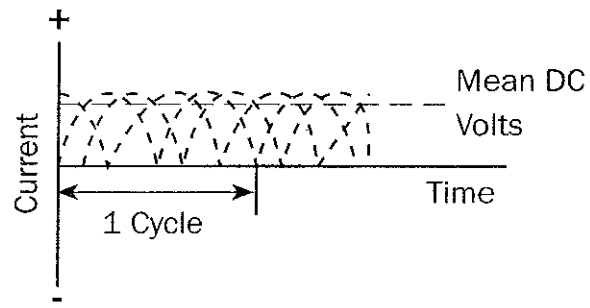
    a. be toxic
    b. be nonferromagnetic
    c. possess high retentivity
    d. possess high permeability

    C.179

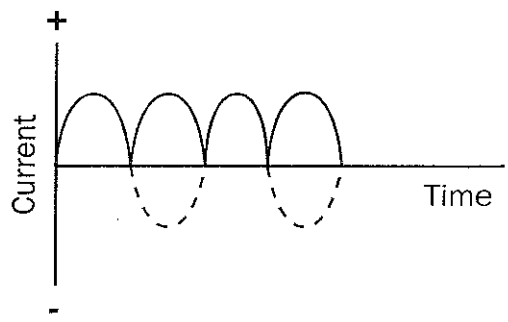
19. Which of the following wave patterns depicts the wave form of three-phase full-wave rectified alternating current?

    C.58; E.14

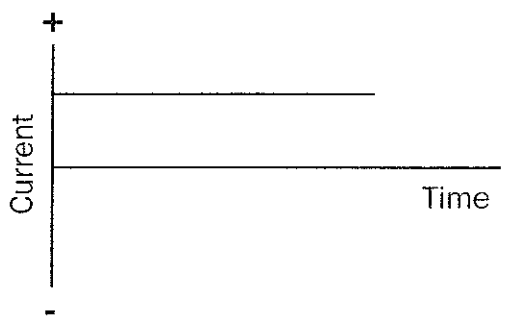
a.



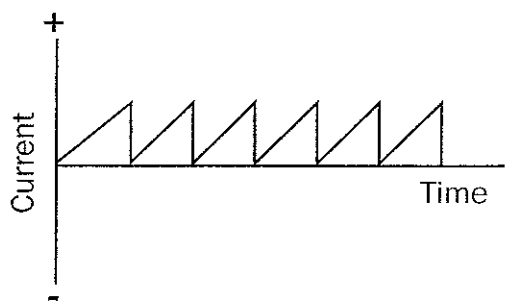
b.



c.



d.



19a 18d 17b 16a 15c

20. A 3500 ampere-turn coil shot is required to be performed in a 5-turn coil after a head shot of 800 A using the wet continuous method. In order to properly conduct the coil shot it is necessary to:

    a. demagnetize the part between the head and first coil shot
    b. check the part for residual magnetism with a field indicator
    c. remove all residual wet magnetic particle fluid from the part using clean, dry absorbent rags
    d. place the part in the coil and continue the inspection after evaluating the head shot indications

    A.308

21. When adding concentrate in paste form to any wet magnetic particle suspension liquid, it is common practice to:

    a. add the paste directly to the suspension liquid
    b. change the entire bath after thoroughly cleaning the system
    c. make a small, slurry-like test mixture of paste and suspension and add directly to the bath
    d. mix paste in a small container with suspension to the required bath strength and add directly to the bath

    A.264

22. Which of the following can cause nonrelevant magnetic particle indications?

    a. joints between dissimilar metals
    b. thread cracks
    c. scratches
    d. burrs

    C.216-218

23. External poles which are too strong to permit good inspection of a part are more likely to result when using:

    a. longitudinal magnetization
    b. polarized magnetization
    c. residual magnetization
    d. circular magnetization

    A.382

24. A rough forging discontinuity has the following characteristics: can occur on surface or internally, is associated with low temperature processing, is often caused by excessive working and creates cavities varying in size. How would it be identified?

    a. pipe
    b. burst
    c. shrinkage
    d. lamination

    C.78

25. Discontinuities in plate, sheet or strip caused by internal fissures, inclusions or blowholes in the original ingot which, after rolling, are usually flat and parallel to the outside surface are called:

    a. laps
    b. seams
    c. cracks
    d. laminations

    C.77

26. Forging laps occur in what relation to the axial direction of a part?

    a. they are always found on thermal centerline
    b. they are found on the surface of a part at a 90-degree angle to the long axis
    c. they may occur anywhere in the part and always run in the direction of working
    d. they may occur anywhere on the surface and may bear no relation to the axial direction of the part

