

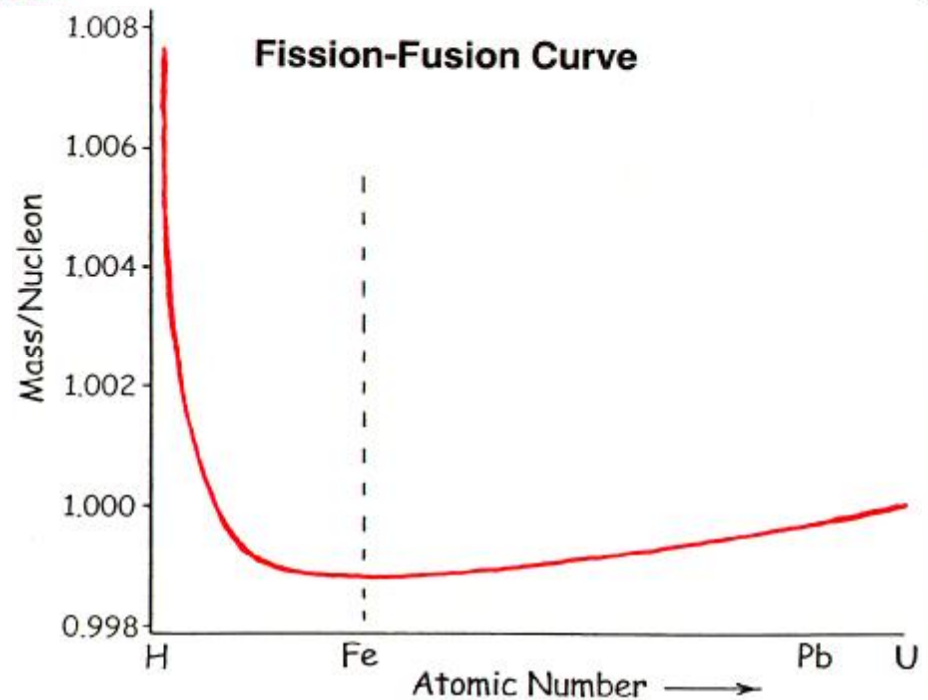
NEXT-TIME QUESTION

Rather than looking at fission and fusion via the traditional curve of binding energy versus atomic number, consider the inverse of this curve—mass/nucleon versus atomic number. We see that when heavy elements undergo fission, the fission fragments lie near the center of the curve, each with decreased mass per nucleon. Similarly we see that when light isotopes fuse, the product nucleus also has decreased mass per nucleon.

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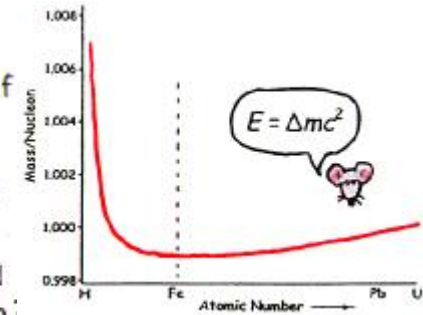
By the difference in mass (mass defect) multiplied by c^2 . With the curve as your guide, answer these three questions:

1. Which releases more energy/nucleon, fission of uranium or fusion of hydrogen?
2. Which process would yield more energy from gold: fission or fusion?
3. Which process would yield more energy from iron: fission, fusion, or (neither)?



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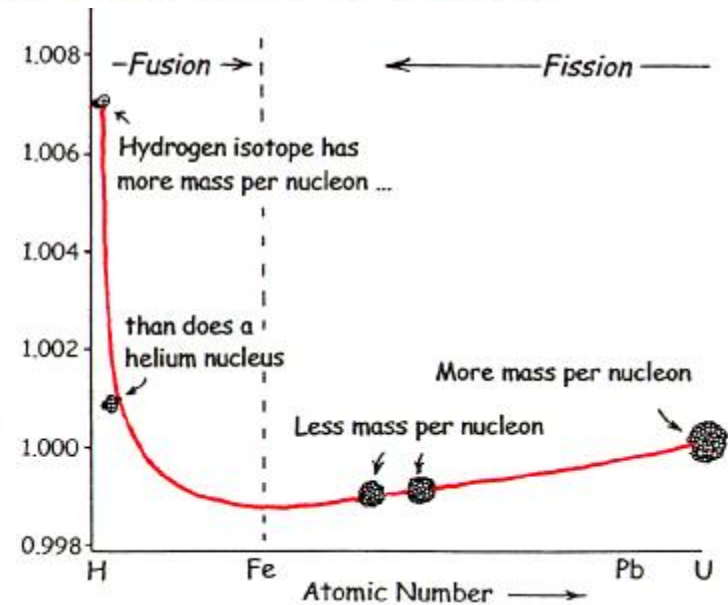


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Answer:

1. More energy is released per nucleon when hydrogen nuclei fuse. Note the sharp decrease in mass/nucleon between hydrogen and helium on the curve.
2. Energy would be released if lead were somehow fissioned. Its products would have decreased mass per nucleon, and be "down hill" on the curve. If a pair of lead nuclei were fused, the product would have more mass per nucleon, and be "up hill." For energy release, the product of a reaction must lie at a lower point on the curve.
3. Neither. Iron is at the bottom of the curve—nuclear sink. Both fission and fusion will be "up hill" and absorb rather than release energy. (That's why stars rapidly cool off when the fusion cycle reaches iron.)



The name of the game for energy release is—reduce mass!

