ALL. 1

1) Descrivi le tecniche analitiche utili per la caratterizzazione morfologica e strutturale di nanoparticelle di alcune decine di nanometri ed elenca le possibili problematicità che si possono presentare durante l'analisi.

2) definire quali sono i momenti centrali principali di una distribuzione, come si calcolano e il loro significato

3) Le attività di ricerca dell'Università

4) Illustrare le principali funzioni di Microsoft Excel

5) Leggere e tradurre:

Magnifying ten million times - Electron microscopes reveal hidden wonders that are smaller than the human eye can see. They fire electrons and create images, magnifying micrometer and nanometer structures by up to ten million times, providing a spectacular level of detail that allows us to view single atoms. Observing the world through electron microscopes can make the invisible visible, expand our horizons, transform our perceptions and open our minds to new possibilities. Electron microscopy is essential for the development of nanotechnology and nanodevices, transforming a material's atoms from an abstract concept to objects we can see with our own eyes, enabling us to engineer materials atom by atom.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Compara vantaggi e limiti delle tecniche microscopiche (imaging) rispetto alle tecniche diffrattometriche per la caratterizzazione morfologica e strutturale di materiali microcristallini o amorfi

2) definire l'indice di correlazione di Pearson e sua applicazione

3) Direttore Generale: funzioni, modalità di incarico e durata del mandato

4) Che cos'è un browser?

5) Leggere e tradurre:

New developments in electron microscopy - In 1959, physicist Richard Feynman proclaimed, "There's plenty of room at the bottom," and called for electron microscopes to be improved and increased in power by 100 times to resolve features as small as one nanometer. Since then, we have met Feynman's demand, and the possibilities for electron microscopy have increased exponentially. In 2017, Jacques Dubochet, Joachim Frank and Richard Henderson received the Nobel Prize in Chemistry for their contributions to the development of the latest evolution in electron microscopy. Each new development in electron microscopy has opened new doors and allowed scientists to explore new features of the world at nanoscale.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche di preparativa e di analisi utili per la caratterizzazione strutturale di macromolecole, quali per esempio proteine

2) definire il test chi quadrato

3) Commissione etica: composizione, funzioni e durata del mandato

4) Che cosa si intende per "testo giustificato" in un programma di elaborazione testi?

5) Leggere e tradurre:

The world of microscopes - Electron and ion microscopes use a beam of charged particles instead of light and use electrostatic or electromagnetic lenses to focus the particles. They can observe features as small as 0.1 nm (one ten-billionth of a meter), such as individual atoms. Scanning probe microscopes use a physical probe (a very small, very sharp needle) that scans over the sample in contact or near-contact with the surface. They map different forces and interactions that occur between the probe and the sample to create an image. These instruments are also capable of atomic-scale resolution.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche di preparativa e di analisi utili per la caratterizzazione morfologica e strutturale di uno strato depositato di circa 500 nanometri di spessore, caratterizzata da una matrice amorfa e da nano-precipitati cristallini.

2) Come si calcola la asimmetria di una distribuzione di un campione statistico?

3) Le attività istituzionali dell'Università

4) Cosa si ottiene utilizzando il comando "incolla" in Microsoft Excel?

5) Leggere e tradurre:

Resolution of the human eye - Given sufficient light, the unaided human eye can distinguish two points 0.2 mm apart. If the points are closer together, they will appear as a single point. This distance is called the resolving power, or resolution of the eye. A lens or an assembly of lenses can be used to magnify this distance and enable the eye to see points even closer together than 0.2 mm. For example, try looking at a newspaper picture, or one in a magazine, through a magnifying glass. You will see that the image is made up of dots too small and too close together to be separately resolved by your eye alone.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche analitiche utili per la caratterizzazione morfologica e strutturale di un campione microcristallino ed eterofasico, ottenuto come prodotto intermedio di una reazione ad alta temperatura non portata a termine.

2) Il ruolo dei metadati: cosa aggiungere al file dei dati acquisiti dallo strumento per permettere la riusabilità dei dati con lettura automatica?

3) Senato Accademico: composizione, funzioni e durata del mandato

4) Per chiudere Excel o un generico programma Office (Word, Power Point, etc) si può usare solo l'icona "X" in alto a destra dello schermo?

5) Leggere e tradurre:

Electron sources - Three key types of electron sources are employed in electron microscopes: tungsten guns, lanthanum hexaboride guns, and field emission guns (FEG). Each represents a different combination of benefits and costs. The choice of source type is a significant part of the instrument selection process. Perhaps the single most important characteristic of the source is brightness, which characterizes the electron current density of the beam and the angle into which the current is emitted; this eventually determines the resolution, contrast and signal-to-noise capabilities of the imaging system. FEG sources provide brightness up to 1,000 times greater than tungsten emitters, but they are also much more expensive.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche di preparativa e di analisi utili per la caratterizzazione morfologica e strutturale di una lega metallica eterofasica, con grani tipicamente dell'ordine di pochi micrometri.

2) Protocolli di archiviazione dati con principi FAIR: Cosa è A e come implementarlo

3) Rettore: funzioni, modalità di elezione e durata del mandato

4) Quale è la funzione principale della firma digitale?

