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# API 510 Quick Reference

## FOR THE SEPTEMBER 2026 TO MAY 2027 EXAM WINDOWS

The exam format, the weighting, every formula the paper leans on, the interval rules, and ten worked questions with full explanations.

Free. Not a copy of any standard. Nothing here replaces the documents the exam is written against.

This is the sheet you would write out for yourself the night before, if you had time. Print it, keep it on your phone, or work through the questions at the back.

## WHAT IS INSIDE


| | |
|---|---|
| **1. The exam at a glance** | Question counts, the two sections and their clocks |
| **2. Where the marks are** | The eleven examinable areas and roughly what each is worth |
| **3. Formula sheet** | Corrosion rate, remaining life, MAWP, static head, welds, testing |
| **4. Interval rules** | The rules that decide when the vessel is next opened |
| **5. Ten questions** | With the full reasoning, and why each wrong option is wrong |



### 613 more questions, every one explained

The app gives you the full bank across all eleven areas, timed 170-question mocks, spaced repetition on your misses, and a predicted score that tells you when you are ready to book.

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# 1. The exam at a glance

Written for the September 2026 to May 2027 exam windows. Always confirm the editions on the effectivity sheet for your own exam date.

One day, two sections, separate clocks. Once you leave a section you cannot go back to it.

| | |
|---|---|
| **Total questions** | 170 |
| **Scored questions** | 140. The other 30 are unmarked trial questions you cannot identify. |
| **Closed book** | 110 questions in 2 hours 45 minutes, roughly 90 seconds each |
| **Open book** | 60 questions in 3 hours 45 minutes, roughly 225 seconds each |
| **Testing time** | 6 hours 30 minutes, inside a day of about 7.5 hours |
| **Options** | Four per question, one defensible answer |
| **Negative marking** | None. Never leave a question blank. |
| **Open book references** | Supplied as PDFs on the exam computer. You bring nothing in. |
| **Pass mark** | Not published. Preparation generally targets 70 to 75 percent. |

### THE PACING TRAP

People budget time evenly and then lose the open book half to lookups. Work the calculations you can do from memory first, flag the rest and come back. The clock punishes hesitation far more than it punishes a wrong answer.

# 2. Where the marks are

No official weighting is published. The figures below are our estimate from question frequency and the emphasis the Body of Knowledge places on each area. The shape is the useful part: over half the paper sits in the inspection code and the calculations.

| | |
|---|---|
| **The inspection code 45%** | Intervals, evaluating inspection data, repairs, alterations, rerating |
| **Calculations 12%** | Corrosion rate, remaining life, intervals, MAWP, static head, welds |
| **Vessel construction 10%** | Joints, materials, heads, openings, impact and pressure testing |
| **Welding qualifications 8%** | Reviewing procedure and performance qualification records |
| **Nondestructive examination 7%** | Radiography, penetrant, magnetic particle, thickness readings |
| **Welding practice 5%** | Processes, inspection, metallurgy, common defects |
| **Damage mechanisms 5%** | Fifteen named mechanisms, not the full catalogue |
| **Relieving devices 3%** | Inspection, testing and intervals |
| **Inspection practices 2%** | Practical vessel inspection technique |
| **Repairs 2%** | Named repair articles and their appendices |
| **Material verification 1%** | Positive material identification programmes |

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# 3. Formula sheet

Everything the numerical questions lean on. Use the corroded thickness, not the nominal one, and read the last line of the stem twice before you pick.

## CORROSION AND LIFE

### LONG-TERM CORROSION RATE

**CR = (t_initial - t_actual) / years between readings**

Spans the whole period. Use it unless the question points you at the recent interval.

### SHORT-TERM CORROSION RATE

**CR = (t_previous - t_actual) / years between those two**

The most recent interval only. Governs when it is the faster of the two.

### REMAINING LIFE

**RL = (t_actual - t_required) / corrosion rate**

The metal you can still afford to lose, not the whole wall.

## PRESSURE AND THICKNESS

### REQUIRED THICKNESS, CYLINDRICAL SHELL

**t = P R / (S E - 0.6 P)**

R is the inside radius in the corroded condition.

### MAWP, CYLINDRICAL SHELL

**P = S E t / (R + 0.6 t)**

Dropping the 0.6t term is the single most common arithmetic trap.

### STATIC HEAD

**head (psi) = 0.433 x height (ft) x specific gravity**

Add it to the operating pressure for the lower part of the vessel.

## WELDS AND TESTING

### FILLET WELD THROAT

**`throat = 0.7 x leg`**

The throat is the shortest path through the weld and carries the load.

### HYDROSTATIC TEST TEMPERATURE

**`metal temp >= MDMT + 30 F`**

Test pressure is the moment cold steel is most likely to fail in a brittle way.

