

CP2 | Student Pre-assessment Quiz

Technician

Dear CP Student,

The purpose of this quiz is to guide you in your course selection. While there are no prerequisites to attend the CP 2 Technician course, it is not an entry level course. Successful completion of the CP 1 Tester course is highly recommended prior to attending CP 2.

Students should be prepared for an intense and fast-paced week of training with evening study to cover the extensive amount of material in CP 2. As such, students will get the most benefit from attending CP 2 when they are already familiar with the concepts taught in CP1 and have experience applying them in the field.

Upon completion of the quiz check your answers against the Grading Key found on the last pages of this document. The below ranges can be used as a suggested training path depending on your score.

Score Suggested Path

- **>90%** – You are set to gain the most benefit from attending CP2 Course.
- **70-90%** – It is recommended that you obtain a better understanding of the quiz topics you had difficulty with before attending the CP2 course.
- **<70%** – You will likely struggle with the CP2 course content and are encouraged to consider taking the CP1 Tester course and/or obtaining more field experience before attending the CP2 course.

We look forward to seeing you in class!

-AMPP

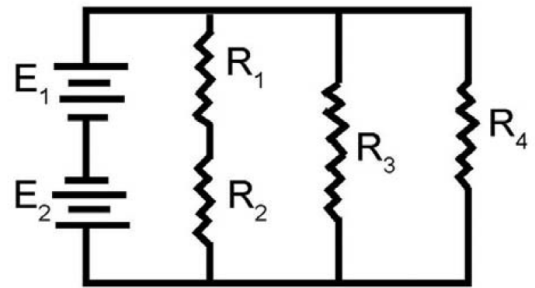
DC Electrical Circuits

1. What is total Resistance in the circuit depicted in Figure 1?

a. $0.77\ \Omega$
b. $0.94\ \Omega$
c. $2.80\ \Omega$
d. $1016\ \Omega$
e. $1.42\ \Omega$

2. What value of E_1 would double the current in R_2 ?

a. 10 V
b. 20 V
c. 30 V
d. 40 V
e. 50 V



$$E_1 = 20\text{ V} \quad E_2 = 10\text{ V} \quad R_1 = 5\ \Omega \\ R_2 = 10\ \Omega \quad R_3 = 1\ \Omega \quad I_4 = 10\text{ mA}$$

Figure 1 – Series Parallel Circuit

The Corrosion Cell

3. In the corrosion cell shown in Figure 2, which of the following occurs at the cathode?

Given:

- | | | |
|------------------|----------------------|---------------|
| 1. Oxidation | 2. Current pick-up | 3. Metal loss |
| 4. No metal loss | 5. Current Discharge | 6. Reduction |

a. 1
b. 1 & 3
c. 1, 3 & 5
d. 2 & 4
e. 2, 4 & 6

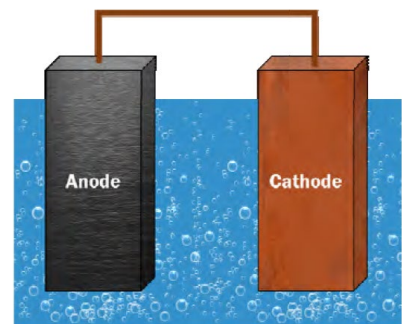


Figure 2 – Typical Corrosion Cell

4. In the corrosion cell shown in Figure 2, what is the direction of I_{CORR} ?

a. Anode to Cathode through the bond wire
b. Cathode to Anode through the electrolyte
c. Clockwise
d. Counterclockwise

5. In the corrosion cell shown in Figure 2, which of the following conditions would reduce I_{CORR} ?

a. Increase salt concentration in the electrolyte
b. Decrease bond wire length
c. Increase ambient temperature
d. Decrease oxygen concentration in the electrolyte
e. Agitate the electrolyte

Reference Electrode Conversions

Given: Potential of Zinc Reference (ZRE) = $-1116 \text{ mV}_{\text{CSE}}$

Potential of Silver Chloride Reference (SSC) = $-60 \text{ mV}_{\text{CSE}}$

6. If a polarized pipe potential of $+240 \text{ mV}$ was measured using ZRE, what would the measured potential be if a CSE was used?
- $-560 \text{ mV}_{\text{CSE}}$
 - $-816 \text{ mV}_{\text{CSE}}$
 - $-876 \text{ mV}_{\text{CSE}}$
 - $-1040 \text{ mV}_{\text{CSE}}$
 - $-1356 \text{ mV}_{\text{CSE}}$
7. If a sheet pile potential of -1.2 V was measured using SSC, what would the measured potential be if ZRE was used?
- $-144 \text{ mV}_{\text{ZRE}}$
 - $-400 \text{ mV}_{\text{ZRE}}$
 - $-0.944 \text{ V}_{\text{ZRE}}$
 - $-1.312 \text{ V}_{\text{ZRE}}$
 - $-1.456 \text{ V}_{\text{ZRE}}$

