TEST BANK



MULTIPLE CHOICE

a. Robert Boyle d. John Dalton b. Robert Millikan c. Albert Einstein c. Joseph John Thomson ANS: C DIF: Easy REF: 2.1 OBJ: Identify the scientists who contributed to the development of modern atomic theory. MSC: Factual 2. Who was the first scientist to determine the charge of an electron? a. Robert Boyle d. John Dalton b. Robert Millikan e. Albert Einstein c. Joseph John Thomson ANS: B ANS: B DIF: Easy REF: 2.1 OBJ: Identify the scientists who contributed to the development of modern atomic theory. MSC: Factual 3. What is the correct symbol for an electron? a. $-1e$ e e b. $-1e$ e $0e$ c. 0 e e d. $1e$ e $0e$ b. $1e$ e e ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a $1e$ a.	1.	Who discovered electrons?		
ANS: C DIF: Easy REF: 2.1 OBJ: Identify the scientists who contributed to the development of modern atomic theory. MSC: Factual 2. Who was the first scientist to determine the charge of an electron? a. Robert Boyle d. John Dalton b. Robert Millikan e. ADS: B DIF: Easy REF: 2.1 OBJ: Identify the scientists who contributed to the development of modern atomic theory. MSC: Factual ANS: B DIF: Easy 3. What is the correct symbol for an electron? a. $\frac{1}{-1}e$ b. $\frac{1}{-1}e$ b. $\frac{1}{-1}e$ c. $\frac{1}{0}e$ c. $\frac{1}{0}e$ c. $\frac{1}{0}e$ c. $0 = e$ ANS: A DIF: Easy REF: 2.1 . . OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 4. What is the correct symbol for a proton? a. $\frac{1}{0}p$ c. $\frac{1}{0}p$ c. $\frac{1}{1}p$ ANS: C DIF: Easy REF: 2.1 . . . OBJ: Write the complete symbols used for subatomic particles. MSC: Applied . 5. What is the correct symbol for a neutron? a.		a. Robert Boyleb. Robert Millikanc. Joseph John Thomson	d. e.	John Dalton Albert Einstein
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3. What is the correct symbol for an electron? a. $\begin{array}{c} 0\\ -1\\ 0\\ 0\\ 0\\ \end{array}$ b. $\begin{array}{c} 1\\ -1\\ 0\\ 0\\ 0\\ \end{array}$ c. $\begin{array}{c} 0\\ 1\\ 0\\ 0\\ \end{array}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 4. What is the correct symbol for a proton? a. $\begin{array}{c} 0\\ -1\\ 0\\ 1\\ p\\ 0\\ 0\\ 1\\ p\\ c. \end{array}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{array}{c} 1\\ 0\\ -1\\ p\\ 0\\ 0\\ p\\ c. \end{array}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{array}{c} 1\\ 0\\ -1\\ n\\ 0\\ 0\\ n\\ c. \end{array}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{array}{c} 4\\ \alpha\\ 1\\ \alpha\\ 0\\ n\\ c. \end{array}$ MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{array}{c} 4\\ \alpha\\ 1\\ \alpha\\ 0\\ \alpha\end{array}$		ANS:BDIF:EasyOBJ:Identify the scientists who contributed toMSC:Factual	REF: the de	2.1 velopment of modern atomic theory.
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b. $\frac{1}{10}$ e. $\frac{1}{00}$ e. $\frac{1}{00}$ e. c. $\frac{1}{00}$ e. ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 4. What is the correct symbol for a proton? a. $\frac{1}{0}$ p. d. $\frac{1}{0}$ p. b. $\frac{1}{0}$ p. e. $\frac{1}{0}$ p. c. $\frac{1}{1}$ p. ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\frac{1}{0}$ n. d. $\frac{1}{-1}$ n. b. $\frac{1}{1}$ n. e. $\frac{1}{0}$ n. c. $\frac{1}{0}$ n. ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1} \alpha$ d. $\frac{4}{2} \alpha$ b. $\frac{2}{2} \alpha$ c. $\frac{1}{0} \alpha$		a. le	d.	1 1 e
c. $\begin{bmatrix} 0 \\ 1 \\ e \end{bmatrix}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 4. What is the correct symbol for a proton? a. $\begin{bmatrix} 0 \\ -1 \\ p \end{bmatrix}$ b. $\begin{bmatrix} 0 \\ -1 \\ p \end{bmatrix}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{bmatrix} 1 \\ n \end{bmatrix}$ b. $\begin{bmatrix} 1 \\ n \end{bmatrix}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{bmatrix} 1 \\ n \end{bmatrix}$ b. $\begin{bmatrix} 1 \\ n \end{bmatrix}$ c. $\begin{bmatrix} 0 \\ n \end{bmatrix}$ c. $\begin{bmatrix} 0 \\ n \end{bmatrix}$ MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{bmatrix} 4 \\ \alpha \end{bmatrix}$ b. $\begin{bmatrix} 2 \\ 2 \\ \alpha \end{bmatrix}$ c. $\begin{bmatrix} 0 \\ 0 \\ \alpha \end{bmatrix}$		b. 1 e	e.	 0 0 e
ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 4. What is the correct symbol for a proton? a. $\frac{0}{-1}p$ b. $\frac{0}{1}p$ c. $\frac{1}{1}p$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\frac{1}{0}n$ b. $\frac{1}{1}n$ c. $\frac{0}{1}n$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an aparticle? a. $\frac{4}{1}\alpha$ b. $\frac{2}{2}\alpha$ c. $\frac{4}{2}\alpha$ c. $\frac{6}{0}\alpha$		c. 0 1e		°
4. What is the correct symbol for a proton? a. $\begin{array}{c} 0\\ -1p\\ b. \\ 1p\\ c. \\ 1p\\ c. \\ 1p\\ c. \end{array}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{array}{c} 1\\ 0\\ 1\\ n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 2\\ \alpha\end{array}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{array}{c} 4\\ 1\\ \alpha\\ 0\\ 1\\ n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 1n\\ c. \\ 0\\ 0\\ n\\ c. \\ 0\\ 0\\ 0\\ n\\ c. \\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0$		ANS:ADIF:EasyOBJ:Write the complete symbols used for sub	REF: atomic	2.1 particles. MSC: Applied
a. $\begin{array}{c} 0\\ -1 \\ p \\ b. \\ 0\\ 1 \\ p \end{array}$ d. $\begin{array}{c} 1\\ 0 \\ p \\ c. \\ 0\\ p \end{array}$ b. $\begin{array}{c} 0\\ 1 \\ p \end{array}$ e. $\begin{array}{c} 0\\ 0\\ p \end{array}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles.MSC: Applied5. What is the correct symbol for a neutron?a. $\begin{array}{c} 1\\ -1 \\ n \end{array}$ a. $\begin{array}{c} 1\\ 0 \\ n \end{array}$ d. $\begin{array}{c} 1\\ -1 \\ n \end{array}$ b. $\begin{array}{c} 1\\ 1 \\ n \end{array}$ e. $\begin{array}{c} 0\\ 0 \\ n \end{array}$ c. $\begin{array}{c} 0\\ 1 \\ n \end{array}$ DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles.6. What is the correct symbol for an α particle?a. $\begin{array}{c} 4\\ 1 \\ \alpha \end{array}$ d. $\begin{array}{c} 4\\ 2 \\ \alpha \end{array}$ 6. What is the correct symbol for an α particle?a. $\begin{array}{c} 4\\ 1 \\ \alpha \end{array}$ d. $\begin{array}{c} 4\\ 2 \\ \alpha \end{array}$ 6. What is the correct symbol for an α particle?a. $\begin{array}{c} 4\\ 1 \\ \alpha \end{array}$ d. $\begin{array}{c} 4\\ 2 \\ \alpha \end{array}$ b. $\begin{array}{c} 2\\ 2 \\ \alpha \end{array}$ e. $\begin{array}{c} 0\\ 0 \\ \alpha \end{array}$	4.	What is the correct symbol for a proton?		
b. $\begin{bmatrix} 0 & 0 \\ 1 & p \\ c. & 1 \\ p \end{bmatrix}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\begin{bmatrix} 1 & n & 0 \\ 0 & n & 0 \\ 1 & n & 0 \\ 0 & n & 0 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & n & 0 \\ 0 & n & 0 \\ 0 & n & 0 \end{bmatrix}$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{bmatrix} 4 & \alpha & 0 \\ 1 & \alpha & 0 \\ 0 & n & 0 \end{bmatrix}$ b. $\begin{bmatrix} 2 & \alpha & 0 \\ 2 & \alpha & 0 \end{bmatrix}$		a. 0	d.	1 0 p
c. $\frac{1}{1p}$ ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\frac{1}{0}n$ d. $\frac{1}{-1}n$ b. $\frac{1}{1}n$ e. $\frac{0}{0}n$ c. $\frac{0}{1}n$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$		b. ⁰ 1p	e.	0 0 0
ANS: C DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 5. What is the correct symbol for a neutron? a. $\frac{1}{0}n$ d. $\frac{1}{-1}n$ b. $\frac{1}{1}n$ e. $\frac{0}{0}n$ c. $\frac{0}{1}n$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$		$\begin{array}{c} c \\ c \\ 1 \\ p \end{array}$		Ů.
5. What is the correct symbol for a neutron? a. $\frac{1}{0}$ n d. $\frac{1}{-1}$ n b. $\frac{1}{1}$ n e. $\frac{0}{0}$ n c. $\frac{0}{1}$ n ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$		ANS: C DIF: Easy OBJ: Write the complete symbols used for sub	REF: atomic	2.1 particles. MSC: Applied
a. $\frac{1}{0}$ n d. $\frac{1}{-1}$ n b. $\frac{1}{1}$ n e. $\frac{0}{0}$ n c. $\frac{0}{1}$ n ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$	5.	What is the correct symbol for a neutron?		
b. $\frac{1}{1}$ n e. $\frac{0}{0}$ n c. $\frac{0}{1}$ n ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$		a. $\frac{1}{0}n$	d.	$^{1}_{-1}n$
c. $\begin{bmatrix} 0 \\ 1 \end{bmatrix} n$ ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\begin{bmatrix} 4 \\ 1 \\ \alpha \\ 0 \\ \alpha \end{bmatrix}$ b. $\begin{bmatrix} 2 \\ 2 \\ \alpha \\ 0 \\ \alpha \end{bmatrix}$ c. $\begin{bmatrix} 0 \\ 2 \\ \alpha \\ 0 \\ \alpha \end{bmatrix}$		b. $\frac{1}{1}n$	e.	0 0 n
ANS: A DIF: Easy REF: 2.1 OBJ: Write the complete symbols used for subatomic particles. MSC: Applied 6. What is the correct symbol for an α particle? a. $\frac{4}{1}\alpha$ d. $\frac{4}{2}\alpha$ b. $\frac{2}{2}\alpha$ e. $\frac{0}{0}\alpha$		$\begin{array}{c} c. & 0\\ & 1 \end{array}$		
6. What is the correct symbol for an α particle? a. $\begin{array}{c} 4\\ 1\\ \alpha\\ b. \end{array}$ b. $\begin{array}{c} 2\\ 2\\ \alpha\\ \alpha\end{array}$ c. $\begin{array}{c} 0\\ 0\\ \alpha\end{array}$ d. $\begin{array}{c} 4\\ 2\\ \alpha\\ 0\\ \alpha\end{array}$		ANS:ADIF:EasyOBJ:Write the complete symbols used for sub	REF: atomic	2.1 particles. MSC: Applied
a. $\begin{array}{ccc} 4 \\ 1 \\ \alpha \end{array}$ b. $\begin{array}{ccc} 2 \\ 2 \\ \alpha \end{array}$ c. $\begin{array}{ccc} 0 \\ 0 \\ \alpha \end{array}$	6.	What is the correct symbol for an α particle?		
b. $\frac{1}{2}\alpha$ e. $\frac{1}{0}\alpha$		a. $\frac{4}{1}\alpha$	d.	⁴ ₂ α.
•		b. $\frac{1}{2}\alpha$	e.	- 0 α

