

CHEMISTRY SAMPLE QUESTIONS

How many hydrogen molecules are needed for complete catalytic hydrogenation of 0.5 moles of the triacylglycerol which forms glycerol, palmitic acid, oleic acid and linoleic acid by hydrolysis?

1. A) 2.4×10^{23} B) 1.2×10^{24} C) 4 D) 2.4×10^{24} E) 10.2×10^{24}
-

Which component of the ammonia buffer will react upon addition of strong base to the buffer solution?

2. A) NH_4Cl B) $\text{NH}_3 \cdot \text{H}_2\text{O}$ C) H_2O D) Cl^- E) OH^-
-

Galvanic cell (element) is composed of aluminum plate submerged in an aqueous solution containing Al^{3+} ions and copper plate submerged in an aqueous solution containing Cu^{2+} ions. Copper electrode is:

3. V) (standard electrode potentials of relevant redox systems are: $\text{Al}^{3+}/\text{Al} = -1.66 \text{ V}$; $\text{Cu}^{2+}/\text{Cu} = 0.35 \text{ V}$)
- A) anode, negative pole B) neutral electrode C) cathode, negative pole
 D) anode, positive pole E) cathode, positive pole
-

If the thermal effect $\Delta_s H$ of the dissolution of an ionic compound is endothermic, and is composed of the amount of energy required for degradation of crystalline lattice of ionic compound to ions $\Delta_l H$, and the amount of energy released by the hydration of ions $\Delta_h H$, then:

4. A) $|\Delta_l H| > |\Delta_h H|$, $\Delta_s H > 0$
 B) $|\Delta_l H| > |\Delta_h H|$, $\Delta_s H < 0$
 C) $|\Delta_l H| < |\Delta_h H|$, $\Delta_s H > 0$
 D) $|\Delta_l H| < |\Delta_h H|$, $\Delta_s H < 0$
 E) $|\Delta_l H| = |\Delta_h H|$, $\Delta_s H = 0$

In which of the following cases a chemical reaction will occur?

5. A) Ag + HCl B) Zn(OH)₂ + NaOH C) O₂ + KMnO₄
 D) NaCl + Br₂ E) KBr + I₂

How many molecules of ammonia are formed when $3 \cdot 10^{20}$ hydrogen atoms react with nitrogen? (Ar(N) = 14)

6. A) $1 \cdot 10^{20}$ B) $1.67 \cdot 10^{20}$ C) $1.5 \cdot 10^{20}$
 D) $3 \cdot 10^{20}$ E) $6 \cdot 10^{20}$

For the equilibrium reaction: $C(s) + CO_2(g) \rightleftharpoons 2CO(g)$, at a certain temperature, equilibrium constant is $2.20 \times 10^{-2} \text{ mol/dm}^3$. If the concentration of CO in an equilibrium mixture is 0.014 mol/dm^3 , what will be the concentration of CO₂?

7. A) 1.571 mol/dm^3 B) 0.636 mol/dm^3 C) 0.00636 mol/dm^3
 D) $8.9 \times 10^{-3} \text{ mol/dm}^3$ E) $3.1 \times 10^{-3} \text{ mol/dm}^3$

What is the pOH of a solution which contains $3 \cdot 10^{16}$ hydronium ions in 50 cm^3 ?

8. A) 7 B) 6 C) 10 D) 3 E) 8

Reaction of silver with dilute nitric acid results in the production of silver-nitrate, nitrogen(II)-oxide and water. What volume of the gas in cm^3 is released by dissolution of 16.2 g of silver? (Ar(Ag) = 108)

9. A) 560 B) 3360 C) 1120 D) 336 E) 1.12

In which of the following sequences only strong electrolytes are listed?

10. A) H₂CO₃, H₃PO₄, CH₃COONH₄
 B) KOH, H₂S, NH₃
 C) HCN, KCl, H₂CO₃
 D) CaS, HNO₂, NaHCO₃
 E) CH₃COONH₄, KOH, NH₄NO₂

How many cm^3 of concentrated phosphoric acid ($w = 0.85$, $\rho = 1.7 \text{ g/cm}^3$) is needed for preparation of 250 cm^3 of a solution of concentration 0.2 mol/dm^3 ? (Ar(P) = 31)

11. A) 3.39 B) 6.78 C) 33.9 D) 67.8 E) 20.6

How much heat will be released by the combustion of carbon(II)-oxide, if 5.6 dm³ of oxygen is burned (normal T and p conditions)? Standard enthalpy of combustion of carbon(II)-oxide is $\Delta_r H = - 282.6$ kJ/mol.

12. A) 141.3 J B) 141.3 kJ C) 70.65 kJ D) 70.65 J E) 14.13 kJ

In which of the following compound pairs ionic bond is present?

