1. chem10b 21.1-7

This reaction is an example of _____.

$^{41}_{20}Ca \rightarrow {}^{41}_{19}K +$ _____

Student Response	Cor□ect Answer
A. electron capture	
B. gamma emission	
C. alpha decay	
D. positron decay	
E. beta decay	

2. chem10b 21.2-42

The mass of a proton is 1.673×10^{-24} g. The mass of a neutron is 1.675×10^{-24} g The mass of the nucleus of an ^{56}Fe atom is 9.289×10^{-23} g. What is the nuclear binding energy (in J) for ^{56}Fe?

Student Response	Correct Answer
A. 8.36×10^{-9}	
B. 6.07×10^{6}	
C. 7.72×10^{-11}	
D. 2.57×10^{-16}	
E. 7.72×10^{-8}	

3. chem10b 21.4-4

Charged particles are accelerated because the faster they move there is a greater chance of producing a nuclear reaction.

Student Response	Value	Correct Answer

4. chem10b 21.1-30

Who is credited with first achieving fission of uranium-235 _____ ?

Student Response	Correct Answer
A. Fermi	
B. Rutherford	
C. Curie	
D. Dalton	
E. Faraday	

5. chem10b 21.2-27

Which of the following correctly represents the transmutation in which a curium-242 nucleus is bombarded with an alpha particle to produce a californium-245 nucleus?

Student Response	Correct Answer
A. Cm(He, n) Cf	
B. Cm(He, p) Cf	
C. Cm(He, 2 p) Cf	
D. Cm(n, He) Cf	
E. Cm(He, e) Cf	

6. chem10b 21.2-48

In terms of binding energy, what element divides fission and fusion processes?

Student Response	Correct Answer

A. He
B. C
C. U
D. H
E. Fe

Score: 1/1

7. chem10b 21.6-8

A freshly prepared sample of curium-243 undergoes 3312 disintegrations per second. After 6.00 yr, the activity of the sample declines to 2755 disintegrations per second. The half-life of curium-243 is

Student Response	Correct Answer
A. 4.99	
B. 32.6	
C. 7.21	
D. 0.765	
E. 22.6	

8. chem10b 21.2-43

When two atoms of ^{2}H are fused to form one atom of ^{4}He, the total energy evolved is

3.83x10^-12 J. What is the total change in mass (in kg) for this reaction?

Student Response	Correct Answer
A. 1.15	
B. 4.26×10^{-26}	
C. 1.28×10^{-17}	
D. 4.26×10^{-29}	
E. 3.45×10^{8}	

9. chem10b 21.4-9

The SI unit of an absorbed dose of radiation is the gray.

Student Response	Value	Correct Answer

10. chem10b 21.2-19

What is emitted in the nuclear transmutation, $^{27}_{13}Al(n, ?)\ ^{24}_{11}Na$?

Student Response	Correct Answer
A. a proton	
B. a gamma photon	
C. an alpha particle	
D. a neutron	
E. a beta particle	

11. chem10b 21.2-25

Bombardment of uranium-238 with a deuteron (hydrogen-2) generates neptunium-237 and _____ neutrons.

Student Response	Correct Answer
A. 1	
B. 2	
C. 3	
D. 4	
E. 5	

12. chem10b 21.1-13

Nuclei above the belt of stability can lower their neutron-to-proton ratio by_____

Student Response	Correct Answer
A. beta emission.	
B. positron emission.	

C. gamma emission.	
D. electron capture.	
E. Any of the above processes will lower the neutron-to-proton ratio.	

13. chem10b 21.1-9

The missing product in this reaction combines with oxygen to form a compound with the formula

$^{42}_{19}K \rightarrow {}^{0}_{-1}e + \square$_____

Student Response	Correct Answer
A. MO_2	
B. MO	
C. M_3O_2	
D. M_2O	
E. M_2O_3	

14. chem10b 21.2-23

Which one of the following requires a particle accelerator to occur?

Student Response	Corre□t Answer
A. $U + n \rightarrow Np + e$	
B. $Co + n \rightarrow Co$	
C. $^{239}_{94}Pu + {}^{4}_{2}He \rightarrow {}^{242}_{96}Cm + {}^{1}_{0}n$	
D. $Fe \rightarrow Co + e$	
E. none of the above	

15. chem10b 21.2-1

All atoms of a given element have the same

Student Response	Correct Answe□
A. number of nuc□eons.	
B. atomic mass.	
C. number of neutrons.	
D. atomic number.	
E. mass number.	

16. chem10b 21.2-13

How many radioactive decay series exist in nature?

Student Response	Correct Answer
A. 0	
B. 1	
C. 2	
D. 3	
E. 10	

17. chem10b 21.1-8

The missing product in this reaction would be found in which group of the periodic table?

