

**ATLANTIS NDT**

Magnetic Particle Testing (MT) Level II

Specific Examination — Practice Questions

20 multiple-choice questions with an answer key and explanations

Candidate name	
Date	
Time allowed (suggested)	60 minutes
Score	____ / 20

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Before you start

Written against the documents named below; check the edition your written practice and contract name. The questions test applying an Article 7 procedure (technique and current, field adequacy, lighting, calibration, procedure variables, demagnetization and records) and the acceptance criteria an MT Level II most often works to on US pressure vessels, process piping and structural steel.

Documents these questions are written against: ASME BPVC Section V, Article 7 (2023 edition); ASME BPVC Section VIII, Division 1, Mandatory Appendix 6 (2023 edition); ASME B31.3 Process Piping (2022 edition); AWS D1.1/D1.1M Structural Welding Code – Steel (2020 edition). Your employer's written practice and the contract decide which edition applies; if yours differs, check the answer against your edition.

Choose the single best answer for each question. Work without notes first, then check yourself against the answer key at the back. Under ASNT SNT-TC-1A your employer's written practice sets the passing grade and the number of questions in the real examination.

These are original study questions written by Atlantis NDT. They are not taken from, and do not reproduce, any ASNT or employer examination.

1. An examiner checks a butt weld with an electromagnetic yoke, placing it once at each location with the legs straddling the weld. Under ASME Section V, Article 7, what else is required?

- A. Nothing more, provided the yoke passed its lifting-power check
- B. A second examination of each area with the flux about 90° to the first
- C. A second pass in the same orientation using fluorescent particles
- D. A residual-method check after the yoke is removed

2. A DC electromagnetic yoke will be used with its legs at a maximum spacing of 150 mm (6 in.). At that spacing it lifts a 4.5 kg (10 lb) test weight but not an 18 kg (40 lb) one. Under Article 7, the yoke:

- A. May be used, because 10 lb applies to every yoke type
- B. May be used at that spacing, but only for the residual method
- C. May not be used at that spacing; DC yokes need at least 40 lb
- D. May be used if it is switched to half-wave rectified current

3. Prods are used on a plate 25 mm (1 in.) thick with a prod spacing of 150 mm (6 in.). What magnetizing current range does Article 7 require?

- A. 600 to 750 A
- B. 540 to 660 A
- C. 900 to 1,100 A
- D. 100 to 125 A

4. Which prod setup meets Article 7?

- A. AC current, 150 mm (6 in.) spacing, remote switch fitted
- B. Rectified current, 225 mm (9 in.) spacing, remote switch fitted
- C. Rectified current, 150 mm (6 in.) spacing, current on before the tips touch
- D. Rectified current, 175 mm (7 in.) spacing, remote switch fitted

5. A solid round bar 6 in. (150 mm) in diameter is to be magnetized by direct contact. Your Article 7 procedure calls for 300 to 800 A per inch of outer diameter, but the unit's maximum output is 1,500 A. What does Article 7 require?

- A. Proceed at 1,500 A, since the range is only a recommendation
- B. Use the maximum current available and demonstrate field adequacy
- C. Proceed at 1,500 A with AC, which penetrates more deeply than DC
- D. Stop, because direct contact is not permitted on bars over 5 in. (125 mm)

6. Your Article 7 procedure gives ampere-turns = $35,000 \div [(L/D) + 2]$ for parts with an L/D of 4 or more in a fixed coil. A bar 400 mm long and 50 mm in diameter is placed in a 5-turn coil. What current is required (within $\pm 10\%$)?

- A. 3,500 A
- B. 1,125 A
- C. 700 A
- D. 875 A

7. A pie-shaped magnetic particle field indicator is used to verify field adequacy under Article 7. How is it placed, and what shows an adequate field?