    A.86

27. The accumulation of particles at a site on the part surface, collected at and held to the site by the magnetic leakage field, is called:

    a. a defect
    b. an indication
    c. a discontinuity
    d. magnetic writing

    D.33; E.2

28. Where particles are attracted to a site on the surface of a part by a magnetic leakage field that is caused by a condition such as a crack, lap, or other condition not acceptable to the applicable standards for the part, then we have:

    a. a defect
    b. an indication
    c. a discontinuity
    d. a nonrelevant indication

    D.33

29. Half-wave rectified alternating current is used for detection of:

    a. surface defects only
    b. subsurface defects only
    c. surface and subsurface defects when using dry particles
    d. surface and subsurface defects when using wet particles

    C.117; E.15

30. Which of the following is an acceptable technique for removing a thin film of oil or grease prior to magnetic particle testing?

    a. wash with a solvent
    b. degrease using a sand-blasting method
    c. brush the surface with power wire brush
    d. coat the surface with a thick layer of chalk and then wipe with cloth

    A.246-247

31. Which of the following is the most common current method used for preserving and documenting magnetic particle indications?

    a. digital photography
    b. color-tinted tape
    c. color-tinted lacquer
    d. all of the above

    A.407-412; C.243

32. Yokes of solid steel have been used for many years to indicate transverse cracks. Alternating current yokes are assembled from laminated transformer sheet to reduce:

    a. the size of the yoke
    b. production costs
    c. the weight of the yoke
    d. eddy current losses

    C.124

33. Which one of the following is <u>not</u> a discontinuity that can be produced by the forging process?

    a. laps
    b. bursts
    c. flakes
    d. shrinkage

    C.77-78

34. Which of the following is a discontinuity commonly associated with the welding process?

    a. flakes
    b. seams
    c. laminations
    d. lack of penetration

    C.78

35. Which of these cracks may appear as an irregular, checked or scattered pattern of fine lines usually caused by local overheating?

    a. corrosion
    b. crater cracks
    c. fatigue cracks
    d. grinding cracks

    C.79

36. Of the following discontinuity categories, which one is considered most detrimental to the service life of an item?

    a. corrosion
    b. subsurface inclusions
    c. cracks open to the surface
    d. subsurface porosity and voids

    A.369-370

37. If a copper conductor is placed through a ferrous cylinder and a current is passed through the conductor, then the magnetic field (flux density) in the cylinder will be:

    a. less than in the conductor
    b. greater than in the conductor
    c. the same intensity and pattern as in the conductor
    d. the same regardless of its proximity to the cylinder wall

    A.192

38. The length of a part being magnetized by passing an electric current from one end to the other:

    a. causes the magnetic field to vary
    b. affects the permeability of the part
    c. changes the strength of the magnetic field
    d. does not affect the strength of the magnetic field

    A.186

39. If 25 mm (1 in.) and 51 mm (2 in.) diameter bars of the same material were magnetized by passing the same current through them, the magnetic fields would be:

    a. the same for both
    b. stronger in the 51 mm (2 in.) diameter bar
    c. weaker in the 25 mm (1 in.) diameter bar
    d. stronger in the 25 mm (1 in.) diameter bar

    A.189

40. If a current of the same amperage is passed through two conductors of the same dimensions, one of which is magnetic and one of which is nonmagnetic, the magnetic field distribution surrounding the conductors will:

    a. vary with the permeability
    b. be the same for both conductors
    c. be stronger for the magnetic conductor
    d. be stronger for the nonmagnetic conductor

    A.189

41. The most effective magnetic particle test method for inspection of a large casting is using:

    a. a central conductor
    b. direct magnetization
    c. multidirectional magnetization
    d. prod inspection in two directions

    A.450

42. The most common failure mechanism associated with inservice parts with sharp fillets, notches, undercuts and seams is:

    a. shrinkage
    b. crystallization
    c. decarburization
    d. fatigue cracking

    A.103, 481-489

43. When it is believed that a discontinuity has been removed by a grinding operation, the next operation is to:

    a. repair it
    b. sign off inspection of the part
    c. measure it to see if minimum thickness remains
    d. re-examine the area by magnetic particle testing

