

ASNT QUESTIONS & ANSWERS BOOK

Third Edition

Magnetic Particle Testing Method

Levels I, II and III Review Questions
Book B



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The American Society for
Nondestructive Testing, Inc.



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REFERENCES

Recommended References

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

Reference A

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

Reference B

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).

Reference C

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

Reference D

Fenton, John D. *ASNT Level III Study Guide: Magnetic Particle Testing Method*, second edition. Columbus, OH: The American Society for Nondestructive Testing, Inc. (2013).

Reference Codes

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

6. Which of the following can be magnetized?
- a. iron
 - b. copper
 - c. aluminum
 - d. magnesium

B.43

In this example, the letter "B" refers to Reference B in the list above and 43 is the specific page in Reference B where the answer to the question is located.

Additional References

The following reference is frequently cited in contracts and may be a useful study aid.

Reference E

ASTM E 1444 / E 1444 M, *Standard Practice for Magnetic Particle Examination*. West Conshohocken, PA: ASTM International. (2011).

Reference Usage

Reference A Total = 47

Level I (30)
Level II (17)
Level III (0)

Reference B Total = 180

Level I (82)
Level II (57)
Level III (41)

Reference C Total = 22

Level I (8)
Level II (14)
Level III (0)

Reference D Total = 43

Level I (13)
Level II (1)
Level III (29)

Reference E Total = 4

Level I (1), Question 15
Level II (0)
Level III (3), Questions 16, 17, 20

LEVEL I

Review Questions

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.

B.8
2. Ferromagnetic material is:
 - a. strongly attracted by a magnetic field.
 - b. not highly saturated by magnetic fields.
 - c. a material with a 0 permeability measurement.
 - d. not capable of being magnetized.

A.159; B.380; D.3
3. The permeability of a material describes the:
 - a. ease with which it can be magnetized.
 - b. depth of the magnetic field in the part.
 - c. length of time required to demagnetize it.
 - d. ability to retain the magnetic field.

A.161; B.56, 385; D.6
4. The retentivity of a material describes the:
 - a. ease with which it can be magnetized.
 - b. depth of the magnetic field in the part.
 - c. length of time required to demagnetize it.
 - d. ability to retain the magnetic field.

B.387; D.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.

B.180
6. Which of the following can be magnetized?
 - a. Iron.
 - b. Copper.
 - c. Aluminum.
 - d. Magnesium.

B.43
7. The magnetic field is strongest when the:
 - a. magnetizing voltage is flowing.
 - b. magnetizing current is flowing.
 - c. material exhibits high coercive forces.
 - d. magnetizing current is not flowing.

B.64
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. leakage field.
 - c. Doppler effect.
 - d. high reluctance at the crack.

B.47, 49-50
9. The unit usually used to denote flux density is:
 - a. tesla.
 - b. henry.
 - c. farad.
 - d. ampere.

