

# API 510 / 570 Certification Prep

## API 578 Practice Questions

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*This following study aid helps you learn the content of API RP-578 - 3<sup>rd</sup> Edition 2018: Material Verification Program for New and Existing Assets. There will be about 5-7 questions from this document on the API 510 and 570 exam. We do NOT spend class time on this publication. So, it is important that you become familiar with this content in your personal study sessions.*

*The questions in this study aid are in the same order as in API 578. The Answer Key with references is in the back of this guide. It is helpful to read through API 578 before working on this exercise!*

### **Questions in Yellow are Open Book Questions!**

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1. The material verification program specified by API 578 covers:
  - a. only pressure-containing components.
  - b. only pipe, and fittings.
  - c. only plate, pipe, fittings, and welds.
  - d. pressure-containing and non-pressure containing components.
  
2. API 578 provides guidelines for a material assurance system to verify:
  - a. all materials.
  - b. all alloy materials.
  - c. only non-ferrous materials.
  - d. only high-alloy materials.
  
3. An alloy material is any metallic material that contains alloying elements that are added:
  - a. only to improve mechanical properties.
  - b. only to improve corrosion resistance.
  - c. to improve either mechanical properties or corrosion resistance.
  
4. An inspection lot includes:
  - a. all materials from a common source.
  - b. all materials included on the same purchase order.
  - c. all materials of the same material type (i.e. 316 SS).
  - d. all materials from a common source, of the same material type and same heat.

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5. Which of the following is not needed on a MTR?
- Date of production & testing
  - Source of ore & % of recycled materials
  - Chemical specifications
  - Physical specifications
6. Incorrect substitution of carbon steel is most likely to be found in:
- any ferritic equipment.
  - any non-ferrous equipment.
  - chrome equipment.
  - stainless equipment.
7. Which of the following material non-conformances has created the greatest number of events with serious consequences?
- Carbon Steel in Low-Alloy equipment
  - Carbon Steel in High-Alloy equipment
  - Chrome in High-Alloy equipment
  - Stainless Steel in Carbon Steel equipment
8. Usually substituting an alloy in carbon steel equipment does not cause a problem. But hardenable alloys may cause failure in some carbon steel systems. In which of the following process services would substituting a hardenable alloy for carbon steel result in a potential problem?
- Benzene
  - Caustic
  - Crude Oil
  - Sulfuric acid
9. Which residual element in a carbon steel has not caused increased corrosion rates in HF acid piping system?
- C
  - Cr
  - Cu
  - Ni

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10. Low silicon carbon steel can corrode rapidly when exposed to:
  - a. hydrogen-free oxidation.
  - b. hydrogen-rich oxidation.
  - c. hydrogen-free sulfidation.
  - d. hydrogen-rich sulfidation.
  
11. Carbon steel can corrode rapidly in hydrogen-free sulfidation conditions when the silicon content in carbon steel is:
  - a. < 0.10%.
  - b. > 0.10%.
  - c. < 0.25%.
  - d. > 0.25%.
  
12. For construction and repair activities a written material verification program should be established by the:
  - a. API 570 Authorized Inspector.
  - b. Engineering Organization.
  - c. Owner/User.
  - d. Repair Organization.
  
13. The material verification program should cover PMI testing of materials:
  - a. during construction of pressure equipment.
  - b. in existing pressure equipment.
  - c. during repairs and alterations of pressure equipment.
  - d. in existing pressure equipment and during construction, repairs and alterations of pressure equipment.
  
14. During repairs, random PMI sampling of new components is most appropriate for:
  - a. low-risk pressure equipment.
  - b. low alloy pressure equipment.
  - c. stainless steel pressure equipment.
  - d. ferritic steel pressure equipment.
  - e. all pressure equipment.

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15. Who has the responsibility to determine the extent of PMI performed?
- API 570 Authorized Inspector
  - Owner/User
  - Pressure Equipment Engineer
  - Repair Organization
16. During construction, the Owner should consider 100% PMI of new components on:
- all pressure equipment.
  - all alloys above P-5.
  - exotic alloys.
  - high-risk pressure equipment.
17. A mill test report:
- eliminates the need for further material verification.
  - is a report showing material discrepancies.
  - is an important part of the material qualify assurance program.
  - is issued by the owner upon receipt of materials.
18. The material verification program should specific roles and responsibilities. Which group will not have specific roles in this program?
- Engineering
  - First Aid
  - Inspection
  - Maintenance
  - Operations
  - Purchasing
  - Warehouse/Receiving
19. When performing material verification, who is responsible to specify the acceptable examination methods?
- Authorized Inspector
  - Examiner
  - Owner/User
  - Pressure Equipment Engineer

