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[Topic II: Thermodynamics](#)

[Chapter 7. Inorganic Chemistry](#)

Practice Problems

1.

The gravimetric analysis of a compound is 40% carbon, 6.7% hydrogen, and 53.3% oxygen. The simplest formula for the compound is most nearly

(A)

HCO

(B)

HCO₂

(C)

CH₂O

(D)

CHO₂

2.

When used together, which of the following metal pairs is LEAST likely to experience galvanic corrosion in sea water?

(A)

zinc and platinum

(B)

zinc and 316/317 stainless steel

(C)

316/317 stainless steel and lead

(D)

brass and copper

3.

When use of dissimilar metals is unavoidable, which of the following CANNOT be used to prevent or reduce the likelihood of galvanic corrosion?

(A)

inert spacers between the dissimilar metals

(B)

sacrificial anodes

(C)

paints, coatings, and natural oxide buildups

(D)

layers of cadmium, nickel, chromium, or zinc plating

[4.](#)

A sacrificial galvanic protection system is proposed for a water storage tank made of low-alloy steel. Which of the following materials is most suitable as the sacrificial anode?

(A)

brass

(B)

nickel

(C)

stainless steel

(D)

zinc

[5.](#)

A linear actuator mechanism incorporates a naval brass threaded rod that passes through a threaded metallic collar. The mechanism is exposed to both fresh and saltwater. To limit galvanic corrosion, which material would be best for the mechanism's collar?

(A)

zinc-plated carbon steel

(B)

nickel-plated carbon steel

(C)

316 stainless steel

(D)

Hastelloy A

Solutions

[1.](#)

Calculate the relative mole ratios of the atoms by assuming there are 100 g of sample.

For 100 g of sample,

substance	mass	$\frac{m}{AW} = \text{no. moles}$	relative mole ratio
C	40 g	$\frac{40}{12} = 3.33$	1
H	6.7 g	$\frac{6.7}{1} = 6.7$	2
O	53.3 g	$\frac{53.3}{16} = 3.33$	1

The empirical formula is CH₂O.

The answer is (C).

[2.](#)

Galvanic corrosion (galvanic action) results from a difference in oxidation potentials of metallic ions. The greater the difference in oxidation potentials, the greater the likelihood of galvanic action. To determine which of the options are least likely to experience galvanic action, use the galvanic series chart, in table CERM22006 (also the *NCEES Handbook* table titled “Galvanic Corrosion”). The closer the pair of metals are, the less likely they are to experience galvanic corrosion. Therefore, of the options, brass and copper are least likely to experience galvanic corrosion.

The answer is (D).

[3.](#)

While cadmium, nickel, chromium, and zinc are often used as protective deposits on steel, porosities in the surfaces can act as small galvanic cells, resulting in invisible subsurface corrosion.

The answer is (D).

[4.](#)

From table CERM22006 (also *NCEES Handbook* table “Galvanic Corrosion”), brass, nickel, and stainless steel have lower potentials than low-alloy steel; therefore, they will be cathodic, not anodic. Zinc has a higher potential than low-alloy steel, so it can be used as the sacrificial anode.

The answer is (D).

[5.](#)

From table CERM22006 (also *NCEES Handbook* table “Galvanic Corrosion”), nickel is the closest to brass of the options provided, so nickel-plated carbon steel should be used to make the actuator’s threaded collar.

The answer is (B).