B.54

- | | |
|---|---|
| <p>10. Which statement is true when related to magnetic lines of force?</p> <ul style="list-style-type: none"> 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. <p style="text-align: right;">B.44</p> | <p>15. The proper number of ampere-turns for a given test specimen being examined by longitudinal magnetism is determined by:</p> <ul style="list-style-type: none"> a. its length and diameter. b. the material and the length. c. the diameter and the material. d. its diameter. <p style="text-align: right;">A.64, 73-75; E.19-20</p> |
| <p>11. Magnetic flux lines that are parallel to a discontinuity produce:</p> <ul style="list-style-type: none"> a. strong indications. b. weak indications. c. no indications. d. fuzzy indications. <p style="text-align: right;">B.48</p> | <p>16. A circular field may be induced into a specimen by:</p> <ul style="list-style-type: none"> 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. <p style="text-align: right;">B.50</p> |
| <p>12. A part is susceptible to magnetic particle inspection if:</p> <ul style="list-style-type: none"> a. it is attached to an electrostatic field. b. the material is ferromagnetic. c. the material is non-ferrous. d. the material is an electric conductor. <p style="text-align: right;">B.43</p> | <p>17. An electrical yoke produces:</p> <ul style="list-style-type: none"> a. a longitudinal field. b. a circular field. c. alternating fields. d. a swinging field. <p style="text-align: right;">A. 71; B.53; D.29</p> |
| <p>13. What rule describes the direction of current flow (+ to -) when lines of magnetic force surround a conductor?</p> <ul style="list-style-type: none"> a. Left-hand rule. b. Right-hand rule. c. Flux rule. d. Reluctance rule. <p style="text-align: right;">B.50</p> | <p>18. An energized coil around the part produces:</p> <ul style="list-style-type: none"> a. a circular field. b. a longitudinal field. c. an intermittent field. d. a field dependent on the type of current applied. <p style="text-align: right;">A.69; B.51; D.9</p> |
| <p>14. The magnitude of the residual magnetic field in a specimen is dependent on the:</p> <ul style="list-style-type: none"> a. length-to-diameter ratio (L/D). b. strength of the applied magnetizing force. c. right-hand rule. d. left-hand rule. <p style="text-align: right;">B.54</p> | <p>19. In longitudinal magnetization the proper term for calculating magnetizing force is:</p> <ul style="list-style-type: none"> a. amperes. b. ampere turns. c. watts. d. ohms. <p style="text-align: right;">A.74, 157</p> |
| | <p>20. Magnetic lines of force:</p> <ul style="list-style-type: none"> a. travel in straight lines. b. form a closed loop. c. are randomly oriented. d. overlay in highly ferromagnetic materials. <p style="text-align: right;">B.44; D.4</p> |

21. A magnetic particle buildup from a discontinuity is strongest when the discontinuity is oriented:
- 180° to the magnetic flux flow.
 - 45° to the magnetic flux flow.
 - 90° to the magnetic flux flow.
 - 90° to the current flow.
- B.48
22. A specimen may be demagnetized by which of the following?
- Heat treatment below the curie temperature.
 - Placing the part in an alternating current coil.
 - Placing the part in reversing and decreasing direct current fields.
 - Applying a direct current yoke and removing it from the part.
- B.59; D.58
23. Which of the following is an advantage of magnetic particle testing over penetrant testing?
- It does not require post-cleaning of the part.
 - It requires direct access to the surface of the part.
 - It can detect near-surface discontinuities.
 - It requires a shorter dwell time to produce results.
- B.7-8, 12
24. The amount of amperage used for magnetic particle inspection using the prod technique is determined from the:
- type and thickness of material.
 - distance between the prods and thickness of the material.
 - diameter of the part.
 - total length of the part.
- B.113
25. The flux within and surrounding a magnetized part or around a conductor carrying a current is known as:
- the saturation point.
 - a magnetic field.
 - the ferromagnetic field.
 - the paramagnetic field.
- A.5, 159; B.380, 383
26. The areas on a magnetized part from which the magnetic field is leaving or returning into the part are called:
- salient points.
 - defects.
 - magnetic poles.
 - nodes.
- A.36, 162; B.44, 384
27. A metal that is difficult to magnetize is said to have:
- high permeability.
 - low permeability.
 - low coercive force.
 - low retentivity.
- A.41; B.56; D.6-7, 48
28. The magnetism that remains in a piece of magnetizable material after the magnetizing force has been removed is called the:
- tramp magnetism.
 - residual magnetism.
 - damped magnetism.
 - permanent magnetism.
- A.39; B.54
29. Subsurface discontinuity indications usually appear:
- sharp and distinct.
 - sharp and wide.
 - wide and fuzzy.
 - high and loosely held.
- A.10; C.35; D.2
30. Which residual field is most difficult to demagnetize?
- Longitudinal.
 - Circular.
 - Vector.
 - Binodal.
- A.58, 85; B.281
31. Which magnetic particle application technique is the most sensitive?
- Continuous.
 - Residual.
 - Interrupted.
 - Counter-current.
- A.50; B.64



