1 ${}^{12}_{6}C$ is an isotope of Carbon; what is the atomic number and the atomic mass number?

2 $^{63}_{29}Cu$ is an isotope of Copper; what is the atomic number and the atomic mass number?

3 ${}^{16}_{8}O$ is an isotope of Oxygen; how many neutrons, protons and electrons does it have?

4 $^{235}_{92}U$ is an isotope of Uranium; how many neutrons, protons and electrons does it have?

5 What is the radius of the $^{218}_{88}Ra$ nucleus?

6 What is the radius of the ${}^{13}_{7}N$ nucleus?

7 $^{37}_{17}Cl$ is an isotope of Chlorine; what is the atomic number and the atomic mass number?

8 ${}^{11}_{5}B$ is an isotope of Boron; what is the atomic number and the atomic mass number?

9 $^{35}_{16}S$ is an isotope of Sulfur; how many neutrons, protons and electrons does it have?

10 $^{208}_{82}Pb$ is an isotope of Lead; how many neutrons, protons and electrons does it have?

11 What is the radius of the $^{210}_{81}Th$ nucleus?

12 What is the radius of the ${}^{8}_{4}Be$ nucleus?

13 Calculate the mass defect and the binding energy of $^{4}_{2}He$ (mass = 4.002602 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

14 Calculate the mass defect and the binding energy of $^{7}_{3}Li$ (mass = 7.016003 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

15 Calculate the mass defect and the binding energy of $^{56}_{26}Fe$ (mass = 55.934940 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

16 Calculate the mass defect and the binding energy of $^{2}_{1}H$ (mass = 2.014102 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

17 Calculate the mass defect and the binding energy of $^{16}_{8}O$ (mass = 15.994915 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

18 Calculate the mass defect and the binding energy of $^{93}_{41}Nb$ (mass = 92.906377 u).

Neutron mass = 1.008665 u

$^{1}_{1}H$ mass = 1.007825 u

19 $^{45}_{20}Ca$ undergoes β^- decay. Using a periodic table, find the resulting atom.

Students type their answers here

20 Fill in the missing component: $^{208}_{83}Bi \rightarrow {}^{4}_{2}He + ?$

Students type their answers here

21 Fill in the missing component: ${}^{32}_{15}P \rightarrow {}^{32}_{16}S + ?$

Students type their answers here

22 $^{22}_{11}Na$ undergoes β^+ decay. Using a periodic table, find the resulting atom.

Students type their answers here

23 Fill in the missing component: ${}^{35}_{16}S \rightarrow {}^{0}_{-1}e + ?$

Students type their answers here

24 Fill in the missing component: $^{212}_{84}Po \rightarrow {}^{208}_{82}Pb + ?$

Students type their answers here

25 An isotope of Bi has a half life of 2 minutes. How much of this isotope will be left after 8 minutes from a starting sample of 800 g?

26 Nitrogen-13 has a half life of 10 minutes. How long will it take for a sample of 500 g to be reduced to 62.5 g?

27 Carbon-11 has a half life of 20 minutes. How much of this isotope will be left after 60 minutes from a starting sample of 40 g?

28 Fermium-257 has a half life of 3 days. How long will it take for a sample of 200 g to be reduced to 25 g?

29 Lead-210 has a half life of 22 years. How much of this isotope will be left after 110 years from a starting sample of 8.0 kg?

30 Radon-222 has a half life of 3.8 days. How much of this isotope will be left after 19 days from a starting sample of 160 g?