13. A) CH₄ and H₂O B) NH₃ and H₂S C) KH and KCl D) KF and H₂S E) Cl₂ and CH₄

In which of the following sequences elements are listed by the increase of ionization energy?

14. A) Na, B, N, O, F B) Ne, O, N, B, Li C) N, B, Na, Ne, O
 D) O, Ne, Li, N, B E) Ar, Cl, S, Mg, Na

pK_b values for several conjugated bases are given below. Which of the corresponding acids is the weakest?

15. pK_b(H₂BO₃⁻) = 4,90 pK_b(S²⁻) = 0,20 pK_b(CH₃COO⁻) = 9,20
 pK_b(PO₄³⁻) = 1,60 pK_b(NH₃) = 4,80
 A) HPO₄²⁻ B) CH₃COOH C) NH₄⁺ D) H₃BO₃ E) HS⁻

Toluene is:

16. A) aliphatic hydrocarbon
 B) aliphatic aldehyde
 C) aromatic aldehyde
 D) aromatic hydrocarbon
 E) alkene

Chemical bond which is formed between two monosaccharide units in the molecule of maltose is:

17. A) α -1,3 glycosidic B) α -1,4 glycosidic C) β -1,6 glycosidic
 D) β -1,4 glycosidic E) α -1,6 glycosidic

In which of the following sequences only five-membered heterocyclic compounds are listed?

18. A) pyrrole, pyrrolidine, furan
B) pyrrole, pyrrolidine, piperidine
C) pyrimidine, pyrrole, thiophene
D) pyrrole, thiophene, pyridine
E) furan, thiophene, pyrimidine

Reaction of 2.6 grams of acetylene and 7.1 grams of chlorine results in the formation of: (Cl-35.5)

19. A) 1,1-dichlorethane
B) 1,1-dichlorethene
C) 1,2-dichlorethane
D) 1,2-dichlorethene
E) 1,2,3,4-tetrachlorethane

An acid and a base are mixed in equimolar amounts to form salt solution. Choose the sequence in which basic salt solutions are formed.

20. A) $\text{H}_2\text{SO}_4 + \text{KOH}$; $\text{NaOH} + \text{HNO}_2$
B) $\text{HCl} + \text{Zn}(\text{OH})_2$; $\text{HCl} + \text{KOH}$
C) $\text{NaOH} + \text{HI}$; $\text{HNO}_3 + \text{Fe}(\text{OH})_3$
D) $\text{H}_2\text{S} + \text{NaOH}$; $\text{HCN} + \text{KOH}$
E) $\text{NaOH} + \text{H}_3\text{PO}_4$; $\text{HNO}_3 + \text{KOH}$

Which of the following statements about aminoacids is not correct?

21. A) solubility of aminoacids in alcohol increases with the growth of hydrocarbon side chain
B) threonine contains hydroxyl group in the side chain
C) in an aqueous solution, aminoacids are found in non-ionized form
D) histidine is an essential aminoacid
E) triptophan is an aromatic aminoacid

Quaternary ammonium-ion is a structural part of:

22. A) ethanolamine B) choline C) histamine D) histidine E) aniline

Which of the following compounds is a derivative of carbonic acid?

23. A) CH_3COCl B) CH_2Cl_2 C) CHCl_3 D) COCl_2 E) CCl_4

How many grams of propanoyl chloride is needed to produce 102 grams of ethyl propanoate by an appropriate chemical reaction? (Cl-35.5)

24. A) 9.25 B) 6.20 C) 4.62 D) 92.50 E) 3.10
-

Which of the following statements is correct?

25. A) D-glucose has 3-chiral C-atoms
B) D- glucose does not form phenylosazones in reaction with phenylhydrazine
C) D- glucose and L- glucose are epimers
D) D- glucose is isomerized to D-manose by the action of dilute alkali
E) D- glucose is a ketose
-

Malic acid is:

26. A) hydroxy-monocarboxylic acid
B) hydroxy-dicarboxylic acid
C) unsaturated dicarboxylic acid
D) unsaturated monocarboxylic acid
E) hydroxy-unsaturated monocarboxylic acid
-

Reduction of acetophenone leads to the formation of:

27. A) primary alcohol
B) secondary alcohol
C) tertiary alcohol
D) carboxylic acid
E) aromatic acid
-

Which of the following statements is correct?

28. A) glutathione does not give positive ninhydrin reaction
B) histidylphenylalanine reacts with α -naphthol
C) valylcysteine reacts with Ag^+ ions
D) alanyltryptophan consists of two essential aminoacids
E) phenylalanylmethionine does not give positive xanthoproteic reaction
-

How many dienes, structural isomers of 2-pentine are there?

29. A) 3 B) 4 C) 5 D) 6 E) 7
-

30. 52.17 g of bromine can be added to the product formed by elimination of water from ethanol. How many grams of ethanol react? (Br-80)

- A) 30 B) 15 C) 7.5 D) 3.5 E) 10

