All. 1 al verbale VI

CONCORSO PER TITOLI ED ESAMI PER L'ASSUNZIONE PRESSO I LABORATORI NAZIONALI DEL GRAN SASSO DELL'INFN DI UNA UNITA' DI PERSONALE A TEMPO INDETERMINATO CON PROFILO DI TECNOLOGO DI III LIVELLO PROFESSIONALE

BANDO 21940

PROVA ORALE

GRUPPO A -impianti industriali per la ventilazione e il trattamento aria:

1. Sistemi di recupero energia su UTA;
2. trattamento aria nel caso invernale;
3. trattamento aria nel caso estivo;
4. Sistemi di filtrazione;
5. Manutenzione UTA;
6. Sistemi di diffusione dell'aria;
7. Tipologie ventilatori UTA;

GRUPPO B - Impianti industriali per il riscaldamento centralizzato:

1. Generatori di calore a combustibile;
2. Generatori di calore termodinamici;
3. Confronto fra sistemi di riscaldamento ad alta temperatura e sistemi di riscaldamento a bassa temperatura;
4. Tipologie di terminali per il riscaldamento;
5. Metodologie di risparmio energetico delle centrali di riscaldamento;
6. Tipologie di pompe;
7. Descrizione dei principali componenti di una centrale di riscaldamento;

GRUPPO C - Impianti idraulici di tipo industriale quali centrali idriche per l'alimentazione di sistemi antincendio e di anelli di raffreddamento:

1. Sistemi di pompaggio antincendio e sistemi di sicurezza;
2. Sistemi di spegnimento incendi;
3. Impianto sprinkler: cos'è e come funziona;
4. Sistemi di rilevazione antincendio;
5. Compartimentazione;
6. Sistema antincendio ad anello;
7. Particolarità centrali idriche per l'alimentazione di sistemi di spegnimento incendi;

GRUPPO D - Nozioni di informatica:

1. Cos'è un file .docx;
2. Cos'è un file .xlsx;
3. Cos'è un file .dwg;
4. Cos'è un sistema operativo;
5. Cos'è la ram;
6. Cos'è la hard disk;
7. Cos'è la CPU;

CONCORSO 21940

Gruppo E - testo 1

PARTICLE PHYSICS

Fermi National Accelerator Laboratory is a Department of Energy national laboratory dedicated to particle physics research. Fermilab supports work by scientists, from across the country and the globe, who seek to further our understanding of matter, energy, space and time.

At Fermilab, a robust scientific program pursues answers to key questions about the laws of nature and the cosmos.

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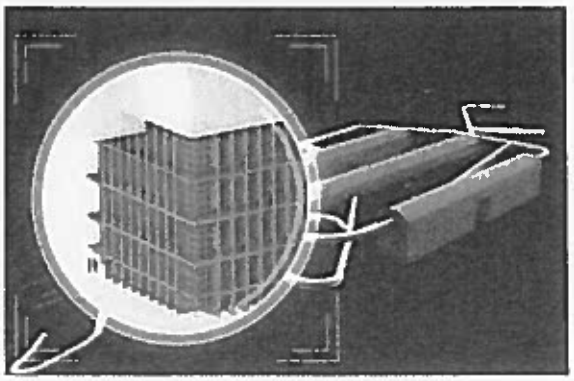
Gruppo E - testo 2

DUNE AT LBNF



The international DUNE at LBNF, hosted by Fermilab, is an international flagship experiment to unlock the mysteries of neutrinos. DUNE will use Fermilab's powerful particle accelerators to send the world's most intense beam of high-energy neutrinos to DUNE's massive neutrino detectors, which will explore neutrinos' interactions with matter.

This ambitious project requires giant particle detectors, an intense beam of neutrinos and international infrastructure to bring it all together.

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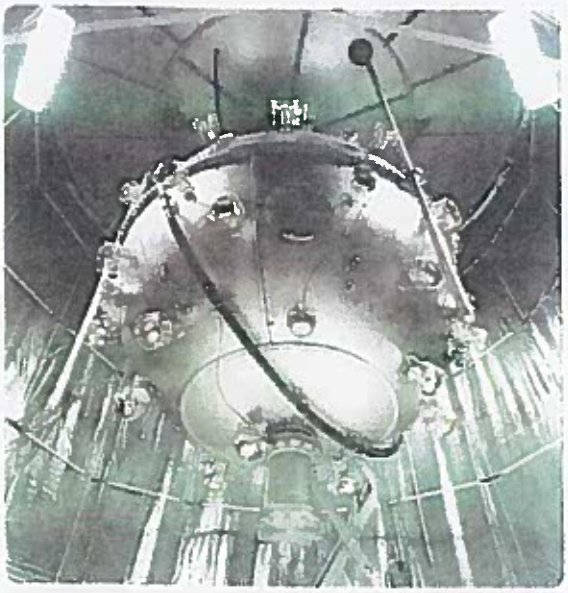
Gruppo E - testo 3

DEAP-3600

Dark Matter

Dark Matter

DEAP-3600 uses a vessel of liquid argon to look for dark matter. When argon atoms are excited by particle interactions, they produce ultraviolet light. This light is then detected by sensors surrounding the vessel and analyzed to determine what caused it.



Did you know?

