

Test Topic 2 Atomic structure Tues 10/24/17

[18 marks]

1. What is the electron configuration of the copper(I) ion, Cu^+ ? [1 mark]

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^9$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

2. Successive ionization energies for an element, **Z**, are shown in the table below. [1 mark]

Electrons removed	1st	2nd	3rd	4th	5th
Ionization energy / kJ mol^{-1}	736	1450	7740	10 500	13 600

What is the most likely formula for the ion of **Z**?

- A. Z^+
- B. Z^{2+}
- C. Z^{3+}
- D. Z^{4+}

3. Which equation represents the second ionization energy of potassium? [1 mark]

- A. $\text{K(g)} \rightarrow \text{K}^{2+}(\text{g}) + 2\text{e}^-$
- B. $\text{K}^+(\text{g}) \rightarrow \text{K}^{2+}(\text{g}) + \text{e}^-$
- C. $\text{K(s)} \rightarrow \text{K}^{2+}(\text{g}) + 2\text{e}^-$
- D. $\text{K}^+(\text{s}) \rightarrow \text{K}^{2+}(\text{g}) + \text{e}^-$

Iron has three main naturally occurring isotopes which can be investigated using a mass spectrometer.

4. State the full electronic configurations of a Cu atom and a Cu^+ ion. [2 marks]

Cu:

Cu^+ :

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5. Between which ionization energies of boron will there be the greatest difference? [1 mark]

- A. Between 1st and 2nd ionization energies
- B. Between 2nd and 3rd ionization energies
- C. Between 3rd and 4th ionization energies
- D. Between 4th and 5th ionization energies

6. What is the correct number of each particle in an oxygen ion, $^{18}\text{O}^{2-}$? [1 mark]

	Protons	Neutrons	Electrons
A.	8	8	10
B.	8	10	8
C.	8	8	6
D.	8	10	10

7. Which subatomic particles are located in the nucleus of an atom? [1 mark]

- A. Protons and electrons
- B. Neutrons and electrons
- C. Protons and neutrons
- D. Protons, neutrons and electrons

^{131}I is a radioactive isotope of iodine.

- 8a. Define the term *isotope*. [1 mark]

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- 8b. Determine the number of neutrons in one atom of iodine-131. [1 mark]

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9. Consider the relative abundance of the isotopes of element X. [1 mark]

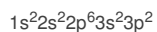
Isotope	Relative abundance (%)
^{24}X	80
^{25}X	10
^{26}X	10

What is the relative atomic mass of X?

- A. 24
- B. 25
- C. Between 24 and 25
- D. Between 25 and 26

10. The full electron configuration of an element is:

[1 mark]

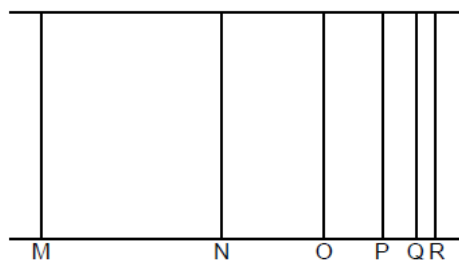


To which group and period does the element belong?

	Group	Period
A.	2	3
B.	3	2
C.	3	4
D.	14	3

11. Which is correct for the line emission spectrum for hydrogen?

[1 mark]



- A. Line M has a higher energy than line N.
- B. Line N has a lower frequency than line M.
- C. Line M has a longer wavelength than line N.
- D. Lines converge at lower energy.

12. Which electron configuration is correct for the selenide ion, Se^{2-} ?

[1 mark]

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^4$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^6$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$

13. Which species have the same electron arrangements?

[1 mark]

- I. O^{2-} , F^- , Ne
 - II. Li^+ , Na^+ , K^+
 - III. S^{2-} , Ar , K^+
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

14. How many protons, neutrons and electrons are present in each atom of ^{31}P ?

[1 mark]

	Protons	Neutrons	Electrons
A.	16	15	16
B.	15	16	15
C.	15	31	15
D.	16	31	16

15. What is the atomic number of a neutral atom which has 51 neutrons and 40 electrons?
- A. 40
 - B. 51
 - C. 91
 - D. 131

[1 mark]

16. The table below shows the number of protons, neutrons and electrons present in five species.

[1 mark]

Species	Number of protons	Number of neutrons	Number of electrons
X	6	8	6
Y	7	7	7
Z	7	7	8
W	8	8	8
Q	8	10	8

Which **two** species are isotopes of the same element?

- A. X and W
- B. Y and Z
- C. Z and W
- D. W and Q