IV verbale All.3

Istituto Nazionale di Fisica Nucleare
SEZIONE DI MILANO-BICOCCA

Milano, 22/12/2021

Prova Orale
Concorso bando 23248/2021

Testo 1

1) Misure in ultra-tracce: descrivere possibili tecniche per isotopi pesanti.

2) Descrivere le misure di attivazione neutronica su reperti archeologici.

3) Descrivere metodologie di misura di elementi rilasciati in atmosfera a seguito di incidenti nucleari.

IV verbale All 4

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Milano, 22/12/2021

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Testo 2

1) Monitoraggio ambientale per inquinamento da elementi pesanti: fornire esempi e descrivere tecniche di misura.

2) Fornire esempi di metodi di datazione di materiali organici.

3) Descrivere tecniche di spettroscopia di massa in ambito archeometrico.

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Verbale All. 5

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Testo 3

1) Identificazione delle sorgenti orfane rilasciate in ambiente: fornire esempi e descrivere metodologie di misura.

2) Fornire esempi di misure per la caratterizzazione della provenienza di materiali archeologici.

3) Descrivere tecniche di analisi non invasive e non distruttive per la caratterizzazione di manufatti in ambito archeometrico.

IV Verbale Au. 6

CHAPTER

2

Introduction to Emission Tomography

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I. WHAT IS EMISSION TOMOGRAPHY?

Emission tomography (ET)[1] is a branch of medical imaging that encompasses two main techniques—positron emission tomography (PET) and single-photon emission computed tomography (SPECT)[2]—which use radioactive materials to image properties of the body's physiology. For example, ET images can represent the spatial distribution of properties such as glucose metabolism, blood flow, and receptor concentrations. Thus, ET can be used to detect tumors, locate areas of the heart affected by coronary artery disease, and identify brain regions influenced by drugs.

ET is categorized as a *functional imaging* approach to distinguish it from methods such as X-ray computed tomography (CT) that principally depict the body's architectural structure (anatomy). PET and CT images of the same patient, shown in Figure 11–7, illustrate the complementary nature of CT's anatomical depiction of the body and PET's functional representation.

As the term *emission tomography* suggests, this form of imaging is a marriage of two basic principles: imaging through the use of gamma-ray *emission* (called the *tracer principle*) and volumetric imaging of the body's interior (called *tomography*).[3] We introduce these fundamental concepts in the following sections.

A. The Tracer Principle

ET is founded on an important insight, known as the tracer principle, which was developed in the early 1900s by

[1] *Emission tomography* is also known as *emission computed tomography* (ECT) and is a subset of the field known generally as *nuclear medicine*. Today, most nuclear medicine imaging studies are tomographic; hence, the terms emission tomography and nuclear medicine are often used interchangeably. However, nuclear medicine also encompasses planar emission imaging and therapeutic uses of radioactive compounds.

[2] In Europe, SPECT is often referred to as *single-photon emission tomography* (SPET).

[3] In this book, we use the term *emission tomography* to refer specifically to methods based on gamma-ray emission, but the term can also be used to describe any tomographic method that is based on radiation emitted from within an object. Two alternative categories of tomographic imaging methods are those that use *reflection* of radiation from within the object (as in ultrasound imaging) and *transmission* of radiation through the object (as in X-ray CT).