



PRACTICE QUESTIONS

for entrance exam



Medical School, Sarajevo School of Science and Technology University

Candidate's name: _____

Mark Awarded: _____

Department of study: _____

CHEMISTRY

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- The element _____ is the most similar to strontium in chemical and physical properties.
A) Li
B) At
C) Rb
D) Ba
E) Cs
- _____ are found uncombined, as monatomic species in nature.
A) Noble gases
B) Chalcogens
C) Alkali metals
D) Alkaline earth metals
E) Halogens
- The formula of a salt is XCl_2 . The X-ion in this salt has 28 electrons. The metal X is _____.
A) Ni
B) Zn
C) Fe
D) V
E) Pd
- Aluminum reacts with a certain nonmetallic element to form a compound with the general formula AlX . Element X is a diatomic gas at room temperature. Element X must be _____.
A) oxygen
B) fluorine
C) chlorine
D) nitrogen
E) sulfur
- The formula for zinc phosphate is $Zn_3(PO_4)_2$. What is the formula for cadmium arsenate?
A) $Cd_4(AsO_2)_3$
B) $Cd_3(AsO_4)_2$
C) $Cd_3(AsO_3)_4$
D) $Cd_2(AsO_4)_3$
E) $Cd_2(AsO_4)_4$
- Which one of the following does not occur as diatomic molecules in elemental form?

- A) oxygen
 B) nitrogen
 C) sulfur
 D) hydrogen
 E) bromine
7. Which compounds do not have the same empirical formula?
 A) C_2H_2 , C_6H_6
 B) CO , CO_2
 C) C_2H_4 , C_3H_6
 D) $C_2H_4O_2$, $C_6H_{12}O_6$
 E) $C_2H_5COOCH_3$, CH_3CHO
8. A molecular formula always indicates _____.
 A) how many of each atom are in a molecule
 B) the simplest whole-number ratio of different atoms in a compound
 C) which atoms are attached to which in a molecule
 D) the isotope of each element in a compound
 E) the geometry of a molecule
9. An empirical formula always indicates _____.
 A) which atoms are attached to which in a molecule
 B) how many of each atom are in a molecule
 C) the simplest whole-number ratio of different atoms in a compound
 D) the isotope of each element in a compound
 E) the geometry of a molecule
10. Which atom has the smallest number of neutrons?
 A) carbon-14
 B) nitrogen-14
 C) oxygen-16
 D) fluorine-19
 E) neon-20
11. Which atom has the largest number of neutrons?
 A) phosphorous-30
 B) chlorine-37
 C) potassium-39
 D) argon-40
 E) calcium-40
12. In the symbol below, X = _____.
 ${}^{13}_6X$
 A) N
 B) C
 C) Al

- D) K
- E) not enough information to determine

13. Which formula/name pair is incorrect?

- A) $\text{Mn}(\text{NO}_2)_2$ manganese(II) nitrite
- B) $\text{Mg}(\text{NO}_3)_2$ magnesium nitrate
- C) $\text{Mn}(\text{NO}_3)_2$ manganese(II) nitrate
- D) Mg_3N_2 magnesium nitrite
- E) $\text{Mg}(\text{MnO}_4)_2$ magnesium permanganate

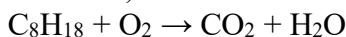
14. Which formula/name pair is incorrect?

- A) FeSO_4 iron(II) sulfate
- B) $\text{Fe}_2(\text{SO}_3)_3$ iron(III) sulfite
- C) FeS iron(II) sulfide
- D) FeSO_3 iron(II) sulfite
- E) $\text{Fe}_2(\text{SO}_4)_3$ iron(III) sulfide

15. The correct name for $\text{Ni}(\text{CN})_2$ is _____.

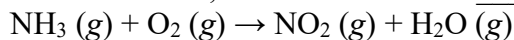
- A) nickel (I) cyanide
- B) nickel cyanate
- C) nickel carbonate
- D) nickel (II) cyanide
- E) nickel (I) nitride