32. Fluorescent magnetic particle indications should be inspected under:
- any light.
 - a neon light.
 - an ultraviolet light.
 - a fluorescent light.
- B.63; D.42
33. Inspecting a part by magnetizing, removing the current flow, then applying the medium is called the:
- continuous technique.
 - wet technique.
 - residual technique.
 - dry technique.
- B.63
34. Of the following techniques, which is most effective in detecting near-surface discontinuities?
- Dry residual technique using DC with surge.
 - Wet continuous technique using half-wave rectified current.
 - Wet residual technique.
 - Dry continuous technique using half-wave rectified current with prods.
- B.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:
- magnetic force curve.
 - hysteresis curve.
 - saturation curve.
 - induction curve.
- A.39; B.54; D.6
36. What technique of applying particles provides greater sensitivity in locating subsurface weld discontinuities?
- Continuous.
 - Residual.
 - Circular.
 - Longitudinal.
- B.180
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?
- The part should be checked to see if demagnetization between operations is necessary.
 - No precautions should be taken before the second operation.
 - This is not a valid technique.
 - There is no need to magnetize a weld in two directions.
- A.22-23; B.278
38. When a ferromagnetic object is placed inside a coil carrying an electric current the magnetic lines of flux concentrate themselves in:
- a circular direction.
 - a longitudinal direction.
 - many directions.
 - no direction.
- B.51
39. What are three causes of nonrelevant indications?
- Lack of fusion, change of section thickness, grinding cracks.
 - Sharp corners, heat affected zones, drilled hole near surface.
 - Very high amperage, drilled hole near surface, blow holes.
 - Drilled hole near surface, very high amperage, lack of fusion.
- B.217
40. Using the residual testing technique, 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?
- There is a possible loss of the magnetic field.
 - It may cause magnetic writing.
 - It may damage the part.
 - It makes parts hard to handle.
- A.76; B.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:
- salient pole.
 - saturation point.
 - residual point.
 - remnant point.
- B.63
- A.39; B.54
42. Which type of current produces a skin effect on the surface of the part?
- Alternating current.
 - Direct current.
 - Half-wave rectified.
 - Full-wave rectified.
- A.9; C.35; D.2
- A.12; B.57; D.13
43. When using wet techniques, why should a high velocity flow of wet bath over surfaces following removal of the magnetizing current not be used?
- The flux leakage may not be able to attract the particles.
 - This is not a problem.
 - The particles may clog the applicator.
 - The flux leakage may increase with the increased velocity.
- A.11
- C.23
44. Residual magnetic particle inspection may be used when:
- parts are irregular in shape.
 - parts are highly retentive.
 - parts are highly stressed.
 - evaluating continuous technique indications.
- A.52
- A.53; B.63-64
45. Magnetic particle inspection is not a reliable method of detecting:
- laps.
 - deep internal cavities.
 - cracks.
 - seams.
- A.15-17
- A.3, 29-30; B.8
46. The wet fluorescent technique is the same as the wet visible technique except that the wet fluorescent technique requires:
- an ultraviolet light.
 - a higher current.
 - a different machine.
 - alternating current.
47. A discontinuity open to the surface produces an indication which is:
- sharp and distinct.
 - wide and indefinite.
 - crisscrossed.
 - high and fuzzy.
48. Which of the following will produce circular magnetism?
- Passing current through a coil.
 - Placing the test part in a solenoid.
 - Yokes.
 - Passing current through prods.
49. When using the wet continuous technique, the flow of suspension from the hose should be shut off:
- immediately after applying the current.
 - immediately before applying the current.
 - while the current is flowing.
 - 30 s before applying the current.
50. The strongest magnetic field in a coil is at the:
- outside edge.
 - inside edge.
 - center.
 - end.

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.
- B.120-121; C.16-17
52. What equipment is used to determine if a part has been demagnetized?
- a. Notched shim.
 - b. Field indicator.
 - c. Pie gage.
 - d. Careful observation for clinging magnetic particles.
- A.22; B.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.
- A.45; B.57-58
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.
- B.50; C.16-17
55. Parts should be cleaned after demagnetization to:
- a. ensure that the magnetic particles are removed.
 - b. prevent false indications.
 - c. save the solids of the suspension.
 - d. prevent cracking during heat treatment.
- B.278; C.39
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.
- C.19
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.
- B.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.10; B.218
59. If wet magnetic particle suspension is not 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.97; B.60
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.43; B.57
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.
- B.53