    A.398-400

37b 38d 39d 40b 41c 42d 43d

44. When the most complete demagnetization available is desired and demagnetization is to be accomplished by placing the part in a coil energized with AC of progressively decreasing amperage, the part should be placed so that its principle axis is in a(n) _____ direction in relation to the Earth's axis.

a. east-west
b. north-east
c. south-west
d. north-south

A.324

45. During a magnetic particle test, nonrelevant indications due to residual local poles are noted to be interfering with the magnetic particle testing. For a successful examination one should:

a. use more amperage
b. use lower amperage
c. magnetize in another direction
d. demagnetize then remagnetize in the desired direction

A.387

46. Cold working indications will not reappear if the part is:

a. demagnetized then retested
b. retested after stress relieving
c. retested in the opposite direction
d. remagnetized at a higher amperage

A.387-388

47. The unit of measure of one line of flux per square centimeter of area is one:

a. ohm
b. gauss
c. ampere
d. oersted

C.381

48. The ability of matter to attract ferromagnetic materials to itself is a phenomenon associated with:

a. magnetism
b. field strength
c. pole strength
d. coercive force

C.44

49. Materials which are strongly attracted to a magnet are called:

a. polarized
b. magnetized
c. nonmagnetic
d. ferromagnetic

C.45; E.3

50. Materials which are weakly attracted magnetically are called:

a. diamagnetic
b. nonmagnetic
c. paramagnetic
d. ferromagnetic

C.45; E.3

51. Materials which are repelled magnetically are called:

a. diamagnetic
b. nonmagnetic
c. paramagnetic
d. ferromagnetic

C.45

52. The end of a magnet at which the lines of flux are thought of as entering the bar is the:

a. north pole
b. south pole
c. positive pole
d. negative pole

C.44

53. A general rule to use for determining the detectability of surface discontinuities by magnetic particle inspection is that:

    a. the depth and width have no bearing to each other
    b. the depth should be at a one-to-one ratio to the width
    c. the depth should be 20% of the material thickness
    d. the depth should be at least five times the width of the opening of the discontinuity at the surface

    A.371

54. The general term used to refer to a break in the metallic continuity of the part being tested is:

    a. discontinuity
    b. crack
    c. seam
    d. lap

    D.33

55. The pattern of iron powder sprinkled on a paper placed over a bar magnet is called a:

    a. flux meter
    b. field survey
    c. magnetometer
    d. magnetograph

    A.119, 169

56. The lines of force that form a path around a crack in a ring magnet are called:

    a. flux leakage
    b. field strength
    c. magnetic lines
    d. longitudinal field

    C.47

57. Since the magnetic lines of force within a bar magnet run the length of the bar, it is said to be:

    a. randomly magnetized
    b. circularly magnetized
    c. permanently magnetized
    d. longitudinally magnetized

    C.47

58. Lines of flux are thought to leave a magnet at the:

    a. north pole
    b. south pole
    c. positive pole
    d. negative pole

    C.44

59. A break in the magnetic uniformity of a part that is called a magnetic discontinuity is related to a sudden change in:

    a. resistivity
    b. inductance
    c. permeability
    d. capacitance

    A.127

60. In order to detect defects in different directions in a material by magnetic particle inspection, it is best to use:

    a. only one field
    b. other probe locations
    c. a high-frequency field
    d. two or more fields in different directions

    C.65

61. The parts are blanks cut from rolled iron bar stock and have been rough machined. Inspection by continuous method reveals distinct but broken lines parallel (6.35 mm to 25 mm [0.25 in. to 1 in.]) with the axis on some of the pieces. These indications are indicative of:

    a. shrinkage
    b. nonmetallic inclusions
    c. surface checking
    d. machining tears

    C.76, 299-300

62. A large forging is repaired by welding. Magnetic particle inspection of the repair weld reveals a sharp irregular indication running parallel with the weld passes. It is located near the center of the bead and starts and ends by turning off slightly from the axial direction. This indication is indicative of:

    a. inclusions
    b. crater cracks
    c. surface checking
    d. weld shrinkage cracks