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20. When performing material verification, who is responsible to specify the process for managing material non-conformances?
- Authorized Inspector
  - Examiner
  - Owner/User
  - Pressure Equipment Engineer
21. Who is responsibility to verify the adequacy of the material verification program that is performed by material suppliers?
- API PMI Specialist
  - Authorized Inspector
  - Pressure Equipment Engineer
  - Owner/User
22. Who has the responsibility to review and approve the adequacy of the material verification program used by fabricators?
- API Authorized Inspector
  - API 578 Certified Inspector
  - Engineering Organization
  - Owner/User
23. Due to the higher potential for material handling mistakes, a higher degree of PMI should be conducted on materials supplied by:
- European materials manufacturers.
  - manufacturers of materials.
  - stocking distributors.
  - warehouse of owner/user.
24. Who has the responsibility to determine the extent of PMI testing required on existing pressure equipment?
- API Authorized Inspector
  - Engineering Organization
  - Owner/User
  - Repair Organization

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25. When prioritizing the need for PMI on existing pressure equipment, which of the following is not a factor to consider?
- Age of the facility
  - Consequence of failure
  - Likelihood of unapproved material substitution
  - Plant experience with inadvertent material substitutions
  - Reason for the alloy
26. Evaluating risk is an important part of prioritizing the need for PMI on existing pressure equipment. Which document can be used to develop risk-based methodologies?
- API 580
  - API 2201
  - ASME FFS-1
  - ASME PCC-2
27. The owner decides to conduct PMI testing on some existing piping systems. Which of the following is a major factor in prioritizing the pipe?
- The effectiveness of the construction & maintenance practices
  - The effectiveness of the inspection practices
  - Age of the unit
  - Line size
28. The owner decides to conduct PMI testing on existing pressure equipment. Which of the following is a major factor in prioritizing the equipment?
- The effectiveness of the inspection practices
  - Reason for the alloy
  - Age of the unit
  - Thickness of the components
29. Which of the following piping components is most likely to have a substitution with the wrong material?
- A 20' length of 6 NPS pipe
  - Weld-neck flange
  - Expansion joint
  - Bolting

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30. Which of the following piping components is most likely to have a substitution with the wrong material?
- A 10' length of 6 NPS 316L SS pipe
  - 6 NPS flanged gate valve
  - 4 NPS Monel elbow
  - Slip-on flange
31. Which of the following components is most likely to have a substitution with the wrong material?
- Small bore piping
  - Vessel head
  - 10 NPS weld-neck flange
  - Exchanger tube
32. The Owner/User is determining how much PMI to do on existing assets. Which of the following is not a significant factor to consider?
- Consequence of loss of containment
  - Number of plant modifications
  - Operating cost of the unit
  - Quality of the material verification program during construction
33. During repairs and alterations, the Owner should:
- use NACE certified examiners.
  - have a written procedure describing their materials verification program.
  - PMI test 100% of all materials.
  - PMI test 100% of all alloy materials.
34. An important part of an Owner/User's materials verification program is to specify:
- requirements for checking materials as received at the warehouse.
  - that all MTR's are scanned into an electronic record system.
  - that suppliers do 100% PMI on alloys at prior to shipment.
  - that suppliers do 100% PMI on exotic alloys at prior to shipment.

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35. PMI of materials received at the warehouse:
- must be done on a sampling of all materials.
  - must be done on a sampling of all alloys.
  - must be done on 100% of all alloys.
  - may be done at the warehouse or at the supplier.
36. PMI of materials at the warehouse:
- is the last PMI check that will be needed.
  - is not a substitute for PMI during fabrication of the asset.
  - eliminates the need to perform any PMI at the supplier.
  - must be done by Owner/User personnel.
37. The Material Verification Program should cover which of the following in-service maintenance activities?
- Temporary removal of blind flanges used for access
  - Replacement of threaded nipples & plugs
  - Assets that are disassembled, like tower trays, or heat exchangers
  - All the above components need to be checked
38. Which of the following does **not** need to be included in a PMI procedure?
- Calibration of the Equipment
  - Documentation requirements
  - Percentage of sampling to be performed
  - Qualification of personnel doing the PMI
  - Surface preparation requirements
39. All personnel performing PMI tests should be:
- qualified by national exam.
  - qualified by the owner/user.
  - knowledgeable about the operation of the PMI test equipment.
  - knowledgeable about the operation of the plant where the PMI is conducted.



