Preparación de nuevos materiales docentes basados en videos y actividades grupales para la asignatura en inglés “Forensic chemistry”

Tania García-Mendiola[1], María José Marqués[2], Elías Blanco [1], Marco Antonio Jiménez-González[2]

1. Departamento de Química Analítica y Análisis Instrumental, 2. Departamento de Geología y Geoquímica. Universidad Autónoma de Madrid.

Introducción

Actualmente un gran número de universidades se centran en políticas lingüísticas que permitan la internacionalización y globalización de la Educación Superior. Puesto que el inglés está considerado como la lengua franca de la Educación Superior, ha cobrado protagonismo en el campo de la docencia en países de habla no inglesa, la Universidad Autónoma de Madrid (UAM) puso en marcha el Plan de Formación y Acreditación para la Docencia en inglés (Plan DOing), con el objetivo fomentar el uso del inglés en las actividades docentes y de gestión académica. Actualmente uno de los grados de la UAM en los que se está impartiendo docencia en inglés es el Grado en Química (sello Eurobachelor® en el año 2019). Dentro del Grado en Química de la UAM se encuentra la asignatura optativa “Forensic chemistry”, en la que se pretende aplicar el proyecto de innovación propuesto. Se trata de una asignatura optativa de cuarto curso que tradicionalmente se ha ofertado en español y que normalmente tiene un gran número de estudiantes interesados. Recientemente se ha implantado su docencia en inglés, por lo que la preparación de nuevos materiales docentes que aseguren un buen proceso de enseñanza-aprendizaje es de gran interés.

Objetivos del proyecto

El objetivo principal de este proyecto se ha centrado en la preparación de nuevos materiales docentes adaptados a la docencia en inglés de la asignatura de “Forensic chemistry”.

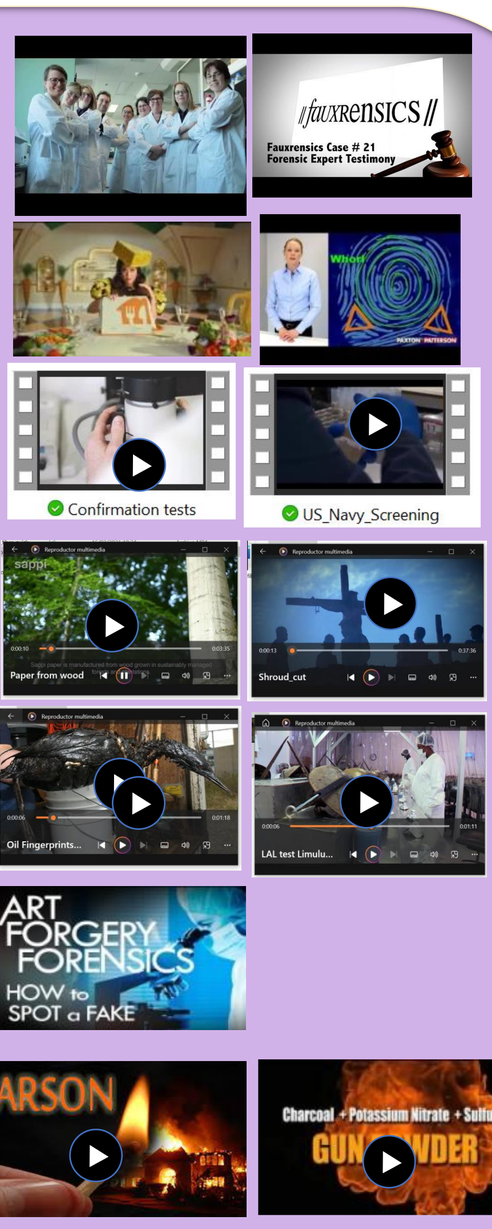
El proyecto se ha dividido en dos objetivos parciales:

-Preparación de videos introductorios de los conceptos más relevantes y vocabulario técnico de cada bloque temático de la asignatura.

-Preparación de actividades grupales relacionadas con los videos o la temática del bloque temático objeto de estudio.