    A.441

63. The wattage most commonly used for mercury vapor bulbs for portable fluorescent magnetic particle inspection is:

    a. 50 watts
    b. 75 watts
    c. 100 watts
    d. 200 watts

    C.227

64. An example of a nonrelevant indication that would be classed as a magnetic discontinuity rather than an actual discontinuity could be caused by:

    a. corrosion
    b. a slag pocket
    c. grinding cracks
    d. a known abrupt change in the hardness of the part

    C.217

65. The detection of deep-lying internal defects in heavy steel weldments at a depth of 6.35 mm (0.25 in.) to 51 mm (2 in.) below surface is:

    a. very improbable
    b. very similar to the detection of surface cracks
    c. simple if the defect's width can be approximated
    d. not difficult if the defect is attributable to fine porosity

    C.216

66. In magnetic particle inspection, it is best to:

    a. make sure that parts meet specified acceptance criteria
    b. reinspect all questionable discontinuities to ensure that no defective parts are accepted
    c. reinspect questionable parts utilizing another nondestructive test method
    d. make certain that parts are better than specified and contain no discontinuities at all

    A.413, 416-417

67. Subjecting a magnetized object to a magnetic force that is continually reversing its direction and gradually decreasing in intensity is know as:

    a. magnetization
    b. continuous method
    c. residual method
    d. demagnetization method

    C.278

68. Any of these welding processes is susceptible to a discontinuity known as slag inclusion except:

    a. flux cored arc welding
    b. submerged arc welding
    c. gas tungsten arc welding
    d. shielded metal arc welding

    C.310

69. Which of the following induces a longitudinal magnetic field?

    a. prod
    b. yoke
    c. head shot
    d. internal conductor

    C.122, 159; E.27

70. At the curie point, steel is temporarily transformed from:

    a. paramagnetic to diamagnetic
    b. ferromagnetic to diamagnetic
    c. paramagnetic to ferromagnetic
    d. ferromagnetic to paramagnetic

    C.279

71. Magnetic field strength is measured in:

    a. tesla
    b. gauss
    c. webers/m^2
    d. ampere/meter

    C.36

72. The following types of discontinuities can be found in an object's subsurface except:

    a. pipe
    b. hot tears
    c. cold shut
    d. segregation

    C.78

73. Which one of following materials has permeability much greater than that of air?

    a. permeability material
    b. diamagnetic material
    c. paramagnetic material
    d. ferromagnetic material

    C.45; E.3

74. As a magnet, the Earth is surrounded by magnetic lines of force. These lines of force make up what is sometimes called Earth field and they can cause problems in both magnetizing and demagnetizing. However Earth field is weak in the order of:

    a. 0.03 mT (0.3 G)
    b. 0.003 mT (0.03 G)
    c. 0.0003 mT (0.003 G)
    d. 0.3 mT (3.0 G)

    C.45

75. A hysteresis curve describes the relation between:

    a. magnetizing force and flux density
    b. magnetizing force and applied current
    c. strength of magnetism and alignment of domains within material
    d. magnetic flux density and current generated

    C.54, 382; E.5-6

76. Demagnetization would most likely be required when:

    a. the material has low retentivity
    b. the object is to be electric arc welded
    c. the material has low reluctance
    d. heat treatment is to be carried out after testing

    C.279

77. One of the disadvantages of half-wave magnetization is that when demagnetizing:

    a. the current has skin effect
    b. the current does not reverse
    c. the current passes very deep
    d. the current passes only on the surface

    C.58

78. One disadvantage of using a single-phase magnetic particle unit at current input values over 600 A, in comparison with a three-phase unit, is that the single-phase unit will:

a. detect only surface discontinuities
b. not detect subsurface discontinuities
c. require 1.73 times more input current
d. require 1.73 times less input current

C.58

79. In longitudinal magnetization of a round bar, residual magnetism will be:

a. greatest at the center of the bar
b. greatest at the ends of the bar
c. the same all over on the bar
d. the minimum at the ends

C.280

80. Magnetic particles of varying size are used for dry powder and wet methods. Typically, particle sizes for wet method testing range from:

a. 1 to 5 micrometers
b. 5 to 20 micrometers
c. 100 to 500 micrometers
d. 100 to 1000 micrometers

C.70

Level III Questions
Magnetic Particle Testing Method

1. The magnetic domains in a permanent magnet are aligned in:

   a. fixed positions with directions that cancel out
   b. fixed positions, predominantly in one direction
   c. the same direction as the metal's grain structure
   d. a random position and may become aligned to attract a magnetic material

