

Atomic structure

Name: _____

Sunday, October 14, 2007

1.

In comparison to an atom of $^{19}_9\text{F}$ in the ground state, an atom of $^{12}_6\text{C}$ in the ground state has

1. three fewer neutrons
2. three fewer valence electrons
3. three more neutrons
4. three more valence electrons

2.

Compared to an element of calcium-40, an atom of potassium-39 contains fewer

1. protons
2. neutrons
3. occupied sublevels
4. occupied principal energy levels

3.

What are the characteristics of a neutron?

1. It has no charge and no mass.
2. It has no charge and a mass of 1 amu.
3. It has a charge of +1 and no mass.
4. It has a charge of +1 and a mass of 1 amu.

4.

What is the maximum number of electrons that may be present in the fourth principal energy level of an atom?

1. 8
2. 2
3. 18
4. 32

5.

The major portion of an atom's mass consists of

1. electrons and protons
2. electrons and neutrons
3. neutrons and positrons
4. neutrons and protons

Atomic structure

6.

How many electrons are contained in an Au^{3+} ion?

- 1. 76 3. 82
- 2. 79 4. 197

7.

Which electron configuration is correct for a sodium ion?

- 1. 2-7
- 2. 2-8
- 3. 2-8-1
- 4. 2-8-2

8.

The atomic mass of an element is defined as the weighted average mass of that element's

- 1. most abundant isotope 3. naturally occurring isotopes
- 2. least abundant isotope 4. radioactive isotopes

9.

The atomic number of an atom is always equal to the number of its

- 1. protons, only 3. protons plus neutrons
- 2. neutrons, only 4. protons plus electrons

10.

What is the total number of electrons found in an atom of sulfur?

- 1. 6 3. 16
- 2. 8 4. 32

Atomic structure

11.

A particle of matter contains six protons, seven neutrons, and six electrons. This particle must be a

- | | |
|--------------------------|------------------------------------|
| 1. neutral carbon atom | 3. positively charged carbon ion |
| 2. neutral nitrogen atom | 4. positively charged nitrogen ion |

12.

What is the charge of the nucleus in an atom of oxygen-17?

- | | |
|-------|--------|
| 1. 0 | 3. +8 |
| 2. -2 | 4. +17 |

13.

The region that is the most probable location of an electron in an atom is

- | | |
|----------------|----------------------|
| 1. the nucleus | 3. the excited state |
| 2. an orbital | 4. an ion |

14.

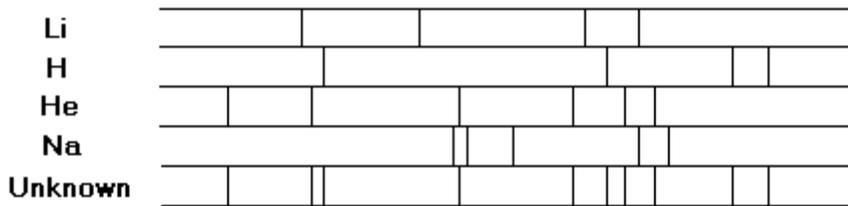


Figure 1

The diagram shows the characteristic spectral line patterns of four elements. Also shown are spectral lines produced by an unknown substance. Which pair of elements is present in the unknown?

- | | |
|------------------------|------------------------|
| 1. lithium and sodium | 3. lithium and helium |
| 2. sodium and hydrogen | 4. helium and hydrogen |

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15.

As an electron in an atom moves from the ground state to the excited state, the electron

1. gains energy as it moves to a higher energy level
2. gains energy as it moves to a lower energy level
3. loses energy as it moves to a higher energy level
4. loses energy as it moves to a lower energy level

16.

What is the total number of protons in the nucleus of an atom of potassium-42?

1. 15
2. 19
3. 39
4. 42

17.

A neutron has approximately the same mass as

1. an alpha particle
2. a beta particle
3. an electron
4. a proton

18.

The characteristic bright-line spectrum of sodium is produced when its electrons

1. return to lower energy levels
2. jump to higher energy levels
3. are lost by the neutral atoms
4. are gained by the neutral atoms

19.

What is the total number of neutrons in an atom of $^{207}_{82}\text{Pb}$?

1. 82
2. 125
3. 207
4. 289

Atomic structure

20.

Which atom has a nucleus that contains 13 protons and 14 neutrons?

