

Unit 2 Exam - Atomic Structure and Nuclear

- The atomic number of an atom is always equal to the total number of
 - neutrons in the nucleus
 - protons in the nucleus
 - neutrons plus protons in the atom
 - protons plus electrons in the atom
- An atom of an element contains 20 protons, 20 neutrons, and 20 electrons. This element is
 - an alkali metal
 - an alkaline earth metal
 - a halogen
 - a noble gas
- What is the atomic number of an element whose atoms each contain 47 protons, 60 neutrons, and 47 electrons?
 - 13
 - 47
 - 60
 - 107
- What is the total number of protons and neutrons in the nuclide ${}_{35}^{80}\text{Br}$?
 - 35
 - 45
 - 80
 - 115
- The mass number of an atom is equal to the number of
 - neutrons, only
 - protons, only
 - neutrons plus protons
 - electrons plus protons
- An atom of ${}_{88}^{226}\text{Rn}$ contains
 - 88 protons and 138 neutrons
 - 88 protons and 138 electrons
 - 88 electrons and 226 neutrons
 - 88 electrons and 226 protons
- The nucleus is the part of the atom that
 - consist mostly of empty space
 - has a negative charge
 - occupies most of the atom's total volume
 - contains most of the atom's total mass
- What is the mass number of an ion that has 83 protons, 80 electrons, and 126 neutrons?
 - 83
 - 206
 - 209
 - 289

9. Which symbol represents a proton?

- A. ${}^1_1\text{H}$ B. ${}^0_1\text{H}$ C. ${}^1_0\text{H}$ D. ${}^0_0\text{H}$

10. The number of protons in an atom of ${}^3_1\text{H}$ is

- A. 1 B. 2 C. 3 D. 4

11. Which atom contains exactly 15 protons?

- A. phosphorus-32 B. sulfur-32
C. oxygen-15 D. nitrogen-15

12. After bombarding a gold foil sheet with alpha particles, scientists concluded that atoms consist mainly of

- A. electrons B. empty space
C. protons D. neutrons

13. What is the charge and mass of a proton?

- A. charge of +1 and mass of 1 amu
B. charge of +1 and mass of $\frac{1}{1836}$ amu
C. charge of -1 and mass of 1 amu
D. charge of -1 and mass of $\frac{1}{1836}$ amu

14. Which particle is electrically neutral?

- A. proton B. positron C. neutron D. electron

15. Which nucleus is from an isotope of an atom with the nucleus $\begin{pmatrix} 6n \\ 6p \end{pmatrix}$?

- A. $\begin{pmatrix} 6n \\ 6p \end{pmatrix}$ B. $\begin{pmatrix} 4n \\ 8p \end{pmatrix}$ C. $\begin{pmatrix} 8n \\ 6p \end{pmatrix}$ D. $\begin{pmatrix} 6n \\ 8p \end{pmatrix}$

16. A neutron has approximately the same mass as

- A. an alpha particle B. a beta particle
C. an electron D. a proton

17. In which two atoms do both nuclides contain the same number of neutrons?

- A. ${}^{20}_{10}\text{Ne}$ and ${}^{40}_{18}\text{Ar}$ B. ${}^{65}_{29}\text{Cu}$ and ${}^{65}_{30}\text{Zn}$
C. ${}^{24}_{12}\text{Mg}$ and ${}^{26}_{12}\text{Mg}$ D. ${}^{14}_6\text{C}$ and ${}^{16}_8\text{O}$

18. What is the total number of electrons in an atom with an atomic number of 13 and a mass number of 27?

- A. 13 B. 14 C. 27 D. 40

19. Which of the following particles has the *least* mass?

- A. an electron B. a proton
C. a deuteron D. a neutron

20. Which pair of atoms are isotopes of element X?

- A. ${}_{90}^{226}\text{X}$ and ${}_{91}^{226}\text{X}$ B. ${}_{91}^{226}\text{X}$ and ${}_{91}^{227}\text{X}$
C. ${}_{91}^{227}\text{X}$ and ${}_{90}^{227}\text{X}$ D. ${}_{90}^{226}\text{X}$ and ${}_{91}^{227}\text{X}$

21. A sample of element X contains 90 percent ${}^{35}\text{X}$ atoms, 8.0 percent ${}^{37}\text{X}$ atoms, and 2.0 percent ${}^{38}\text{X}$ atoms. The average isotopic mass is closest to

- A. 32 B. 35 C. 37 D. 38

22. Which statement best explains why most atomic masses on the Periodic Table are decimal numbers?

- A. Atomic masses are determined relative to an H-1 standard.
B. Atomic masses are determined relative to an O-16 standard.
C. Atomic masses are a weighted average of the naturally occurring isotopes.
D. Atomic masses are an estimated average of the artificially produced isotopes.

