

- 1) What is the formula of the compound whose name is iron (III) hydrogen sulfide?
- a) Fe_3HS b) $\text{Fe}(\text{HS})_3$ c) $\text{Fe}(\text{HSO}_3)_3$ d) FeHSO_3 e) no answer is correct
- 2) Calculate the mass of nitrogen contained in 17 grams of amino acid alanine: ($A_r(\text{H})=1$, $A_r(\text{C})=12$, $A_r(\text{N})=14$, $A_r(\text{O})=16$).
- a) 4.71 b) 1.34 c) 0.37 d) 2.67 e) no answer is correct
- 3) Calculate the number of H_2O molecules contained in 228 cm^3 of water. Density of water is 1 g/mL .
- a) 7.63×10^{24} b) 7.63×10^{25} c) 1.94×10^{22} d) 1.94×10^{23}
- e) no answer is correct
- 4) Calculate the volume of H_2 that will be released in reaction of sulfuric acid with 5 g of zinc. $A_r(\text{Zn}) = 65$; consider the standard conditions and properties of an ideal gas.
- a) 16.8 dm^3 b) 3.45 dm^3 c) 0.86 dm^3 d) 1.72 dm^3 e) no answer is correct
- 5) Which of the following elements has the electron configuration $[\text{Ar}]4s^24p^5$:
- a) I b) Cl c) Br d) P e) no answer is correct
- 6) How many valence electrons are in the atom of an element with a proton number 16?
- a) 16 b) 7 c) 2 d) 6 e) no answer is correct
- 7) An isotope of oxygen ^{18}O contains:
- a) 18 protons b) 18 neutrons c) 8 protons + 10 neutrons
- d) 10 protons + 8 neutrons e) no answer is correct
- 8) Select an ionic compound among the following:
- a) CaCl_2 b) H_2O c) SiO_2 d) NO_2 e) no answer is correct
- 9) In 500 cm^3 of a solution is dissolved 120 g of acetic acid. The solution density is $1180 \text{ g}\cdot\text{dm}^{-3}$. What is the mass fraction of the acetic acid in the solution?
- a) 0.42 b) 0.24 c) 0.10 d) 0.20 e) no answer is correct
- 10) 250 mL of a hydrogen peroxide solution contains 40 g of H_2O_2 ($M_r=34$). What is the molar concentration of the solution?
- a) $4.70 \text{ mol}\cdot\text{dm}^{-3}$ b) $1.17 \text{ mol}\cdot\text{dm}^{-3}$ c) $0.29 \text{ mol}\cdot\text{dm}^{-3}$ d) $3.40 \text{ mol}\cdot\text{dm}^{-3}$ e) no answer is correct

- 11) An aqueous HCl solution has a concentration of 4.1 mol.dm^{-3} . The solution density is 1068 g.dm^{-3} . Calculate the mass of HCl contained in 120 g of the solution. ($M_r(\text{HCl})=36.5$)
- a) 1.33 g b) 13.5 g c) 16.8 g d) 36.5 g e) no answer is correct
- 12) You need to prepare a 10% solution of sucrose from 200 g of 30% solution. What mass of water is necessary to add? :
- a) 67 g b) 400 g c) 280 g d) 600 g e) no answer is correct
- 13) For neutralization of 6 cm^3 of acetic acid solution was used 12 cm^3 of NaOH with concentration 0.2 mol.dm^{-3} . What is the concentration of acetic acid?
- a) 0.80 mol.dm^{-3} b) 0.40 mol.dm^{-3} c) 0.15 mol.dm^{-3} d) 0.20 mol.dm^{-3}
e) no answer is correct
- 14) A pH value of a HCl solution is 2.5; what is the concentration of the solution?
- a) 2.2 mmol/L b) 3.2 mmol/L c) 4.1 mmol/L d) 2.8 mmol/L e) no answer is correct
- 15) A solution of HNO_3 (50 cm^3 , $c=0.1 \text{ mol/L}$) was diluted by addition of 450 mL of water. What is the pH of the solution?
- a) 1 b) 1.5 c) 2 d) 3.2 e) no answer is correct
- 16) Select a solution at which the concentration of chloride anions is the same as in the solution of FeCl_3 with a concentration of 2 mmol.dm^{-3} .
- a) HCl, $c= 2 \text{ mmol.dm}^{-3}$ b) CaCl_2 , $c= 6 \text{ mmol.dm}^{-3}$ c) AlCl_3 $c=1 \text{ mmol.dm}^{-3}$
d) KCl, $c=6 \text{ mmol.dm}^{-3}$ e) no answer is correct
- 17) Which of the following aqueous solutions will have a neutral pH value?
- a) NaHCO_3 b) sodium acetate c) NH_4NO_3 d) CaCl_2 e) no answer is correct
- 18) The value of the ionic product of water, K_w , at 25°C is:
- a) 55.4×10^{14} b) 1.0×10^{-14} c) 14.0 d) 2.0×10^{-7}
e) no answer is correct
- 19) Which of the following species does not display acidic properties in an aqueous solution:
- a) NH_4^+ b) HS^- c) $\text{H}-\text{CH}=\text{O}$ d) H_2O e) no answer is correct
- 20) Select the redox reaction from the following:
- a) $\text{ZnO} + \text{H}_2\text{O} \rightarrow \text{Zn}(\text{OH})_2$ b) $\text{KOH} + \text{HBr} \rightarrow \text{KBr} + \text{H}_2\text{O}$
c) $3\text{CaCl}_2 + 2\text{Na}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + 6\text{NaCl}$ d) $2\text{Na} + \text{H}_2 \rightarrow 2 \text{NaH}$ e) no answer is correct

21) Which of the following molecular formulas represents a correct formula of toluene?