5) Leggere e tradurre:

The electron microscope column - The electron column is comprised of elements analogous to those of a light microscope. The light source of the light microscope is replaced by an electron gun. The glass lenses are replaced by electromagnetic or electrostatic lenses. Unlike glass lenses, the power of magnetic lenses can be changed by modifying the current through the lens coil. The ocular, or eyepiece, is replaced by a fluorescent screen and/or a digital camera. The electron beam is generated by the electron gun and is condensed into a nearly parallel beam at the specimen by the condenser lenses. For TEM, the specimen must be adequately thin such that it can transmit the electrons, usually 0.5 µm or less; however, for SEM this is not important.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi e compara vantaggi e limiti delle differenti tecniche di microscopia elettronica.

2) definire il test t di Student

3) Quali sono gli organi di ateneo?

4) Cosa si deve conoscere, del destinatario, per inviargli un messaggio di posta elettronica?

5) Leggere e tradurre:

An overview of TEM - It is possible to compare a transmission electron microscope with a slide projector. In a slide projector, light from a light source is made into a parallel beam by the condenser lens; this travels through the slide and is then focused as an enlarged image onto the screen by the objective lens. In the electron microscope, the glass lenses are replaced by magnetic lenses, the light source is replaced by an electron source, and the projection screen is replaced by a fluorescent screen, or, more often in modern instruments, an electronic imaging device such as a charge-coupled device camera

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi e compara vantaggi e limiti delle differenti tecniche diffrattometriche basate su raggi-X, neutroni ed elettroni.

2) Protocolli di archiviazione dati con principi FAIR: Cosa è F e come implementarlo

3) Direttore di dipartimento: funzioni, modalità di elezione, durata del mandato

4) Come si accede alla funzione "Conteggia parole" in Microsoft Word?

5) Leggere e tradurre:

The electron gun - High-resolution TEM, based on phase contrast, requires the high spatial coherence of a field emission source, i.e., the field emission source should create waves of regular phase and shape. The greater current density and higher brightness provided by these sources produce smaller beams with higher currents for better spatial resolution and faster, more precise X-ray analysis. Field emission sources are available in two types, cold field emission and thermally assisted field emission. Cold field emission offers extremely high brightness but varying beam currents. Thermally assisted field emission offers high brightness and high, stable current with no flashing.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Compara vantaggi e limiti delle tecniche di microscopia ottica rispetto alle tecniche di microscopia elettronica.

2) definire una distribuzione normale (gaussiana) e sue caratteristiche

3) Consiglio di Amministrazione: composizione, funzioni e durata del mandato

4) Che cos'è One Drive?

5) Leggere e tradurre:

Electron penetration - Electrons are easily stopped or deflected by matter. That is why the microscope must be evacuated and why specimens—for the transmission microscope—have to be very thin. Typically, for electron microscopy studies, a TEM specimen must be no thicker than a few hundred nanometers. Different thicknesses provide different types of information. For present day electron microscopy studies, thinner is almost always better. Specimens as thin as a few tenths of a nanometer can be created from some materials using modern preparation techniques. While thickness is a primary consideration, it is equally important that the preparation preserves the specimen's bulk properties and not alter its atomic structure.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche di preparativa e di analisi utili per la caratterizzazione morfologica e strutturale di una ceramica, caratterizzata da impurezze con dimensioni tipiche di alcuni micrometri.

2) Protocolli di archiviazione dati con principi FAIR: Cosa è I e come implementarlo

3) Comitato unico di garanzia: composizione, funzioni e durata del mandato

4) Cosa si intende per SPAM ?

5) Leggere e tradurre:

Aberration-corrected TEM - The latest development of a dedicated commercial aberration-corrected TEM has allowed major advances in both STEM and TEM capability. Without correction, TEM resolution is limited primarily by spherical aberration, which causes information from a point on the object to be spread over an area in the image. This results in a general blurring of the image and in a phenomenon known as delocalization, in which periodic structures appear to extend beyond their actual physical boundaries. In a light microscope, spherical aberration can be reduced by integrating lens elements that have opposing spherical aberrations

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche analitiche utili per la caratterizzazione morfologica e strutturale di composti organici 'small-molecule', quali per esempio un prodotto farmaceutico, che si presentano nella forma di cristalli con dimensione di pochi micrometri.

2) Protocolli di archiviazione dati con principi FAIR: Cosa è R e come implementarlo

3) Le attività didattiche e formative dell'Università

4) Che cos'è "PowerPoint"?

5) Leggere e tradurre:

Specimen orientation and manipulation - The TEM specimen stage must provide a range of movements to control and orient the sample. Tilt and X, Y and Z translation are used to move the correct region of the sample into the field of view of the microscope. Tilt along a second axis is needed to allow precise orientation of crystalline samples with respect to the beam for diffraction studies and analysis along a specific crystallographic orientation or grain boundary. Specialized stages may also provide heating, cooling and straining of the specimen for experiments in the microscope. The elementary movements are provided by a goniometer mounted very close to the objective lens.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)

1) Descrivi le tecniche di preparativa e di analisi utili per la caratterizzazione strutturale di copolimeri a blocchi

2) definire la matrice di covarianza fra due quantità correlate x e Y

3) Il codice etico: da quale organo è approvato e cosa rappresenta?

4) Cosa si intende per Internet Point?

5) Leggere e tradurre:

From a practical point of view, the gallium supply of the LMIS is consumed during use, and so the source must be changed periodically. Similarly, the various beam-limiting apertures in the column will be eroded by the ion beam and, therefore, also need periodic replacement. Source lifetime and ease of replacement are key considerations.

Lifetime relies on the size of the liquid metal reservoir; however, larger reservoirs increase the total size of the source, making the source harder to integrate into the column design as an easily replaceable module.

(da *Exploring Uncharted Realms with Electron Microscopy by ThermoScientific*)