

CHEMISTRY

Instruction: You are offered the test tasks with one correct answer from five proposed. The selected answer should be marked on the answer sheet by painting the appropriate circle.

1. Abnormally high boiling point of water can be in structure
 - A) Hydrogen bonding
 - B) Ionic
 - C) Covalent non-polar
 - D) Metallic
 - E) Covalent polar
2. When an excess of calcium carbonate is added to dilute HCl, the reaction gradually becomes slower over the time and finally stops. The following statement explains why this happens
 - A) the concentration of CO_2 gradually decreases
 - B) the calcium carbonate is covered by bubbles of carbon dioxide
 - C) the pieces of calcium carbonate gradually become bigger
 - D) the pieces of calcium carbonate gradually become smaller
 - E) an insoluble layer of calcium chloride is formed on the calcium carbonate
3. The most abundant element on the Earth is
 - A) Carbon
 - B) Hydrogen
 - C) Nitrogen
 - D) Sulfur
 - E) Oxygen
4. The electron configuration of calcium cation is
 - A) $1s^2 2s^2 2p^6 3s^2 3p^1$
 - B) $1s^2 2s^2 2p^6 3s^2 3p^6$
 - C) $1s^2 2s^2 2p^6$
 - D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
 - E) $1s^2 2s^2 2p^6 3s^1$
5. The most abundant element in the air is
 - A) Water
 - B) Nitrogen
 - C) Sulfur dioxide
 - D) Oxygen
 - E) Carbon dioxide
6. General formula of alkynes
 - A) $\text{C}_n\text{H}_{2n+2}$
 - B) $\text{C}_n\text{H}_{2n+1}$
 - C) $\text{C}_n\text{H}_{2n-6}$
 - D) $\text{C}_n\text{H}_{2n-2}$
 - E) C_nH_{2n}

7. The molecular formula of 2,3,4-trimethyl-1,3-pentadiene is
- A) C_5H_8
 - B) C_8H_{18}
 - C) C_8H_{16}
 - D) C_5H_{10}
 - E) C_8H_{14}
8. A car and an airplane are made of metal. Identify usage of metal
- A) an airplane – lithium
 - B) a car – gold
 - C) a car – lead
 - D) an airplane – aluminum
 - E) a car – copper
9. When 10 g mixture of silicon and carbon is dissolved in water solution of KOH 11.2 L of hydrogen was produced at STP. Calculate the percentage by mass of silicon in the mixture
- A) $\omega(\text{Si}) = 70\%$, $\omega(\text{C}) = 30\%$
 - B) $\omega(\text{Si}) = 25\%$, $\omega(\text{C}) = 75\%$
 - C) $\omega(\text{Si}) = 55\%$, $\omega(\text{C}) = 45\%$
 - D) $\omega(\text{Si}) = 60\%$, $\omega(\text{C}) = 40\%$
 - E) $\omega(\text{Si}) = 45\%$, $\omega(\text{C}) = 55\%$
10. Calculate the molar concentration of Al^{3+} and SO_4^{2-} in the solution, if the molar concentration of aluminum sulfate is 0.001 mol/L and degree of ionization is 80%
- A) $n(\text{Al}^{3+})=0.0521$ mol, $n(\text{SO}_4^{2-})=0.00375$ mol
 - B) $n(\text{Al}^{3+})=0.0125$ mol, $n(\text{SO}_4^{2-})=0.00375$ mol
 - C) $n(\text{Al}^{3+})=0.075$ mol, $n(\text{SO}_4^{2-})=0.00177$ mol
 - D) $n(\text{Al}^{3+})=0.0016$ mol, $n(\text{SO}_4^{2-})=0.0024$ mol
 - E) $n(\text{Al}^{3+})=0.0948$ mol, $n(\text{SO}_4^{2-})=0.0246$ mol
11. Copper (II) oxide is a black solid. It catalyzes the decomposition of hydrogen peroxide. Some hydrogen peroxide was shaken with copper (II) oxide in a test tube. When the reaction had stopped, the test tube contained
- A) a brown solid and a colorless solution
 - B) a blue solution only
 - C) a black solid and a colorless solution
 - D) a black solid and a blue solution
 - E) a blue solid and a black solution