- 1. Mg 3. Al
- 2. Be 4. N

21.

Which electron configuration represents an atom of chlorine in an excited state?

- 1. 2-8-7 3. 2-8-6-1
- 2. 2-8-8 4. 2-8-7-1

22.

When the electrons of an excited atom return to a lower energy state, the energy emitted can result in the production of

- 1. alpha particles 3. protons
- 2. isotopes 4. spectra

23.

Which of these phrases best describes an atom?

- 1. a positive nucleus surrounded by a hard negative shell
- 2. a positive nucleus surrounded by a cloud of negative charges
- 3. a hard sphere with positive particles uniformly embedded
- 4. a hard sphere with negative particles uniformly embedded

24.

Which atom contains exactly 15 protons?

- 1. phosphorus-32 3. oxygen-15
- 2. sulfur-32 4. nitrogen-15

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25.

Which element has no stable isotopes?

1. Co₂₇
2. Sb₅₁
3. Th₉₀
4. Pb₈₂

26.

Which term refers to the region of an atom where an electron is most likely to be found?

1. orbital
2. orbit
3. quantum
4. spectrum

27.

Which electron configuration represents the electrons of an atom in an excited state?

1. 2-8-1
2. 2-8-6
3. 2-8-17-6
4. 2-8-18-5

28.

Rutherford's gold foil experiment illustrated that the atom

1. is mostly empty space
2. is densely packed with electrons
3. cannot be penetrated by any radiation
4. contains a negatively charged nucleus

29.

Potassium ions are essential to human health. The movement of dissolved potassium ions, $K^+(aq)$, in and out of a nerve cell allows that cell to transmit an electrical impulse.

What is the total number of electrons in a potassium ion?

electrons

Atomic structure

30.

Which principal energy level change by the electron of a hydrogen atom will cause the greatest amount of energy to be absorbed?

1. $n = 2$ to $n = 4$
2. $n = 2$ to $n = 5$
3. $n = 4$ to $n = 2$
4. $n = 5$ to $n = 2$

31.

Base your answer to the question on the information.

Naturally occurring elemental carbon is a mixture of isotopes. The percent composition of the two most abundant isotopes is listed below.

- 98.93% of the carbon atoms have a mass of 12.00 atomic mass units.
- 1.07% of the carbon atoms have a mass of 13.00 atomic mass units.

Figure 2

Which of the following is a correct numerical setup for calculating the average atomic mass of carbon?

1.
$$\frac{(12.00)(98.93) + (13.00)(1.07)}{100}$$
2.
$$\frac{(12.00)(98.93) + (13.00)(1.07)}{100}$$
3.
$$\frac{(98.3) + (13.00) + (12.00) + (1.07)}{(12) + (13)}$$
4.
$$\frac{(12)(13) + (98.3)(1.07)}{100}$$

32.

When a lithium atom forms an Li^+ ion, the lithium atom

1. gains a proton
2. gains an electron
3. loses a proton
4. loses an electron

Atomic structure

33.

An experiment using alpha particles to bombard a thin sheet of gold foil indicated that most of the volume of the atoms in the foil is taken up by

1. electrons
2. protons
3. neutrons
4. empty space

34.

Which statement is true about the charges assigned to an electron and a proton?

1. Both an electron and a proton are positive.
2. An electron is positive and a proton is negative.
3. An electron is negative and a proton is positive.
4. Both an electron and a proton are negative.

35.

As a Ca atom undergoes oxidation to Ca^{2+} , the number of neutrons in its nucleus

1. decreases
2. increases
3. remains the same

36.

A student determined the heat of fusion of water to be 88 calories per gram. If the accepted value is 80. calories per gram, what is the student's percent error?

1. 5.0%
2. 10.%
3. 11%
4. 90.%

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37.

A sample of water is being heated from 20°C to 30°C , and the temperature is recorded every 2 minutes. Which table would be most appropriate for recording the data?

Time (min)	Temp ($^{\circ}\text{C}$)	Time (min)	Temp ($^{\circ}\text{C}$)	Temp ($^{\circ}\text{C}$)	Time (min)	Temp ($^{\circ}\text{C}$)	Time (min)
0		20		0		20	
2		22		2		22	
4		24		4		24	
6		26		6		26	
8		28		8		28	
10		30		10		30	

1.

2.

3.

4.

38.

What is the total number of protons in the nucleus of an F^{-} ion?

