

Exam Review Questions - Multiple Choice

SCH 3UE_07-08

The following questions are for review. They are in no particular order.

- An atom of iron $^{56}_{26}\text{Fe}$ has...
 - 26 protons, 26 electrons, 30 neutrons
 - 30 protons, 30 electrons, 26 neutrons
 - 26 protons, 26 electrons, 56 neutrons
 - 30 protons, 26 electrons, 26 neutrons
- A bromide ion will have a charge of ...
 - 1
 - 2
 - 3
 - +1
- The atom with an atomic number 13 will tend to ...
 - gain 5 electrons
 - gain 3 electrons
 - lose 5 electrons
 - lose 3 electrons
- The first four ionization energies of an element X are 740, 1450, 7730, and 10 470 kJ mol⁻¹. The formula for the stable ion of X is most likely to be ...
 - X⁺
 - X²⁺
 - X³⁺
 - X⁴⁺
- Which one of the following best supports the concept that electrons in atoms may have only certain energies (i.e. are quantized)...
 - emission spectrum of mercury
 - mass spectrum of the isotopes
 - scattering of alpha particles by gold foil
 - make up of the periodic table
- For the species below, the one that would be expected to require the most energy for the removal of another electron is...
 - Na⁺
 - Mg⁺
 - Al²⁺
 - Cl⁺
- _____ discovered the nuclear atom...
 - Thomson
 - Bohr
 - Rutherford
 - Ms. Pall
- How many electrons are in the outer (highest) energy level of a $^{39}_{19}\text{K}^{+1}$ ion?
 - 3
 - 5
 - 7
 - 8
- The following species Cl⁻, Ar, and K⁺ all have the same...
 - number of protons
 - number of electrons
 - number of neutrons
 - number of isotopes

10. Which of the following elements would have the **largest** atomic radius...
- a) Li b) Cs c) F d) I
11. All of the following ions are isoelectronic with a Noble gas except...
- a) Al^{3+} b) H^- c) Ga^{3+} d) Cl^-
12. Of the pairs of elements below, which would have the highest melting point?
- a) MgCl_2 b) NaCl c) CCl_4 d) NCl_3
13. Which of the following molecule has only Van-der-Walls forces of attraction...
- a) HF b) CF_4 c) NaF d) NF_3
14. The formula for a compound of thulium is TmPO_4 . The formula for the nitrate of thulium would be...
- a) $\text{Tm}(\text{NO}_3)_3$ b) Tm N c) $\text{Tm}_2(\text{NO}_3)_3$ d) $(\text{NO}_3)_3\text{Tm}$
15. Which of the following molecule would be polar and pyramidal...
- a) CHCl_3 b) NI_3 c) OF_2 d) BeCl_2
16. Atoms of the different isotopes of the same element are identical in the...
- a) number of electrons b) sum of number of protons and neutrons
c) sum of the number of protons and neutrons d) mass number
17. All of the following are isoelectronic (have the same number of valence electrons) except...
- a) CO_3^{2-} b) NO_3^- c) SO_3^{2-} d) BO_3^{3-}
18. What is the basis of metallic bonding?
- a) the attraction of metal ions for delocalized electrons
b) the attraction between neutral metal ions
c) the attraction of oppositely charged ions
d) the sharing of two valence electrons between two atoms
19. When is ionic bonding likely to occur between two atoms?
- a) when both atoms have low ionization energy and low electron affinity
b) when both atoms have high ionization energy and low electron affinity
c) when both atoms have high ionization energy and high electron affinity
d) when one atom has high ionization energy and high electron affinity, and the other atom has low ionization energy and low electron affinity.

30. When an electron in an atom moves from an excited state to a ground state...

- a) it produces a continuous spectrum
- b) it produces a discontinuous spectrum
- c) it produces an absorption spectrum
- d) it produces a magnetic resonance spectrum

31. Which one of the following will be observed as the atomic number of the elements in a single group of elements on the periodic table increases?

- a) an increase in the atomic radii
- b) an increase in the ionisation energies
- c) an increase in the electronegativities
- d) a decrease in the ionic radii

32. Hydrogen, HF, has a boiling point of 20°C , while hydrogen chloride, HCl, has a boiling point of -84°C

This is explained by...

- a) the Van der Waals' forces
- b) the hydrogen bonds
- c) the orbital structure
- d) the molecular structure

33. Given a list of the following substances:



Which of these is molecular and bonded by hydrogen bonds?

- a) CH_4
- b) Ne
- c) $\text{C}_2\text{H}_5\text{OH}$
- d) CO_2

34. Given the following substances :



Which substance would you expect to have the highest melting point?