16. When the following equation is balanced, the coefficients are _____.



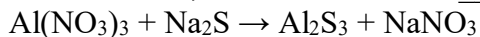
- A) 2, 3, 4, 4
- B) 1, 4, 8, 9
- C) 2, 12, 8, 9
- D) 4, 4, 32, 36
- E) 2, 25, 16, 18

17. When the following equation is balanced, the coefficients are _____.



- A) 1, 1, 1, 1
- B) 4, 7, 4, 6
- C) 2, 3, 2, 3
- D) 1, 3, 1, 2
- E) 4, 3, 4, 3

18. When the following equation is balanced, the coefficients are _____.



- A) 2, 3, 1, 6
- B) 2, 1, 3, 2
- C) 1, 1, 1, 1
- D) 4, 6, 3, 2

E) 2, 3, 2, 3

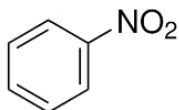
19. The formula weight of the compound, $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ is:

- A) 394.4
- B) 666.4
- C) 110.900
- D) 466.8
- E) 561.2

20. The formula weight of ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$, rounded to the nearest integer, is _____ amu.

- A) 100
- B) 118
- C) 116
- D) 132
- E) 264

21. The structural formula of nitrobenzene is presented below. The molecular weight of this compound is _____ amu.



- A) 107.11
- B) 43.03
- C) 109.10
- D) 123.11
- E) 3.06

22. The element that corresponds to the electron configuration $1s^2 2s^2 2p^2$ is _____.

- A) lithium
- B) beryllium
- C) boron
- D) nitrogen
- E) carbon

23. The complete electron configuration of sulfur, element 16, is _____.

- A) $1s^2 2s^2 2p^6 3s^2 3p^4$
- B) $1s^2 2s^2 2p^{10} 3s^2$
- C) $1s^4 2s^4 2p^6 3s^2$
- D) $1s^4 2s^4 2p^8$
- E) $1s^6 2s^6 2p^2 3s^2$

24. The element that has a valence configuration of $5s^2 5p^6$ is _____.

- A) Xe
- B) Rn

- C) Ne
- D) Ar
- E) Kr

25. Which compound has the atom with the highest oxidation number?

- A) CaS
- B) Na₃N
- C) MgSO₃
- D) Al(NO₂)₃
- E) NH₄Cl

26. In which species does chlorine have an oxidation number of zero?

- A) Cl₂
- B) HClO₄
- C) NaClO₃
- D) Cl⁻
- E) HCl

27. In which species does nitrogen have the highest oxidation number?

- A) NaNO₃
- B) HNO₂
- C) NO₂⁻
- D) NH₃
- E) N₂

28. Consider the general valence electron configuration of ns²np⁵ and the following statements:

- (i) Elements with this electron configuration are expected to form -1 anions.
- (ii) Elements with this electron configuration are expected to have large positive electron affinities.
- (iii) Elements with this electron configuration are nonmetals.
- (iv) Elements with this electron configuration form acidic oxides.

Which statements are true?

- A) (i) and (ii)
- B) (i), (ii), and (iii)
- C) (ii) and (iii)
- D) (i), (iii,) and (iv)
- E) All statements are true.

29. Consider the following properties of an element:

- (i) It is solid at room temperature.
- (ii) It easily forms an oxide when exposed to air.
- (iii) When it reacts with water, hydrogen gas evolves.
- (iv) It must be stored submerged in oil.

Which element fits the above description the best?

- A) sulfur
- B) copper

- C) mercury
- D) sodium
- E) magnesium

30. Hydrogen is unique among the elements because _____.

- 1) It has only one valence electron.
- 2) It is the only element that can emit an atomic spectrum.
- 3) Its electron is not at all shielded from its nucleus.
- 4) It is the lightest element.
- 5) It is the only element to exist at room temperature as a diatomic gas.

Correct statements are:

- A) 1, 2, 3, 4, 5
- B) 1, 3, 4
- C) 1, 2, 3, 4
- D) 2, 3, 4
- E) 3, 4

31. What is the concentration (M) of CH_3OH in a solution prepared by dissolving 34.4 g of CH_3OH in sufficient water to give exactly 230 mL of solution?