- DEAP-3600 gets its name because it uses about 3,600 kg of liquid argon as its target.
- The spherical acrylic vessel in the centre of DEAP had to be brought into the lab in orange-slice shaped pieces because it was too big to fit in the mine cage in one piece.
- The argon is kept liquid through high pressure and low temperature. If it became gaseous, it would take up almost 600 times as much volume.

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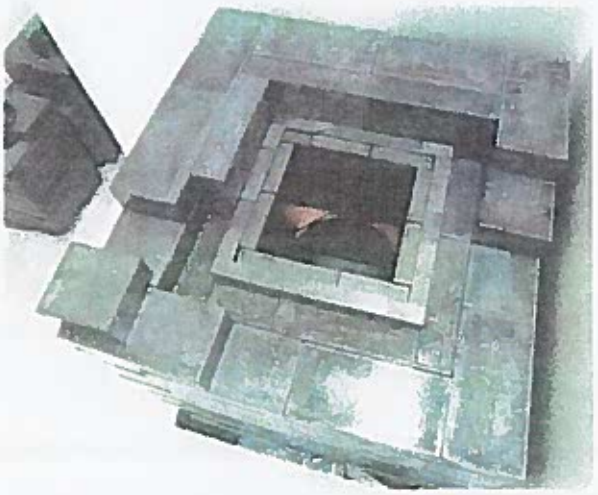
Gruppo E - testo 4

DAMIC

Dark Matter

Dark Matter

DAMIC uses CCDs (charged coupled devices) to look for dark matter interactions. The silicon CCDs are electical circuits made up of many capacitors, which are extremely sensitive to small changes in energy. When a dark matter particle interacts, that energy change can be measured, creating a signal in the data.



Did you know?

- The CCDs used in the next generation DAMIC-M will be some of the largest ever built, at 20 g each.
- Interactions within the CCDs are recorded in pixels along the x and y axes, making it possible to map an interaction and determine what particle caused it.
- DAMIC is housed in a copper box which is kept in a vacuum at a temperature of 130 Kelvin, or about -140 C.

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Gruppo E - testo 5

Research highlights

JUST ADD SALT WATER TO BREATHE LIFE INTO MARS

A device that uses electricity to decompose water could transform brines on Mars into a supply of hydrogen fuel and life-supporting oxygen.

The red planet's atmosphere is rich in carbon dioxide but contains just 0.14% oxygen. To support a human on Mars, NASA plans to generate oxygen by ripping it from CO_2, creating carbon monoxide and oxygen.

As an alternative strategy, Vijay Ramani and his colleagues at Washington University in St. Louis, Missouri, built an electrolyser, a device that splits liquid water into its constituent gases, hydrogen and oxygen. On Mars, most water is frozen, but some areas have high concentrations of magnesium salts, which help water to remain liquid at low temperatures. The authors' electrolyser has one electrode made of a lead- and ruthenium-based compound, which promotes oxygen gas generation at the electrode even under salty conditions.

The team tested the electrolyser on a concentrated solution of magnesium salts in a CO_2-rich atmosphere at −36 °C, simulating Martian conditions. Compared with NASA's approach, the electrolyser has the potential to make 25 times the volume of oxygen using the same amount of power.

Proc. Natl Acad. Sci. USA https://doi.org/fmcf (2020)

News in brief

MILKY WAY MAP REVEALS ONE BILLION STARS IN MOTION

A huge data update from the Gaia space observatory – which is tracking more than one billion stars in the Galaxy – offers a picture of what Earth's night sky will look like for 1.6 million years to come.

The European Space Agency probe lifted off in late 2013, and began observing stars in July 2014 from a perch 1.5 million kilometres from Earth. Gaia continuously scans the sky as it slowly spins, and it has now measured the positions of the same stars multiple times. This enables scientists to track stars' nearly imperceptible motions across the Galaxy year after year, and to triangulate their positions using a technique called parallax.

The latest update is based on around three years of data, and includes a complete census of the Sun's neighbourhood: all but the faintest stars within 100 parsecs (326 light years), totalling more than 300,000 objects. The mission has expanded its catalogue of stars by 15%, and its measurements have become more precise

The data will underpin studies that range from the origins and evolution of the Galaxy to locating its dark matter.

History of SNOLAB

From 1970 to 1994, there was another underground neutrino detector set up in a mine in South Dakota. The Homestake experiment, a brainchild of Dr. Ray Davis, was set up to measure neutrinos from the Sun. The data collected presented a problem: the detector measured only about a third the number of neutrinos predicted by theorists. The experiment appeared to be sound, so what was going on? Physicists were concerned there may be fundamental flaws in the Standard Model, something wrong with our entire understanding of physics. There was even a possibility the diminished neutrino output was a sign that the Sun was actually going out (because of electromagnetic interactions light takes much longer to escape the Sun than neutrinos, so this was a valid concern).

The SNO experiment was designed to address this question, dubbed by physicists 'The Solar Neutrino Problem'. Scientists knew that neutrinos came in three flavours: electron, muon, and tau. Up until this point, it was assumed that they did not change flavour. The Homestake experiment was sensitive only to electron neutrinos, the flavour produced in the Sun. SNO was designed to be sensitive to all three flavours of neutrino. Years of data from the SNO experiment found that in fact the Sun was creating the expected number of neutrinos, but they were changing flavour on their journey to Earth, so the Homestake experiment missed some of them.

https://www.snolab.ca