	$c = \frac{1}{4} \alpha$
	ANS:DDIF:MediumREF:2.1OBJ:Write the complete symbols used for subatomic particles.MSC:Applied
7.	In the Rutherford–Geiger–Marsden experiment, α particles were projected at a thin film of
	a.gold.d.sodium.b.silver.e.aluminum.c.platinum.
	ANS:ADIF:EasyREF:2.1OBJ:Identify and describe experiments that provided evidence to support modern atomic theory.MSC:Factual
8.	In the atoms in the Rutherford–Geiger–Marsden experiment, the α particles were repelled by
	a.electrons.d.nuclei.b.protons.e.gravity.c.neutrons.e.gravity.
	ANS:DDIF:EasyREF:2.1OBJ:Identify and describe experiments that provided evidence to support modern atomic theory.MSC:Factual
9.	Which one of the following experiments provided evidence that atoms contained small massive nuclei with positive charges?
	 a. Bunsen and Kirchoff's flame test b. Fraunhofer lines c. the Rutherford–Geiger–Marsden experiment d. Thomson's experiments with cathode ray tubes e. Millikan's oil-drop experiment
	ANS:CDIF:EasyREF:2.1OBJ:Identify and describe experiments that provided evidence to support modern atomic theory.MSC:Factual
10.	Rutherford, Geiger, and Marsden's experiment demonstrated that the volume of the nucleus is roughly what fraction of the volume occupied by the electrons?
	a. 1/10 d. 1/10,000 b. 1/100 e. 1/100,000 c. 1/1,000 1/100,000 1/100,000
	ANS:DDIF:EasyREF:2.1OBJ:Compare the size of the nucleus with the size of the atom.MSC:Factual
11.	If an atom had a radius of 100 m, it would be approximately the size of a football stadium. On this scale, what would be the radius of the atomic nucleus since the radius of the nucleus is approximately 10,000 times smaller than the radius of an atom?
	 a. 1 mm, like a very dull pencil point b. 1 cm, like a dime c. 10 cm, like your longest finger d. 10 μ m, like a red blood cell e. 100 pm, like a real atom
	ANS:BDIF:DifficultREF:2.1OBJ:Compare the size of the nucleus with the size of the atom.MSC:Applied
12.	Protons and neutrons are examples of
	a. nuclei.b. nuclides.d. isotopes.e. charged particles.