- A. Copper side away from the part; a clear line forms with current on
- B. Copper side against the part; read after the current stops
- C. Either side against the part; any build-up at its outer edge
- D. Copper side away from the part; read after demagnetizing

8. A Hall-effect tangential-field probe is used to verify field adequacy for a direct-contact shot. With the current applied, the peak reading is 22 G (about 1.75 kA/m). What is the correct conclusion under Article 7?

- A. Adequate; any reading above 20 G is accepted
- B. Adequate, if confirmed by a reading with the current off
- C. Not adequate; at least 100 G (8 kA/m) is required
- D. Not adequate; the field must be 30 to 60 G while magnetizing

9. Visible (nonfluorescent) particles are used. What minimum light intensity does Article 7 require at the examination surface?

- A. 100 fc (1,076 lx)
- B. 50 fc (538 lx)
- C. 20 fc (215 lx)
- D. 2 fc (21.5 lx)

10. During a fluorescent examination, the UV-A lamp is unplugged and moved to another power outlet. Under Article 7, what must happen before the examination continues?

- A. Nothing, since it was measured at the start of the shift
- B. Return the lamp to its manufacturer for recalibration
- C. Remeasure UV-A; at least $1,000 \mu\text{W}/\text{cm}^2$ at the surface
- D. Wait 30 minutes so the examiner's eyes readapt

11. A unit with a 2,000 A full-scale ammeter is checked against a calibrated test meter at three output levels (unit reading / test meter): 500 / 560 A, 1,000 / 1,150 A and 1,500 / 1,720 A. Article 7 allows $\pm 10\%$ of full scale. The unit is:

- A. Acceptable; the average deviation is under 10% of full scale
- B. Out of tolerance; at 1,500 A it is off by 11% of full scale
- C. Acceptable; each deviation is within 15% of its own reading
- D. Acceptable; only the mid-range level must meet $\pm 10\%$

12. Your MT procedure was qualified by demonstration because the referencing Code requires it. Which change requires requalification under Article 7?

- A. Using another manufacturer's AC yoke of the same type
- B. Changing the demagnetizing technique
- C. Switching from the yoke technique to prods
- D. Changing the post-examination cleaning technique

13. A broad area of heavy particle accumulation covers part of a weld, and nothing beneath it can be seen. Under Article 7, what is required?

- A. Record it as one rounded indication and continue
- B. Evaluate it against the acceptance criteria as a single indication
- C. Accept it, since broad accumulations are always nonrelevant
- D. Clean the area and re-examine it, since such masking is prohibited

14. Under Article 7, when must a part be demagnetized after examination?

- A. When residual magnetism could affect later processing or use
- B. Always, before any indication is evaluated
- C. Only if the residual field exceeds 3 G (240 A/m)
- D. Never on welds, because the welding heat has already removed the field

15. A rejectable indication is found. Under Article 7, what must be recorded about it as a minimum?

- A. Its location only; repair staff measure the rest
- B. A photograph alone, without a written record
- C. Its depth, found by exploratory grinding
- D. Its type (linear or rounded), location and extent

16. Under ASME Section VIII, Division 1, Mandatory Appendix 6, an MT indication on a weld measures 3 mm (1/8 in.) long and 0.8 mm (1/32 in.) wide. How is it classified and dispositioned?

- A. Rounded; acceptable because it is under 5 mm (3/16 in.)
- B. Nonrelevant, because its width is under 1.5 mm (1/16 in.)
- C. Linear and relevant; rejectable
- D. Linear; acceptable because it is under 5 mm (3/16 in.)

17. Under Appendix 6, which of these groups of rounded indications on a weld surface is rejectable?

- A. One rounded indication 4 mm (5/32 in.) across
- B. Four in a line, each 2 mm across, 0.8 mm (1/32 in.) apart edge to edge
- C. Three in a line, each 2 mm across, 0.8 mm (1/32 in.) apart edge to edge
- D. Four scattered, each 2 mm across, at least 25 mm apart

18. An examiner believes an indication is nonrelevant, caused by a permeability change, but has not verified it. How must it be treated under Appendix 6?

