(a) The artefact consists of mud and metal strips.

- Salt solutions (e.g., $NaCl$) dissolved in the sea water,
- mud, saltpetre and saltpetre the wood. Salt solutions
- mud penetrate into the plant cells of the wood, causing
- weakening of the structure cell walls, become weak
- these the artefact will break easily after 150 years
- of saturation. Also, enrustating unlike organics
- and various mures would reside on the wood. Such
- results in visual holes on the surface of wood.

2. It means the salt saturation to occur we slightly,
- as the saltly is able to penetrate deeper into the wood.
- Salt solutions also penetrate into the rocks on the metal
- strips (i.e., salt saturation). Continuous exposure to
- the oxidising agents of $H_2O$ (e.g., $O_2$) under the
- ocean would have caused corrosion of the metal. Black
- metal sulphides (e.g., $Ag_2S$, $PbS$) would be on the surface
- of the metal. If it is him strips, hostile would be
- found (Fe$_2$O$_3$·$H_2$O). The corrosion causes weakening
- of the metal structure, making it easily broken and
- brittle. Enrustation would also be found on the metal.
(b) Dc power source + conductive wire

Anode: $2\text{H}_2\text{O}(l) \rightarrow \text{O}_2(g) + 4\text{H}^+ + 4\text{e}^- \quad E^0 = -1.23 \text{V}$

Cathode: $2\text{H}_2\text{O}(l) + 2\text{e}^- \rightarrow \text{H}_2(g) + 2\text{H}_2\text{O}(l) \quad E^0 = -0.83 \text{V}$

Overall: $6\text{H}_2\text{O}(l) \rightarrow 2\text{O}_2(g) + 2\text{H}_2(g) + 4\text{H}_2\text{O}(l) \quad E^0 = -2.06 \text{V}$

Zn an electrolytic cell, electricity is put in for non-spontaneous reaction (redox). Since cathode is where reduction occurs (gaining of electrons), the electrode to which negative terminal of the DC electricity is connected is the cathode. It reportedly changes.
o Steel 1 has 0.2% carbon and 99.8% iron. Such a composition suggests that it is a mild steel, low concentration of carbon (0.1 - 0.5%) provides flexibility to the steel. This type of steel is able to withstand severe events as it is flexible, e.g. it could be used to build ship hulls which must be able to withstand weather events.

However, because steel 1 is only composed of Fe and C, it has low resistance to corrosion, thus would rust relatively rapidly when exposed to atmospheric agents (O, CO, H2O).

Therefore, steel used in ship building must be protected in corrosion.

o Steel 2 has 1.5% C, which makes it much harder than mild steel. Such type of steel is used to make tools such as hammers because it is very strong. However, its lack of flexibility (high C) makes it unsuitable for ship or built by captains (unable to withstand events).

o Steel 3 contains manganese and silicon, which provide a degree of resistance to corrosion. However, its high carbon concentration makes it very brittle. Such steel would crack when cold and Si has its distinct appearance as silumin made it very useful to other iron alloys. This steel 3 could be used to make cutlery to provide a brittle aspect, as well as if stay out hard nature.
Start here.

(Cd)

1/0 pH of the water in which sun is submerge:

- Sun (FeCl)
- Until pink

pH 4
pH 7
pH 9

- Set up the above apparatus.
- Observe the changes made to the Sun plants over a 5 day period. Rate the degree of corrosion of Sun:
  1: No corrosion, 5: Significant corrosion.
- All the other variables will be kept the same
  eg. weight of each piece, temperature, amount of water used

- Concentration of oxygen O₂ in the water.

- Set up the tube apparatus
- Observe the changes made over a 5 day period, and rate the level of corrosion from 1 to 5
- All the other variables kept the same
  eg. pH of the water, weight of each Sun piece, temperature etc.
Temperature of water

Fe(s)  

Tap water  

kept in the fridge  

for 30 minutes  

Set up the above apparatus, observe the changes for  
5 day period. Measure the level of copper ion 1 to 5  
Other variables: pH, concentration of O₂ etc. must be kept the same.

7) Iron could be suffered alloyed very rapidly.  
It forms an impermeable layer of oxide, which  
prevents the O₂ gas from reaching the Fe(s).  
Thus, the level of copper would be decreased.

(c)

Wooden artefacts.

- when wooden artefacts are recovered from the sea water,  
  it must be placed in distilled water to diffuse salt ions  
  which have saturated into the organic materials. The water  
  must be replaced regularly, until an equilibrium is reached  
  i.e. no more ions. The process can be monitored using conductivity  
  probe, as ions (Fe⁺, Fe₂⁺) are able to conduct electricity.  
  i.e. it conductively  
  - wooden artefacts are not suitable for electrolysis.  

When the current is put into the objects, it goes further  

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dangers to the structure as plant cells in wood
artefacts become run the current is applied.
– After delamination of salt layers, the wooden artefacts
can be dried. If delamination is not controlled adequately,
the salts would expand and crystallise, causing further
damage to the artefacts. When the artefacts are completely
dry, PEA can be applied to the objects. It provides
physical bound to the wooden objects to prevent the
weakening of the structure. It also strengthens the
cell wall and helps the artefacts to maintain their shape.
→ Evaluate: Techniques used in laboratory and conserving
wooden artefacts are very suitable, because they prevent
further damage due to the structure and also helps
to purify by neutralising acidic and salt
agents.

0 Copper artefacts
– Salt solution in the sea water would have saturated
the copper artefacts. If it is kept dry, salts crystallise
and expand, causing damage to the artefacts as cracks widen.
The copper artefacts are stabilised in dilute nitric
solutions, which diffuses the salt lens. Also, it prevents
the artefacts from being exposed to acidic environment
which will accelerate the corrosion.

\[ \text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O} \quad E^\circ = 1.23 \text{ V} \]
– Eucalyptus proved on the surface of the artefacts

You may ask for an extra Writing Booklet if you need more space.