c. r	nucleons.						
ANS MSC	: C : Factual	DIF:	Easy	REF:	2.2	OBJ:	Identify the subatomic particles.
The ⁴	He nucleus is an e	example	e of				
a. a	nuclide.			d.	a neutron.		
b. a c. a	n element. proton.			e.	a nucleon.		
ANS: MSC	: A : Factual	DIF:	Easy	REF:	2.2	OBJ:	Identify the subatomic particles.
A 35	C1 atom has		protons,	net	itrons, and		electrons.
a. 1	7, 18, 19			d.	17, 18, 17		
b. 1 c. 1	7, 20, 17 7, 17, 20			e.	18, 17, 18		
ANS: OBJ: MSC	D Decompose an Applied	DIF: atomic	Easy symbol to deterr	REF: nine the	2.2 number of proto	ns, neut	rons, and electrons.
A 16	0 ^{2–} ion has		protons,	ne	utrons, and		electrons.
a. 8	8, 10, 8			d.	8, 8, 8		
b. 8 c. 8	3, 10, 10 3, 8, 10			e.	8, 16, 8		
ANS	: C	DIF:	Easy	REF:	2.2		
OBJ: MSC	Decompose an : Applied	atomic	symbol to deterr	nine the	number of proto	ns, neut	rons, and electrons.
Whic	h particle diagram	is the	best representation	on for a	Li atom?		
● = Pr ○ = N ○ = E	roton eutron lectron						
a.	0]		c.	0		
	0				0	0	
	c. r ANS MSC The ⁴ a. a b. a c. a ANS MSC A $\frac{35}{17}$ a. 1 b. 1 c. 1 ANS OBJ: MSC A $\frac{16}{8}$ a. ϵ b. ϵ c. ϵ ANS OBJ: MSC C A $\frac{16}{8}$ A. ϵ b. ϵ c. ϵ A. $\frac{16}{8}$ A. ϵ c. ϵ A. ϵ A. $\frac{16}{8}$ A. ϵ c. ϵ A. $\frac{16}{8}$ A. $\frac{16}{8}$	c. nucleons. ANS: C MSC: Factual The ⁴ He nucleus is an e a. a nuclide. b. an element. c. a proton. ANS: A MSC: Factual A $\frac{35}{17}$ Cl atom has a. 17, 18, 19 b. 17, 20, 17 c. 17, 17, 20 ANS: D OBJ: Decompose an MSC: Applied A $\frac{16}{8}$ O ²⁻ ion has a. 8, 10, 8 b. 8, 10, 10 c. 8, 8, 10 ANS: C OBJ: Decompose an MSC: Applied Which particle diagram = Proton = Neutron \odot = Electron a.	c. nucleons. ANS: C DIF: MSC: Factual The ⁴ He nucleus is an example a. a nuclide. b. an element. c. a proton. ANS: A DIF: MSC: Factual A $\frac{35}{17}$ Cl atom has a. 17, 18, 19 b. 17, 20, 17 c. 17, 17, 20 ANS: D DIF: OBJ: Decompose an atomic MSC: Applied A $\frac{16}{8}$ O ²⁻ ion has a. 8, 10, 8 b. 8, 10, 10 c. 8, 8, 10 ANS: C DIF: OBJ: Decompose an atomic MSC: Applied Which particle diagram is the P • = Proton • = Neutron • = Electron a.	c. nucleons. ANS: C DIF: Easy MSC: Factual The ⁴ He nucleus is an example ofa. a nuclide. b. an element. c. a proton. ANS: A DIF: Easy MSC: Factual A ${}^{35}_{17}$ Cl atom hasprotons,a. a. 17, 18, 19 b. 17, 20, 17 c. 17, 17, 20 ANS: D DIF: Easy OBJ: Decompose an atomic symbol to detern MSC: Applied A ${}^{16}_{8}$ O ²⁻ ion hasprotons,a. a. 8, 10, 8 b. 8, 10, 10 c. 8, 8, 10 ANS: C DIF: Easy OBJ: Decompose an atomic symbol to detern MSC: Applied Which particle diagram is the best representation • = Proton • = Neutron • = Electron a.	c. nucleons. ANS: C DIF: Easy REF: MSC: Factual The ⁴ He nucleus is an example of a. a nuclide. d. b. an element. e. c. a proton. ANS: A DIF: Easy REF: MSC: Factual A $\frac{35}{17}$ Cl atom has protons, net a. 17, 18, 19 d. b. 17, 20, 17 e. c. 17, 17, 20 ANS: D DIF: Easy REF: OBJ: Decompose an atomic symbol to determine the MSC: Applied A $\frac{16}{8}$ O ²⁻ ion has protons, net a. 8, 10, 8 d. b. 8, 10, 10 e. c. 8, 8, 10 ANS: C DIF: Easy REF: OBJ: Decompose an atomic symbol to determine the MSC: Applied ANS: C DIF: Easy REF: OBJ: Decompose an atomic symbol to determine the MSC: Applied Which particle diagram is the best representation for a $\frac{7}{2}$ • = Proton • = Neutron a. C.	c. nucleons. ANS: C DIF: Easy REF: 2.2 MSC: Factual The ⁴ He nucleus is an example of a. a nuclide. d. a neutron. b. an element. e. a nucleon. c. a proton. ANS: A DIF: Easy REF: 2.2 MSC: Factual A $\frac{35}{17}$ Cl atom has protons, neutrons, and a. 17, 18, 19 d. 17, 18, 17 b. 17, 20, 17 e. 18, 17, 18 c. 17, 17, 20 ANS: D DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of proton MSC: Applied A $\frac{16}{8}$ O ²⁻ ion has protons, neutrons, and a. 8, 10, 8 d. 8, 8, 8 b. 8, 10, 10 e. 8, 16, 8 c. 8, 8, 10 ANS: C DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of proton MSC: Applied ANS: C DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of proton MSC: Applied Which particle diagram is the best representation for a $\frac{7}{3}$ Li atom? • = Proton • = Neutron • = Neutron • = Neutron • = Electron a. C	c. nucleons. ANS: C DIF: Easy REF: 2.2 OBJ: MSC: Factual The ⁴ He nucleus is an example of a. a nuclide. d. a neutron. b. an element. e. a nucleon. c. a proton. ANS: A DIF: Easy REF: 2.2 OBJ: MSC: Factual A $^{25}_{17}$ Cl atom has protons, neutrons, and a. 17, 18, 19 d. 17, 18, 17 b. 17, 20, 17 e. 18, 17, 18 c. 17, 17, 20 ANS: D DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of protons, neut MSC: Applied A $^{16}_{8}$ O ²⁻ ion has protons, neutrons, and a. 8, 10, 8 d. 8, 8, 8 b. 8, 10, 10 e. 8, 16, 8 c. 8, 8, 10 ANS: C DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of protons, neut MSC: Applied A $^{16}_{8}$ O ²⁻ ion has protons, neutrons, and a. 8, 10, 8 d. 8, 8, 8 b. 8, 10, 10 e. 8, 16, 8 c. 8, 8, 10 ANS: C DIF: Easy REF: 2.2 OBJ: Decompose an atomic symbol to determine the number of protons, neut MSC: Applied Which particle diagram is the best representation for a $\frac{7}{3}$ Li atom? • = Proton • = Neutron • = Electron a. C

d.