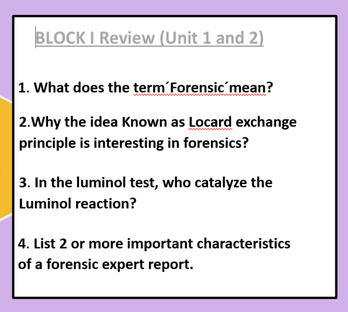
Videos

- ✓ Videos bloque **1 y 2** Ciencias forenses, informe pericial, tipos de muestras huellas dactilares
- ✓ Videos bloque **3**. Las drogas, análisis y tipos de drogas
- ✓ Videos bloque **4**. Las fibras y tejidos, tipos y análisis disponibles
- ✓ Videos Bloque **5**. Delitos ambientales
- ✓ Videos bloque **6.** Pinturas y falsificaciones
- ✓ Videos Bloque **7**. Combustión e incendios.



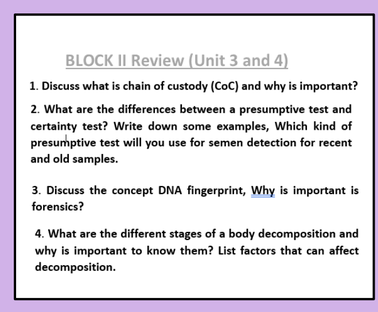
Actividades

- ✓ Cuestionarios-Puzzle bloque **1 y 2**



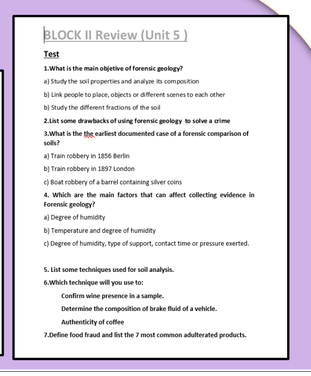
BLOCK I Review (Unit 1 and 2)

1. What does the term´Forensic´mean?
2. Why the idea Known as Locard exchange principle is interesting in forensics?
3. In the luminol test, who catalyze the Luminol reaction?
4. List 2 or more important characteristics of a forensic expert report.



BLOCK II Review (Unit 3 and 4)

1. Discuss what is chain of custody (CoC) and why is important?
2. What are the differences between a presumptive test and certainty test? Write down some examples, Which kind of presumptive test will you use for semen detection for recent and old samples.
3. Discuss the concept DNA fingerprint, Why is important is forensics?
4. What are the different stages of a body decomposition and why is important to know them? List factors that can affect decomposition.

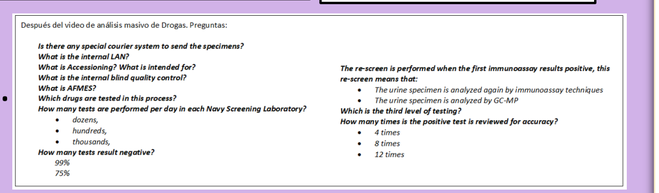


BLOCK II Review (Unit 5)

Test

1.What is the main objetive of forensic geology?
a) Study the soil properties and analyze its composition
b) Link people to place, objects or different scenes to each other
b) Study the different fractions of the soil
2.List some drawbacks of using forensic geology to solve a crime
3.What is the the earliest documented case of a forensic comparison of soils?
a) Train robbery in 1856 Berlin
b) Train robbery in 1897 London
c) Boat robbery of a barrel containing silver coins
4. Which are the main factors that can affect collecting evidence in Forensic geology?
a) Degree of humidity
b) Temperature and degree of humidity
c) Degree of humidity, type of support, contact time or pressure exerted.
5. List some techniques used for soil analysis.
6.Which technique will you use to:
Confirm wine presence in a sample.
Determine the composition of brake fluid of a vehicle.
Authenticity of coffee
7.Define food fraud and list the 7 most common adulterated products.

- ✓ Bloque **3.** Ejemplo.



