

Name: Answer key

Date: _____

Period: _____

Nuclear Change: Quiz Review (20 pts)

1. What makes something radioactive?

when the nucleus is heavy with too many neutrons, it tries to get to the ideal proton to neutron ratio by releasing alpha + beta particles.

2. Fill in the following chart for three different types of nuclear decay:

Decay Type	Symbol	Charge	Penetrating power
alpha	α ${}^4_2\text{He}$	+2	stopped by paper
beta	β ${}^0_{-1}\text{e}$	-1	stopped by foil
gamma	γ		stopped by concrete

3. Name three examples of radioactive elements and three uses for radioactive decay.

* see notes

4. What is fission and give an example?

when nucleus splits into smaller atoms



5. What is fusion and give an example?

when two nucleus fuse or come together



6. How are fission and fusion similar? How are they different?

similar: create large amt of heat + energy
change elements into new elements

different: opposite processes, one divides, the other brings together

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MORE PRACTICE: More half-life problems

Finding the total time of decay

7 1. Thallium-208 has a half life of 3.0 minutes, how long will it take for 120 grams to decay to 7.5 grams?

time	mass
0	120 g
3	60
6	30
9	15
12	7.5

12 min

8 2. If the half life of iodine-131 is 8 days, how long will it take a 50 gram sample to decay to 6.25 grams?

time	mass
0	50
8	25
16	12.5
24	6.25

24 days

Finding the quantity of mass

9 3. Carbon-14 has a half life of 5700 years. How much of a 144 gram sample will remain after 17,100 years?

t	m
0	144
5700	72
11400	36
17100	18

18 g

10 4. Potassium-42 has a half life of 12.4 hours. How much of a 848 grams sample of potassium-42 will be left after 62.0 hours?

time	mass
0	848
12.4	424
24.8	212
37.2	106
49.6	53
62	26.5

26.5 g

Finding the half life

11. What is the half life of a 100.0 gram sample of nitrogen-16 that decays to 12.5 grams in 20 seconds?

t	m
0	100
7	50
14	25
21	12.5

7 seconds

3 steps
 $\frac{21}{3} = 7$

12. A 208 g sample of sodium-24 decays to 13 grams within 60.0 hours. What is the half life of this radioactive isotope?

t	m
0	208
15	104
30	52
45	26
60	13

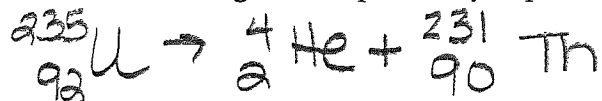
15 hrs

4 steps = 15

over
→

Write nuclear equations that describe the following processes.

9. Uranium-235 undergoes an alpha decay to produce thorium-231.



10. Lanthanum-144 becomes cerium-144 when it undergoes a beta decay.



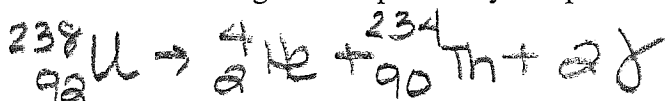
11. Neptunium-233 is formed when americium-237 undergoes a ^{which} nuclear decay process.?



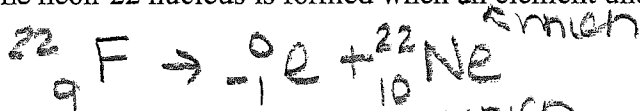
12. When protactinium-229 goes through two alpha decays, francium-221 is formed.



13. Uranium-238 undergoes an alpha decay and produces two gamma rays.



14. The neon-22 nucleus is formed when an ^{which} element undergoes a beta decay.?



15. Samarium-146 is produced when an ^{which} element undergoes an alpha decay.?



16. The beta decay of dysprosium-165 creates a new element.



Answer the following questions. Include the mass number when naming isotopes.

17. What atom produces scandium-47 when it goes through a beta decay?



18. What new element is formed when curium-244 emits two alpha particles and three gamma rays?



make word bank

Across

- 3 A nuclear moderator controls fission chain reactions to produce useable energy
- 7 One danger of nuclear reactors is the breakdown of cooling systems to allow control rods down.
- 10 Radioactive nuclei, with mass numbers over 82, are always unstable.
- 12 reaction occurring when neutrons produced in fission reaction strike other nuclei

- 13 electron emitted when neutron changes into proton in nucleus Beta
- 16 splitting of a heavy nucleus fission
- 18 When electrical repulsion between protons is greater than strong forces, the nucleus will be unstable.
- 20 Fusion occurs on the sun
- 21 protons and neutrons nucleons
- 22 atoms of the same element with different masses isotopes
- 23 emission with no mass or charge gamma
- 24 nuclear bullets used in fission reactions neutrons

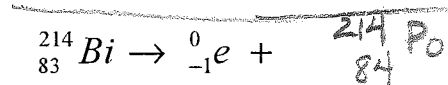
Down

- 1 The nucleus makes up almost all the mass of the atom.
- 2 Unstable nuclei are - radioactive
- 4 Fusion reactions only occur at extremely high - temperature
- 5 Minimum mass required for chain fission reaction is critical mass.
- 6 the fuel for fusion reactions hydrogen
- 8 changing into another element through radioactive decay transmutation
- 9 Man-made elements are by bombardment of an isotope with nuclear "bullets".
- 11 The time it takes half the mass of a radioactive isotope to decay is called half life.
- 14 combination of two nuclei into one fusion
- 15 Large nuclei need a neutron to proton ratio of over 1:1 to be stable.
- 17 force of attraction between nearest neighbor nucleons strong
- 19 emitted particle identical to helium nucleus alpha

Matching: Answers can be used more than once.

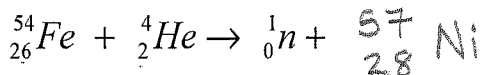
- | | | |
|----------|---|------------|
| <u>b</u> | 1. can penetrate paper, but not thick aluminum | d. alpha |
| <u>c</u> | 2. can penetrate thick aluminum, but not concrete | b. beta |
| <u>a</u> | 3. cannot penetrate paper | c. gamma |
| <u>a</u> | 4. ${}^4_2\text{He}$ | d. neutron |
| <u>b</u> | 5. ${}^0_{-1}e$ | e. proton |
| <u>e</u> | 6. <i>Z atomic</i> number of an element is number of these | |
| <u>d</u> | 7. a reactant and a product of nuclear fission | |
| <u>e</u> | 8. repel each other in the nucleus | |
| <u>c</u> | 9. has no mass and no charge | |
| <u>e</u> | 10. 2 isotopes of same element have number of these in common | |
| <u>d</u> | 11. 2 isotopes of same element have different number of these | |

Complete these reaction equations, using the periodic table to identify any elements:

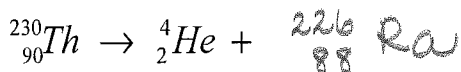


identify type of reaction

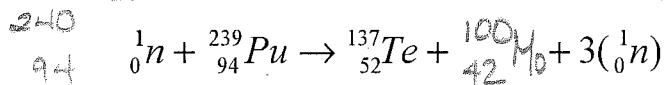
beta



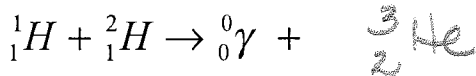
fusion



alpha



fission



fusion