- A. As a defect until re-examination or other NDT shows otherwise
- B. As nonrelevant, on the examiner's own judgment and experience
- C. As acceptable if it is shorter than 5 mm (3/16 in.)
- D. As a rounded indication, whatever its shape

19. On an ASME B31.3 piping system, a required random examination reveals a defect in one weld. Under the Code's progressive sampling rules, what comes next?

- A. Examine every weld on the line at once by radiography
- B. Repair the defect and accept the lot without more sampling
- C. Examine one more weld by any welder, using penetrant testing
- D. Two more welds of that kind, same welder, same examination

20. On a statically loaded structure built to AWS D1.1, MT shows a 3 mm (1/8 in.) crack at the toe of a fillet weld. How is it dispositioned?

- A. Acceptable, because short cracks are allowed in statically loaded work
- B. Rejectable; any crack fails the visual criteria used for MT
- C. Acceptable if it is less than 1 mm (1/32 in.) deep
- D. Evaluated against ASME Section VIII, Appendix 6 instead

Answer key and explanations

1. B	2. C	3. A	4. D	5. B	6. C	7. A	8. D	9. A	10. C
11. B	12. C	13. D	14. A	15. D	16. C	17. B	18. A	19. D	20. B

1. B — Article 7 requires at least two separate examinations of each area, with the lines of flux in the second approximately perpendicular to those in the first, and enough overlap for 100% coverage. A single yoke orientation finds mainly discontinuities lying across the line between the poles. [ASME BPVC Section V, Article 7 (2023)]

2. C — Article 7 requires an AC yoke to lift at least 10 lb (4.5 kg), and a DC or permanent-magnet yoke at least 40 lb (18 kg), at the maximum pole spacing that will be used. The spacing could be reduced and the check repeated at the new maximum. [ASME BPVC Section V, Article 7 (2023)]

3. A — For sections 19 mm (3/4 in.) thick or more, Article 7 requires 100 to 125 A per inch (4 to 5 A/mm) of prod spacing: $6 \times 100 = 600$ A and $6 \times 125 = 750$ A. The 540–660 A option uses the 90–110 A/in. range that applies only to sections thinner than 19 mm. [ASME BPVC Section V, Article 7 (2023)]

4. D — Article 7 requires direct or rectified current for prods, a prod spacing not exceeding 200 mm (8 in.), and a remote switch so current is applied only after the prods are positioned, to avoid arcing. Spacings below about 75 mm (3 in.) are usually impractical because particles band around the prods. [ASME BPVC Section V, Article 7 (2023)]

5. B — The range calls for $6 \times 300 = 1,800$ A up to $6 \times 800 = 4,800$ A, so 1,500 A falls short. When the required current cannot be obtained, Article 7 allows the maximum obtainable current to be used, provided field adequacy is then demonstrated, for example with artificial flaw shims. AC would not help, because the skin effect keeps its field nearer the surface. [ASME BPVC Section V, Article 7 (2023); current range as stated in the procedure]

6. C — $L/D = 400 \div 50 = 8$, so ampere-turns = $35,000 \div (8 + 2) = 3,500$, and dividing by 5 turns gives 700 A. Leaving out the + 2 gives 875 A, and forgetting to divide by the number of turns gives 3,500 A. [ASME BPVC Section V, Article 7 (2023); formula as stated in the procedure]

7. A — The indicator is placed with its copper-plated side away from the examination surface. An adequate field is shown when a clearly defined line of particles forms across the copper face while particles are applied with the magnetizing force on; if none forms, the technique must be changed. [ASME BPVC Section V, Article 7 (2023)]

8. D — Article 7 treats a tangential field of 30 to 60 G (2.4 to 4.8 kA/m), measured while the magnetizing force is applied, as adequate. At 22 G the current or technique must be changed and the field verified again. [ASME BPVC Section V, Article 7 (2023)]

9. A — Article 7 requires at least 100 fc (1,076 lx) on the examination surface for visible particles, measured with a light meter before the examination or provided by a verified light source. Darkened viewing applies to fluorescent particles, not visible ones. [ASME BPVC Section V, Article 7 (2023)]