Potential Measurements, Criteria, & Isolation

8. In Figure 3, which potential is used to evaluate $-850 \text{ mV}_{\text{CSE}}$ potential criterion?
- 5 only
 - 4 only
 - 4 to 5
 - 3 to 4
 - 1 to 3
9. In Figure 3, which potential is used to evaluate 100 mV polarization criteria?
- 5 only
 - 4 only
 - 4 to 5
 - 3 to 4
 - 1 to 3
10. Which measured potential below is most likely for new unprotected steel in moist soil?
- $+150 \text{ mV}_{\text{CSE}}$
 - $-358 \text{ mV}_{\text{CSE}}$
 - $-620 \text{ mV}_{\text{CSE}}$
 - $-830 \text{ mV}_{\text{CSE}}$
 - $-920 \text{ mV}_{\text{CSE}}$

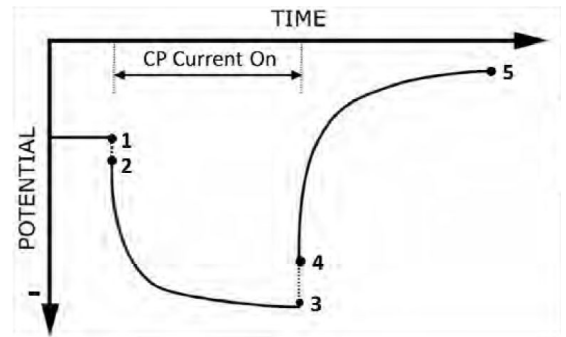


Figure 3 – Structure Polarization and Depolarization due to CP Current

11. Referring to the cased crossing in Figure 4, if the IR-free polarized potentials of the Pipe & Casing are as shown, which of the following conditions most likely exists?

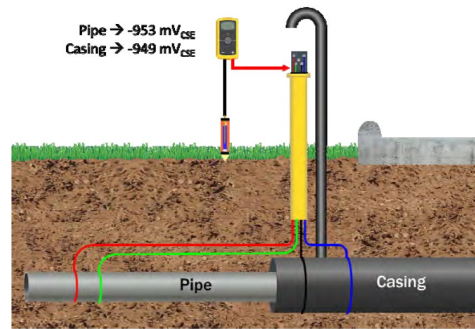


Figure 4 – Cased Crossing

	<u>Pipe & Casing Shorted/Isolated</u>	<u>Pipe Outside Casing</u>	<u>Pipe Inside Casing</u>	<u>Casing External Surface</u>
a.	Isolated	Protected	Protected	Unprotected
b.	Shorted	Protected	Protected	Protected
c.	Unknown	Protected	Unknown	Unknown
d.	Shorted	Protected	Unprotected	Protected
e.	Isolated	Protected	Unknown	Unknown

12. Referring to Figure 5, if the indicated potentials are measured while the CP system is on, which of the following conditions is confirmed?

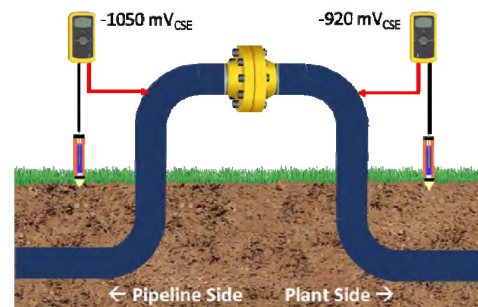


Figure 5 – Isolating Flange

	<u>Flange Isolated</u>	<u>Pipeline Side</u>	<u>Plant Side</u>
a.	Isolated	Protected	Protected
b.	Unknown	Unknown	Unknown
c.	Shorted	Protected	Protected
d.	Isolated	Protected	Unprotected
e.	Unknown	Protected	Protected

13. Referring to TR panel in Figure 7, what is the DMM in Figure 6 most likely measuring?

- Voltage at 1 to 2
- Voltage at 5 only
- Voltage at 8 to 9
- Voltage at 10 only
- Voltage at 11 only