- A) 11.9
- B) 0.00159
- C) 1.59
- D) 4.67
- E) 5.31

32. How many grams of H_3PO_4 are in 145 mL of a 3.50 M solution of H_3PO_4 ?

- A) 0.508
- B) 49.7
- C) 20.0
- D) 4.90
- E) 612

33. What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 185.6 mL to make a 3.23 M solution of sodium hydroxide?

- A) 99.9
- B) 3600
- C) 287
- D) 0.104
- E) 0.0100

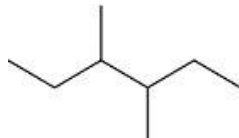
34. What is the IUPAC name of this compound?



- A) cyclopentane
- B) cyclohexane

- C) cycloheptane
- D) cyclooctane
- E) hexane

35. What is the IUPAC name for this alkane?



- A) 2-ethyl-3-methylpentane
- B) 4-ethyl-3-methylpentane
- C) 3, 4-dimethylhexane
- D) 2, 3-diethylbutane
- E) octane

36. What is the IUPAC name for the following compound?



- A) 6-chloro-2-pentyne
- B) 6-chloro-1-pentyne
- C) 1-chloro-5-hexyne
- D) 6-chloro-1-heptyne
- E) 6-chloro-1-hexyne

37. Thiols have structures similar to alcohols except that they contain

- A) three alcohol groups.
- B) more than one carbon.
- C) sulfur in place of oxygen in the functional group.
- D) lithium in place of oxygen in the functional group.
- E) nitrogen in place of oxygen in the functional group.

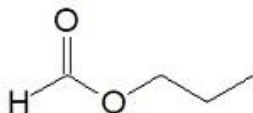
38. In a tertiary alcohol, how many alkyl groups are attached to the carbon atom bonded to the -OH group?

- A) none
- B) one
- C) two
- D) three
- E) four

39. What kind of bonds do alcohols form between individual molecules?

- A) oxygen bonds
- B) hydrogen bonds
- C) single bonds
- D) carbon bonds
- E) ionic bonds

40. How many carbonyl-containing isomers does the formula C_3H_6O have?
A) two
B) three
C) five
D) seven
E) eight
41. How many hydrogen atoms are bonded to the carbonyl group in a ketone?
A) none
B) one
C) two
D) three
E) four
42. What is the IUPAC name for a two-carbon alkyl group?
A) methyl
B) ethyl
C) propyl
D) butyl
E) pentyl
43. What is the method of preparing carboxylic acids from primary alcohols or aldehydes?
A) reduction
B) hydration
C) oxidation
D) saponification
E) hydrolysis
44. The reaction of an ester with NaOH is known as
A) esterification.
B) neutralization.
C) saponification.
D) reduction.
E) oxidation.
45. What is the common name of this compound?



- A) propyl methyl ester
B) diethyl ester
C) propyl methanoate
D) propyl formate
E) ethyl acetate

Representative elements

Period number	Group 1A	Group 2A	Transition elements										Group 3A	Group 4A	Group 5A	Group 6A	Group 7A	Group 8A
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H 1.008												B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	He 4.003
2	Li 6.941	Be 9.012											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ne 20.18
3	Na 22.99	Mg 24.31	3B	4B	5B	6B	7B	8B	9	10	11B	12B	Al	Si	P	S	Cl	Ar
4	K 39.10	Ca 40.08	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb 85.47	Sr 87.62	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs 132.9	Ba 137.3	57*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr (223)	Ra (226)	Ac (227)	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn		Fl		Lv		
			58	59	60	61	62	63	64	65	66	67	68	69	70	71		
			Ce 140.1	Pr 140.9	Nd 144.2	Pm (145)	Sm 150.4	Eu 152.0	Gd 157.3	Tb 158.9	Dy 162.5	Ho 164.9	Er 167.3	Tm 168.9	Yb 173.0	Lu 175.0		
			Th 232.0	Pa 231.0	U 238.0	Np (237)	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (262)		

*Lanthanides

†Actinides

Metals

Metalloids

Nonmetals