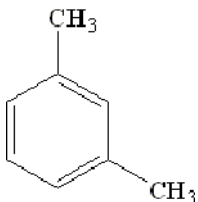
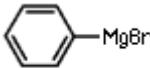
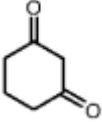


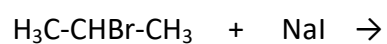
Palacky University Olomouc  
 Petroleum Engineering Program  
 Chemistry Entrance Exam Model  
 2023

1. Complete the following table

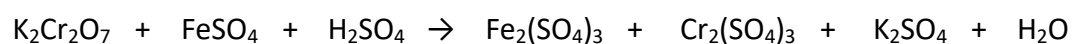
	Formula	Name
1	SeBr <sub>4</sub>	
2	NH <sub>4</sub> Cl	
3	Na <sub>2</sub> O <sub>2</sub>	
4	K <sub>4</sub> [Fe(CN) <sub>6</sub> ]	
5	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	
6	HOOC—COOH	
7	$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CH} - \text{CH} = \text{CH}_2 \\   \\ \text{CH}_2\text{CH}_3 \end{array}$	
8		
9		
10		
11		Trihydroboric acid
12		Calcium imide
13		Sodium peroxodisulfate
14		Ferrous thiocyanate

15		Silicon carbide
16		4,4-dichlor-2-pentanone
17		Butanoic acid methyl ester
18		Phenanthrene
19		Diethyl ether
20		Hepta-1,3,5-trien

- 
2. Complete the right-hand sides of the equations, calculate them and name the products for the second equation:



- 
3. Number the equation



- 
4. Finish the equation:



5.  $\text{H}_3\text{O}^+$  ion concentration in an aqueous solution is  $10^{-3}$ . What is the  $\text{OH}^-$  ion concentration, and what is the pH of the solution?

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6. Calculate the mass fraction and mass percent of the sodium hydroxide solution formed by adding 10g of solid NaOH to 150g of a 10% NaOH solution.

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7. Calculate the substance concentration of the sodium chloride solution (in units of  $\text{mol.l}^{-1}$ ), which was prepared by dissolving 5 g of NaCl in 150 ml of water (neglecting the change in volume due to the addition of the solid phase). The molar mass of  $M(\text{NaCl}) = 58,443\text{g.mol}^{-1}$ .

---

8. Chemical bond  $\sigma$  :

a) it arises outside the junction of nuclei by the overlap of orbitals

*s-s, s-p a s-d.*

b) it arises outside the junction of nuclei by the overlap of orbitals

*p-p, p-d a d-d.*

c) it arises at the junction of nuclei by the overlap of orbitals

*s-s, s-p a p-p.*

d) forms a triple bond together with another  $\sigma$  bond and a bond.

---

9. Lewis acid is:

a) is any nucleophilic molecule, atom or ion.

b) is any electrophilic molecule, atom or ion capable of accepting a bonding electron pair.

c) is any electrophilic molecule, atom or ion capable of donating a non-bonding electron pair.

d) appears as a molecule, atom or ion with an incomplete octet or a particle with an energetically available vacant orbital d.

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10. Addition means:

- a) a reaction in which the  $\pi$  bonds between carbon atoms or a carbon atom and another element are destroyed.
  - b) a reaction in which two or more parts are split off from an organic molecule to form a multiple bond or cycle.
  - c) a reaction in which other atoms or groups of atoms replace atoms or groups of atoms.
  - d) a reaction in which atoms or groups of atoms move from one place in the molecule to another.
- 

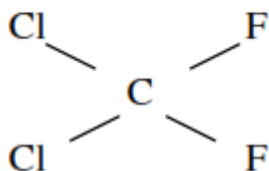
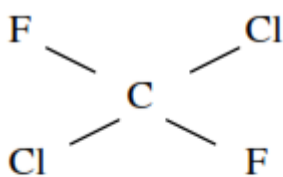
11. State the oxidation states of oxygen for the given ions:

- a) oxide,
  - b) peroxide,
  - c) superoxide.
- 

12. The simplest freon (dichlorodifluoromethane) can be written structurally:

Note: the molecule is not planar (it forms a tetrahedron).

Choose the correct statement:



- a) there is a difference between the two methods of notation - they are geometric isomers
  - b) in both cases, the absolute identical molecule is expressed
-

13. Chirality is:

- a) the ability to bend the plane of unpolarized light.
- b) the ability to turn the plane of polarized light only to the left.
- c) the ability to turn the plane of polarized light only to the right.
- d) the ability to turn the plane of polarized light to the right or to the left.