

CHEMISTRY

PRACTICE TEST

The test contains 35 questions. In the first section, you will find 16 multiple choice questions, similar to those given below. One of the answers is correct and should be marked in the appropriate box.

1. Choose the correct name for a compound with formula $\text{Ca}(\text{NO}_2)_2$.
A. Potassium nitrite
B. Calcium nitrate
C. Calcium nitride
D. Calcium nitrite
E. Calcium hyponitrite
F. Calcium azide
 2. What is the spatial arrangement of electron orbitals in a water molecule?
A. linear
B. tetrahedral
C. octahedral
D. trigonal
E. triangular
F. equatorial
 3. Which of the following compounds is an ionic hydride?
A. H_2O
B. CaH_2
C. CH_4
D. H_2S
 4. What element is oxidised in the following reaction?
 $\text{Cd} + \text{NiO}_2 + 2\text{H}_2\text{O} \rightarrow \text{Cd}(\text{OH})_2 + \text{Ni}(\text{OH})_2$
A. Ni
B. H
C. Cd
D. O
E. All of the above
 5. In an equation representing the NH_3 equilibrium in water, the conjugate acid of NH_3 would be:
A. H_3O^+
B. NH_4^+
C. NH_2^-
D. OH^-
E. NH_2^+
 6. Which of the following ions can be further oxidised?
A. Fe^{2+}
B. Zn^{2+}
C. Li^+
D. Na^+
E. Ba^{2+}
F. OH^-
 7. Cellulose is
A. a storage polysaccharide found in animals
B. a structural polysaccharide of plants
C. made up of amino acid residues
D. made up of phospholipids
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In this section, please give short answers and draw the required formulae.

8. Write down the electronic configuration of the atom with the proton number 22 and state to which group of the Periodic Table it belongs.

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9. Balance the following equations, giving the values of a , b , c , x , y .



$a =$	$b =$	$c =$	$x =$	$y =$
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$a =$	$b =$	$c =$	$x =$	$y =$
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10. 2-Hydroxypropanoic (*lactic*) acid exists as two optical isomers. Draw structures to show each isomer. How may the isomers be distinguished from each other?
11. Write the formula of the product formed by the reaction of but-1-ene (formerly 1-butene) with hydrogen bromide.
12. Write the equation for the formation of phenyl acetate by esterification.
13. Write the structural formula for alanine.
14. What is the final product of anaerobic glycolysis ?

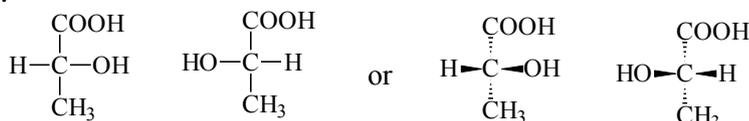
In the last section, there are 5 calculations, similar to those given below.

15. Limestone (CaCO_3) is decomposed by heating to quicklime (CaO) and carbon dioxide. Calculate how many grams of quicklime can be produced from 1.0 kg of limestone
Relative atomic masses: Ca = 40 C = 12 O=16.
16. Calculate the pH of a HNO_3 solution of concentration 0.02 mol dm^{-3} .
17. Ammonia is bought as "880 ammonia" (a solution of density 0.880 g cm^{-3}), whose content is 28% ammonia (i.e. it contains 280 g ammonia per kilogram of solution). What

volume of the “880 ammonia” solution would you need to prepare 1.0 dm³ of 2.0 mol dm⁻³ ammonia solution ?

18. A sodium hydroxide solution (25.0 cm³) is neutralized by 16.0 cm³ of a solution of sulfuric acid of concentration 0.01 mol dm⁻³. Find the NaOH concentration.
19. Calculate the concentration (in mol dm⁻³) of 3% (percentage by mass) solution of potassium iodide. The density of the solution is assumed to be 1.
Relative atomic masses: K = 39, I = 127.
20. For the reaction, $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$, calculate the equilibrium constant if the concentrations at equilibrium are 0.082 mol/l N₂, 2.14 mol/l H₂, and 0.26 mol/l NH₃.

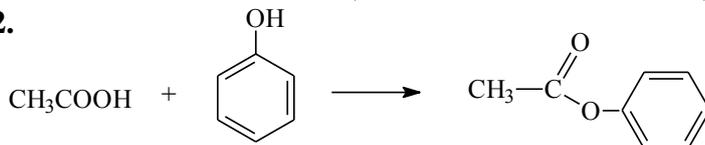
Answers: 1.D, 2.B, 3.B, 4.C, 5.B, 6A, 7.B,
 8. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$ or [Ar] $4s^2 3d^2$
 9. a=2 b=3 c=2 x=2 y=3; a=2 b=10 c=6 x=6 y=12,
 10.



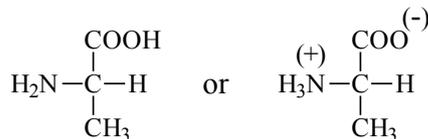
They can be distinguished by the rotation of plane-polarized light (i.e. optical rotation)

11. CH₃-CHBr-CH₂-CH₃ (not CH₂Br-CH₂-CH₂-CH₃)

12.



13.



14. lactic acid, 15. 560 g, 16. 1.7, 17. 0.138 l, 18. 0.0128 mol dm³, 19. 0.18 mol dm³, 20. 0.18