September 18, 2017

Q.1) Consider the following statements about WASP-12b

1. It was discovered by the SuperWASP planetary transit survey
2. The measured albedo is twice that of Earth
3. It is categorised as a hot Jupiter

Select the correct statements

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.1) Solution (c)

WASP-12b is an extrasolar planet orbiting the star WASP-12, discovered by the SuperWASP planetary transit survey. Its discovery was announced on April 1, 2008.

WASP-12b reflects almost no light, making it appear essentially pitch black.

The measured albedo of WASP-12b is 0.064 at most. This makes WASP-12b two times less reflective than our Moon which has an albedo of 0.12. Earth's albedo 0.3.

WASP-12b orbits the Sun-like star WASP-12A.

With a radius almost twice that of Jupiter and a year of just over one Earth day, WASP-12b is categorised as a hot Jupiter.

Since it is so close to its parent star, the gravitational pull of the star has stretched WASP-12b into an egg shape and raised the surface temperature of its daylight side to 2600 degrees Celsius.

The high temperature is also the most likely explanation for WASP-12b's low albedo.

The daylight side of WASP-12b is so hot that clouds cannot form and alkali metals are ionised.

It is even hot enough to break up hydrogen molecules into atomic hydrogen which causes the atmosphere to act more like the atmosphere of a low-mass star than like a planetary atmosphere. This leads to the low albedo of the exoplanet.

To measure the albedo of WASP-12b, the scientists observed the exoplanet last year during an eclipse, when the planet was near full phase and passed behind its host star for a time.

This is the best method to determine the albedo of an exoplanet, as it involves directly measuring the amount of light being reflected. However, this technique requires a precision ten times greater than traditional transit observations.

WASP-12b is only the second planet to have spectrally resolved albedo measurements, the first being HD 189733b, another hot Jupiter.

WASP-12b atmosphere is composed of atomic hydrogen and helium.

Q.2) Consider the following statements about Air Independent Propulsion (AIP) Systems in Submarines

1. AIP modules give stealth and extended endurance to diesel-electric submarines by allowing them to stay submerged longer.
2. DRDO is developing fuel cell based Air Independent Propulsion (AIP) system

Select the correct statements

a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

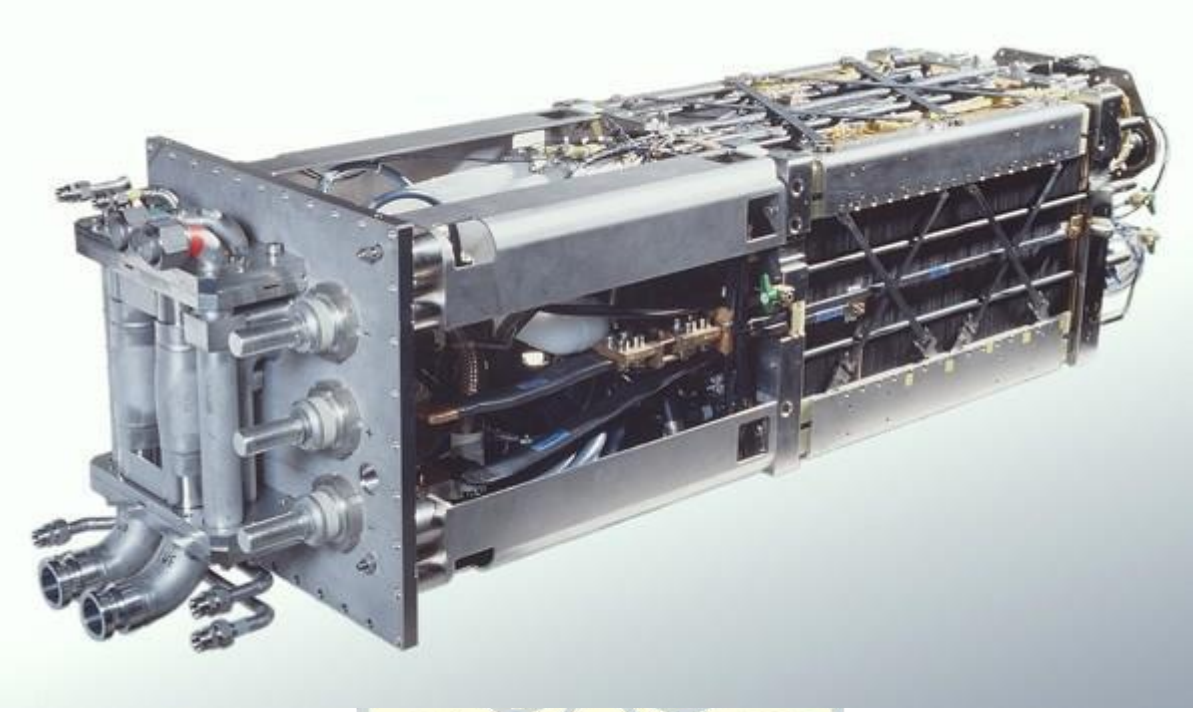
Q.2) Solution (c)

The use of AIP on a diesel-electric submarine, greatly increases their underwater endurance, allowing them to continuously stay submerged for weeks without surfacing. Although the submarine eventually needs to surface to charge its batteries and their endurance is nowhere on-par with nuclear powered submarines, the vast increase in endurance offered by AIP gives them an advantage over non AIP equipped diesel-electric submarines. However AIP doesn't give any advantage other than increased underwater advantage and it should not be assumed that AIP-equipped submarines will always defeat their non-AIP equipped counterparts.