31 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{27}_{13}Al + {}^{1}_{0}n \rightarrow {}^{4}_{2}He + \ ?$$

32 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{12}_{6}C + {}^{1}_{1}H \rightarrow {}^{13}_{6}C + \ ?$$

33 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$?+{}^{1}_{1}H \rightarrow {}^{22}_{11}Na + {}^{4}_{2}He$$

34 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{55}_{25}Mn + ? \rightarrow {}^{55}_{26}Fe + {}^{1}_{0}n$$

35 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{27}_{13}Al + ^{1}_{0}n \rightarrow ^{4}_{2}He + ^{24}_{11}Na$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
	(Neutron)	*n*	1	1.008665
2	Helium	He	4	4.002602
11	Sodium	Na	24	23.990961
13	Aluminum	Al	27	26.981538

36 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{12}_{6}C + ^{1}_{1}H \rightarrow ^{13}_{6}C + ^{0}_{-1}e$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
1	Hydrogen	H	1	1.007825
5	Carbon	C	12	12.000000
			13	13.003355

37 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{25}_{12}Mg + ^{1}_{1}H \rightarrow ^{22}_{11}Na + ^{4}_{2}He$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
1	Hydrogen	H	1	1.007825
12	Magnesium	Mg	25	24.985837
11	Sodium	Na	22	21.994434
2	Helium	He	4	4.002602

38 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{55}_{25}Mn + ^{1}_{1}H \rightarrow ^{55}_{26}Fe + ^{1}_{0}n$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
1	Hydrogen	H	1	1.007825
	(Neutron)	*n*	1	1.008665
25	Manganese	Mn	55	54.938048
26	Iron	Fe	55	54.938293

39 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{16}_{8}O + ^{4}_{2}He \rightarrow \gamma + \ ?$$

40 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$ {}_{1}^{2}H + {}_{1}^{3}H \rightarrow {}_{2}^{4}He + \ ? $$

41 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{7}_{3}Li + ^{2}_{1}H \rightarrow \ ?+ \ ^{1}_{0}n$$

42 Fill in the missing component of the following reaction (this requires a periodic table).

Students type their answers here

$$^{13}_{6}C + {}^{208}_{82}Pb \rightarrow \ ?+3\,{}^{1}_{0}n$$

43 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{16}_{8}O + ^{4}_{2}He \rightarrow \gamma + ^{20}_{10}Ne$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
2	Helium	He	4	4.002602
8	Oxygen	O	16	15.994915
10	Neon	Ne	20	19.992435

44 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$ {}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n $$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
1	Deuterium	H or D	2	2.014102
1	Tritium	H or T	3	3.016049
	(Neutron)	*n*	1	1.008665
2	Helium	He	4	4.002602

45 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{7}_{3}Li + ^{2}_{1}H \rightarrow ^{8}_{4}Be + ^{1}_{0}n$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
1	Deuterium	H or D	2	2.014102
	(Neutron)	*n*	1	1.008665
3	Lithium	Li	7	7.016003
4	Beryllium	Be	8	8.005305

46 Calculate the mass defect (in amu) and reaction energy (in MeV) of the following reaction.

$$^{13}_{6}C + {}^{208}_{82}Pb \rightarrow {}^{218}_{88}Ra + 3\,{}^{1}_{0}n$$

Atomic number	Element	Symbol	Mass Number	Atomic Mass (u)
	(Neutron)	*n*	1	1.008665
6	Carbon	C	13	13.003355
82	Lead	Pb	208	207.976652
88	Radium	Ra	218	218.007140

47 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here

$$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{145}_{57}La + ? + 3\,^{1}_{0}n$$

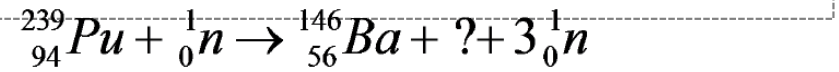
48 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here

$$^{13}_{6}C + {}^{4}_{2}He \rightarrow {}^{16}_{8}O + \ ?$$

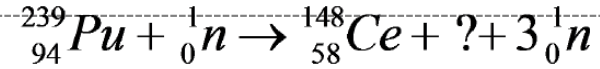
49 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here



50 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here



51 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here

$$^{14}_{7}N + ^{4}_{2}He \rightarrow ?+ \ ^{1}_{0}n$$

52 Fill in the missing component of the following reaction and specify if it is fission or fusion (this requires a periodic table):

Students type their answers here

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{131}_{50}Sn + ? + 2\,{}^{1}_{0}n$$