   C.44; E.4

2. For which of the following would the wet fluorescent technique be preferred over the dry technique?

   a. when the parts are large and bulky
   b. when increased speed and sensitivity are desired
   c. when the parts being inspected are to be field welded
   d. when it is desired to use the fluorescent lighting provided in many plants

   A.345

3. Gas, hot tears, cold shuts, shrinkage cracks and sand inclusions are examples of defects resulting from which of the following processes?

   a. forging
   b. grinding
   c. casting
   d. heat treatment

   A.88

4. Which of the following statements is <u>not</u> a valid reason for demagnetizing a part after completing a magnetic particle test?

   a. residual magnetism can disturb the welding arc path on parts to be welded
   b. residual magnetism may attract chips or small particles in service, causing galling or mechanical wear
   c. residual magnetism could interfere with the operation or accuracy of instruments placed on or near the part during service
   d. if the part is to be radiographed after magnetic particle inspection, residual magnetism may interfere with the electromagnetic radiation spectrum

   C.278-279

5. Subjecting a part to a magnetic field that is constantly reversing in polarity and gradually diminishing in strength accomplishes which of the following?

   a. magnetizes the part
   b. demagnetizes the part
   c. helps to locate deep-lying defects
   d. increases the strength of the retained magnetic field

   C.284

6. The concentration of the solid content in a suspension of magnetic particles is measured by:

   a. weighing the suspension
   b. soaking the solids in benzol
   c. measuring the pull on a magnet
   d. permitting the solids to settle out of suspension

   A.261-263

7. An important factor that must be considered when selecting a method of magnetization is the:

   a. part's curie point
   b. location of the inspection station
   c. location of the inspection unit
   d. alloy, shape and condition of the part

   A.229-243; C.116-119

8. When a magnetic material reaches its curie temperature, the material becomes:

   a. magnetic
   b. radioactive
   c. diamagnetic
   d. paramagnetic

   C.279

9. Magnetic particle inspection methods on ferromagnetic materials are recognized as superior to liquid penetrant techniques when:

   a. the surface is plated
   b. the parts are painted
   c. the surface is anodized
   d. dry particles are used for fine surface cracks

   C.369

10. A paramagnetic material:

    a. is highly magnetic
    b. is slightly magnetic
    c. has no magnetic properties at all
    d. has a demonstrated lack of electron mobility

    C.44; E.3

11. Which of the following will reduce a magnetic field?

    a. move the direct current coil closer to the part
    b. reduce the current in only one direction
    c. move the alternating current coil farther away from the part
    d. move the part toward the inner surface of the coil

    C.284-288

12. When an external magnetizing force is removed, some of the magnetic domains remain preferentially oriented. The additional force required to return them to their original random orientation is commonly referred to as:

    a. coercive force
    b. applied field force
    c. residual field force
    d. direct current electric force

    C.54

13. When a cylinder is magnetized by a central conductor, the field is most intense:

    a. at the ends of the cylinder
    b. at the outer surface of the cylinder
    c. at the inside surface of the cylinder
    d. halfway through the thickness of the cylinder wall

    C.50, 114-115

14. When is the magnetic field strongest in an object being inspected by the magnetic particle method?

    a. while the magnetizing current is applied
    b. just after the magnetizing current is shut off
    c. when the magnetic particle powder is applied
    d. just prior to current reversal when using alternating current

    C.54, 114-115

15. Which of the demagnetization methods listed below is most effective?

    a. full-wave rectified
    b. half-wave rectified alternating current
    c. direct current with reversing and step-down control
    d. variable voltage alternating current with step-down control

    C.287-288

7d 8d 9b 10b 11c 12a 13c 14a 15c

16. When using the longitudinal magnetization method to inspect a bar 152 mm (6 in.) long and 51 mm (2 in.) in diameter with a 5-turn coil, which of the following amperage values should be used?

    a. 1200 A
    b. 3000 A
    c. 12 000 A
    d. 2000 amp-turns

    A.181-182

17. To examine a part 127 mm (5 in.) long and 51 mm (2 in.) in diameter using a 5-turn coil and head stock magnetic particle machine, what amperage should be used for longitudinal magnetization?

    a. 3000 A
    b. 3600 A
    c. 4500 A
    d. 10 000 ampere-turns

    A.181-182

18. To examine a bar 381 mm (15 in.) long and 51 mm (2 in). in diameter using a 7-turn coil and head-stock magnetic particle machine, what amperage should be used for circular magnetization?

