

**UNIVERSITY OF EAST SARAJEVO**  
**Practice questions for entrance test**

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**GENERAL AND INORGANIC CHEMISTRY**

**1. Which of the following substances is an element:**

- a) ammonia   **b) helium**   c) water   d) air   e) cryolite

**2. An element with electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$  is in the following periode:**

- a) the fifth   **b) the fourth**   c) the first   d) the third   e) the second

**3. An element with electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^3$  is in the following periode:**

- a) the first   b) the fifth   c) the fourth   d) the sixth   **e) the third**

**4. In which sequence of elements are there elements with the lowest ionization energy?**

- a) C, Si, Ge, Sn, Pb  
b) Be, P, Ca, S, Mn  
c) N, P, As, Sb, Bi  
d) **Na, K, Rb, Cs, Fr**

**5. If an element is in the fourth periode and in the second group, its ordinal number is:**

- a) 15   b) 25   **c) 20**   d) 18   e) 12

**6. If the atomic masses for calcium 40 and for phosphorus 31, then the molecular weight for primary calcium phosphate is:**

- a) 256   b) 218   **c) 234**   d) 236   e) 416

**7. Of these molecules, the largest dipole moment is in:**

- a) nitrogen   b) hydrogen   **c) hydrogen chloride**   d) helium   e) fluorine

**8. An element with atomic number 16 has the properties most similar to an element which atomic number is:**

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

a) 6 b) 32 **c) 34** d) 17 e) 15

9. The molecular weight of tertiary calcium phosphate is: ( Ca = 40, P = 31 )

a) 212 b) 365 c) 135 **d) 310** e) 175

10. The relative atomic mass of iodine is 127. What is the mass of the molecule of that element?

a)  $4,23 \times 10^{19}$  b) 254 c)  $2,11 \times 10^{-22}$  **d)  $4,23 \times 10^{-22}$**  e)  $4,23 \times 10^{-19}$

11. Which of the following compounds has a covalent bond type?

**a) PH<sub>3</sub>** b) NaH c) CaH<sub>2</sub> d) Na<sub>2</sub>O<sub>2</sub>

12. Which of the following pairs of chemical elements does not build ionic compounds:

a) Ca and O b) Ba and J c) Li and Cl d) Na and F **e) C and Cl**

13. Which of the following compounds has an ionic type of bond?

a) PH<sub>3</sub> **b) Na<sub>2</sub>O<sub>2</sub>** c) AsH<sub>3</sub> d) NH<sub>3</sub> e) P<sub>2</sub>O<sub>5</sub>

14. How much litres NO, calculated under standard conditions, results from the complete combustion of 2 moles of ammonia?

a) 11,2 b) 4,48 c) 2,24 d) 22,4 **e) 44,8**

15. Circle the letter in front of the acid oxide formula!

a) NO b) Al<sub>2</sub>O<sub>3</sub> **c) P<sub>2</sub>O<sub>5</sub>** d) Na<sub>2</sub>O e) ZnO

16. Circle the letter in front of the base oxide formula!

**a) Cs<sub>2</sub>O** b) SO<sub>3</sub> c) CO d) SiO<sub>2</sub> e) NO<sub>2</sub>

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

17. Circle the letter in front of the nitric acid anhydride formula!

- a)  $\text{NO}_2$  **b)  $\text{N}_2\text{O}_3$**  c)  $\text{N}_2\text{O}_5$  d)  $\text{N}_2\text{O}$  e)  $\text{NO}$

18. Circle the letter in front of the amphoteric oxide formula!

- a)  $\text{P}_2\text{O}_3$  b)  $\text{Li}_2\text{O}$  c)  $\text{N}_2\text{O}_5$  **d)  $\text{ZnO}$**  e)  $\text{Na}_2\text{O}$

19. Circle the letter in front of the oxide formula which, in reaction with water, gives a double-acid base!

- a)  $\text{CaO}$**  b)  $\text{K}_2\text{O}$  c)  $\text{Cl}_2\text{O}$  d)  $\text{N}_2\text{O}_5$  e)  $\text{CO}_2$

20. Circle the letter in front of the oxide formula which, in reaction with sodium hydroxide, can give two types of salts, one acidic and one neutral!