Ο

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Ο

ANS: B DIF: Easy REF: 2.2 OBJ: Identify how particles are distributed in an atom given its atomic symbol. MSC: Conceptual

b.

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 \bigcirc

- 17. Which particle-level diagram is the best representation of a $\frac{14}{7}$ N³⁻ ion?
 - = Proton
 - \bigcirc = Neutron \bigcirc = Electron



ANS:CDIF:EasyREF:2.2OBJ:Identify how particles are distributed in an atom given its atomic symbol.MSC:Conceptual

- 18. When cosmic rays strike atoms in the upper atmosphere, energetic neutrons are produced. These neutrons collide with nitrogen-14 atoms, producing carbon-14 atoms and hydrogen atoms. Which diagram represents the carbon-14 product?
 - = Proton= Neutron
 - \bigcirc = Electron



ANS:DDIF:MediumREF:2.2OBJ:Identify how particles are distributed in an atom given its name.MSC:Conceptual

- 19. Which statement best describes isotopes?
 - a. They have the same atomic mass.

They have the same total number of protons and neutrons. b. They have the same number of neutrons but a different number of protons. c. They have the same number of protons but a different number of neutrons. d. They have very different chemical reactivity. e. DIF: Easy ANS: D REF: 2.2 OBJ: Identify the feature that distinguishes one isotope from another. MSC: Factual 20. The average atomic mass of calcium is 40.078 amu. Which is the most abundant isotope of calcium? ⁴⁰Ca ⁴⁴Ca d. a. ⁴²Ca ⁴⁸Ca b. e. ⁴³Ca c. DIF: Medium REF: ANS: A 2.3 OBJ: Given an average atomic mass, identify the isotope that is likely to be the most abundant. MSC: Conceptual 21. For each of the elements below, there are only two naturally occurring isotopes. Using information in your periodic table, identify the pair in which the heavier isotope is the more abundant one. 63Cu and 65Cu 79Br and 81Br a. d. 85Rb and 87Rb ¹⁴N and ¹⁵N b. e. ¹⁰B and ¹¹B c. ANS: C DIF: Medium REF: 2.3 OBJ: Given an average atomic mass, identify the isotope that is likely to be the most abundant. MSC: Conceptual 22. For each of the elements below, there are only two naturally occurring isotopes. Using information in your periodic table, identify the pair in which the lighter isotope is the more abundant one. ¹⁹¹Ir and ¹⁹³Ir 6Li and 7Li d. a. ⁷⁹Br and ⁸¹Br 50V and 51V b. e. 10 B and 11 B c. ANS: B DIF: Medium REF: 2.3 OBJ: Given an average atomic mass, identify the isotope that is likely to be the most abundant. MSC: Conceptual

23. The average atomic mass of zinc is 65.39 amu. Given the data in the following table, what is the natural abundance of ⁶⁶Zn?

		Isotope	e Mass (amu)	Natural Ab	oundance (%)
		⁶⁴ Zn	63.9291	4	8.89
		⁶⁶ Zn	65.9260		?
		⁶⁷ Zn	66.9271	4	.11
		⁶⁸ Zn	67.9249	1	8.56
		⁷⁰ Zn	69.9253	0	0.62
0	27 910/		đ	2 7810/	
a.	27.01%		u.	2.701%	
b.	0.2781%		e.	28.71%	
c.	50.00%				
AN	S: A	DIF: Med	ium REF:	2.3	
OD	I. Dotormino	the abundance of	an isotona givan th	a average mes	isotono mass

OBJ: Determine the abundance of an isotope given the average mass, isotope masses, and abundances of the other isotopes. MSC: Applied

24. An unknown element is found to contain isotopes with the following masses and natural abundances: 38.9637 amu (93.08%), 39.9640 amu (0.012%), and 40.9618 amu (6.91%). Using these data, identify the element.

a. S d. K

b. Cl e. Ca c. Ar DIF: Difficult REF: 2.3 ANS: D OBJ: Determine the average atomic mass of an atom from data on the masses and natural abundances of its isotopes. MSC: Applied 25. A hypothetical element has two stable isotopes: one isotope has a mass of 106.9051 amu with an abundance of 48.183%, the other isotope has a mass of 108.9048 amu with an abundance of 51.825%. What is the average atomic mass of this element? 107.980 amu 107.950 amu а d. 107.970 amu 107.940 amu b. e. 107.960 amu c. ANS: D DIF: Difficult REF: 2.3 OBJ: Determine the average atomic mass of an atom from data on the masses and natural abundances of its isotopes. MSC: Applied 26. The average atomic mass of lithium is 6.941 amu. Lithium has two naturally occurring isotopes, ⁶Li (7.52%) and ⁷Li (92.48%). The mass of ⁶Li is 6.0151 amu. What is the mass of ⁷Li? 7.016 amu 7.000 amu d. a. 0.926 amu 6.941 amu b. e. 6.001 amu c. DIF: Difficult ANS: A REF: 2.3 OBJ: Determine the mass of an isotope from the average mass and natural abundances of other isotopes. MSC: Applied 27. Zinc has five naturally occurring isotopes with an average mass of 65.39 amu. Three isotopes, in roughly equal amounts, account for 95% of zinc. Which isotope is most abundant? ⁶⁴Zn, 63.9291 amu 68Zn, 67.9249 amu d a. 66Zn, 65.9260 amu ⁷⁰Zn, 69.9253 amu b. e. ⁶⁷Zn, 66.9271 amu c. ANS: A DIF: Difficult REF: 2.3 OBJ: Given an average atomic mass, identify the isotope that is likely to be the most abundant. MSC: Conceptual 28. Enriched weapons-grade uranium consists of 80% uranium-235 (235.044 amu) and 20% uranium-238 (238.051 amu). What is the average atomic mass of weapons grade uranium assuming the percentages are exact? 235.044 amu d. 235.645 amu a. 236.547 amu 235.754 amu b. e. c. 238.051 amu Difficult ANS: D DIF: REF: 2.3 OBJ: Determine the average atomic mass of an atom from data on the masses and natural abundances of its isotopes. MSC: Applied 29. What is the symbol for sulfur? Si S a. d. b. Sc e. Sf C. Su ANS: D DIF: REF: 2.4 Easy MSC: Factual OBJ: Convert between the name and symbol of an element. 30. What is the symbol for magnesium?

