Nuclear Chemistry

Question1

Which among the following minerals contains radioactive element in it?

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Options:

A. Cleveite

B. Carnallite

C. Chile salt petre

D. Baryte

Answer: A

Solution:

Identify the Minerals :

Cleveite : This is a variety of the uranium mineral uraninite. Uraninite is known to contain uranium, a radioactive element.

Carnallite : A hydrated potassium-magnesium chloride ($KCl \cdot MgCl_2 \cdot 6H_2O$). It does not inherently contain radioactive elements.

Chile Saltpetre : Also known as sodium nitrate ($NaNO_3$). It is not radioactive.

Baryte (Barite) : Barium sulfate ($BaSO_4$), typically not radioactive, although it may contain trace amounts of radioactive elements, it is not classically known for its radioactivity.

Conclusion :

Among the given options, **Cleveite** is the known mineral containing a radioactive element (uranium).

Correct Answer :

Cleveite (Option A)

Question2

Which of the following pair of nuclides is an example of isotones?

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Options:

A. $^{35}_{17}\mathrm{Cl}, ^{37}_{17}\mathrm{Cl}$

B. $^{40}_{18}\mathrm{Ar}, ^{40}_{19}\mathrm{K}$

C. $^{13}_{6}\mathrm{C}, ^{11}_{5}\mathrm{B}$

D. $^{12}_{6}\mathrm{C}, ^{11}_{5}\mathrm{B}$

Answer: D

Solution:

The atoms of different elements having same number of neutrons in their nuclei are called isotones.

$^{12}_{6}\mathrm{C}$ and $^{11}_{5}\mathrm{B}$ are isotones.

Question3

Which element from following is used for cancer treatment?

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Options:

A. Ba

B. Sr

C. Ra

D. Ru

Answer: C

Solution:

The element used for cancer treatment from the options listed is Option C, Ra, which stands for Radium. Radium is a radioactive element that has been historically used in various forms of cancer treatment, particularly before the advent of more modern techniques. It emits alpha particles that can kill cancer cells when placed near or within tumors. The most commonly known use of radium in medicine was in the form of radium needles, which were inserted into tumors to deliver a high radiation dose directly to the cancerous tissue. Although radium has largely been replaced by more targeted and less harmful forms of radiation therapy, its role in the history of cancer treatment is significant.

Here are the details for each of the options:

- Option A: Ba - Barium is not typically used for cancer treatment. However, barium compounds are used in medical imaging to enhance X-ray and CT imaging.
- Option B: Sr - Strontium, especially the radioactive isotope Strontium-89 ($^{89}_{38}Sr$), is used in the treatment of metastatic bone cancer. It acts in a manner similar to calcium and selectively localizes in the bone, providing targeted radiation therapy.
- Option C: Ra - Radium, particularly Radium-223 ($^{223}_{88}Ra$), is used in the treatment of prostate cancer that has spread to the bones.
- Option D: Ru - Ruthenium is not commonly used for cancer treatment; it's primarily utilized in catalysts and electrical contacts.

In the context of these options, while Radium and Strontium have applications in treating cancer, specifically Radium (Ra) is the more historically notable element for cancer therapy.

Question4

Which from following elements is NOT radioactive?

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Options:

A. At

B. Po

C. Rn

D. Ar

Answer: D

Solution:

The element that is **NOT radioactive** is:

✅ **Argon (Ar)**

Explanation:

- **Astatine (At)** – radioactive
- **Polonium (Po)** – radioactive
- **Radon (Rn)** – radioactive (a noble gas, but radioactive)
- **Argon (Ar)** – **not radioactive** ; it has stable isotopes and is a noble gas commonly found in air

So, the correct answer is **Argon (Ar)** .

Question5

Which element from following is radioactive?

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Options:

A. Pr

B. Nd

C. Pm

D. Sm

Answer: C

Solution:

All lanthanoids are non-radioactive except promethium (Pm).