Después del vídeo de análisis masivo de Drogas. Preguntas:

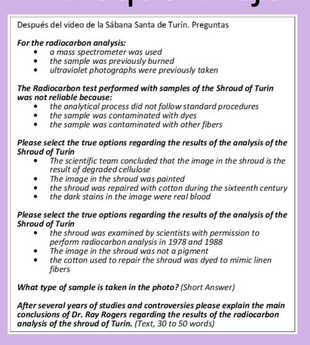
Is there any special courier system to send the specimens?
What is the internal LAN?
What is Accessioning? What is intended for?
What is the internal blind quality control?
What is AFMES?
Which drugs are tested in this process?
How many tests are performed per day in each Navy Sreening Laboratory?
- *dozens,*
- *hundreds,*
- *thousands,*

How many tests result negative?
99%
75%

The re-screen is performed when the first immunoassay results positive, this re-screen means that:
- *The urine specimen is analyzed again by immunoassay techniques*
- *The urine specimen is analyzed by GC-MP*

Which is the third level of testing?
How many times is the positive test is reviewed for accuracy?
- *4 times*
- *8 times*
- *12 times*

- ✓ Bloque **4.** Ejemplo.



Después del vídeo de la Sábana Santa de Turín. Preguntas

For the radiocarbon analysis:
- *a mass spectrometer was used*
- *the sample was previously burned*
- *ultraviolet photographs were previously taken*

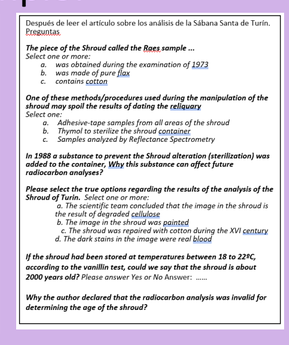
The Radiocarbon test performed with samples of the Shroud of Turin was not reliable because:
- *the analytical process did not follow standard procedures*
- *the sample was contaminated with dyes*
- *the sample was contaminated with other fibers*

Please select the true options regarding the results of the analysis of the Shroud of Turin
- *The scientific team concluded that the image in the shroud is the result of degraded cellulose*
- *The image in the shroud was painted*
- *the shroud was repaired with cotton during the sixteenth century*
- *the dark stains in the image were real blood*

Please select the true options regarding the results of the analysis of the Shroud of Turin
- *the shroud was examined by scientists with permission to perform radiocarbon analysis in 1978 and 1988*
- *The image in the shroud was not a pigment*
- *the cotton used to repair the shroud was dyed to mimic linen fibers*

What type of sample is taken in the photo? (Short Answer)

After several years of studies and controversies please explain the main conclusions of Dr. Ray Rogers regarding the results of the radiocarbon analysis of the shroud of Turin. (Text, 30 to 50 words)



Después de leer el artículo sobre los análisis de la Sábana Santa de Turín. Preguntas

The piece of the Shroud called the Raes sample ...
Select one or more:
- *a. was obtained during the examination of 1973*
- *b. was made of pure flax*
- *c. contains cotton*

One of these methods/procedures used during the manipulation of the shroud may spoil the results of dating the reliquary
Select one:
- *a. Adhesive-tape samples from all areas of the shroud*
- *b. Thymol to sterilize the shroud container*
- *c. Samples analyzed by Reflectance Spectrometry*

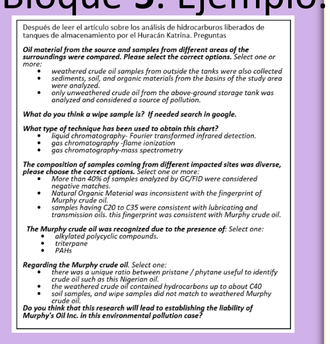
In 1988 a substance to prevent the Shroud alteration (sterilization) was added to the container, Why this substance can affect future radiocarbon analyses?

Please select the true options regarding the results of the analysis of the Shroud of Turin. Select one or more:
- *a. The scientific team concluded that the image in the shroud is the result of degraded cellulose*
- *b. The image in the shroud was painted*
- *c. The shroud was repaired with cotton during the XVI century*
- *d. The dark stains in the image were real blood*

If the shroud had been stored at temperatures between 18 to 22ºC, according to the vanillin test, could we say that the shroud is about 2000 years old? Please answer Yes or No Answer: .....

Why the author declared that the radiocarbon analysis was invalid for determining the age of the shroud?

Bloque **5**. Ejemplo.



Después de leer el artículo sobre los análisis de hidrocarburos liberados de tanques de almacenamiento por el Huracán Katrina. Preguntas

Oil material from the source and samples from different areas of the surroundings were compared. Please select the correct options. Select one or more:
- *weathered crude oil samples from outside the tanks were also collected*
- *sediments, soil, and organic materials from the basins of the study area were analyzed.*
- *only unweathered crude oil from the above-ground storage tank was analyzed and considered a source of pollution.*

What do you think a wipe sample is? If needed search in google.