Figure 6 – DMM Measurement

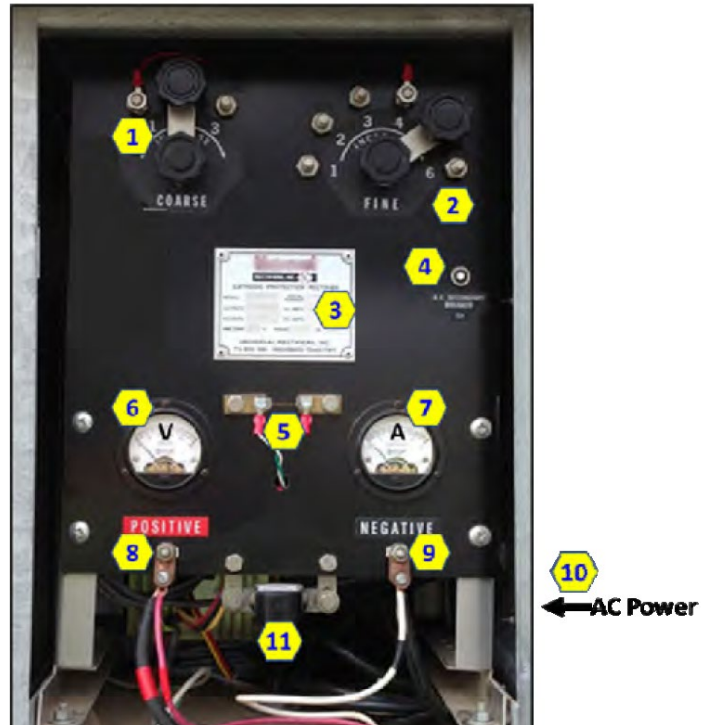


Figure 7 – Typical TR Front Panel

14. Referring to TR panel in Figure 7, which most accurately describes component IDs?

	<u>ID 1</u>	<u>ID 4</u>	<u>ID 5</u>	<u>ID 6</u>	<u>ID 7</u>	<u>ID 8</u>	<u>ID 9</u>	<u>ID 11</u>
a.	Tap	Breaker	Shunt	Ammeter	Voltmeter	+ve Out	-ve Out	Spark Gap
b.	Breaker	Tap	Spark Gap	Voltmeter	Ammeter	+ve Out	-ve Out	Shunt
c.	Breaker	Tap	Spark Gap	Voltmeter	Ammeter	-ve Out	+ve Out	Shunt
d.	Tap	Breaker	Shunt	Voltmeter	Ammeter	-ve Out	+ve Out	Spark Gap
e.	Tap	Breaker	Shunt	Voltmeter	Ammeter	+ve Out	-ve Out	Spark Gap

15. Referring to Figure 8, which value will DMM display when connected as shown?

- 27 A
- 2.7 A
- 2.7 mV
- 0.27 V
- 0.027 V



Figure 8 -TR Measurement

Soil Resistivity

16. Assuming the measurement shown in Figure 9 is from a Wenner 4-Pin arrangement with 1.5 m spacing between pins, what is the corresponding soil resistivity?

- a. $66 \Omega \cdot \text{m}$
- b. $660 \Omega \cdot \text{cm}$
- c. $6,600 \Omega \cdot \text{m}$
- d. $66,000 \Omega \cdot \text{cm}$
- e. $660,000 \Omega \cdot \text{m}$

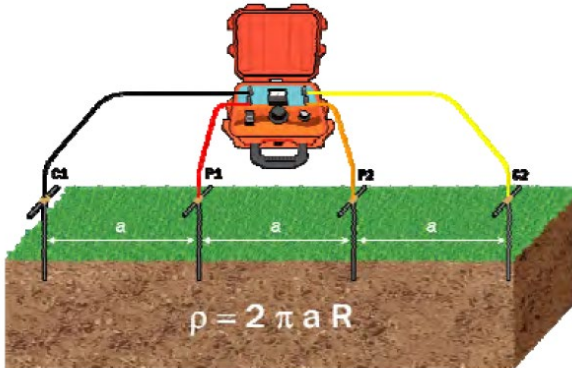


Figure 9 – Soil Resistance Measurement

Figure 10 – 4-Pin Wenner Measurement

17. Assuming the measurement shown in Figure 11 is for the soil box as shown in Figure 12 having a soil cross-sectional area (A) of 12 cm^2 and length (L) of 120mm between the red terminals, what is the corresponding soil resistivity?