d. Mo

a. M

	b. M c. M	Mg Mn			e.	Ma		
	ANS OBJ:	: B Convert betwee	DIF: on the national	Easy me and symbol	REF: ol of an eler	2.4 nent.	MSC:	Factual
31.	He is	the symbol for						
	a. h b. h c. r	nydrogen. nafnium. nercury.			d. e.	helium. holmium.		
	ANS OBJ:	: D Convert betwee	DIF: on the na	Easy me and symbo	REF: ol of an eler	2.4 nent.	MSC:	Factual
32.	Whic	h of the following	is an al	kali metal?				
	a. H b. M c. A	K Mg Al			d. e.	Cu Ca		
	ANS	: A	DIF:	Easy	REF:	2.4		
	OBJ:	Associate elem	ents with	h the group to	which they	belong.	MSC:	Factual
33.	Elem	ents 21 through 30) are kno	own as				
	a. a b. c c. h	alkaline earths. chalcogens. nalides.			d. e.	transition metal rare earths.	ls.	
	ANS OBJ:	: D Associate elem	DIF: ents with	Easy h the group to	REF: which they	2.4 belong.	MSC:	Factual
34.	Calci	um is an example	of					
	a. a b. a c. a	an alkali metal. a transition metal. an alkaline earth m	etal.		d. e.	a halogen. a chalcogen.		
	ANS OBJ:	: C Associate elem	DIF: ents with	Easy h the group to	REF: which they	2.4 belong.	MSC:	Factual
35.	Elem	ents in group 17 (VIIA) aı	e called				
	a. a b. p c. a	alkali metals. onictogens. alkaline earth meta	1.		d. e.	halogens. chalcogens.		
	ANS OBJ:	: D Associate elem	DIF: ents wit	Easy h the group to	REF: which they	2.4 belong.	MSC:	Factual
36.	Elem	ents in group 18 (VIIIA) a	re called				
	a. a b. r c. a	alkali metals. noble gases. alkaline earth meta	ls.		d. e.	halogens. chalcogens.		
	ANS OBJ:	: B Associate elem	DIF: ents with	Easy h the group to	REF: which they	2.4 belong.	MSC:	Factual
37.	Silico	on is best described	d as a					
	a. r b. r c. t	netalloid. netal. ransition metal.			d. e.	noble gas. nonmetal.		

	ANS:ADIF:EasyREF:2.4OBJ:Classify/identify an element as a metal, metalloid, or nonmetal.MSC:Factual
38.	Sodium is best described as a
	 a. metalloid. b. metal. c. transition metal. d. noble gas. e. nonmetal.
	ANS:BDIF:EasyREF:2.4OBJ:Classify/identify an element as a metal, metalloid, or nonmetal.MSC:Factual
39.	Cobalt is best described as a
	a.metalloid.d.noble gas.b.transition metal.e.nonmetal.c.chalcogen.chalcogen.chalcogen.
	ANS:BDIF:EasyREF:2.4OBJ:Identify the transition metals in the periodic table.MSC:Factual
40.	Oxygen is best described as a
	a.metalloid.d.noble gas.b.metal.e.nonmetal.c.transition metal.e.nonmetal.
	ANS:EDIF:EasyREF:2.4OBJ:Classify/identify an element as a metal, metalloid, or nonmetal.MSC:Factual
41.	Based on its position in the periodic table, which atom would you predict to form a compound with two bromine atoms?
	a.sodiumd.calciumb.aluminume.carbonc.lithiume.carbon
	ANS:DDIF:EasyREF:2.4OBJ:Identify combining ratios of atoms based on their positions in the periodic table.MSC:Applied
42.	Based on its position in the periodic table, which atom would you predict to form a compound with one chlorine atom?
	a.borond.calciumb.aluminume.carbonc.lithiume.carbon
	ANS:CDIF:EasyREF:2.4OBJ:Identify combining ratios of atoms based on their positions in the periodic table.MSC:Applied
43.	What is the correct formula for the compound formed between sodium and iodine based on their positions in the periodic table?
	a. Na_2I d. Na_2I_2 b. NaI_2 e. Na_3I c. NaI
	ANS:CDIF:EasyREF:2.4OBJ:Identify combining ratios of atoms based on their positions in the periodic table.MSC:Applied
44.	The sixth period of the periodic table contains elements.

	a. 18 d. 16 b. 32 e. 8 c. 24 24 16	
	ANS:BDIF:DifficultREF:2.4OBJ:Identify periods in the periodic table.MSC:Applied	
45.	5. Dalton's law of multiple proportions deals with	
	a. the proportions of reacting chemicals that maximize the reaction rate.b. the total number of different compounds that can be made from two elements.c. the volumes of two elements that can combine to form two or more compounds.d. the masses of two elements that can combine to form two or more compounds.e. reactions that involve multiple steps.	
	ANS:DDIF:MediumREF:2.5OBJ:Identify the meaning of Dalton's law of multiple proportions.MSC:Conceptual	
46.	6. Dalton's law of multiple proportions can be applied to	
	a. H_2O and CO_2 .d. SO_2 and CO .b.CO and NO.e. O_2 and O_3 .c. PF_3 and PF_5 .	
	ANS:CDIF:EasyREF:2.5OBJ:Identify the meaning of Dalton's law of multiple proportions.MSC:Conceptual	
47.	 Iron can form two sulfides: FeS and Fe₂S₃. Use Dalton's law of multiple proportions to predictive two masses of sulfur that combine with 100 g of iron in each case to form these compounds. 	et the ratio of the
	a. 1:1 d. 2:3 b. 1:3 e. 3:4 c. 1:2 1:2 1:2	
	ANS:DDIF:EasyREF:2.5OBJ:Use Dalton's law of multiple proportions to determine the combining ratio of elemen compounds.MSC:Applied	ts in forming
48.	8. When 10.0 g of sulfur is combined with 10.0 g of oxygen, 20.0 g of sulfur dioxide is formed. oxygen would be required to convert 10.0 g of sulfur into sulfur trioxide?	What mass of
	a. 5.0 g d. 30 g b. 10 g e. 20 g c. 15 g g	
	ANS:CDIF:DifficultREF:2.5OBJ:Use Dalton's law of multiple proportions to determine the combining ratio of elemen compounds.MSC:Applied	ts in forming
49.	9. Nitrogen and oxygen combine to form several different nitrogen oxides. In one case, 8.4 g of completely with 4.8 g of oxygen. In another case, 4.2 g of nitrogen reacted with 9.6 g of oxyg nitrogen oxides is consistent with these data?	nitrogen reacted gen. Which pair of
	a.NO and N_2O d.NO and N_2O_4 b.NO and NO_2 e. N_2O and N_2O_4 c. N_2O and N_2O_5 N_2O and N_2O_4	
	ANS: EDIF: DifficultREF: 2.5OBJ: Use Dalton's law of multiple proportions to determine the combining ratio of elemen compounds.MSC: Applied	ts in forming

- 50. Which one of the following statements is not consistent with Dalton's atomic theory of matter?
 - a. Atoms of one element can be converted into atoms of another element.