12. The following statement is not correct for oxygen
- A) oxygen is needed for combustion
 - B) oxygen is used in metallurgy
 - C) oxygen is used in diving
 - D) oxygen is a flammable gas
 - E) oxygen is blue gas
13. The functional group of alcohols is
- A) $-\text{NH}_2$
 - B) $-\text{NO}_2$
 - C) $-\text{COOH}$
 - D) $-\text{CH}=\text{O}$
 - E) $-\text{OH}$
14. Moles of aluminum sulfide can be produced from the reaction of 0.12 mole of aluminum with an excess amount of sulfur
- A) 0.18
 - B) 0.06
 - C) 0.8
 - D) 1.2
 - E) 0.1
15. 50% of 4.6 g of N_2O_4 is decomposed to NO_2 . The mole number of gases in the container after the reaction
- A) 0.2
 - B) 0.05
 - C) 0.15
 - D) 0.1
 - E) 0.075
16. What is the percentage of calcium by mass in calcium hydrocarbonate
- A) 48 %
 - B) 12 %
 - C) 40 %
 - D) 39 %
 - E) 25 %
17. Mass of H_2SO_4 can be produced from 300 g of FeS_2 which is 60% pure by weight
- A) 414 g
 - B) 124 g
 - C) 207 g
 - D) 621 g
 - E) 294 g

18. Volume (STP) of oxygen can be released from decomposition of 1700 g of 3.0 % (by mass) hydrogen peroxide solution
- A) 44.8 L
 - B) 5.60 L
 - C) 33.6 L
 - D) 89.6 L
 - E) 22.4 L
19. Mass of H_2SiF_6 was obtained by dissolving 30 g of pure sand (silicon dioxide) in enough amount of dilute HF according reaction $\text{SiO}_2 + \text{HF} = \text{H}_2\text{SiF}_6 + \text{H}_2\text{O}$
- A) 157
 - B) 124
 - C) 163
 - D) 72
 - E) 32
20. NO and H_2O were produced by combustion of NH_3 in the presence of Pt catalyst. When 3.4 g of NH_3 is burnt, X liters of NO is produced at STP
- A) 44.8
 - B) 1.12
 - C) 67.2
 - D) 2.24
 - E) 4.48

Instruction: You are offered the test items on the base of context with one correct answer from five proposed ones. Read the context attentively and do the items. The selected answer should be marked on the answer sheet by full painting the appropriate circle.

Teflon

The development of the polymer industry provides a striking example of the importance of serendipity in the progress of science. Many discoveries in polymer chemistry arose from accidental observations that scientists followed up. The polyethylene and teflon polymers illustrate one of the major types of polymerization reactions, called addition polymerization.

The discovery of Teflon, a very important substituted poly(ethylene), is another illustration of the role of chance in chemical research. In 1938 a DuPont chemist named Roy Plunkett was studying the chemistry of gaseous tetrafluoroethylene. He synthesized about 100 pounds of the chemical and stored it in steel cylinders. When one of the cylinders failed to produce perfluoroethylene gas when the valve was opened, the cylinder was cut open to reveal a white powder. This powder turned out to be a polymer of perfluoroethylene, which was eventually developed into Teflon. Because of the resistance of the strong C-F bonds to chemical attack, Teflon is an inert, tough, and nonflammable material widely used for electrical insulation, nonstick coatings on cooking utensils, and bearings for low-temperature applications.

21. The formula of teflon monomer is
- A) C_2F_4
 - B) C_2H_4
 - C) $C_2H_2F_2$
 - D) C_2H_2
 - E) C_2Cl_4
22. Choose the reaction addition polymerization for teflon
- A) $nCHF = CHF \rightarrow (-CHF - CHF-)_n$
 - B) $nCH_2 = CHCl \rightarrow (-CH_2 - CHCl-)_n$
 - C) $nCH \equiv CH \rightarrow (-CH = CH-)_n$
 - D) $nCF_2 = CF_2 \rightarrow (-CF_2 - CF_2-)_n$
 - E) $nCH_2 = CH_2 \rightarrow (-CH_2 - CH_2-)_n$
23. Give the name of reaction obtain teflon and poly(ethelene)
- A) burning
 - B) displacement
 - C) addition polymerization
 - D) decomposition
 - E) condensation polymerization

24. The mass (grams) of teflon polymer, find the number of repeating, if it has 2000 repeating units

A) $2 \cdot 10^5$

B) $2 \cdot 10^6$

C) $2.8 \cdot 10^6$

D) $2.9 \cdot 10^5$

E) $5.6 \cdot 10^5$

25. If the teflon polymer has 4000 repeating units so find the mass of teflon polymer

A) 400000 g

B) 120000 g

C) 100000 g

D) 124000 g

E) 200000 g

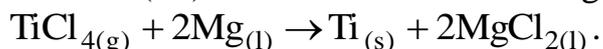
Instruction: You are offered the test tasks with one or more correct answers from multiple choices. The selected answer should be marked on the answer sheet by painting the appropriate circle.