- a)  $\text{Cl}_2\text{O}$  **b)  $\text{SO}_3$**  c)  $\text{N}_2\text{O}_5$  d)  $\text{N}_2\text{O}_3$  e)  $\text{Cl}_2\text{O}_7$

21. Which sequence contains only elements that can build up acidic oxides?

- a) N, P, Cu, Hg, S **b) Cl, P, C, N, B** c) Ca, Sr, Cu, Hg, P  
d) Cr, N, P, B, Mn e) S, Mn, Si, Mg, Li

22. Which sequence contains only elements that can build up base oxide?

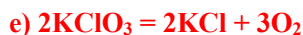
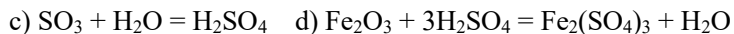
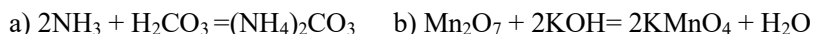
- a) Si, B, Al, Hg, Na b) B, As, Ca, S, Cl c) F, Fe, Hg, Cu, Ca  
**d) Cu, Co, Hg, Na, Ca** e) F, Na, Mg, Li, Pb

23. Which of these oxides, when reacted with 0.6 moles of calcium hydroxide, provides 0.6 moles of neutral salt?

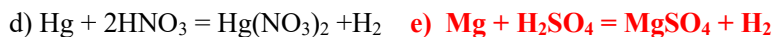
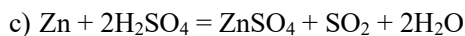
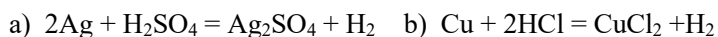
- a)  $\text{N}_2\text{O}$  b)  $\text{Fe}_2\text{O}_3$  c)  $\text{P}_2\text{O}_5$  d)  $\text{As}_2\text{O}_5$  **e)  $\text{N}_2\text{O}_3$**

24. Which reaction shows the oxidoreduction reaction?

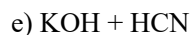
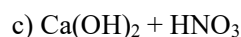
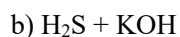
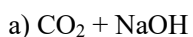
**\*\*\*The correct answer has written in red colour and bolded\*\*\***



**25. Which reaction is possible?:**



**26. Which solution obtained by mixing (of equal volume) two solutions of the same concentration (mol / L) reacts acidily?**



**27. What is the pH value of the solution containing 3.15 g of nitric acid in 50 mL of solution. N-14?**

a) 1

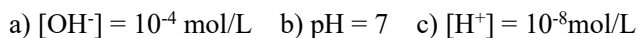
b) 2

c) 3

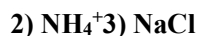
d) 4

**e) 0**

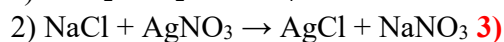
**28. Circle the letter in front of the concentration for the acidic solution!**



**29. Ampholyteis:**



**30. Find the reaction where oxidation the chlorine atom is occurred.**



**\*\*\*The correct answer has written in red colour and bolded\*\*\***



31. Which of the following compounds is written in the form of molecules in ionic reactions?

- 1) HBr      2) LiOH      3)  $\text{NH}_4\text{Cl}$       **4) AgCl**      5)  $\text{NaNO}_3$

32. Conjugated acid against base  $\text{H}_2\text{PO}_4^-$  is:

- 1)  $\text{PO}_4^{3-}$       **2)  $\text{H}_3\text{PO}_4$**       3)  $\text{HPO}_4^{2-}$       4)  $\text{H}_3\text{O}^+$       5)  $\text{H}_2\text{O}$