$^{24}_{11}Na \rightarrow {}^{0}_{-1}e +$ _____

Student Response	Correct Answer
A. 7A	
B. 2A	
C. 8A	
D. 1A	
E. 3A	

18. chem10b 21.1-16

The largest number of stable nuclei have an _____ number of protons and an

_____ number of neutrons.

Student Response	Correct Answer
A. even, odd	
B. odd, odd	
C. even, equal	
D. odd, even	
E. even, even	

19. chem10b 21.1-4

In balancing the nuclear reaction $^{293}_{92}U \rightarrow {}^{234}_{90}E + {}^{4}_{2}He$, the identity of element E is _____ .

Student Response	Correct Answer
A. Pu.	
B. Pa.	
C. U.	
D. Np.	
E. Th.	

20. chem10b 21.2-16

What is required for a nuclear transmutation to occur?

Student Response	Correct Answer
A. gamma emission	
B. a particle to collide with a nucleus	
C. a corrosive environment	
D. very high temperature	
E. spontaneous nuclear decay	

1. chem10b 21.4-7

In the formula $k=0.693/t_{1/2}$, k is the decay constant.

Student Response	Value	Correct Answer

2. chem10b 21.5-1

Electrons do not exist in the nucleus, yet beta emission is ejection of electrons from the nucleus. How does this happen?

Sample Correct Answer: A neutron breaks apart to produce a proton and an electron in the nucleus. The proton remains in the nucleus and the electron is ejected.

Score: (Not graded)

4. chem10b 21.2-48

In terms of binding energy, what element divides fission and fusion processes?

Student Response	Correct Answer
A. U	
B. He	
C. C	
D. H	
E. Fe	

5. chem10b 21.1-25

Due to the nature of the positron, _____ is actually detected in positron emission tomography.

Student Response	Correct Answer
A. gamma radiation.	
B. neutron emission.	

C. x-ray emission.
D. beta radiation.
E. alpha radiation.

6. chem10b 21.2-51

Which one of the following is not true concerning radon?

Student Response	Correct Answer
A. It has been implicated in lung cancer.	
B. It is chemically active in human lungs.	
C. It is generated as uranium decays.	
D. It decays to polonium-218, an alpha emitter.	
E. It decays by alpha emission.	

7. chem10b 21.2-27

Which of the following correctly represents the transmutation in which a curium-242 nucleus is bombarded with an alpha particle to produce a californium-245 nucleus?

Student Response	Correct Answer
A. Cm(He, 2 p) Cf	
B. Cm(He, e) Cf	
C. Cm(n, He) Cf	
D. $^{242}_{96}Cm(^{4}_{2}He,^{1}_{0}n)^{245}_{98}Cf$	
E. Cm(He, p) Cf	

8. chem10b 21.1-29

What drives the turbine in a nuclear power plant _____ ?

Student Response	Correct Answer
A. the control rods	
B. UF_6 gas	

C. steam
D. the moderator
E. the primary coolant

9. chem10b 21.2-15

Which of these nuclides is most likely to be radioactive?

Student Response	Correct Answer
A. I	
B. Al	
C. K	
D. Bi	
E. $^{243}_{95}Am$	

10. chem10b 21.2-34

The half-life of a radionuclide

Student Response	Correct Answer
A. gets shorter with passing time.	
B. gets longer with passing time.	
C. gets longer with increased temperature.	
D. gets shorter with increased temperature.	
E. is constant.	

11. chem10b 21.6-5

Potassium-40 decays to argon-40 with a half-life of 1.27×10^9 yr. The age of a mineral sample that has a mass ratio of ^{40}Ar to ^{40}K of 0.812 is _____ yr.

Student Response	Correct Answer
A. 7.55×10^8	

B. 1.56×10^9
C. 1.09×10^9
D. 1.02×10^9
E. 1.47×10^9

12. chem10b 21.2-2

Atoms containing radioactive nuclei are called

Student Response	Correct Answer
A. radioisophores.	
B. nucleons.	
C. radioisotopes.	
D. nuclides.	
E. radionuclides.	

1. chem10b 21.6-7

If we start with 1.000 g of cobalt-60, 0.675 g will remain after 3.00 yr. This means that the half-life of cobalt-60 is _____ yr.

Student Response	Correct Answer
A. 7.65	
B. 3.08	
C. 5.30	
D. 2.03	
E. 4.44	

2. chem10b 21.1-24

The decay of a radionuclide with a half-life of 4.3×10^5 years has a rate constant (in yr^{-1}) equal to _____.

Student Response	Correct Answer
A. 1.6×10^{-6}.	
B. 5.9×10^{-8}.	
C. 2.8×10^{3}.	
D. 2.3×10^{-6}.	
E. 6.2×10^{5}.	

3. chem10b 21.2-25

Bombardment of uranium-238 with a deuteron (hydrogen-2) generates neptunium-237 and _____ neutrons.