## JOINT EFFICIENCY, FROM THE JOINT TYPE AND THE RADIOGRAPHY

| | |
|---|---|
| **Double-welded butt** | Full RT 1.00 \| Spot RT 0.85 \| No RT 0.70 |
| **Single butt with backing strip** | Full RT 0.90 \| Spot RT 0.80 \| No RT 0.65 |
| **Single butt, no backing strip** | No RT 0.60 |
| **Seamless sections and heads** | Treated separately. Check the rule before assuming 1.00. |

# 4. The interval rules

These decide when the vessel is next opened, and they come up constantly.

| | |
|---|---|
| **Internal or on-stream** | The lesser of half the remaining life or 10 years. |
| **Remaining life under 4 years** | You may use the full remaining life, capped at 2 years. |
| **Thickness measurement** | Same basis as the internal or on-stream interval. |
| **External visual** | The lesser of 5 years or the internal or on-stream interval. |
| **Risk-based programme** | Can extend intervals, within published limits, if it is justified. |

## WORKED EXAMPLE, START TO FINISH

Wall was 0.500 in. ten years ago and is 0.400 in. today, required thickness 0.250 in.

Corrosion rate: (0.500 - 0.400) / 10 = 0.010 in. per year.
Remaining life: (0.400 - 0.250) / 0.010 = 15 years.
Interval: lesser of 15/2 = 7.5 years, or 10 years. So 7.5 years.
External visual: lesser of 5 years or 7.5 years. So 5 years.

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# 5. Ten questions

Answer these before you look at the back. A score you did not earn tells you nothing useful.

**1. A vessel wall measured 0.500 in. at the last inspection and 0.400 in. today, ten years apart. What is the corrosion rate?**

A 0.100 in. per year
B 0.010 in. per year
C 0.040 in. per year
D 0.050 in. per year

**2. That vessel is 0.400 in. now and needs 0.250 in. to stay in service, corroding at 0.010 in. per year. Remaining life?**

A 40 years
B 25 years
C 15 years
D 10 years

**3. A vessel has 15 years of remaining life and is not on a risk-based programme. Longest permitted internal or on-stream interval?**

A 15 years
B 10 years
C 7.5 years
D 5 years

**4. A vessel is found to have 3 years of remaining life. What interval is permitted?**

A The full 3 years
B Up to 2 years
C 1.5 years
D 6 months

**5. Water of specific gravity 1.0, nozzle 40 ft below the surface. What static head does the nozzle see?**

A 17.3 psi
B 40 psi
C 92.4 psi
D 4.33 psi

**6. Inside radius 24 in., corroded thickness 0.400 in., allowable stress 17,500 psi, joint efficiency 1.0. MAWP?**

A 292 psi
B 289 psi
C 175 psi
D 700 psi

**7. A double-welded butt joint received spot radiography. What joint efficiency applies?**

A 1.00
B 0.85
C 0.80
D 0.70

**8. A fillet weld has a leg dimension of 0.500 in. What is the throat?**

A 0.500 in.
B 0.707 in.
C 0.350 in.
D 0.250 in.

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**9. During a hydrostatic test, how far above the minimum design metal temperature should the metal be held?**

A At least 10 F
B At least 30 F
C At least 50 F
D It does not matter

**10. How often should the external visual inspection normally be carried out?**

A Every 10 years
B Same as the internal interval
C The lesser of 5 years or the internal interval
D Only when opened

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# Answers and why

**1. Answer B**

Metal lost divided by the time it took. 0.500 minus 0.400 is 0.100 in. over ten years, so 0.010 in. per year. This is the long-term rate because it spans the whole period between readings.

**2. Answer C**

Metal you can still afford to lose, divided by the rate. 0.400 minus 0.250 is 0.150 in. available, at 0.010 in. per year, so 15 years.

**3. Answer C**

The lesser of half the remaining life or ten years. Half of 15 is 7.5, which is less than 10, so 7.5 governs.

**4. Answer B**

Below four years of remaining life you may use the full remaining life rather than halving it, capped at two years.

**5. Answer A**

0.433 psi per foot for water at SG 1.0. Forty feet gives 17.3 psi, which is added to the operating pressure.

**6. Answer B**

SEt divided by (R + 0.6t). That is 17,500 x 1.0 x 0.400 = 7,000, over 24 + 0.24 = 24.24, giving 289 psi. Dropping the 0.6t term gives 292 and is the trap.

**7. Answer B**

Full radiography of that joint type earns 1.00, spot earns 0.85, none earns 0.70.

**8. Answer C**

Throat is 0.7 times the leg for an equal-leg fillet. The throat is the shortest path through the weld, so it is always smaller than the leg.

**9. Answer B**

At least 30 F above the MDMT. Test pressure is higher than operating pressure and cold steel fails in a brittle way, so the margin keeps the metal ductile at its most stressed moment.

**10. Answer C**

The lesser of five years or the internal or on-stream interval. It needs no shutdown and catches insulation, support and external corrosion problems early.

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# Where to go next

This sheet covers the mechanical parts, which are the ones you can learn from a page. The rest of the exam is judgement, and judgement only comes from answering a lot of questions and understanding why you got them wrong.

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