b. Each element is composed of atoms that are identical in size, mass, and chemical properties. Compounds are formed from different atoms in simple whole number ratios. c. Atoms of different elements can combine in several different proportions to make different d. compounds. e. Matter is discrete, as proposed by Democritus. DIF: ANS: A Easy REF: 2.5 OBJ: Identify the components of the modern atomic theory. MSC: Factual 51. Which has more mass: a lump of coal (assumed to be 100% carbon) or the carbon dioxide gas formed from burning the lump of coal? The lump of coal because it is a solid. a. The lump of coal because gases have little mass. b. The carbon dioxide gas because it occupies a much larger volume. c. The carbon dioxide gas because it includes oxygen that was added from the air. d. Both weigh the same because mass is conserved. e. ANS: D DIF: Easy REF: 2.5 MSC: Conceptual OBJ: Apply conservation of mass to chemical reactions. 52. Which contains more carbon by mass, 1 g of CO_2 or 1 g of CO_2 ? CO_2 a. CO b. Both contain the same mass of carbon. c. d. Both contain the same mass of carbon, but different masses of oxygen. ANS: B DIF: Medium REF: 2.5 OBJ: Apply conservation of mass to chemical reactions. MSC: Conceptual 53. Which has more mass, 1 g of CO_2 gas or 1 g of CO gas? CO a. b. CO₂ c. Both have the same mass. d. It depends on the density of these gases. e. It depends on the volume of these gases. ANS: C DIF: Easy REF: 2.5 OBJ: Apply the concepts of mass, volume, and density correctly. MSC: Conceptual 54. Which would produce the larger mass of carbon dioxide, CO₂, when combined with oxygen: 1 g of pure carbon or 1 g of pure octane (C_8H_{14})? Assume that all the carbon is converted to carbon dioxide in both cases. a. C b. C₈H₁₄ They would produce the same mass of CO₂. c. d. It depends on the densities of the carbon and octane. ANS: A DIF: Difficult REF: 2.5 OBJ: Apply conservation of mass to chemical reactions. MSC: Conceptual 55. Which one of the following is an ionic compound? a. SO_2 d. TiO₂ b. ClO_2 e. CO_2 c. H₂O ANS: D DIF: Easy REF: 2.5 OBJ: Classify a compound as molecular or ionic. MSC: Conceptual

56. Which one of the following is a molecular compound? Molecular compounds also are known as covalent compounds.

	a. b. c.	Na Ca Fe	20 0 0			d. e.	CCl ₄ Fe ₂ O ₃		
	AN OB	S: J:	D Classify a com	DIF: pound as	Easy molecular or io	REF: nic.	2.5	MSC:	Conceptual
57.	Wh	ich (of the following	g is most	likely to exhibit	covalen	nt bonding?		
	a. b. c.	Na Ca Cs ₂	F Cl ₂ 2O			d. e.	CO ₂ NaCl		
	AN OB	S: J:	D Classify a com	DIF: pound as	Easy molecular or io	REF: nic.	2.5	MSC:	Conceptual
58.	Ide	ntify	the binary con	npound t	hat has ionic bor	nding.			
	a. b.	H ₂ NC	0			c. d.	LiF CH4		
	AN OB	S: J:	C Classify a com	DIF: pound as	Easy molecular or io	REF: nic.	2.7	MSC:	Conceptual
59.	Wh	ich (one of the follo	wing is a	cation?				
	a.	NC	0_{3}^{-}	e		d.	Na		
	b. с.	SO Ca ²	2 2+			e.	O ₂		
	AN OB	S: J:	C Distinguish bet	DIF: tween an	Easy ions and cations	REF:	2.5	MSC:	Factual
60.	Wh	ich (one of the follo	wing is a	n anion?				
	a.	Na	+			d.	Na		
	b. с.	CC Cl-) ₂			e.	O ₃		
	AN OB	S: J:	C Distinguish bet	DIF: tween an	Easy ions and cations	REF:	2.5	MSC:	Factual
61.	Wh	at is	the empirical f	ormula f	or benzene, C ₆ H	[₆ ?			
	a. b. c.	CH C ₆ I C ₂ I	I H ₆ H ₂			d. e.	CH ₃ C ₆ H		
	AN OB	S: J:	A Identify the me	DIF: aning of	Easy an empirical for	REF: rmula.	2.5	MSC:	Applied
62.	Act in t	ive he a	metals often for ir. Which one o	m a prot f the foll	ective oxide sur owing formulas	face film for the 1	n that prevents fu metal oxide is <i>no</i>	irther rea	action of the metal with oxygen t?
	a. Al_2O_3 is aluminum(III) oxide.db. Fe_2O_3 is iron(III) oxide.ec. Na_2O is sodium oxide.						 MgO₂ is magnesium oxide. FeO is iron(II) oxide. 		
	AN OB MS	S: J: C:	D Convert betwee Applied	DIF: en the na	Medium me and formula	REF: of a bin	2.6 ary ionic compo	und.	
63.	Wh	at is	the formula for	r sodium	bromide?				

a. SBr d. NaBrO

	 b. NaBr e. NaBr₂ c. Na₂Br 							
	ANS:BDIF:EasyREF:2.6OBJ:Convert between the name and formula of a binary ionic compound.MSC:Applied							
64.	What is the correct name for FeCl ₃ ?							
	 a. iron(III) chloride b. iron trichloride c. ferrum trichloride d. ferric trichloride e. iron chloride 							
	ANS:ADIF:MediumREF:2.6OBJ:Convert between the name and formula of a binary ionic compound.MSC:Applied							
65.	Manganese(IV) oxide is a brown insoluble solid often found as a product of reactions of potassium permanganate. What is the formula of manganese(IV) oxide?							
	$ \begin{array}{llllllllllllllllllllllllllllllllllll$							
	c. Mn(IV)O							
	ANS:DDIF:MediumREF:2.6OBJ:Convert between the name and formula of a binary ionic compound.MSC:Applied							
66.	TiO_2 is a white oxide used in paints. What is the proper name for TiO_2 ?							
	 a. titanium oxide b. titanium(IV) oxide c. titanic acid d. titanium oxoate e. titanium dioxide 							
	ANS:BDIF:MediumREF:2.6OBJ:Convert between the name and formula of a binary ionic compound.MSC:Applied							
67.	Zinc oxide is found in ointments for the skin. What formula best describes this compound, which has Zn as a doubly charged cation?							
	a. ZnO d. Zn ₂ O ₂							
	b. Zn_2O e. Zn_2O_3 c. ZnO_2							
	ANS:ADIF:MediumREF:2.6OBJ:Convert between the name and formula of a binary ionic compound.MSC:Applied							
68.	Name the following oxides of nitrogen in this sequence: NO, N ₂ O, NO ₂ , N ₂ O ₄ .							
	a. nitrogen monoxide, dinitrogen oxide, nitrogen dioxide, dinitrogen tetroxide							
	 c. mononitrogen monoxide, dinitrogen monoxide, mononitrogen dioxide, dinitrogen tetraoxide d. nitrogen oxide, nitrogen(II) oxide, nitrogen oxide(II), nitrogen(II) oxide(IV) e. nitric oxide, nitrous oxide, nitrogen dioxide, nitrogen tetraoxide 							
	ANS:ADIF:MediumREF:2.6OBJ:Convert between names and formulas of molecular compounds.MSC:Applied							
69.	Which one of the formula-name combinations is not correct?							
	a. sulfur monoxide: SO d. disulfur oxide: S_2O							