Student Response	Correct Answer
A. 1	
B. 2	
C. 3	
D. 4	
E. 5	

4. chem10b 21.2-52

The curie is a measure of the

Student Response	Correct Answer
A. number of disintegrations per second of a radioactive substance.	
B. number of alpha particles emitted by exactly one gram of a radioactive substance.	
C. total energy absorbed by an object exposed to a radioactive source.	
D. lethal threshold for radiation exposure.	
E. None of the above is correct.	

5. chem10b 21.1-22

What order process is radioactive decay _____ ?

Student Response	Correct Answer
A. zeroth	
B. first	
C. second	
D. third	
E. fourth	

6. chem10b 21.2-22

In the nuclear transmutation represented by $^{14}_{7}N(^{1}_{0}n, ^{1}_{1}p)$?, what is the product?

Student Response	Correct Answer
A. nitrogen-15	
B. carbon-14	
C. carbon-12	
D. carbon-16	
E. nitrogen-16	

7. chem10b 21.6-9

Carbon-11 decays by positron emission:

$^{11}_{6}C \rightarrow {}^{11}_{5}B + {}^{0}_{1}e$

The decay occurs with a release of 2.87×10^{11} J per mole of carbon-11. When 4.00 g of carbon-11 undergoes this radioactive decay, _____ g of mass is converted to energy.

Student Response	Correct Answer
A. 8.62×10^{2}	
B. 1.28×10^{-2}	
C. 1.16×10^{-6}	
D. 3.48×10^{5}	
E. 1.16×10^{-3}	

8. chem10b 21.2-53

Which one of the following forms of radiation can penetrate the deepest into body tissue?

Student Response	Correct Answer
A. gamma	
B. beta	
C. proton	
D. positron	
E. alpha	

9. chem10b 21.1-2

By what process does thorium-230 decay to radium-226 _____ ?

Student Response	Correct Answer
A. electron capture	
B. alpha emission	
C. beta emission	
D. positron emission	
E. gamma emission	

10. chem10b 21.2-48

In terms of binding energy, what element divides fission and fusion processes?

Student Response	Correct Answer
A. C	
B. Fe	
C. He	
D. U	
E. H	

11. chem10b 21.2-8

Alpha decay produces a new nucleus whose _____ than those respectively of the original nucleus.

Student Response	Correct Answer
A. atomic number is 2 more and mass number is 2 less	
B. atomic number is 2 less and mass number is 2 less	
C. atomic number is 1 less and mass number is 2 less	
D. atomic number is 2 less and mass number is 4 less	
E. atomic number is 2 more and mass number is 4 more	

12. chem10b 21.2-7

Which type of radioactive decay results in no change in mass number and atomic number for the starting nucleus?

Student Response	Correct Answer
A. electron capture	
B. beta	
C. gamma	
D. positron emission	
E. alpha	

1. chem10b 21.6-1

The half-life of cobalt-60 is 5.2 yr. How many milligrams of a 2.000-mg sample remains after 6.55 years?

Student Response	Correct Answer
A. 0.837	
B. 3.23×10^{-15}	
C. 4.779	
D. 1.163	

E. 1.588

2. chem10b 21.2-22

In the nuclear transmutation represented by $^{14}_{7}N(^{1}_{0}n, ^{1}_{1}p)$?, what is the product?

Student Response	Correct Answer
A. nitrogen-16	
B. carbon-12	
C. carbon-16	
D. carbon-14	
E. nitrogen-15	

3. chem10b 21.1-18

Bombardment of uranium-235 with a neutron generates tellurium-135, 3 neutrons, and _____.

Student Response	Correct Answer
A. strontium-99.	
B. zirconium-99.	
C. zirconium-98.	
D. krypton-101.	
E. krypton-103.	

Score: 1/1

4. chem10b 21.4-1

Gamma radiation only changes the atomic number but not the mass number of a nucleus.

Student Response	Value	Correct Answer

5. chem10b 21.2-37

Cesium-137 undergoes beta decay and has a half-life of 30 years. How many beta particles

are emitted by a 14.0-g sample of cesium-137 in three minutes?

Student Response	Correct Answer
A. 6.1×10^{13}	
B. 6.2×10^{22}	
C. 8.1×10^{15}	
D. 1.3×10^{-8}	
E. 8.4×10^{15}	

6. chem10b 21.2-21

In the nuclear transmutation represented by $^{14}_{7}N(^{1}_{0}n, ^{1}_{1}p)$?, what is the emitted particle?

Student Response	Correct Answer
A. electron	
B. alpha particle	
C. positron	
D. neutron	
E. proton	

7. chem10b 21.2-45

The mass of a proton is 1.00728 amu and that of a neutron is 1.00867 amu. What is the binding energy per nucleon (in J) of a $^{60}_{27}Co$ nucleus? (The mass of a cobalt-60 nucleus is 59.9338 amu.)