In the test tasks with one or more correct answers there can be up to three correct answers.

26. Select possible reactants for the given net ionic equation: $\text{H}^+ + \text{OH}^- = \text{H}_2\text{O}$
- A) H_2SO_4 and LiOH
 - B) MgSO_4 and $\text{Al}(\text{OH})_3$
 - C) CuCl_2 and $\text{Mg}(\text{OH})_2$
 - D) H_2SO_4 and $\text{Ba}(\text{OH})_2$
 - E) H_2SiO_3 and $\text{Fe}(\text{OH})_2$
 - F) HNO_3 and $\text{Ba}(\text{OH})_2$
 - G) CuCl_2 and $\text{Fe}(\text{OH})_2$
 - H) HCl and $\text{Fe}(\text{OH})_2$
27. All ions have stable noble gas configuration. Find ion(s) with same electron configuration
- A) N^{2-}
 - B) Cl^-
 - C) O^{2-}
 - D) Br^-
 - E) H^-
 - F) F^-
 - G) N^{3-}
 - H) I^-
28. The ores of iron are ...
- A) Graphite
 - B) Bauxite
 - C) Limestone
 - D) Sand
 - E) Coal
 - F) Alumina
 - G) Hematite
 - H) Pyrite
29. Group(s) of transition metals is/are
- A) Cu, Ba, Mn
 - B) Na, Cr, Ni
 - C) Au, Hg, Mn
 - D) Ca, V, Mn
 - E) Al, Cu, Fe
 - F) Cu, Br, Mn
 - G) Ca, Ba, Sr
 - H) Cr, Mn, Fe

30. Organic compound (s) with molar mass is 60 g/mole is/are
- A) C_4H_{10}
 - B) C_3H_7OH
 - C) NH_2CH_2CHO
 - D) CH_3COOH
 - E) C_2H_5OH
 - F) $C_3H_7NH_2$
 - G) C_5H_{10}
 - H) C_6H_6
31. Identify row with an increase of atomic radius of elements are
- A) Fr, Cs, Rb
 - B) Sn, As, S
 - C) K, Sr, Pb
 - D) P, S, Cl
 - E) Ca, Sr, Ba
 - F) C, B, Be
 - G) Po, Sb, N
 - H) Ga, Al, B
32. The properties of sulfur
- A) ductile
 - B) good conductor
 - C) poor conductor
 - D) 3 common allotropes
 - E) elasticity
 - F) malleable
 - G) gaseous
 - H) configuration ends ns^2np^4
33. In comparison with benzene toluene easier undergoes to the reaction of
- A) oxidation
 - B) substitution
 - C) addition
 - D) combustion
 - E) reduction
 - F) isomerization
 - G) polymerization
 - H) hydrogenation

34. Titanium is a strong, lightweight, corrosion-resistant metal that is used in rockets, aircraft, jet engines, and bicycle frames. It is prepared by the reaction of titanium (IV) chloride with molten magnesium between 950°C and 1150°C:



In a certain industrial operation 285 g of TiCl_4 is reacted with 60 g of Mg. Calculate the theoretical yield of Ti in grams. Calculate the percent yield if 18.6 g of Ti are actually obtained

- A) 31 %
 - B) 50 g
 - C) 45 g
 - D) 60 %
 - E) 27 g
 - F) 60 g
 - G) 38%
 - H) 25%
35. Calcium oxalate precipitated when solution of calcium hydroxide and oxalic acid were mixed: $\text{Ca}(\text{OH})_2 + \text{H}_2\text{C}_2\text{O}_4 \rightarrow \text{CaC}_2\text{O}_4 + 2\text{H}_2\text{O}$.

When 0.650 mole of calcium hydroxide was mixed with an excess of oxalic acid, 78.4g of dried calcium oxalate was isolated. Calculate the percent yield of this reaction

- A) 24.1 %
- B) 84.4 %
- C) 34.1 %
- D) 64.1 %
- E) 94.2 %
- F) 74.2 %
- G) 44.2%
- H) 14.2 %

CHEMISTRY TEST IS COMPLETED