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40. Qualifications for personnel performing PMI testing should be submitted and reviewed by:
- API.
  - ASNT.
  - the Authorized Inspection Agency.
  - the Owner/User.
  - the Pressure Equipment Engineer.
41. Who is responsible to assure that all personnel performing PMI testing are trained and qualified?
- Owner/User
  - Contractor's Supervisor
  - Authorized Inspector
  - Warehouse Supervisor
42. Chemical spot testing:
- is the fastest PMI technique.
  - is an easy test to use and interpret.
  - uses droplets of acids or caustics that are placed on the component. Different colors indicated different materials.
  - removes a small amount of surface metal that is placed in a filter paper. Small droplets of reagents are used on the sample and different colors indicated different materials.
43. The principle used with Resistivity Testing PMI tools is called the:
- Barlow effect.
  - Doppler effect.
  - Estee Lauder effect.
  - Seebeck effect.
44. Which of following describes the principle of Resistivity PMI Testing?
- The metal is heated and a voltage based on the material is generated.
  - The metal is cooled and a voltage based on the material is generated.
  - The metal is heated and radiation based on the material is emitted.
  - The metal is cooled and radiation based on the material is emitted.

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45. PMI tools that use Resistivity Testing are not always able to sort:
- low chromes.
  - high chromes.
  - 300 series stainless steels.
  - 400 series stainless steels.
  - low chromes and austenitic stainless steels.
  - high chromes and martensitic stainless steels.
46. How do portable X-Ray Fluorescence PMI tools work?
- Radiation waves excite the materials and the material emits a different spectrum of radiation that can be analyzed.
  - Radiation waves excite the materials and the material emits a different spectrum of light that can be analyzed.
  - Sound waves excite the materials and the material emits a different spectrum of radiation that can be analyzed.
  - Sound waves excite the materials and the material emits a different spectrum of light that can be analyzed.
47. PMI tools that use X-Ray fluorescence cannot detect:
- carbon.
  - chrome.
  - iron.
  - molybdenum.
48. Which of the following is true concerning performing PMI with X-Ray Fluorescence tools?
- Advance XRF tools can detect all elements
  - Surface preparation is extremely important
  - An Authorized Inspector must overview this exam
  - Advance XRF tools detect a material voltage

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49. How does Portable Optical Emission Spectrometry determine the elements in a material?
- An electric arc or laser striking the material causes a spectrum of light to be emitted from the tested material. The light is analyzed.
  - An electric arc or laser striking the material causes a spectrum of radiation to be emitted. The radiation is analyzed.
  - X-rays striking the material cause a spectrum of radiation to be emitted from the tested material. The radiation is analyzed.
  - Specific chemicals deposited on the tested material cause a spectrum of colors to be emitted. The colors are analyzed.
  - The surface is polished and etched. A replication is performed and is analyzed with a microscope.
50. Which of the following is true concerning performing PMI with Portable Optical Emission Spectrometry tools?
- Interpretation of the results when using the field-portable lab-grade analyser is not easy
  - Laser-induced breakdown spectroscopy can only provide qualitative data
  - Some of these tools can detect the carbon content
  - These tools never require gas testing or a hot-work permit
51. PMI testing equipment should be:
- calibrated every 4 hrs.
  - calibrated as specified by the equipment manufacturer.
  - used only by the manufacturer's personnel.
  - used by owner/user personnel.
52. XRF analyzers are **not**:
- intrinsically safe.
  - useful for determining the amount of nickel in an alloy.
  - useful for determining the amount of chrome in an alloy.
  - useful for quantitative analysis.

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53. PMI of the weld cap of a production weld:
- is a great way to determine if weld met appropriate specifications.
  - does not assure that the root pass is the correct material.
  - will always require a hot permit.
  - requires the participation of an API Authorized Inspector.
54. When using bare wire electrodes, prior to fabrication,:
- one roll from each pallet should be identified using PMI.
  - two rolls from each pallet should be identified using PMI.
  - each heat should be identified using PMI.
  - each roll should be identified using PMI.
55. When using flux covered electrodes, prior to fabrication,:
- one electrode from each pallet should be identified using PMI.
  - one electrode from each lot should be identified using PMI.
  - one electrode from each package should be identified using PMI.
  - two electrodes from each lot should be identified using PMI.
56. If alloy element(s) are contained in the flux of a welding electrode, PMI testing:
- is not necessary.
  - is not necessary provided appropriate documentation is provided by the supplier.
  - should be conducted on any of the production welds.
  - should be conducted on a "weld button" prior to production welds.
57. New longitudinal welded alloyed pipe should:
- never be used.
  - always receive random PMI testing of weld and base metal.
  - receive random PMI testing of weld and base metal if there is a reason to suspect problems.
  - always receive 100% PMI testing of weld and base metal.