33. To which group of the periodic system does the element belong, if it has a configuration  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$

- a) the first      b) the sixth      **c) the second**      d) the seventh      e) the third

34. In which compounds the ionic bond is represented.

- a) KCl, MgCl<sub>2</sub>, NaCl, KBr, FeCl<sub>3</sub>, LiCl**, b)  $\text{H}_3\text{PO}_4$ ,  $\text{CO}_2$ ,  $\text{Cl}_2$ ,  $\text{HNO}_3$ , c)  $\text{H}_2\text{SO}_4$ ,  $\text{N}_2$ ,  $\text{CO}$ ,  $\text{Cl}_2\text{O}$ ,  $\text{NH}_3$   
d) AgJ, HCl, KBr,  $\text{CaC}_2$ , e)  $\text{AlH}_3$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ , CuCl

35. Circle the element sequence with the element having the highest electronic affinity!

- a) Be, Mg, Ca,    b) Sr, Ba, Li,    c) Na, K, Rb,    d) Cs, B, Al,    **e) F, Cl, S**

36. Bases were added to the acid solutions in the same molar ratio (1: 1). Which of the solutions obtained will react acidically?

- a)  $\text{HCl} + \text{NaOH}$     **b)  $\text{H}_2\text{SO}_4 + \text{NaOH}$**     c)  $\text{CH}_3\text{COOH} + \text{NaOH}$

37. In the oxido-reduction equation  $\text{KMnO}_4 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + \text{KCl} + \text{H}_2\text{O}$  molar ratio of  $\text{KMnO}_4$  and HCl is:

- a) 2 : 6      b) 1 : 3      c) 2 : 10      d) 3 : 7      e) **2:16**

38. Calculate the volume under normal conditions of 5 g of nitrogen. Ar (N) = 14 g.

- a) 6.0    **b) 4.0**    c) 5.6    d) 2.6    e) 7.2

39. Which compound has an ionic type bond:

- a)  $\text{O}_2$     **b)  $\text{CaCl}_2$**     c)  $\text{NH}_3$     d)  $\text{CO}$

40. Which of the following solution mixtures has buffering properties:

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

a) HCl + NaCl **b)  $\text{NH}_3 + \text{NH}_4\text{Cl}$**  c) NaOH + KCl

41. Circle the colligative property of the solution.

a) quantitative concentration b) molality **c) osmotic pressure of solution**

d) vapor pressure of pure liquid e) boiling point of solution

42. In the oxide reduction equation  $\text{H}_2\text{SO}_3 + \text{J}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + \text{HJ}$  molar ratio of  $\text{H}_2\text{SO}_3 + \text{HJ}$  is:

a) 1:1 b) 3:2 c) 3:1 d) 2:3 **e) 1:2**

43. Bases were added to the acid solutions in the same molar ratio (1: 1). Which of the solutions obtained will react neutrally?

a) NaOH +  $\text{CH}_3\text{COOH}$  b) KOH +  $\text{H}_2\text{SO}_4$  **c) KOH + HCl** d) KOH + HCN e) LiOH + HF

44. In the oxide reduction equation  $\text{H}_2\text{O}_2 + \text{KMnO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{MnSO}_4 + \text{O}_2 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$  molar ratio of  $\text{H}_2\text{O}_2$  i  $\text{KMnO}_4$  is:

a) 1:1 **b) 5:2** c) 3:1 d) 2:3 e) 1:3

45. Calculate the volume under normal conditions of 5 g oxygen:  $A_r(\text{O})=16$ .

**a) 3.5** b) 2.9 c) 4.5 d) 7.0 e) 1.3

46. Circle the compound where iron has oxidation number two:

**a)  $\text{FeSO}_4$**  b)  $\text{ZnCl}_2$  c)  $\text{Fe}(\text{NO}_3)_3$  d)  $\text{Fe}(\text{OH})_3$  e)  $\text{FeCl}_3$