What type of technique has been used to obtain this chart?
- *liquid chromatography. Fourier transformed infrared detection.*
- *gas chromatography -flame ionization*
- *gas chromatography-mass spectrometry*

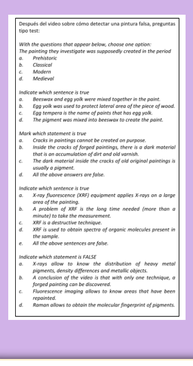
The composition of samples coming from different impacted sites was diverse, please choose the correct options. Select one or more:
- *More than 40% of samples analyzed by GC/FID were considered negative matches.*
- *Natural Organic Material was inconsistent with the fingerprint of Murphy crude oil.*
- *samples having C20 to C35 were consistent with lubricating and transmission oils. this fingerprint was consistent with Murphy crude oil.*

The Murphy crude oil was recognized due to the presence of: Select one:
- *alkylated polycyclic compounds.*
- *triterpane*
- *PAHs*

Regarding the Murphy crude oil. Select one:
- *there was a unique ratio between pristane / phytane useful to identify crude oil such as this Nigerian oil.*
- *the weathered crude oil contained hydrocarbons up to about C40*
- *soil samples, and wipe samples did not match to weathered Murphy crude oil.*

Do you think that this research will lead to establishing the liability of Murphy's Oil Inc. in this environmental pollution case?

- ✓ Bloque **6.** Ejemplo



Después del video sobre cómo detectar una pintura falsa, preguntas tipo test:

With the questions that appear below, choose one option:
The painting they investigate was supposedly created in the period
a. *Prehistoric*
b. *Classical*
c. *Modern*
d. *Medieval*

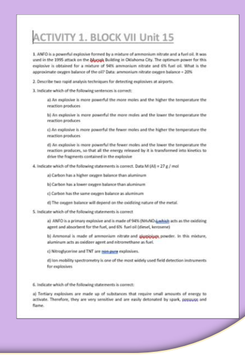
Indicate which sentence is true
a. *Beeswax and egg yolk were mixed together in the paint.*
b. *Egg yolk was used to protect lateral area of the piece of wood.*
c. *Egg tempera is the name of paints that has egg yolk.*
d. *The pigment was mixed into beeswax to create the paint.*

Mark which statement is true
a. *Cracks in paintings cannot be created on purpose.*
b. *Inside the cracks of forged paintings, there is a dark material that is an accumulation of dirt and old varnish.*
c. *The dark material inside the cracks of old original paintings is usually a pigment.*
d. *All the above answers are false.*

Indicate which sentence is true
a. *X-ray fluorescence (XRF) equipment applies X-rays on a large area of the painting.*
b. *A problem of XRF is the long time needed (more than a minute) to take the measurement.*
c. *XRF is a destructive technique.*
d. *XRF is used to obtain spectra of organic molecules present in the sample.*
e. *All the above sentences are false.*

Indicate which statement is FALSE
a. *X-rays allow to know the distribution of heavy metal pigments, density differences and metallic objects.*
b. *A conclusion of the video is that with only one technique, a forged painting can be discovered.*
c. *Fluorescence imaging allows to know areas that have been repainted.*
d. *Roman alloys to obtain the molecular fingerprint of pigments.*