10. C — UV-A intensity must be measured before use, whenever the lamp's power source is interrupted or changed, and at the end of the examination or series of examinations, and it must be at least 1,000 $\mu\text{W}/\text{cm}^2$ at the examination surface. Article 7's dark-adaptation period for examiners is at least 5 minutes, not 30. [ASME BPVC Section V, Article 7 (2023)]

11. B — Each reading is compared with full scale: 60 A is 3%, 150 A is 7.5% and 220 A is 11% of 2,000 A. The 1,500 A level exceeds $\pm 10\%$, so the unit must be corrected before use. Article 7 calls for this check at least once a year and after major electrical repair, periodic overhaul or damage. [ASME BPVC Section V, Article 7 (2023)]

12. C — The magnetizing technique is an essential variable in Article 7, so moving from a yoke to prods requires the procedure to be requalified by demonstration. Equipment of the same type, the demagnetizing technique and the post-examination cleaning technique are nonessential; changing them needs a revision of, or addendum to, the procedure, not requalification. [ASME BPVC Section V, Article 7 (2023), procedure requirements table]
13. D — Article 7 prohibits broad areas of particle accumulation that might mask indications from discontinuities; the area must be cleaned and re-examined, often with the technique adjusted. Such an accumulation cannot be evaluated or accepted as it stands. [ASME BPVC Section V, Article 7 (2023)]
14. A — Article 7 requires demagnetization when residual magnetism could interfere with subsequent processing or usage, such as arc blow during later welding, and allows it any time after the examination is complete. Any numeric limit on the remaining field comes from the referencing Code, specification or procedure. [ASME BPVC Section V, Article 7 (2023)]
15. D — Rejectable indications must be recorded with at least their type (linear or rounded), location and extent (length, diameter or aligned). Nonrejectable indications are recorded as the referencing Code Section specifies, and the examination record also covers items such as the procedure and revision, equipment and current type, particles, lighting equipment, examiner and date. [ASME BPVC Section V, Article 7 (2023)]
16. C — $\text{Length} \div \text{width} = 1/8 \div 1/32 = 4$, which is more than 3, so it is linear, and its major dimension exceeds 1/16 in. (1.5 mm), so it is relevant. Appendix 6 accepts no relevant linear indications, so the imperfection must be removed or reduced to an acceptable size and the area re-examined. [ASME BPVC Section VIII, Division 1, Mandatory Appendix 6 (2023)]
17. B — Appendix 6 rejects relevant rounded indications larger than 3/16 in. (5 mm) and four or more relevant rounded indications in a line separated by 1/16 in. (1.5 mm) or less edge to edge. A single 4 mm indication, three in a line, or widely scattered indications do not meet either rejection rule. [ASME BPVC Section VIII, Division 1, Mandatory Appendix 6 (2023)]
18. A — Appendix 6 requires any indication believed to be nonrelevant to be regarded as a defect unless re-examination by the same method, other NDT methods or surface conditioning shows that no unacceptable imperfection is present. The examiner's belief alone is not a basis for dismissing it. [ASME BPVC Section VIII, Division 1, Mandatory Appendix 6 (2023)]
19. D — B31.3 progressive sampling requires two additional samples of the same kind, by the same welder or operator, given the same type of examination. If both are acceptable, the defective weld is repaired and re-examined and the items represented are accepted; if either is defective, two further samples are examined for each defective item found, and a further failure means all items represented must be repaired or replaced, or fully examined and repaired as necessary. [ASME B31.3 (2022), progressive sampling for examination]
20. B — AWS D1.1 has MT performed to ASTM E709 and evaluates welds tested by MT against its visual inspection acceptance criteria, under which any crack is unacceptable regardless of size or location. The crack must be repaired and the repaired weld re-examined. [AWS D1.1/D1.1M:2020 (visual inspection acceptance criteria; MT per ASTM E709)]

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