- a) C_6H_8 b) C_7H_8O c) C_7H_9 d) $C_6H_2O_2$ e) no answer is correct

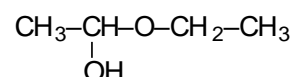
22) The residue $C_6H_5-CH_2-$ is named:

- a) phenyl b) tolyl c) phenoyl d) benzyl e) no answer is correct

23) Conversion of propane-2-ol to acetone is:

- a) dehydrogenation b) dehydration c) hydration d) dehydration
e) no answer is correct

24) A compound with the formula on the right was formed by a reaction of:



- a) two molecules of ethanol b) ethanol and ethanal c) ethanol and acetic acid
d) two molecules of ethanal e) no answer is correct

25)) Select a correct statement about amines:

- a) aqueous solutions of secondary amines have neutral pH
b) reduction of primary amines will produce nitro-compounds
c) a reaction of primary amines with aldehydes would produce hemiacetals
d) aniline belongs to the group of primary amines
e) no answer is correct

26) Hydrolytic cleavage of the compound on the right will provide:



- a) butanol + ethanol b) acetate + n-butanol c) ethanol + propionate d) ethanol + butanoate
e) no answer is correct

27) Which of the following compounds would provide H^+ in an aqueous solution?

- a) methylammonium chloride b) urea c) benzylamine d) acetamide
e) no answer is correct

28) Enzymatic hydration of fumaric acid will produce:

- a) lactic acid b) malic acid c) succinic acid d) oxalic acid e) no answer is correct

29) Select a monocarboxylic acid among the following:

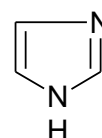
- a) fumaric b) glutaric c) citric d) pyruvic e) no answer is correct

30) Which of the following compounds is a six-membered heterocycle with two nitrogen atoms?

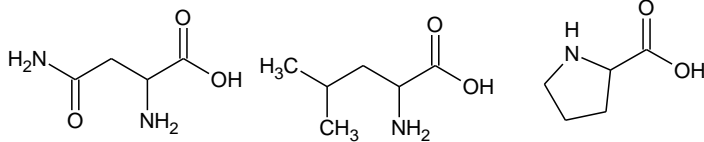
- a) pyrimidine b) imidazole c) pyridine d) pyrrol e) no answer is correct

31) Select the name of heterocycle on the right:

- a) pyrrolidine b) imidazole c) pyrrol d) pyran e) no answer is correct



32) Provide the correct names for the three amino acids whose structural formulas are below:



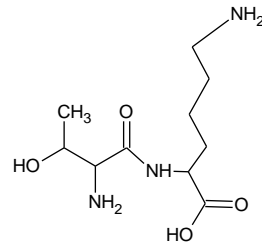
- a) glutamine, valine, histidine b) asparagine, threonine, histidine
c) aspartate, leucine, proline d) asparagine, leucine, proline e) no answer is correct

33) Select an amino acid that has a molecular formula $C_5H_{11}NO_2S$:

- a) methionine b) glutamine c) threonine d) cysteine e) no answer is correct

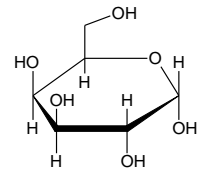
34) Provide the name for a peptide shown on the right.

- a) serylleucine b) threonyllysine c) seryllysine
d) lysylthreonine e) no answer is correct



35) Select a name of the compound:

- a) α -D-glucopyranose b) α -D-galactopyranose c) β -D-mannopyranose
d) α -D-fructopyranose e) no answer is correct

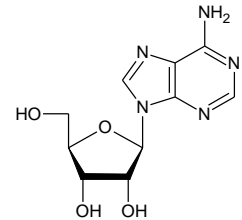


36) Select the name of the compound:

- a) Guanine b) guanosine c) guanidine d) adenosine e) no answer is correct

37) Select a true statement about DNA:

- a) double stranded DNA has parallel arrangement
b) DNA contains the same number of thymine and adenine molecules
c) opposite nucleotides in double helix are held by hydrophobic bonds between bases
d) H-bonds are made between adenine and guanine
e) no answer is correct



38) Select the biochemical conversion that is catalyzed by oxidoreductase enzymes:

- a) conversion of L-alanine to pyruvate b) conversion of maltose to glucose
c) conversion of ethanol to acetaldehyde d) conversion of glucose-6 phosphate to glucose
e) no answer is correct

39) Select the vitamin needed for blood coagulation:

- a) phyloquinone b) riboflavin c) biotin d) tocopherol e) no answer is correct

40) Select the reaction of the tricarboxylic acid cycle, at which NADH is formed:

- a) synthesis of isocitrate
b) conversion of 2-oxoglutarate to succinyl-CoA
c) conversion of succinate to fumarate
d) conversion of citrate to isocitrate
e) no answer is correct the correct