

Sample Questions

1. Which of the following sets of quantum numbers describe a possible atomic orbital?

- a) $n = 4, l = 3, m_l = -3, m_s = \frac{1}{2}$
- b) $n = 1, l = 0, m_l = 0, m_s = -1$
- c) $n = 0, l = 0, m_l = 0, m_s = -\frac{1}{2}$
- d) $n = 2, l = 3, m_l = 0, m_s = \frac{1}{2}$

2. Which compound is ionic?

- a) CaCl_2
- b) N_2O
- c) HCl
- d) SO_2

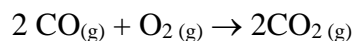
3. What is empirical and molecular formula for epinephrine, a hormone secreted into the blood stream during times of danger or stress. Its elemental composition is 59.0% C, 7.1% H, 26.2% O, and 7.7% N. Its molecular weight is 183.

- a) $\text{C}_9\text{H}_{13}\text{O}_3\text{N}_2$
- b) $\text{C}_8\text{H}_{12}\text{O}_2\text{N}$
- c) $\text{C}_{18}\text{H}_{13}\text{O}_3\text{N}$
- d) $\text{C}_9\text{H}_{13}\text{O}_3\text{N}$

4. Which one of the following processes is accompanied with the entropy increase:

- a) freezing of water at 0°C and $p=101.325\text{ kPa}$
- b) condensation of water vapor into liquid water
- c) formation of liquid water from gaseous hydrogen and oxygen
- d) sublimation of arsenic-trioxide

5. How we have to change the concentration of CO if the concentration of O_2 decreased four times in order to keep the reaction rate unchanged:



- a) to increase 4 times
- b) to decrease 4 times
- c) to increase 2 times
- d) to decrease 2 times

6. Weak electrolytes are:

- a) Na_2CO_3 and KOH
- b) $\text{CH}_3\text{COONH}_4$ and AlCl_3
- c) HCN and HNO_2
- d) HNO_3 and KCl

7. Which one molecule or ion is amphoteric?

- a) HCO_3^-
- b) CN^-
- c) H_2SO_4
- d) C_6H_6

8. Calculate the volume, in cm^3 , of sucrose solution with value for mass fraction 0.43 and density 1.19 g/cm^3 , necessary for the preparation of 0.5 dm^3 sucrose solution, concentration 0.05 mol/dm^3 ? $M_r(\text{sucrose}) = 342$

- a) 8.6
- b) 19.9
- c) 16.7
- d) 23.7

9. Calculate degree of dissociation (α) in % if 750 of 1000 molecules are dissociated.

- a) 0.75
- b) 750
- c) 75
- d) 100

10. Which of the following salts does not hydrolyze in aqueous solution?

- a) NH_4Cl
- b) NaNO_3
- c) $(\text{NH}_4)_2\text{SO}_4$
- d) AlCl_3

11. Calculate pH value of solution in which the concentration of OH^- ion is $1 \cdot 10^{-8} \text{ mol/L}$.

- a) 8
- b) 7
- c) 2
- d) 6

12. What is a buffer solution?

- a) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COOK}$
- b) $\text{HCl} + \text{NaCl}$
- c) $\text{HNO}_3 + \text{KNO}_3$
- d) $\text{HCl} + \text{NH}_4\text{Cl}$

13. The oxidation number of chromium in the dichromate ion, $\text{Cr}_2\text{O}_7^{2-}$ is:

- a) +3
- b) +2
- c) +6
- d) +7

14. Considering the elements B, Al, Mg and K, the correct order of their metallic character is:

- a) $\text{B} > \text{Al} > \text{Mg} > \text{K}$
- b) $\text{Al} > \text{Mg} > \text{B} > \text{K}$
- c) $\text{Mg} > \text{Al} > \text{K} > \text{B}$
- d) $\text{K} > \text{Mg} > \text{Al} > \text{B}$

15. Which set of the chemical name and chemical formula for the compound is correct?

- a) iron (III) phosphate, FePO_4
- b) ammonium sulfite, $(\text{NH}_4)_2\text{S}$
- c) lithium carbonate, LiCO_3
- d) magnesium dichromate, MgCrO_4

16. Atomic orbitals for carbon of methane are considered:

- a) non hybridized
- b) sp hybridized
- c) sp^2 hybridized
- d) sp^3 hybridized

17. Which pair of compounds are isomers?

- a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_3$
- b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_3$
- c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{C}(\text{CH}_3)_2$
- d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

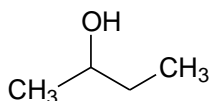
18. The main product of the reaction of 1-butene with HBr is:

- a) 2-bromobutane
- b) 1-bromobutane
- c) butane
- d) butanal

19. Calculate the difference between benzyl chloride and chlorobenzene molar masses.

- a) 12
- b) 14
- c) 16
- d) 28

20. A correct name for following compound is:



- a) isobutyl alcohol
- b) 2-butanol
- c) 3-butanol
- d) 3-hydroxybutane

21. Reaction of phenol with an excess of bromine gives:

- a) 3-bromophenol
- b) 2,5-dibromophenol
- c) 2,3,4-tribromophenol
- d) 2,4,6-tribromophenol

22. By the reaction with ammonia solution of silver hydroxide benzaldehyde is transformed to:

- a) benzyl alcohol
- b) benzoic acid
- c) methyl phenyl ketone
- d) benzophenone

23. Which of the following acids belong to the group of unsaturated dicarboxylic acids:

- a) glutaric acid
- b) fumaric acid
- c) citric acid
- d) succinic acid

24. Which structure among the following molecules contains thiol group?

- a) $\text{CH}_3\text{-SH}$
- b) $\text{CH}_3\text{-S-CH}_3$
- c) $\text{CH}_3\text{-SO-CH}_3$
- d) $\text{CH}_3\text{-SO}_3\text{H}$

25. Which dipeptide is not optically active?

- a) alanyl-glicine
- b) glicyl-alanine
- c) glicyl-glicine
- d) leucyl-valine

26. Which of the following amino acid is the sulfur-containing?

- a) methionine
- b) glycine
- c) isoleucine
- d) serine

27. Which one is tertiary amine?

- a) $(\text{CH}_3)_3\text{CNH}_2$
- b) $\text{CH}_3\text{NHCH}_2\text{CH}_3$
- c) $(\text{CH}_3)_2\text{CHCH}_2\text{N}(\text{CH}_3)_2$
- d) $(\text{CH}_3)_2\text{CHNHCH}_3$

28. Purine structure consists of:

- a) a pyridine ring fused to a pyrrole ring
- b) a pyrazine ring fused to a pyrimidine ring
- c) a pyrimidine ring fused to an imidazole ring
- d) a pyridazine ring fused to a thiazole ring

29. D-glucopyranose is:

- a) oligosaccharide
- b) aldohexose
- c) ketohexose
- d) disaccharide

30. Which of the given fatty acids has one double bond in their structure?

- a) palmitic acid
- b) oleic acid
- c) myristic acid
- d) stearic acid