

ANSWER MASK

157. Hydrogen sulfide corrosion is usually concentrated on small areas. It is a form of (uniform / localized) corrosion.
158. The iron sulfide becomes the cathode and the steel underneath it becomes the _____ .
159. The steel will corrode (mildly / severely) .
160. When carbon dioxide combines with water, carbonic acid forms. This mixture would (be corrosive / not be corrosive) .
161. When carbon dioxide is present, there is relatively no odor. Therefore, it is known as sweet corrosion.
- The product of sweet corrosion is (iron carbonate / iron sulfide) .
162. These gases often appear within the product being produced. So, corrosion is a problem (outside / inside) the pipe itself.
163. Carbonic acids present in a solution give that solution a _____ pH level.
164. Oxygen also becomes corrosive in the presence of _____ .
165. Oxygen in this type of situation acts as a depolarizer. Depolarization has the opposite effect as polarization; this means that oxygen (slows down / speeds up) corrosion.
166. Oxygen can also be considered corrosive when different concentrations are present in the same corrosion cell. As you recall, this forms an _____ - _____ cell.
167. The area with the low oxygen concentration is the (anode / cathode) .

SALTS

168. Along with these gases, dissolved salts can also alter the corrosion rate.
- Salt increases the ability of an electrolyte to conduct _____ .
169. Therefore, since salt increases the electric current, you can expect the rate of corrosion to _____ .
170. The concentrations of salt in the electrolyte solution, as you learned, affects corrosion. The area with the higher concentration of salt is (anodic / cathodic) .
171. In addition, salt often interferes with the formation of a passive film. Therefore, the chance of corrosion (increases / decreases) .

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MICROORGANISMS

172. Oilfield equipment not only corrodes because of salt, there is also a problem with microorganisms (called sulfate reducing bacteria, or SRB's).

There are some microorganisms that produce a sulfide as part of their life processes. This sulfide reacts with the moisture surrounding the equipment in the _____ .

173. The outcome of sulfide reacting with the moisture is hydrogen sulfide. As you recall, this combination is very _____ .
174. Some microorganisms produce a slime that covers the surface of the metal. This reduces the amount of oxygen under the slime layer and forms an _____ - _____ cell.
175. The area under the slime layer will (be passive / corrode) .
176. A slime layer is more likely to form in an area of (low flow / high flow) .

CORROSION MONITORING

177. In order to control corrosion effectively, it is helpful to detect corrosion when the problem is still small. Therefore, the earlier you find a corrosion problem, the easier it usually is to _____ .
178. Monitoring serves two main purposes. First, it can be used to determine the rate at which _____ is occurring.
179. Second, monitoring is a way to determine whether steps being taken to reduce corrosion are _____ .
180. In either case, careful monitoring allows for comparison of existing conditions for corrosion with previous conditions in order to determine if some corrective _____ needs to be taken.

VISUAL INSPECTION

181. A very basic way to detect corrosion is by visual inspection. If you see rust on a pipe, you know _____ has occurred.
182. If you see that the water from within the system had either a red or black tint, you could assume (corrosion has occurred / this is normal) .
183. Odor is another way to detect corrosion. If you smell an odor similar to rotten eggs, this can indicate the presence (oxygen / hydrogen sulfide) .

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184. Since you, as the operator, work with the equipment, you may detect a problem sooner than anyone else. Therefore, it is essential for you to report any changes that you may see. When you suspect a problem, you should (report it / forget it).
185. There are obvious limitations to visual inspection. Subsurface and downhole equipment and inner surfaces of equipment can only be visually _____ when pulled or disassembled.
186. If a scale or paraffin layer has formed over the metal, the full extent of corrosion and its damage may be _____.
187. Also, visual inspection is (a good indication / not a good indication) of the cause of corrosion.
188. Visual inspection may be a helpful starting point to corrosion detection because the results let you know (the cause of corrosion / that you need more tests).

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WATER SAMPLING

189. Another method of monitoring corrosion is sampling any water present in most production processes.
- Therefore, testing or sampling the water can indicate the presence of _____.
190. Repeated samples can give you an indication as to the probability or rate at which corrosion may occur. This way you can treat or _____ corrosion before it gets out of hand.
191. To accurately test the water, it is important to collect water that represents the existing conditions.
- This means that you should take a sample at conditions that (normally exist / only indicate the presence of corrosion).
192. Therefore, in a well producing water, you would want to collect water that is (static / moving).
193. Also, in order to make this sampling as accurate as possible, it is important to use clean equipment. Dirty equipment will (contaminate / not affect) the sample.
194. You should also cover your sample as soon as possible to avoid any unwanted particles from entering the container and _____ the sample.
195. As with any type of monitoring system, accurately labeling of the specimen is essential. Incorrect or missing information will make the specimen _____.
196. A label should include such information as the equipment used, the service involved, and the location in which the _____ was taken.

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197. There are several products that you should look for when sampling.

Most often you can check the iron content in the water. Large amounts of iron usually indicate the presence of _____.

198. Many times, suspended corrosion products found in the water would indicate probable _____.

199. As you recall, many bacteria produce a sulfide. So, if bacteria cultures are found in the water, you would know that (carbon dioxide / hydrogen sulfide) may be present.

200. In addition, you can test for particles that are floating in the water.

If you found particles of iron carbonate suspended in the water, this would indicate the presence of (carbon dioxide / hydrogen sulfide).

201. If large amounts of gases, such as oxygen or carbon dioxide, are found dissolved in the water, you know the water is (corrosive / passive).

202. Knowing the products present in the water guides us in knowing how to _____ corrosion.

203. Water sampling can also indicate how well the treatment is working.

If, after two months of treatment, there is still iron sulfide visible in the water, you could conclude that treatment is (successful / not working effectively).

204. There are also limitations to this method of monitoring.

As you recall, results can be misleading or incorrect if the sampling equipment is _____ or the sample taken was of conditions that do not _____ exist.

205. Results are also misleading with regard to severity. The test results may show corrosion is present, but the results are (able / unable) to reveal the severity of the corrosion that has occurred.

206. Also, the results are not conclusive as to the location or the reason the corrosion agent is present.

This is especially true when checking the iron content in the water. Because so many variables can affect the amount of iron found, the results (can determine / cannot determine) the cause or rate of corrosion.

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