Student Response	Correct Answer
A. 9.432×10^{-13}	
B. 7.009×10^{-14}	
C. 2.487×10^{-12}	
D. 1.368×10^{-12}	
E. 3.039×10^{-12}	

8. chem10b 21.2-5

Which one of the following processes results in an increase in the atomic number?

Student Response	Correct Answer
A. beta emission	
B. corrosion	
C. alpha emission	
D. positron emission	
E. gamma emission	

9. chem10b 21.2-43

When two atoms of ^{2}H are fused to form one atom of ^{4}He, the total energy evolved is 3.83×10^{-12} J. What is the total change in mass (in kg) for this reaction?

Student Response	Correct Answer
A. 1.15	
B. 4.26×10^{-29}	
C. 3.45×10^{8}	
D. 4.26×10^{-26}	
E. 1.28×10^{-17}	

Score: 1/1

10. chem10b 21.1-20

How many neutrons are emitted when a californium-249 nucleus (Z=98) is bombarded with a carbon-12 nucleus to produce a $^{257}_{104}Rf$ nucleus _____ ?

Student Response	Correct Answer
A. four	
B. zero	
C. three	
D. two	
E. one	

11. chem10b 21.1-5

This reaction is an example of _____.

$^{210}_{84}Po \rightarrow {}^{206}_{82}Pb +$ _____

Student Response	Correct Answer
A. gamma emission	
B. electron capture	
C. beta emission	
D. positron emission	
E. alpha decay	

12. chem10b 21.2-17

In the nuclear transmutation, $^{16}_{8}O$ (p, α) $^{13}_{7}N$, what is the bombarding particle?

Student Response	Correct Answer
A. an alpha particle	
B. a phosphorus nucleus	
C. a proton	
D. a beta particle	
E. a gamma photon	

1. chem10b 21.6-5

Potassium-40 decays to argon-40 with a half-life of 1.27×10^9 yr. The age of a mineral sample that has a mass ratio of ^{40}Ar to ^{40}K of 0.812 is _____ yr.

Student Response	Correct Answer
A. 1.02×10^9	
B. 1.09×10^9	
C. 7.55×10^8	
D. 1.47×10^9	
E. 1.56×10^9	

2. chem10b 21.2-13

How many radioactive decay series exist in nature?

Student Response	Correct Answer
A. 0	
B. 1	
C. 2	
D. 3	
E. 10	

3. chem10b 21.2-39

Which one of the following devices converts radioactive emissions to light for detection?

Student Response	Correct Answer
A. scintillation counter	
B. Geiger counter	
C. photographic film	
D. none of the above	
E. radiotracer	

4. chem10b 21.2-43

When two atoms of ^{2}H are fused to form one atom of ^{4}He, the total energy evolved is . What is the total change in mass (in kg) for this reaction?

Student Response	Correct Answer
A. 4.26×10^{-26}	
B. 1.15	
C. 1.28×10^{-17}	
D. 4.26×10^{-29}	
E. 3.45×10^{8}	

5. chem10b 21.2-12

Atoms with the same atomic number and different mass numbers

Student Response	Correct Answer
A. do not exist.	
B. are resonance structures.	
C. are allotropes	
D. are isotopes.	
E. are isomers.	

6. chem10b 21.1-12

What is the mass number of a neutron _____ ?

Student Response	Correct Answer
A. 0	
B. 4	
C. 2	
D. 1	
E. 3	

7. chem10b 21.1-17

In the nuclear transmutation represented by O(p, α) N, the emitted particle is _____.

Student Response	Correct Answer
A. a beta particle.	
B. a neutron.	
C. a positron.	
D. an alpha particle.	

E. a proton.

8. chem10b 21.4-4

Charged particles are accelerated because the faster they move there is a greater chance of producing a nuclear reaction.

Student Response	Value	Correct Answer

9. chem10b 21.2-38

What is a phosphor?

Student Response	Correct Answer
A. a substance that thermally reduces to phosphorus	
B. an alkali metal phosphide	
C. a bioluminescent substance	
D. a substance that emits light when excited by radiation	
E. an oxide of phosphorus	

10. chem10b 21.1-32

The nuclear disintegration series of _____ is the source of radon-222 in soil.

Student Response	Correct Answer
A. ^{14}C	
B. ^{238}U	
C. ^{235}U	
D. ^{235}Th	
E. ^{236}Pb	

11. chem10b 21.2-36

Consider the following data for a particular radionuclide:

What is the half-life (in min) of this radionuclide?

Student Response	Correct Answer
A. 0.0242	
B. 0.0224	
C. 30.9	
D. 44.64	
E. 0.0324	

Score: 1/1

12. chem10b 21.5-4

The use of radioisotopes in tracing metabolism is possible because _____

Sample
Correct
Answer