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58. PMI testing of completed autogenous welds is:
- always required.
  - never required.
  - not required if the weld rod was PMI tested.
  - not required if the base metal was PMI tested.
59. When performing PMI testing on dissimilar-metal welds, which of following is true?
- The minimum material composition of the weld should be specified by the Owner/User.
  - The minimum material composition of the weld should at least equal the base metal with the highest alloy content.
  - The minimum material composition of the weld should at least equal the base metal with the lowest alloy content.
  - The minimum material composition of the weld should at least equal the midpoint between the two base metals.
60. An alloy weld overlay is applied to carbon steel base metal. What will occur?
- Cracking due to differential expansion rates
  - Dilution
  - Lack of Fusion
  - Underbead cracking
61. When PMI testing indicates that an alloy is outside the range allowed on the material spec, the component can:
- never be used.
  - be used if the alloy percentages exceed requirements.
  - be used in low risk piping systems.
  - be used if accepted by the Owner/User following an assessment.
62. What is the appropriate action to take when an incorrect material is located during a PMI sampling of an inspection lot?
- Inspect 2 more items from the inspection lot.
  - Inspect 100% of the items from the inspection lot.
  - Inspection all items supplied by that manufacturer.
  - A more extensive inspection of the lot should be considered.

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63. A color code system for marking materials is specified in:
- ASME B31.3.
  - ASME 16.34.
  - NACE 3389.
  - PFI ES22.
64. Identification of materials by color coding:
- is not an important part of the material verification program.
  - is not a substitute for any permanent markings required by the material specification.
  - is important only on high alloy materials.
  - should only be done by inspectors.
65. If the owner's PMI system requires physical marking of components, which of the following is not required?
- Specify whether the marking should remain legible for the component's life
  - The name of individual doing the marking is recorded
  - If colors are used, a description of which color is used for each alloy
  - Markers with Zinc or Lead should not be used
66. Marking pens should not contain chlorides or:
- carbon.
  - chrome.
  - oxides.
  - sulfur.
67. When PMI testing is conducted on a new piping system, the documentation of the PMI results should be kept:
- until the equipment is operational.
  - 1 year.
  - until the equipment is no longer in operation.
  - until the equipment is removed or scrapped.
  - forever.

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### Study Guide Answers:

<u>#</u>	<u>Ans.</u>	<u>Reference</u>
1.	a	1.1
2.	b	1.2
3.	c	3.1.1
4.	d	3.1.7
5.	b	3.1.13
6.	c	4.1
7.	a	4.1
8.	d	4.2
9.	a.	4.4
10.	c	4.5
11.	a	4.5
12.	c	5.1
13.	d	5.1
14.	a	5.1
15.	b	5.1
16.	d	5.1
17.	c	5.3
18.	b	5.4
19.	c	5.4.b
20.	c	5.4.f
21.	d	5.5.2
22.	d	5.5.2
23.	c	5.5.4
24.	c	5.6.2.1
25.	a	5.6.2.1.a/b/c/d
26.	a	5.6.2.1
27.	a	5.6.2.2
28.	b	5.6.2.2
29.	d	5.6.2.2
30.	b	5.6.2.2
31.	a	5.6.2.2
32.	c	5.6.2.3
33.	b	5.7.2
34.	a	5.7.2
35.	d	5.7.3

<u>#</u>	<u>Ans.</u>	<u>Reference</u>
36.	b	5.7.3
37.	d	5.7.4.a/b/d/e
38.	c	6.3
39.	c	6.4
40.	d	6.4
41.	a	6.4
42.	d	6.5.2
43.	d	6.6.1
44.	a	6.6.1
45.	e	6.6.1
46.	a	6.7.1
47.	a	6.7.1
48.	b	6.7.1
49.	a	6.7.2
50.	c	6.7.2
51.	b	6.7.3
52.	a	6.8.2.1
53.	b	6.8.3
54.	c	6.8.3
55.	b	6.8.3
56.	d	6.8.3
57.	c	6.8.3.1
58.	d	6.8.3.2
59.	a	6.8.3.3
60.	b	6.8.3.3
61.	d	7.1.c
62.	d	7.2
63.	d	8.2.1
64.	b	8.2.1
65.	b	8.3
66.	d	8.3
67.	d	9.2

**SDG**