	b. su c. su	llfur dioxide: SO Ilfur trioxide: SC	2 3		e.	heptasulfur oxide: S ₆ O
	ANS: OBJ: MSC:	E Convert betwee Applied	DIF: en names	Medium and formulas o	REF: of molecu	2.6 alar compounds.
70.	The M but po	lurrah Federal B werful, bomb ma	uilding in ide from	n Oklahoma City 4800 lb of amm	y was des nonium ni	stroyed on April 19, 1995, killing 168 people by a simple, itrate. What is the formula for ammonium nitrate?
	 a. A b. A c. N 	m(NO ₃) ₂ m(NO ₃) H ₄ NO ₃			d. e.	NH ₄ (NO ₃) ₂ (NH ₄) ₂ NO ₃
	ANS: OBJ: MSC:	C Convert betwee Applied	DIF: en the na	Medium me and the cher	REF: nical form	2.6 mula of compounds with a polyatomic ion.
71.	Radiu What i	m often is found is the formula for	in uraniu r radium	im ores and can sulfate?	be separa	rated from solutions by precipitation as radium sulfate.
	a. Ra b. Ra c. Ra	nSO4 aSO4 n ₂ SO3			d. e.	Ra ₂ SO ₄ Ra(SO ₄) ₂
	ANS: OBJ: MSC:	B Convert betwee Applied	DIF: en the na	Medium me and the cher	REF: nical form	2.6 mula of compounds with a polyatomic ion.
72.	What i	is the proper nam	ne for Co	(ClO ₄) ₃ ?		
	a. co b. co c. co	balt trichlorate balt chlorate baltous chlorate			d. e.	cobalt(III) perchlorate cobalt(III) chlorate
	ANS: OBJ: MSC:	D Convert betwee Applied	DIF: en the na	Medium me and the cher	REF: nical fori	2.6 mula of compounds with a polyatomic ion.
73.	Buffer comm formu	solutions that m on buffer system las of these two o	aintain c uses soc compoun	ertain levels of j lium dihydroger ds?	pH or aci 1phospha	idity are widely used in biochemical experiments. One ate and sodium monohydrogenphosphate. What are the
	a. N b. N	a(HPO ₄) and Na aH ₂ PO ₄ and Na ₂	(HPO ₄) ₂ HPO ₄		c. d.	$Na_2H_2PO_4$ and $NaHPO_4$ $NaPO_4$ and $NaHPO_4$
	ANS: OBJ: MSC:	B Convert betwee Applied	DIF: en the na	Difficult me and the cher	REF: nical fori	2.6 mula of compounds with a polyatomic ion.
74.	Aqua formul	regia is a mixture las of these acids	e of hydr ?	ochloric acid an	d nitric a	acid that is capable of dissolving gold. What are the
	a. Hb. Hc. H	ClO, HNO4 ClO4, HNO3 Cl, HNO2			d. e.	HCl, HNO3 HCl, HNO
	ANS: OBJ:	D Convert betwee	DIF: en names	Easy and formulas o	REF: f acids.	2.6 MSC: Factual
75	C a diam		a wood !		a haat-	an implicated as a possible balth barand because it are

75. Sodium nitrite, which is used in meat processing, has been implicated as a possible health hazard because it can react with amines present in meat to form trace quantities of carcinogenic nitrosamines. What is the formula of sodium nitrite?

	a. b. c.	SN Na Na	NO 1NO2 1NO3			d. e.	Na ₂ NO ₄ Na ₂ NO ₂				
	ANS OBJ MSC	S: I: C:	B Convert betw Applied	DIF: een the na	Medium ame and the c	REF: hemical for	2.6 mula of comp	pounds with	a polyatomic	c ion.	
76.	Acc	ord	ling to the Big	Bang the	ory, which sta	atement abo	ut the origin	of the eleme	ents is <i>not</i> con	rrect?	
	a. b. c. d. e.	Ini As Cc pa Th Th	tially, energy the universe o llisions of neu rticles. he nuclides of t hese nuclear re	was transf cooled, ne itrons and he elemer actions all	formed into el utrons and pro protons prodents then were l require the a	lectrons and otons were f uced deutero formed by r ddition of e	other elemen formed. ons, which th nuclear reacti nergy to form	ntary particl ten led to the ons in the ir n the elemer	es. e formation o nterior of star nts.	f alpha s.	
	ANS OBJ MSC	S: I: C:	E Describe the Factual	DIF: sequence	Medium of events that	REF: are part of	2.7 the Big Bang	, theory.			
77.	A hi	igh	-energy partic	le with a r	legative charg	ge is called a	ι	_ particle?			
	a. b. c.	α β γ				d. e.	neutron positron				
	ANS OBJ	S: I:	B Identify the p	DIF: articles as	Easy ssociated with	REF: nuclear rea	2.7 actions.	MSC:	Factual		
78.	The	The emission of a β particle is associated with the									
	a. b. c.	co co inc	nversion of a r nversion of a p crease in mass	neutron to proton to a number.	a proton. a neutron.	d. e.	decrease in the formation	mass numb on of an isot	er. Tope.		
	ANS OBJ	S: I:	A Identify the p	DIF: roducts in	Medium a nuclear rea	REF: action.	2.7	MSC:	Factual		
79.	Two one	Two neutrons were walking down the street. One said, "Wait a minuteI think I lost a!" The other one asked, "Are you sure?" The first replied, "Yes, I'm <i>positive</i> !"									
	a. b.	ро β1	sitron particle			c. d.	γray neutrino				
	ANS OBJ	S: I:	B Identify the p	DIF: roducts in	Medium a nuclear rea	REF: action.	2.7	MSC:	Factual		
80.	A su The	A supernova event is the explosion caused by the collapse of a dying star that has run out of its nuclear fuel. These stars and events are responsible for									
	a. b. c. d. e.	the nu the bo bo	e production of clear fission of distribution of th a and c. th b and c.	f elements f heavy el of heavy el	heavier than ements. lements throu	iron-56. ghout the u	niverse.				
	ANS OBJ	S: ſ:	D Identify the s	DIF: ource of e	Medium lements heav	REF: ier the iron-	2.7 56.	MSC:	Factual		
81.	Whi	ich	stellar nuclear	reaction	is <i>not</i> correctl	y written?					
	9	12	4	16		Ь					

a. ${}^{12}_{6}C + {}^{4}_{2}\alpha \longrightarrow {}^{16}_{8}O$ d. ${}^{68}_{30}Zn + 2{}^{1}_{0}n \longrightarrow {}^{70}_{31}Ga + {}^{0}_{1-}\beta$ b. $\begin{array}{l} 32 \\ 16 \end{array} + \begin{array}{l} 4 \\ 2 \end{array} \alpha \longrightarrow \begin{array}{l} 36 \\ 18 \end{array} Ar \\ c. \\ \begin{array}{l} 65 \\ 29 \end{array} Cu + 3 \\ 0 \end{array} n \longrightarrow \begin{array}{l} 68 \\ 30 \end{array} Zn + \begin{array}{l} 0 \\ 1 \\ -\beta \end{array} \beta \\ \end{array}$

ANS:CDIF:DifficultREF:2.7OBJ:Identify the source of elements heavier the iron-56.MSC:Applied

SHORT ANSWER

1. In one sentence, describe the picture of the atom that emerged from the Rutherford-Geiger-Marsden experiment with alpha particles.