1. 8 3. 10

2. 9 4. 11

39.

What is the total number of neutrons in the nucleus of a neutral atom that has 19 electrons and a mass number of 39?

1. 19 3. 39

2. 20 4. 58

40.

A substance that is composed only of atoms having the same atomic number is classified as

1. a compound 3. a homogeneous mixture

2. an element 4. a heterogeneous mixture

Atomic structure

41.

Which conclusion is based on the "gold foil experiment" and the resulting model of the atom?

- | | |
|---|---|
| <p>1. An atom is mainly empty space, and the nucleus has a positive charge.</p> <p>2. An atom is mainly empty space, and the nucleus has a negative charge.</p> | <p>3. An atom has hardly any empty space, and the nucleus has a positive charge.</p> <p>4. An atom has hardly any empty space, and the nucleus has a negative charge.</p> |
|---|---|

42.

Trial	Particle Size of NaHCO ₃	Concentration of HCl	Temperature (°C) of HCl
<i>A</i>	small	1 M	20
<i>B</i>	large	1 M	20
<i>C</i>	large	1 M	40
<i>D</i>	small	2 M	40
<i>E</i>	large	2 M	40

Figure 3

The table represents the production of 50 milliliters of CO₂ in the reaction of HCl with NaHCO₃. Five trials were performed under different conditions as shown. (The same mass of NaHCO₃ was used in each trial.) Which trial would produce the fastest reaction?

- | | |
|-------------------|-------------------|
| 1. trial <i>A</i> | 3. trial <i>C</i> |
| 2. trial <i>B</i> | 4. trial <i>D</i> |

43.

Compared to the entire atom, the nucleus of the atom is

- | | |
|---|--|
| 1. smaller and contains most of the atom's mass | 3. larger and contains most of the atom's mass |
| 2. smaller and contains little of the atom's mass | 4. larger and contains little of the atom's mass |

44.

What is the total number of electrons present in an atom of $^{39}_{27}\text{Co}$?

- | | |
|-------|-------|
| 1. 27 | 3. 39 |
| 2. 32 | 4. 86 |

Atomic structure

45.

Which measurement contains three significant figures?

1. 0.08 cm
2. 0.080 cm
3. 800 cm
4. 8.08 cm

46.

A student wishes to prepare approximately 100 milliliters of an aqueous solution of 6M HCl using 12 M HCl. Which procedure is correct?

1. adding 50 mL of 12 M HCl to 50 mL of water while stirring the mixture steadily
2. adding 50 mL of 12 M HCl to 50 mL of water, and then stirring the mixture steadily
3. adding 50 mL of water to 50 mL 12 M HCl while stirring the mixture steadily
4. adding 50 mL of water to 50 mL 12 M HCl, and then stirring the mixture steadily

47.

Which particles account for most of the mass of the atom?

1. protons and neutrons
2. protons and electrons
3. neutrons and electrons
4. neutrons and positrons

48.

The atomic mass of an element is the weighted average of the masses of

1. its two most abundant isotopes
2. its two least abundant isotopes
3. all of its naturally occurring isotopes
4. all of its radioactive isotopes

Atomic structure

49.

[Refer to figure 3 in question 42]

The table represents the production of 50 milliliters of CO_2 in the reaction of HCl with NaHCO_3 . Five trials were performed under different conditions as shown. (The same mass of NaHCO_3 was used in each trial.) Which two trials could be used to measure the effect of surface area?

1. trials *A* and *B*
2. trials *A* and *C*
3. trials *A* and *D*
4. trials *B* and *D*

50.

What is the total number of neutrons in an atom of ${}^7_3\text{Li}$?

1. 7
2. 10
3. 3
4. 4

Atomic structure

Answer Key for Atomic structure

1. 2
2. 1
3. 2
4. 4
5. 4
6. 1
7. 2
8. 3
9. 1
10. 3
11. 1
12. 3
13. 2
14. 4
15. 1
16. 2
17. 4
18. 1
19. 2
20. 3
21. 3
22. 4
23. 2
24. 1
25. 3
26. 1
27. 3
28. 1
29. 18
30. 2
31. 1
32. 4
33. 4
34. 3
35. 3
36. 2
37. 1
38. 2
39. 2
40. 2
41. 1
42. 4
43. 1
44. 1
45. 4
46. 1

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47. 1
48. 3
49. 1
50. 4