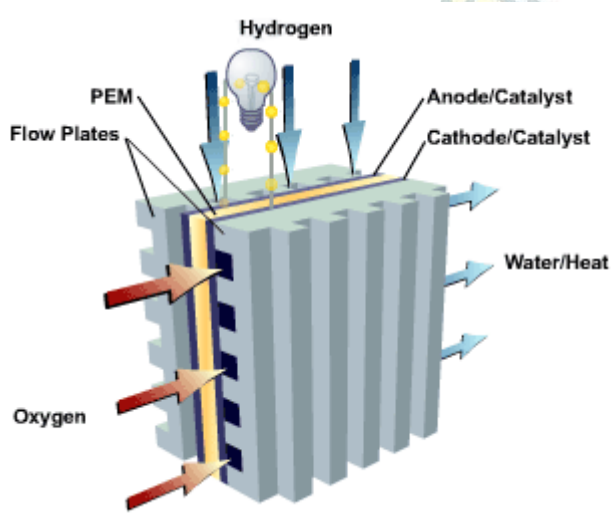
Fuel Cells

A Fuel Cell is a device which converts chemical energy into electricity. This is done using a fuel and an oxidizer. A typical fuel cell converts Hydrogen (fuel) and Oxygen (oxidizer) into electricity, with water and heat released as by-products. This is done by an electrolytic cell which consists of two electrodes, one positive (anode) and the other negative (cathode), separated by an electrolytic barrier. The reaction between the cathode and anode produces

an electric current, which is used to charge the batteries. A chemical catalyst is used to speed up the reactions.



Phosphoric Acid Fuel Cells (PAFC) and Proton Exchange Membrane Fuel Cells (PEMFC) are presently used in submarines. Germany is said to be the world leader in developing and fielding this type of AIP, which is backed by the large number of export orders they have received. France is developing a new generation Fuel Cell AIP as a successor to its MESMA. India is another country which is developing a Fuel Cell AIP to be integrated on their submarines.



Fuel cells are the most advanced and preferred AIP technology today. This is because of the major advantages they offer in stealthiness and power generation. They contribute to the

stealthiness of the sub as Fuel Cells have almost no moving parts, which significantly reduces the acoustic signature of the sub. Fuel Cells can achieve an efficiency of over 80% under certain circumstances. They can also be scaled easily into large or small sizes depending on the displacement of the submarine. This is easier than developing different systems for each submarine class. Hydrogen Fuel Cells are also very environment friendly as they generate no exhaust fumes, which in turn eliminates the need to have special exhaust scrubbing and disposal machinery. The only drawback is that they are expensive and complex.

L&T is currently partnering with the DRDO as Lead System Integrator for the indigenous development of the fuel cell based AIP system.

Source: http://www.thehindu.com/todays-paper/tp-miscellaneous/tp-others/scorpene-submarines-to-get-indian-aip-modules/article19701741.ece

Q.3) Java is an island of which of the following?

a) Sri Lanka
b) Borneo
c) Nicobar
d) Indonesia

Q.3) Solution (d)

Source: http://www.thehindu.com/todays-paper/tp-miscellaneous/tp-others/tiger-species-thought-extinct-may-be-alive/article19701660.ece

Q.4) The Trade Disputes Act of 1929 provided for

a) the participation of workers in the management of industries

b) arbitrary powers to the management to quell industrial disputes
c) an intervention by the British Court in the event of a trade dispute
d) a system of tribunals and a ban on strikes

Q.4) Solution (d)

The Trade Disputes and Trade Unions Act 1927 (17 and 18 Geo V c 22) was a British Act of Parliament passed in response to the General Strike of 1926, introduced by the Attorney General for England and Wales, Sir Douglas Hogg MP.

The Act declared unlawful secondary action and any strike whose purpose was to coerce the government of the day directly or indirectly. These provisions were declaratory insofar as such strikes had already been ruled unlawful by Astbury, J in the National Sailors' and Firemen's Union v Reed. The Act reaffirmed his judgment and gave it the force of statute law. In addition, incitement to participate in an unlawful strike was made a criminal offence, punishable by imprisonment for up to two years; and the attorney general was empowered to sequester the assets and funds of unions involved in such strikes.

Q.5) Which of the following statements is/are correct?

Proper design and effective implementation of UN-REDD+ Programme can significantly contribute to

1. protection of biodiversity
2. resilience of forest ecosystems
3. poverty reduction

Select the correct code

a) 1 and 2 only
b) 3 only
c) 2 and 3 only
d) 1, 2 and 3

Q.5) Solution (d)

The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries was launched in 2008 and builds on the convening role and technical expertise of the Food and Agriculture Organization of the

United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

The UN-REDD Programme supports nationally led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including indigenous peoples and other forest-dependent communities, in national and international REDD+ implementation.

Reducing Emissions from Deforestation and Forest Degradation (REDD+) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths for sustainable development.