- a) CaF_2
- b) HF
- c) F_2
- d) CH_3Cl

35. The elements X and Y have 6 and 7 electrons respectively, in the highest energy levels of their atoms. What is the formula and type of bonding used in a compound formed by these elements?

- a) XY_2 , ionic
- b) X_2Y , ionic
- c) X_2Y , covalent
- d) XY_2 , covalent

36. An element, J, has three isotopes with the relative abundances of ...

Atomic Number	Atomic Mass	Relative Abundance
22	45.00	10 %
22	46.00	75 %
22	47.00	15 %

Given this information, what is the atomic mass of element J ?

- a) 22.00 u
- b) 46.00 u
- c) 46.05 u
- d) 47.90 u

37. Which statement is true about ionization energies?
- The first ionization energies in a period increase smoothly from left to right across the periodic table.
 - The first ionization energies of the elements in a family increase smoothly down the family.
 - Successive ionization energies increase smoothly with the charge on the species.
 - Successive ionization energies increase with the charge on the species in an irregular manner.
38. In which one of the species below would the F - X - F bond angle be expected to be the smallest?
- CF₄
 - NF₃
 - BF₃
 - OF₂
39. The increase in boiling points observed for F₂, Cl₂, Br₂, I₂ is best attributed to...
- an increase in Van der Waals' forces with increasing atomic number.
 - a decrease in the electronegativity with increasing atomic number.
 - an increase in the X - X bond energy with increasing atomic number.
 - a decrease in the ionization energy with increasing atomic number.
40. Which of the following substances would be expected to exhibit hydrogen bonding?
- I. CH₃F II. CH₃OH III. CH₃NH₂
- I only
 - II only
 - II and III only
 - I, II and III
41. Which one of the following species would be expected to have the largest radius?
- Sr
 - Sr²⁺
 - Te
 - I
42. Magnesium is found in the second column of the periodic table. What ionic state and charged particles will it have after reacting with another atom in an ionic bond?
- Mg²⁺, 10 protons, 12 electrons
 - Mg²⁺, 12 protons, 10 electrons
 - Mg⁺, 12 protons, 10 electrons
 - Mg²⁻, 12 protons, 14 electrons
43. Which of the following particles is isoelectronic with an atom of argon?
- K⁻
 - Cl⁺
 - Na⁺
 - S²⁻
44. Which one of the following electronic configurations is correct for a halogen atom?
- [Ne] 3s² 3d⁵
 - [Ar] 4s² 4p⁵
 - [Ar] 4s² 3d⁵
 - [Kr] 5s² 4d¹⁰ 5p⁵
45. What is the systematic, IUPAC, name for the compound Cr₂O₃?
- Chromium (III) oxide
 - Chromium (II) oxide (III)
 - Chromium trioxide
 - Trichromium dioxide

46. In the periodic table, the elements are arranged in order of increasing . . .

- a) Number of neutrons
- b) Number of protons
- c) Ionization energy
- d) Electronegativity

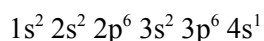
47. Which molecule shows covalent bonding, with the least ionic character?

- a) F-Be-F
- b) F-Li
- c) F-Br
- d) F-F

48. Which pair of characteristics applies to typical ionic solids?

- a) Good electrical conductivity and high ionization energy
- b) High melting point and malleability
- c) High melting point and crystalline structure
- d) Low melting point and low aqueous solubility

49. The following electronic configuration applies to a neutral atom or a cation:



The element or ion could be:

- a) An argon ion
- b) A neutral potassium atom
- c) A chloride ion
- d) A neutral calcium atom

50. Sulfur has three natural isotopes of relative masses 32.0, 33.0, 34.0. If the relative atomic mass of sulfur is 32.07, which one of the following statements must be correct?

- a) ^{32}S is less abundant than ^{34}S
- b) ^{34}S is more abundant than ^{33}S
- c) ^{32}S is more abundant than either ^{33}S or ^{34}S
- d) Another natural isotope of lesser mass must exist

51. Which of the following compounds possesses at least one σ bond:

- A. CH_4
- B. C_2H_2
- C. C_2H_4
- D. All of the above

52. In a double-bonded carbon atom:

- A. hybridization between the s orbital and one p orbital occurs.
- B. hybridization between the s orbital and two p orbitals occurs.
- C. hybridization between the s orbital and three p orbitals occurs.
- D. no hybridization occurs between the s and p orbitals.

53. Which of the following hybridizations does the Be atom in BeH_2 assume?

- A. sp
- B. sp^2
- C. sp^3
- D. None of the above

54. π bonds are formed by which of the following orbitals?

- A. two s orbitals
- B. two p orbitals
- C. one s and one p orbital
- D. All of the above