47. Which of the following compounds is secondary calcium phosphate?

1)  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  **2)  $\text{CaHPO}_4$**  3)  $\text{Ca}_3(\text{PO}_4)_2$  4)  $\text{CaPHO}_3$  5)  $\text{Ca}(\text{H}_2\text{PO}_3)_2$

48. Circle the letter in front of the acid oxide formula:

a)  $\text{Cs}_2\text{O}$  **b)  $\text{N}_2\text{O}_3$**  c) CO d)  $\text{Mg}(\text{OH})_2$  e) ZnO

49. How many milliliters of sodium sulfate solution, concentration 1 mol/L can be obtained from 28.4 g of that salt? ( $A_r(\text{Na})=23$ ;  $A_r(\text{S})=32$ ).

a) 240 **b) 200** c) 24 d) 20 e) 220

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

50. How many milliliters of sodium carbonate solution, at a concentration of 2 mol / L, can get from 31.8 g of that salt? (Na = 23)

- a) **150** b) 190 c) 175 d) 19 e) 15

### **ORGANIC CHEMISTRY**

1. What is the name, according to JUPAC nomenclature, for a hydrocarbon having one tertiary atom and a molecular formula  $C_4H_8$ ?

- a) 2-methyl-1-butane b) 2-methyl-1,3-butadiene c) 2-methylpropene  
d) **2-methylpropane** e) 1-butene

2. How many secondary C-atoms does the 2-methyl-4-ethylhexane molecule contain?

- a) 2 b) **3** c) 4 d) 5 e) 1

3. Which of the following molecular types is an electrophilic reagent?

- a)  $H_2O$  b)  $NH_3$  c)  $OH^-$  d)  $CN^-$  e)  **$NO_2^+$**

4. What is the oxidation number of C-atom in methane?

- a) 0 b) **-4** c) +4 d) +2 e) -2

5. Which of the following gases (under the same conditions) has the highest density?

- a)  **$C_3H_8$**  b)  $C_2H_2$  c)  $C_2H_6$  d) CO e)  $C_2H_4$

6. Which of the following gases (under the same conditions) has the lowest density?

- a)  $C_3H_8$  b)  **$C_2H_2$**  c)  $C_2H_6$  d) CO e)  $C_2H_4$

7. How many monochlorine derivatives can be obtained by chlorination of 2-methyl-propane?

- a) one b) **two** c) three d) four e) noone

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

8. The number of hydrocarbons isomeric to 2,2-dimethylbutane is:

- a) **4**   b) 2   c) 6   d) 3   e) 1

9. In which of the following hydrocarbons does the optical isomer occur?:

- a) 2-methylpentane   b) 3-methylpentane   c) 2,2-dimethylpentane  
d) **2,3-dimethylpentane**   e) 2,4-dimethylpentane

10. Which of the following compounds is isomeric with vinyl-alcohol??

- a) allyl alcohol   **b) acetaldehyde**   c) divinyl ether  
d) acrolein   e) vinyl acetic acid

11. Which of these compounds does the geometric (*cis-trans*) isomer occur in?

- a) 1-butene   **b) 2-butene**   c) 1-pentene   d) ethene   e) propene

12. Which of the following compounds does the *cis-trans* isomer occur in?

- a) 4-methyl-1-pentene   **b) 1,3-dimethylcyclopentane**   c) isoprene  
d) 3-methyl-1-butyne   e) 2-pentene

13. In how many isomeric forms does 1,3-dimethylcyclobutane occur?

- a) **two**   b) three   c) four   d) five   e) none

14. Eten is always more reactive than:

- a) acetylene   **b) methane**   c) butylene   d) propylene   e) butadiene

15. Addition of water to 1-butene results in:

- a) 1-butanol   **b) 2-butanol**   c) 1,2-butanediol   d) diethylether   e) butanone