23. Base your answer(s) to the following question(s) on the data table below, which shows three isotopes of neon.

Isotope	Atomic Mass (atomic mass units)	Percent Natural Abundance
${}^{20}\text{Ne}$	19.99	90.9%
${}^{21}\text{Ne}$	20.99	0.3%
${}^{22}\text{Ne}$	21.99	8.8%

Based on natural abundances, the average atomic mass of neon is closest to which whole number?

24. The atomic mass of element A is 63.6 atomic mass units. The only naturally occurring isotopes of element A are A-63 and A-65. The percent abundances in a naturally occurring sample of element A are closest to

- A. 31% A-63 and 69% A-65
B. 50% A-63 and 50% A-65
C. 69% A-63 and 31% A-65
D. 100% A-63 and 0% A-65

25. Base your answer(s) to the following question(s) on the information below.

Naturally Occurring Isotopes of Sulfur

Isotope	Atomic Mass (atomic mass units, u)	Natural Abundance (%)
${}^{32}\text{S}$	31.97	94.93
${}^{33}\text{S}$	32.97	0.76
${}^{34}\text{S}$	33.97	4.29
${}^{36}\text{S}$	35.97	0.02

Show a correct numerical setup for calculating the atomic mass of sulfur.

26. Isotopes of the same element must have the same

- A. atomic number
- B. mass number
- C. number of nucleons
- D. number of neutrons

27. Atoms of every isotope of calcium have the same

- A. atomic mass
- B. atomic number
- C. number of neutrons
- D. number of nucleons

28. As the mass number of the isotopes of hydrogen increases, the number of protons

- A. decreases
- B. increases
- C. remains the same

29. All atoms in a given sample of an element contain the same number of

- A. nucleons and electrons
- B. nucleons and neutrons
- C. protons and electrons
- D. protons and neutrons

30. The stability of an isotope is based on its

- A. number of neutrons, only
- B. number of protons, only
- C. ratio of neutrons to protons
- D. ratio of electrons to protons

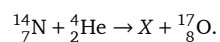
31. For a given mass, the energy released is greatest for a reaction involving

- A. slow oxidation
- B. rapid oxidation
- C. fission
- D. fusion

32. Which process occurs in a controlled fusion reaction?

- A. Light nuclei collide to produce heavier nuclei.
- B. Heavy nuclei collide to produce lighter nuclei.
- C. Neutron bombardment splits light nuclei.
- D. Neutron bombardment splits heavy nuclei.

33. Given the equation:



When the equation is correctly balanced, the particle represented by the X will be

- A. ${}^0_{-1}\text{e}$
- B. ${}^1_0\text{n}$
- C. ${}^1_1\text{H}$
- D. ${}^2_1\text{H}$

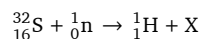
34. When a uranium nucleus breaks up into fragments, which type of nuclear reaction occurs?

- A. fusion
- B. fission
- C. replacement
- D. redox

35. Which materials are commonly used for shielding in a nuclear fission reactor?

- A. uranium and plutonium
- B. boron and cadmium
- C. steel and concrete
- D. beryllium and heavy water

36. Given the nuclear reaction:



What does X represent in this reaction?

- A. ${}_{15}^{31}\text{P}$
- B. ${}_{15}^{32}\text{P}$
- C. ${}_{16}^{31}\text{S}$
- D. ${}_{16}^{32}\text{S}$

37. One benefit of nuclear fission reactions is

- A. nuclear reactor meltdowns
- B. storage of waste materials
- C. biological exposure
- D. production of energy

38. An 80 milligram sample of a radioactive isotope decays to 5 milligrams in 32 days. What is the half-life of this element?

- A. 8 days
- B. 2 days
- C. 16 days
- D. 4 days

39. An original sample of a radioisotope had a mass of 10 grams. After 2 days, 5 grams of the radioisotope remains unchanged. What is the half-life of this radioisotope?

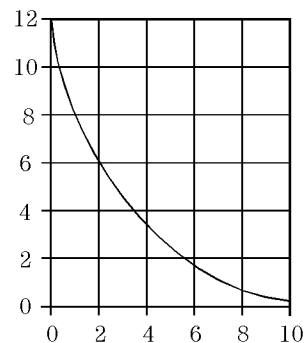
- A. 1 day
- B. 2 days
- C. 5 days
- D. 4 days

40. In 6.20 hours, a 100-gram sample of ${}_{47}^{112}\text{Ag}$ decays to 25.0 grams. What is the half-life of ${}_{47}^{112}\text{Ag}$?

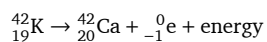
- A. 1.60 hours
- B. 3.10 hours
- C. 6.20 hours
- D. 12.4 hours

41. The graph shown represents the decay of a radioactive isotope. What is the half-life of this isotope?

- A. 1 hour
- B. 2 hours
- C. 3 hours
- D. 6 hours



42. Given the nuclear equation:



This equation is an example of

- A. alpha decay
- B. beta decay
- C. fission
- D. fusion

43. Diagnostic injections of radioisotopes used in medicine normally have

- A. short half-lives and are quickly eliminated from the body
- B. short half-lives and are slowly eliminated from the body
- C. long half-lives and are quickly eliminated from the body
- D. long half-lives and are slowly eliminated from the body

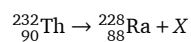
44. After 30 days, 5.0 grams of a radioactive isotope remains from an original 40-gram sample. What is the half-life of this element?