- ✓ Bloque **7.** Ejemplo

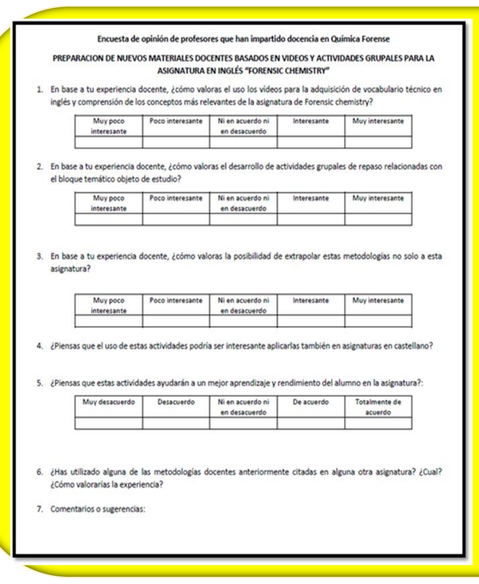


ACTIVITY 1. BLOCK VII Unit 15

1. ANFO is a powerful explosive formed by a mixture of ammonium nitrate and a fuel-oil. It was used in the 1995 attack on the Murrah building in Oklahoma City. The optimum power for this explosive is obtained for a mixture of 94% ammonium nitrate and 6% fuel oil. What is the approximate oxygen balance of the oil? Data: ammonium nitrate oxygen balance = 20%
2. Describe two rapid analysis techniques for detecting explosives at airports.
3. Indicate which of the following sentences is correct:
a) An explosive is more powerful the more moles and the higher the temperature the reaction produces
b) An explosive is more powerful the more moles and the lower the temperature the reaction produces
c) An explosive is more powerful the fewer moles and the higher the temperature the reaction produces
d) An explosive is more powerful the fewer moles and the lower the temperature the reaction produces, as long as the energy released by it is transformed into kinetics to drive the fragments contained in the explosive
4. Indicate which of the following statements is correct. Data: Mr (Al) = 27 g / mol
a) Carbon has a higher oxygen balance than aluminum
b) Carbon has a lower oxygen balance than aluminum
c) Carbon has the same oxygen balance as aluminum
d) The oxygen balance will depend on the oxidizing nature of the metal.
5. Indicate which of the following statements is correct
a) ANFO is a primary explosive and is made of 94% (NH4NO3) which acts as the oxidizing agent and absorbent for the fuel, and 6% fuel oil (diesel, kerosene)
b) Ammonal is made of ammonium nitrate and aluminum powder. In this mixture, aluminum acts as oxidizer agent and nitromethane as fuel.
c) Nitroglycerine and TNT are isotope explosives.
d) Ion mobility spectrometry is one of the most widely used field detection instruments for explosives
6. Indicate which of the following statements is correct:
a) Tertiary explosives are made up of substances that require small amounts of energy to activate. Therefore, they are very sensitive and are easily detonated by spark, pressure and flame.

Encuestas de opinión

Profesores



Encuesta de opinión de profesores que han impartido docencia en Química Forense

PREPARACION DE NUEVOS MATERIALES DOCENTES BASADOS EN VIDEOS Y ACTIVIDADES GRUPALES PARA LA ASIGNATURA EN INGLÉS “FORENSIC CHEMISTRY”

1. En base a tu experiencia docente, ¿cómo valoras el uso los vídeos para la adquisición de vocabulario técnico en inglés y comprensión de los conceptos más relevantes de la asignatura de Forensic chemistry?

Muy poco interesante	Poco interesante	Ni en acuerdo ni en desacuerdo	Interesante	Muy interesante

2. En base a tu experiencia docente, ¿cómo valoras el desarrollo de actividades grupales de repaso relacionadas con el bloque temático objeto de estudio?

Muy poco interesante	Poco interesante	Ni en acuerdo ni en desacuerdo	Interesante	Muy interesante

3. En base a tu experiencia docente, ¿cómo valoras la posibilidad de extrapolar estas metodologías no solo a esta asignatura?

Muy poco interesante	Poco interesante	Ni en acuerdo ni en desacuerdo	Interesante	Muy interesante

4. ¿Piensas que el uso de estas actividades podría ser interesante aplicarlas también en asignaturas en castellano?

5. ¿Piensas que estas actividades ayudarán a un mejor aprendizaje y rendimiento del alumno en la asignatura?:

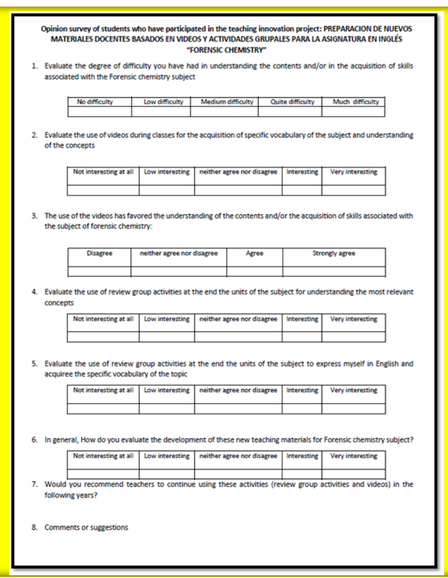
Muy desacuerdo	Desacuerdo	Ni en acuerdo ni en desacuerdo	De acuerdo	Totalmente de acuerdo