16. Addition of sulfuric acid to 2-methyl-1-butene and then hydrolysis of the resulting product results in:

**\*\*\*The correct answer has written in red colour and bolded\*\*\***



- a) **2-methylbutanol-2**    b) 2-methylbutanol    c) butanone  
d) 2-methylbutanol-1    e) sulfuric acid ester

17. From which of the following compounds can toluene be obtained by dehydrogenation?

- a) o-xylene    b) ethyl-benzene    c) benzyl-chloride  
d) **methyl-cyclohexane**    e) anthracene

18. An aromatic hydrocarbon containing five rings of benzene is:

- a) naphthalene    b) benzanthracene    c) **benzpyrene**  
d) anthracene    e) aniline

19. Addition of hydrogen iodide to propene produces:

- a) 1-iod-propane    b) 3-iod-propane    c) **2-iod-propane**  
d) 2,2-diiod-propane    e) propane

20. The reaction of cyclopropane with bromine produces:

- a) 1,2-dibromocyclopropane    b) 1,3-dibromocyclopropane    c) **1,3-dibromopropane**  
d) 1,2-dibromopropane    e) 1,1-dibromocyclopropane

21. Oxidation of propylbenzene with a strong oxidizing agent results in:

- a) formic acid    b) propionic acid    c) salicylic acid    d) **benzoic acid**    e) 1,4-dioxane

22. If by dehydrogenation of a compound of the molecular formula  $C_3H_8O$  a product which reduces the Tollens reagent is obtained, the starting compound is:

- a) **primary alcohol**    b) ketone    c) aldehyded) secondary alcohol    e) ether

23. What alcohol gives 2-methylpropanoic acid by oxidation?

- a) **2-methyl-1-propanol**    b) 2-butanol    c) 2-methyl-2-propanol  
d) 1-butanol    e) 2-metil-propanol

\*\*\*The correct answer has written in red colour and bolded\*\*\*

24. 2-methylpropene is produced by dehydration of:

- a) butanone                      b) 2-butanol                      c) 1,2-propanediol  
d) 2-methyl-2-butanol                      **e) 2-methyl-2-propanol**

25. Which of the following is an enol?

- a) vinyl-alcohol**                      b) phenol                      c) allyl-alcohol  
d) 1,2,3-propanetriol                      e) cresol

26. Which statement is correct?

- a) benzene is more easily oxidized than phenol  
b) polyhydroxyl phenols are more difficult to oxidize than phenols  
c) **pyridine is a weaker base than piperidine**  
d) alcohols are stronger acids than water

27. Which of the following acids is the strongest in aqueous solution?

- a)  $\text{CH}_3\text{COOH}$    b)  $\text{CH}_2\text{ClCOOH}$    c)  $\text{CHCl}_2\text{COOH}$  **d)  $\text{CCl}_3\text{COOH}$**    e)  $\text{ClCH}_2\text{CH}_2\text{COOH}$

28. Hydroxysuccinic acidsalts are:

- a) citrates   b) tartarates **c) malates**   d) lactates   e) urates

29. Ortho-hydroxy-benzoic acid is:

- a) salicylic acid**   b) tartaric acid   c) oxalic acid   d) phthalic acid   e) terephthalic acid

30. Oxalic acid is obtained by oxidation:

- a) 1,2-propanediol   b) propanetriol **c) ethylene glycol**   d) glyceraldehyde   e) dioxyacetone

31. The relative molecular weight of acrylic acid is:

- a) 74   b) 58   c) 56   d) 73   **e) 72**

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

32. Dihydroxysuccinic acid is:

- a) lactic acid   b) salicylic acid   c) phthalic acid   d) oxalic acid   **e) tartaric acid**

33. Which of the following is not an organic acid derivative?

- a)  $C_6H_5CONHCH_3$    b)  $C_6H_5COOCOC_6H_5$    c)  $CH_3OCOCH_2CH_3$   
**d)  $C_6H_5CH(NH_2)COOH$**    e)  $CH_3CH_2CONH_2$