    a. 750 A
    b. 1800 A
    c. 1800 ampere-turns
    d. 49 000 ampere-turns

    A.208

19. If the same amperage is passed through a 25 mm (1 in.) diameter bar and a 51 mm (2 in.) diameter bar of the same length and material, the strength of the magnetic field at the surface:

    a. will be the same for both bars
    b. of the 25 mm (1 in.) bar will be one-half that of the 51 mm (2 in.) bar
    c. of the 25 mm (1 in.) bar will be approximately twice that of the 51 mm (2 in.) bar
    d. of the 51 mm (2 in.) bar will be approximately four times that of the 25 mm (1 in.) bar

    A.186

20. If the same amperage is passed through a 25 mm (1 in.) diameter bar and a 51 mm (2 in.) diameter bar of the same length and material, the strength of the magnetic field at the center of:

    a. both bars will be 0
    b. the 25 mm (1 in.) bar will be one-half that of the 51 mm (2 in.) bar
    c. the 51 mm (2 in.) bar will be one-half that of the 25 mm (1 in.) bar
    d. the 25 mm (1 in.) bar will be approximately one-fourth that of the 51 mm (2 in.) bar

    A.186-187

21. When a magnetic field is induced in a part with prods spaced 152 mm (6 in.) apart, the field is a:

    a. circular field
    b. residual field
    c. solenoid field
    d. longitudinal field

    C.53, 112-113; E.27

22. When circular magnetization is used to detect subsurface discontinuities, direct current is used instead of alternating current because:

    a. particle mobility is no longer a factor
    b. there is no logical reason to use direct current instead of alternating current
    c. direct current saturates the magnetic particles better than alternating current
    d. the skin effect of alternating current reduces the maximum depth at which discontinuities can be found

    C.57, 116-119

23. An inspection method in which an initial magnetizing force is applied to a part and then reduced to a lower continuous value is called:

    a. the surge method
    b. the residual method
    c. the multivector method
    d. the continuous method

    A.155-156

16b 17b 18b 19c 20a 21a 22d 23a

24. Which of the statements below is most appropriate concerning Materials I and II represented by the hysteresis curves shown in Figure 1?

    a. Material I is not a good subject for magnetic particle inspection
    b. Material I could be used for dry powder magnetic particles
    c. Material II could be used for dry powder magnetic particles
    d. Material II is paramagnetic

    A.217

25. Considering the curves shown in Figure 1, Material II in comparison to Material I indicates that the material:

    a. has a high retentivity
    b. has a high permeability
    c. has a high coercive force
    d. would make an excellent permanent magnet

    A.217-219

26. Which point on the hysteresis curve shown in Figure 1 represents the residual field value?

    a. A
    b. B
    c. C
    d. E

    A.116-1117

27. Point B on the hysteresis curve for Material I shown in Figure 1:

    a. is the limit of coercive force
    b. is the material's magnetic saturation point
    c. represents the mid-point of the rectified alternating current applied
    d. represents the point at which the residual magnetic value will remain when the magnetizing current is removed