- a. $0.35 \Omega \cdot \text{m}$
- b. $3.5 \Omega \cdot \text{m}$
- c. $35 \Omega \cdot \text{cm}$
- d. $35 \Omega \cdot \text{m}$
- e. $350 \Omega \cdot \text{m}$



Figure 11 – Soil Resistance Measurement



Figure 12 – Soil Box Measurement

Shunt Measurements

18. What is the shunt current magnitude & direction for the measurement shown in Figure 13?

	<u>Current</u>	<u>Direction</u>
a.	6.5mA	Right to Left
b.	6.5 A	Left to Right
c.	6.5 A	Right to Left
d.	10.4 A	Left to Right
e.	10.4 A	Right to Left

19. What would the meter in Figure 13 display if the shunt current was 40 A from Right-to-Left?

- 25 mV
- +25 mV
- 40 mV
- +40 mV
- +50 mV



Figure 13 – Shunt Measurement

Meter Operation

20. Referring to Figure 14, select the correct configuration to measure 50mA output current of a galvanic anode with a 'positive' meter indication.

	<u>Connect to</u> <u>Anode</u>	<u>Connect to</u> <u>Structure</u>	<u>Selector</u> <u>Switch</u>	<u>Mode</u>
a.	2	1	V _{DC}	--
b.	1	2	V _{DC}	--
c.	2	3	mA	DC
d.	3	2	mA	DC
e.	2	4	A	AC

21. Referring to Figure 14, select the recommended configuration for pipe-to-soil potential measurements to assess protection.

	<u>Connect to</u> <u>Structure</u>	<u>Connect to</u> <u>Reference</u>	<u>Selector</u> <u>Switch</u>	<u>Mode</u>
a.	1	2	V _{DC}	--
b.	2	1	V _{DC}	--
c.	1	2	V _{AC}	--
d.	3	2	mA	DC
e.	1	2	Ω	--



Figure 14 – Typical DMM

Stray Current

22. At which location(s) in Figure 15 is corrosion expected due to stray current?
- 1 & 2 only
 - 1, 3 & 5 only
 - 2, 4 & 6 only
 - 3 & 5 only
 - 5 only

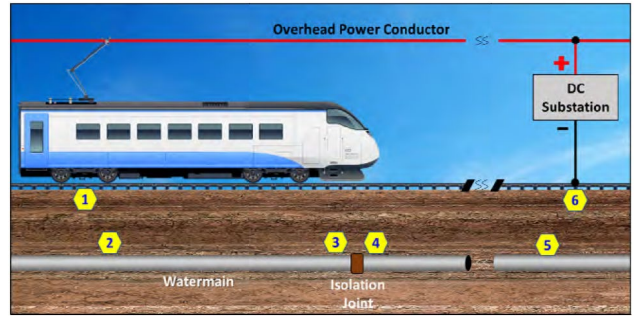


Figure 15 – DC Powered Train

Math – Algebra, Geometry, Logic, Unit Conversions

23. What is the weight of a steel rod that is 50 mm diameter by 3 feet long?
- Given: 1 inch = 2.54 cm; 1 foot = 12 inches, 1 kg = 2.205 lb, 1 cm³ of steel = 8 g
- 3.25 lb
 - 3.69 kg
 - 11.6 kg
 - 31.7 lb
 - 59 kg
24. How much CP current is required to protect a buried steel storage tank that is 3 m diameter by 6 m long and coated (i.e. 4% bare) in 8,500 $\Omega \cdot \text{cm}$ soil based on a design CP current density of 20 mA/m² of exposed steel surface area?
- 45 mA
 - 51 mA
 - 57 mA
 - 1.27 A
 - 1.41 A
25. Point A on a pipeline is 16 km upstream of Point B. There are no sources of DC current connected to the pipeline between these two points. The line current measured at Point A is 6.3 A upstream and the line current measured at Point B is 2.4 A downstream. How much CP current is being picked up or discharged along the pipeline between Points A & B?
- 3.9 A pick-up
 - 3.9 A discharge
 - 6.3 A pick-up
 - 8.7 A discharge
 - 8.7 A pick-up

- | | |
|-------|-------|
| 1. B | 13. A |
| 2. C | 14. E |
| 3. E | 15. E |
| 4. D | 16. C |
| 5. D | 17. D |
| 6. C | 18. D |
| 7. A | 19. A |
| 8. B | 20. A |
| 9. C | 21. A |
| 10. C | 22. B |
| 11. D | 23. D |
| 12. B | 24. C |
| | 25. E |