6. ¿Has utilizado alguna de las metodologías docentes anteriormente citadas en alguna otra asignatura? ¿Cual? ¿Cómo valorarías la experiencia?
7. Comentarios o sugerencias:

Los profesores encuestados indicaron de gran interés los materiales desarrollados. Todos mostraban que son herramientas de gran ayuda que pueden mejorar el aprendizaje, alguno de los profesores indicó el empleó ocasional de este material con excelentes resultados en el alumnado.

Alumnos

En las encuestas a los alumnos se consiguió una participación del 65%. La gran mayoría de los alumnos encuestados indicaron de gran interés el empleo de material audiovisual y realización de trabajos grupales para el desarrollo de la asignatura. Los estudiantes estaban de acuerdo que este tipo de actividades ayudaría a la asimilación de conceptos específicos de la Química Forense.



Opinion survey of students who have participated in the teaching innovation project: PREPARACION DE NUEVOS MATERIALES DOCENTES BASADOS EN VIDEOS Y ACTIVIDADES GRUPALES PARA LA ASIGNATURA EN INGLÉS “FORENSIC CHEMISTRY”

1. Evaluate the degree of difficulty you have had in understanding the contents and/or in the acquisition of skills associated with the Forensic chemistry subject

No difficulty	Low difficulty	Medium difficulty	Quite difficulty	Much difficulty

2. Evaluate the use of videos during classes for the acquisition of specific vocabulary of the subject and understanding of the concepts

Not interesting at all	Low interesting	neither agree nor disagree	Interesting	Very interesting

3. The use of the videos has favored the understanding of the contents and/or the acquisition of skills associated with the subject of forensic chemistry:

Disagree	neither agree nor disagree	Agree	Strongly agree

4. Evaluate the use of review group activities at the end the units of the subject for understanding the most relevant concepts

Not interesting at all	Low interesting	neither agree nor disagree	Interesting	Very interesting

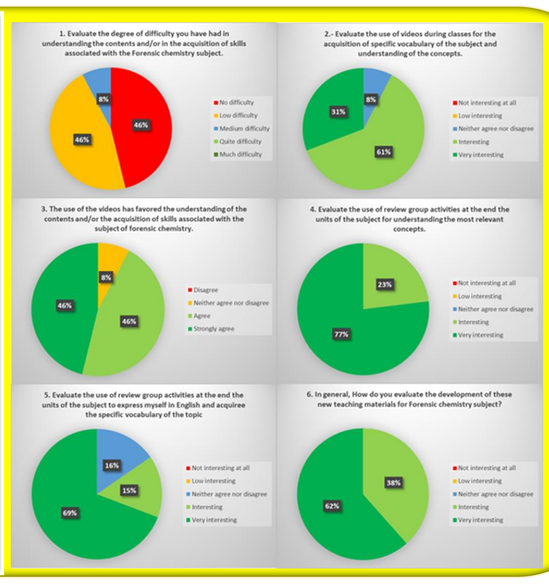
5. Evaluate the use of review group activities at the end the units of the subject to express myself in English and acquiree the specific vocabulary of the topic

Not interesting at all	Low interesting	neither agree nor disagree	Interesting	Very interesting

6. In general, How do you evaluate the development of these new teaching materials for Forensic chemistry subject?

Not interesting at all	Low interesting	neither agree nor disagree	Interesting	Very interesting

7. Would you recommend teachers to continue using these activities (review group activities and videos) in the following years?
8. Comments or suggestions



Conclusiones

Los materiales docentes preparados en este proyecto de innovación ayudan a la comprensión de los conceptos más relevantes de la asignatura de “Forensic chemistry”. Los indicadores de seguimiento del proyecto nos han demostrado el cumplimiento de las tareas programadas. Además, los profesores hemos podido recibir retroalimentación de los materiales docentes por parte de estudiantes y profesores. Los resultados apuntan que, tanto los estudiantes como los profesores, consideran estos materiales muy interesantes para la explicación y comprensión de los conceptos básicos y vocabulario técnico de cada bloque temático de la asignatura.