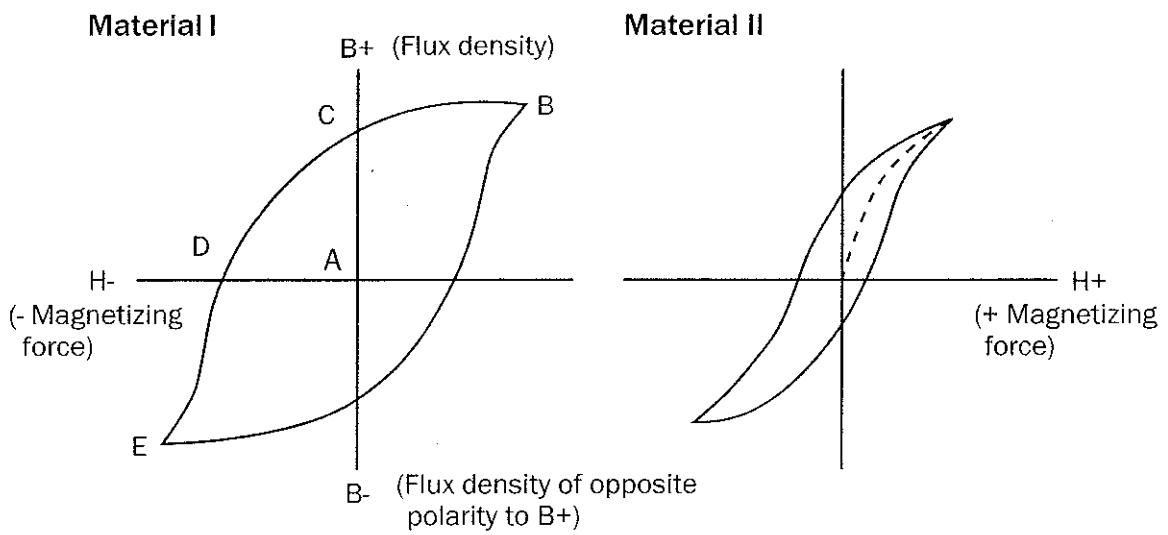
    A.116-117

28. When deciding to inspect a part by the residual method of applying the particles, what factor affects the residual magnetic field strength of the part?

    a. the retentivity of the part
    b. the part's magnetic field saturation point
    c. the direction of the magnetic field in the part
    d. the type of field indicator used to measure the residual field

    A.237-240; C.63-64

Figure 1: Hysteresis curves.



24c 25b 26c 27b 28a

29. Factors that must be considered when interpreting an indication are:

    a. the direction of the magnetic field and location of the magnetic particle unit
    b. the location of the magnetic particle unit and the nondestructive testing level of the inspector
    c. the orientation and shape of the indication and the direction of the magnetic field
    d. the strength of the leakage field at the indication and the type of demagnetization method

    A.379; C.216-218

30. A 7-turn coil at 1000 A is used to inspect a round solid part 381 mm (15 in.) long and 64 mm (2.5 in.) in diameter. The length-to-diameter ratio is:

    a. 2.14
    b. 6.0
    c. 7000 amp-turns
    d. 45 000 amp-turns

    A181-182

31. Which of the following, when used as the last magnetizing method, will best render a part suitable for relatively easy measurement of the external magnetic field using a field indicator?

    a. probe magnetization
    b. circular magnetization
    c. longitudinal magnetization
    d. central bar conductor magnetization

    C.284-285

32. When using direct current, an indication is detected. What is the next logical step to determine if the indication results from a surface or subsurface condition?

    a. reinspect using alternating current
    b. reinspect at higher amperage
    c. demagnetize and apply powder
    d. reinspect using the residual method

    A.397

33. When withdrawing a part from the field around a coil and without changing the direction of current, which of the following has the least effect on demagnetizing the part?

    a. direct current
    b. alternating current
    c. full-wave rectified current
    d. half-wave rectified alternating current

    C.284-287

34. The least important factor below that should be considered when selecting a method of magnetization to detect subsurface discontinuities is:

    a. orientation of the discontinuity
    b. configuration of the part
    c. cost of the equipment
    d. type of material the part is made from

    C.216

35. Which of the following discontinuities occur as a result of the rolling process?

    a. fissures
    b. laminations
    c. lack of penetration
    d. blowholes and pipe

    C.77

36. Which of the following discontinuities occur as a result of the forging process?

    a. pipe
    b. laps
    c. laminations
    d. lack of penetration

    C.78

37. If an indication is formed when using the residual method as well as the continuous method, it is most likely:

    a. very deep and tight
    b. a relevant indication
    c. a nonrelevant indication
    d. very shallow and open to the surface

    A.397

38. Plated parts can be reliably tested for fine surface cracks using the magnetic particle method if the plating is less than:

    a. 0.762 mm (0.03 in.) thick
    b. 1.016 mm (0.04 in.) thick
    c. 0.127 mm (0.005 in.) thick
    d. 0.2032 mm (0.008 in.) thick

    A.247

39. The magnetic lines of flux in a permanent magnet:

    a. in all cases produce a longitudinal field
    b. enter the south pole and leave the north pole
    c. flow from the north pole through the magnet to the south pole
    d. change direction 60 times a second with the magnetizing current

    C.44

40. Which of the following magnetization techniques is <u>not</u> recommended for magnetic particle testing?

    a. vector magnetization
    b. parallel magnetization
    c. circular magnetization
    d. longitudinal magnetization