- A. 5 days
- B. 10 days
- C. 15 days
- D. 20 days

45. A gamma ray is best described as having

- A. no electric charge and no mass
- B. a negative charge and no mass
- C. a positive charge and a mass number of 2
- D. a positive charge and a mass number of 4

46. Given the nuclear equation:



The letter X in the equation represents

- A. an alpha particle
- B. a beta particle
- C. a gamma ray
- D. a neutron

47. The structure of an alpha particle is the same as a

- A. lithium atom
- B. neon atom
- C. hydrogen nucleus
- D. helium nucleus

48. Gamma rays are most similar to

- A. positively charged hydrogen nuclei
- B. positively charged helium nuclei
- C. high-energy X-rays
- D. high-speed electrons

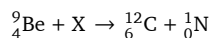
49. Gamma rays are emanations that have

- A. mass but no charge
- B. charge but no mass
- C. neither mass nor charge
- D. both mass and charge

50. Given the nuclear equation: ${}^9_4\text{Be} + X \rightarrow {}^6_3\text{Li} + {}^4_2\text{He}$. What is the identity of particle X in this equation?

- A. ${}^1_1\text{H}$ B. ${}^2_1\text{H}$ C. ${}^0_{-1}\text{e}$ D. ${}^1_0\text{n}$

51. Given the nuclear reaction:



What is the identity of particle X ?

- A. alpha particle B. beta particle
C. proton D. neutron

52. Which of these types of radiation has the greatest penetrating power?

- A. alpha B. beta C. gamma D. positron

53. Which of these particles has the greatest mass?

- A. alpha B. beta C. neutron D. positron

54. An unstable nucleus loses the most mass if the nucleus emits

- A. an alpha particle B. a beta particle
C. a positron D. a gamma ray

55. Within a nuclear reactor, the purpose of the moderator is to

- A. absorb neutrons in the reactor core
B. absorb neutrons in the outer containment structure
C. slow down neutrons in the reactor core
D. slow down neutrons in the outer containment structure

56. Which isotope is most commonly used in the radioactive dating of the remains of organic materials?

- A. ${}^{14}\text{C}$ B. ${}^{16}\text{N}$ C. ${}^{32}\text{P}$ D. ${}^{37}\text{K}$

57. What is a problem commonly associated with nuclear power facilities?

- A. A small quantity of energy is produced.
B. Reaction products contribute to acid rain.
C. It is impossible to control nuclear fission.
D. It is difficult to dispose of wastes.

Unit 2 Exam - Atomic Structure and Nuclear 10/03/2016

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|--|---|
| <p>1.
Answer: B</p> <p>2.
Answer: B</p> <p>3.
Answer: B</p> <p>4.
Answer: C</p> <p>5.
Answer: C</p> <p>6.
Answer: A</p> <p>7.
Answer: D</p> <p>8.
Answer: C</p> <p>9.
Answer: A</p> <p>10.
Answer: A</p> <p>11.
Answer: A</p> <p>12.
Answer: B</p> <p>13.
Answer: A</p> <p>14.
Answer: C</p> <p>15.
Answer: C</p> <p>16.
Answer: D</p> <p>17.
Answer: D</p> <p>18.
Answer: A</p> <p>19.
Answer: A</p> <p>20.
Answer: B</p> | <p>21.
Answer: B</p> <p>22.
Answer: C</p> <p>23.
Answer: 20</p> <p>24.
Answer: C</p> <p>25.
Answer: $(31.97)(0.9493) + (32.97)(0.0076) + (33.97)(0.0429) + (35.97)(0.0002)$</p> <p>26.
Answer: A</p> <p>27.
Answer: B</p> <p>28.
Answer: C</p> <p>29.
Answer: C</p> <p>30.
Answer: C</p> <p>31.
Answer: D</p> <p>32.
Answer: A</p> <p>33.
Answer: C</p> <p>34.
Answer: B</p> <p>35.
Answer: C</p> <p>36.
Answer: B</p> <p>37.
Answer: D</p> <p>38.
Answer: A</p> <p>39.
Answer: B</p> |
|--|---|

- 40.
Answer: B
- 41.
Answer: B
- 42.
Answer: B
- 43.
Answer: A
- 44.
Answer: B
- 45.
Answer: A
- 46.
Answer: A
- 47.
Answer: D
- 48.
Answer: C
- 49.
Answer: C
- 50.
Answer: A
- 51.
Answer: A
- 52.
Answer: C
- 53.
Answer: A
- 54.
Answer: A
- 55.
Answer: C
- 56.
Answer: A
- 57.
Answer: D