ANS:

The atom was pictured as consisting of a tiny, positively charged nucleus surrounded by a diffuse cloud of negatively charged electrons.

DIF:EasyREF:2.1OBJ:Describe the picture of the atom that emerged from the Rutherford-Geiger-Marsden experiment with
alpha particles.MSC:Factual

2. The average atomic mass of carbon is 12.01 amu. What is the average atomic mass of carbon in grams? (1 amu = $1.6605402 \times 10^{-27}$ kg)

ANS: $1.994 \times 10^{-23} \text{ g}$

DIF:MediumREF:2.1OBJ:Convert between atomic mass units, amu, and grams, g, given the equivalence statement.MSC:Applied

3. Write the complete atomic symbol with both a superscript and a subscript for a sodium ion that contains 11 protons, 10 electrons, and 12 neutrons.

ANS: ²³11 Na⁺

DIF:EasyREF:2.2OBJ:Write the complete atomic symbol for a given element or ion.MSC:Applied

4. ¹H, ²H, and ³H are examples of ______ because they have different numbers of ______.

ANS: isotopes / neutrons

DIF:EasyREF:2.2OBJ:Identify the feature that distinguishes one isotope from another.MSC:Applied

5. What distinguishes one isotope from another?

ANS:

Isotopes have the same number of protons but different numbers of neutrons.

DIF:EasyREF:2.2OBJ:Identify the feature that distinguishes one isotope from another.MSC:Applied

6. Nuclear reactors used for power generation require uranium enriched in uranium-235. What is the average atomic mass of enriched uranium consisting of exactly 3.0% uranium-235 (235.04 amu) and 97.0% uranium-238 (238.05 amu)? ANS: 237.96 amu DIF: Difficult REF: 2.3 Calculate the average atomic mass of an element given the masses of the isotopes and their abundances. OBJ: MSC: Applied 7. Boron, which has an average atomic mass of 10.81 amu, has two stable isotopes: boron-10 (19.78%) and boron-11 (80.22%). Boron-10 has an atomic mass of 10.0129 amu; what is the atomic mass of boron-11? ANS: 11.01 amu DIF: REF: 2.3 Difficult OBJ: Determine the mass of an isotope from the average mass and natural abundances of other isotopes. MSC: Applied 8. Give an example of an alkali metal. ANS: Sodium; answers will vary. DIF: Easy REF: 2.4 OBJ: Associate elements with the group to which they belong. MSC: Applied 9. Give an example of an alkaline earth metal. ANS: Calcium; answers will vary. DIF: Easy REF: 2.4 OBJ: Associate elements with the group to which they belong. MSC: Applied 10. Give an example of a halogen. ANS: Bromine; answers will vary. REF: 2.4 OBJ: Associate elements with the group to which they belong. DIF: Easy MSC: Applied 11. Give an example of a transition metal. ANS: Iron; answers will vary. DIF: Easy OBJ: Associate elements with the group to which they belong. REF: 2.4 MSC: Applied 12. Give an example of a nonmetal. ANS: Sulfur; answers will vary. DIF: Easy REF: 2.4

OBJ: Classify/identify elements as metals, metalloids, or nonmetals. MSC: Applied 13. Give an example of a metalloid (aka semimetal). ANS: Silicon; answers will vary. DIF: REF: 2.4 Easy Classify/identify elements as metals, metalloids, or nonmetals. MSC: Applied OBJ: 14. Give an example of an ionic compound. ANS: Sodium chloride, NaCl; answers will vary. REF: 2.5 OBJ: Distinguish between ionic and covalent compounds. DIF: Easy MSC: Applied 15. Give an example of a molecular compound (aka a covalent compound). ANS: Carbon dioxide, CO₂; answers will vary. DIF: Easy REF: 2.5 OBJ: Distinguish between ionic and covalent compounds. MSC: Applied 16. A cation has a _____ charge, and an anion has a _____ charge. ANS: positive / negative DIF: Easy REF: 2.5 OBJ: Distinguish between anions and cations. MSC: Factual 17. Nitrogen and oxygen combine to form several different nitrogen oxides. Chemical analysis found that the N:O mass ratio in NO is 0.875. Two other nitrogen oxides were produced by reacting 8.4 g of nitrogen completely with 4.8 g of oxygen in one case and in another case by reacting 4.2 g of nitrogen with 9.6 g of oxygen. What are the empirical formulas of these two nitrogen oxides? ANS: N₂O and NO₂ DIF: Difficult REF: 2.5 OBJ: Use Dalton's law of multiple proportions to determine combining ratios of elements in forming compounds. MSC: Applied 18. What is the chemical formula for manganese(IV) oxide? ANS: MnO_2 DIF: Easv REF: 2.6 OBJ: Convert between the name and formula of a binary ionic compound. MSC: Applied 19. What is the correct name for $CuCl_2$? ANS: Copper(II) chloride

DIF: Easy REF: 2.6

OBJ: Convert between the name and formula of a binary ionic compound.

MSC: Applied

20. What is the chemical formula for hexasulfur monoxide?

ANS: S₆O

 DIF:
 Easy
 REF:
 2.6

 OBJ:
 Convert between the name and the molecular formula of a binary molecular compound.

 MSC:
 Applied

21. What is the correct name for SO_3 ?

ANS: Sulfur trioxide

 DIF:
 Easy
 REF:
 2.6

 OBJ:
 Convert between the name and the molecular formula of a binary molecular compound.

 MSC:
 Applied

22. The evaporation of seawater gives a mixture of ionic compounds containing sodium combined with chloride, sulfate, carbonate, and hydrogen carbonate. Write the chemical formulas of these compounds.

ANS: NaCl, Na₂SO₄, Na₂CO₃, NaHCO₃

DIF:DifficultREF:2.6OBJ:Convert between the name and the chemical formula of compounds with a polyatomic ion.MSC:Applied

23. Iodine-137 decays to xenon by beta emission, which then decays to cesium-137. Write the nuclear reaction equations for these two decay processes.

ANS:

 $\lim_{53}^{137} I \longrightarrow \lim_{54}^{137} Xe + \mathop{\scriptstyle 0}_{1-} \beta$ $\lim_{54}^{137} Xe \longrightarrow \lim_{55}^{137} Cs + \mathop{\scriptstyle 0}_{1-} \beta$

DIF: Difficult REF: 2.7 MSC: Applied OBJ: Write nuclear reaction equations.