    A.139; C.121

41. When attempting to demagnetize a part containing a circular residual field:

    a. use a swinging cyclic field
    b. consideration of the material's hysteresis is most important
    c. establish a longitudinal field and then proceed with demagnetization
    d. using half-wave current with a head shot setup and step-down magnetization will ensure complete removal of the residual field

    C.280

42. Small parts requiring demagnetization should be:

    a. loaded in baskets in a single layer and passed through an alternating current coil
    b. loaded in a steel basket for better field distribution
    c. processed through a demagnetization cycle one at a time
    d. demagnetized after assembly to ensure complete demagnetization of the entire assembly

    A.314

43. The best shape for magnetic particles used in the dry powder method is:

    a. globular
    b. elongated
    c. long and slender
    d. a mixture of elongated and globular

    C.179

44. An effective method for testing hardened steel ball bearings is:

    a. along one axis using a coil
    b. two head shots along the X and Y axes
    c. two shots using a coil at the X and Y axes
    d. induced current shots along X, Y, and Z axes, with controlled rotation between each positioning

    A.349-350

45. When a magnetized ferromagnetic object is exposed to a subsequent heating operation above the curie point:

    a. the marten site structure will occur
    b. the magnetic domains become random
    c. there is no change from its previous state
    d. the magnetic domains are reversed from their previous state

    C.278

46. A discontinuity caused by a welding operation is:

a. creep crack
b. segregation
c. machining tear
d. lamellar tearing

C.307

47. The most effective current to be used with dry magnetic particles is:

a. direct current
b. half-wave rectified alternating current
c. full-wave rectified alternating current with three-phase bridge circuitry
d. full-wave rectified alternating current with single-phase bridge circuitry

C.117

48. The following properties should be considered in choosing a vehicle for the wet method, except:

a. capillarity
b. corrosivity
c. wetting ability
d. foaming ability

C.186-187

49. The amount of light reflected by one surface compared to that reflected by another adjacent surface is:

a. length-to-diameter ratio
b. B/H ratio
c. color contrast
d. brightness contrast

C.212

50. Given a certain continuous magnetization current in a material, which type of current would give the deepest penetration?

a. direct current
b. alternating current
c. direct current surge
d. half-wave direct current

C.119

51. Given a certain continuous magnetization current in a material, which type of current would give the shallowest penetration?

a. direct current
b. alternating current
c. direct current surge
d. half-wave direct current

C.119

52. Which type of radiation can most damage human tissue?

a. UV-A
b. UV-B
c. white light
d. visible light

C.24

53. Compared with magnetic particle testing, liquid penetrant testing is <u>not</u> as reliable after paint removal from a weld because:

a. liquid penetrant testing can be applied only to small parts
b. liquid penetrant testing can be applied only in field conditions
c. magnetic particle testing will detect subsurface discontinuities
d. partial smearing of weld surface metal across the discontinuity opening can occur

C.369

54. Prod spacing less than 76.2 mm (3 in.) is usually <u>not</u> practical because:

a. the possibility of sparking will increase
b. more time will be consumed for inspection
c. it requires more media than a 152 mm (6 in.) prod distance
d. particles tend to bend around the prod making interpretation difficult

C.113

55. One of most important facts that must be remembered while establishing magnetic particle procedure is that:

    a. the magnetic field follows the path of greatest reluctance
    b. the coil shot, wet method provides only surface discontinuities
    c. the head shot, wet method is better for detecting subsurface discontinuities
    d. in most cases the continuous method is more sensitive than is the residual method

    C.63

56. Which one of the following magnetic particle testing techniques is logically acceptable for testing a large flat area?

    a. prod inspection
    b. rod shot inspection
    c. coil shot inspection
    d. head shot inspection

    C.120

57. Permeability of a material can be numerically written as:

    a. RIB
    b. B/H
    c. Hc/Hb
    d. ampere-turns/number of turns

    C.56

58. One disadvantage for using undyed wet magnetic particles is:

    a. it is more costly
    b. it is suitable for the fluorescent method only
    c. it is suitable for surface discontinuity detection only
    d. the lack of contrasting color makes them difficult to see

    C.61

59. One of most desirable characteristics of the media for magnetic particle testing is:

    a. the ability to show clearly against any background
    b. the insensitiveness to concentration in water as a vehicle
    c. no need for agitation when used with a liquid vehicle
    d. the highest possible permeability and lowest retentivity

    C.60