34. Ethyl urethane belongs to:

- a) amide esters**   b) diesters   c) chloride esters   d) diamides   e) dichlorides

35. Which of the following is ethyl carbamate?

- a)  $H_2NCOOC_2H_5$**    b)  $H_2NCO-COOC_2H_5$    c)  $CH_3CH_2CONH_2$   
d)  $H_2NC_6H_4COOC_2H_5$    e)  $H_2NCH_2COOC_2H_5$

36. Which of the following is diethyl carbonate?

- a)  $CH_3OCOCH_3$    b)  $C_2H_5COC_2H_5$    **c)  $C_2H_5OCOOC_2H_5$**    d)  $C_2H_5CONH_2$    e)  $C_2H_5OCONH_2$

37. The formula of formic acid amide is:

- a)  $CH_3CONH_2$    b)  $HCOONH_4$    c)  $CH_3COONH_4$    d)  $C_6H_5CONH_2$    **e)  $HCONH_2$**

38. The catalytic hydrogenation of nitriles produces:

- a) nitro compounds   b) carboxylic acids   c) amides   **d) primary amines**   e) nitroso-amines

39. Pyrimidine is:

- a) a five-membered heterocyclic compound with a single nitrogen atom  
b) a five-membered heterocyclic compound with two nitrogen atoms  
**c) a six-membered heterocyclic compound having a single nitrogen atom**  
d) a six-membered heterocyclic compound having two nitrogen atoms  
e) a nine-membered heterocyclic compound with four nitrogen atoms

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

40. Purin is:

- a) a nine-membered heterocyclic compound with four nitrogen atoms
- b) a five-membered heterocyclic compound with two nitrogen atoms
- c) a six-membered heterocyclic compound having a single nitrogen atom
- d) a six-membered heterocyclic compound having two nitrogen atoms
- e) a five membered heterocyclic compound having a single nitrogen atom

41. Cysteine is:

- a) alpha-amino-butyric acid
- b) alpha-amino-beta-methyl-butyric acid
- c) para hydroxy-phenylalanine
- d) alpha-amino-beta-hydroxy-propionic acid
- e) **alpha-amino-beta-thiol-propionic acid**

42. Lactose consists of:

- a) **glucose and galactose**
- b) glucose and mannose
- c) galactose and mannose
- d) mannose and fructose
- e) glucose and fructose

43. Carbamic acid provides by heating:

- a) **ammonia and carbon dioxide**
- b) ammonia and carbon monoxide
- c) urea
- d) ammonium carbonate
- e) cyanamide

44. In reaction with mineral acids, the amines give:

- a) esters
- b) ethers
- c) **salts**
- d) anhydrides
- e) amides

45. Which of the following compounds has an aromatic property?

- a) cyclopentadiene
- b) **pyrrole**
- c) glycerol
- d) cyclohexanol
- e) glucose

46. Which compound is included in the composition of a porphyrin ring?

- a) pyridine
- b) quinoline
- c) imidazole
- d) pyrimidine
- e) **pyrrole**

**\*\*\*The correct answer has written in red colour and bolded\*\*\***

47. The formula  $\text{CH}_3\text{OCH}_3$  represents:

- a) **dimethyl-ether** b) dimethyl ester c) semiacetal d) dimethyl peroxide e) aldehyde

48. Which of the following amino acids contains heterocyclic compounds in the side sequence?

- a) phenylalanine b) alanine c) tyrosine d) **histidine** e) glutamine

49. The heterocyclic nucleic acid base is:

- a) aniline  
b) **adenine**  
c) an aldehyde  
d) alanine  
e) albumin

50. Purine bases:

- a) enter the protein composition b) build polysaccharides  
c) **are included in the nucleotide composition** d) contain pyridine e) are acidic in nature

\*\*\*The correct answer has written in red colour and bolded\*\*\*