29. June 2021 Test: CHEMISTRY Group: A

Test contains 15 questions, 2 marks each. **No negative marks.**

$N_A = 6\times10^{23}$ mol^{-1}; Ar: N-14; O-16; K-39; I-127.

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1. Electron configuration for the element E is $1s^2\,2s^2\,2p^6\,3s^2\,3p^6$.
Which one of the following statements is correct?

1) Mass number of the element E is 18
2) Atom of the element E contains 6 valence electrons
3) The element E is in Group VIA and Period 3
4) Valence electrons of the element E are in the third shell

2. Calculate the value of the equilibrium constant, K_c, for the reaction:

$$2HI(g) \rightleftarrows H_2(g) + I_2(g)$$

for given equilibrium concentration: HI 0.1 mol/L, H_2 0.4 mol/L and I_2 0.2 mol/L.

1) 8
2) 0.125
3) 1.25 L/mol
4) 0.8 mol/L

3. Calculate the mass percent (%) of NaOH in a solution prepared by adding 100 g of water to 200 g 30 % NaOH solution.

1) 15 %
2) 10 %
3) 20 %
4) 25 %

4. In oxidation-reduction reaction between potassium iodide and potassium nitrite in acidic solution (H_2SO_4) produce elemental iodine, nitrogen monoxide, potassium sulfate and water.
If 25 mL 2 mol/L of potassium nitrite solution is reacted, how many grams of iodine are produced?

1) 12.7
2) 6.35
3) 3.175
4) 25.4

5. Which of the following water solution is basic?

1) Solution which in 0.1 L contains 10^{-8} mol OH^-
2) Solution which in 10 mL contains 10^{-8} mol H^+
3) Solution which in 1 L contains 6×10^{18} OH^-
4) Solution with a pH=3

6. In which one of the following sets all substances have pH of water solutions higher than pH of pure water?

1) CaO, Na, $NaCH_3COO$
2) Na_2CO_3, $NaNO_3$, CO_2
3) SO_2, NH_4Cl, CH_3COOH
4) $NaNO_2$, HNO_2, N_2O_3

7. Which of the following substances reacts with hydrochloride acid?

1) NH_4Cl
2) $NaCH_3COO$
3) elemental silver
4) CO_2

8. Mark **the correct** statement:

1) benzene has three single (C-C) longer bonds and three double (C=C) shorter bonds
2) length of all bonds in benzene is between the length of the single (C-C) bond and the length of the double (C=C) bond
3) benzene reacts with hydrochloric acid
4) reaction of benzene and an electrophile produces carbanion in the initial step

9. Mark **the correct** statement:

1) addition of sulfuric acid to alkenes follows the ionic mechanism
2) addition of sulfuric acid to alkenes is initiated by formation of a carbanion
3) addition of sulfuric acid to alkenes is initiated by nucleophilic addition of the sulfate anion
4) addition of sulfuric acid to alkenes does not bear any similarities to the addition of hydrochloric acid to alkenes

10. In which group **all listed compounds** react with hydrogen in the presence of a catalyst:

1) cyclobutane, propene, cyclopentane
2) cyclopropane, isobutane, 1-butanol
3) cyclopentane, cyclopropane, cyclohexene
4) cyclopentene, cyclopropane, propanone

11. Thermal cracking of alkanes can be considered as:

1) elimination reaction
2) substitution reaction
3) acid-base reaction
4) reduction with hydrogen

12. Mark the **correct** statement:

1) aniline is stronger base than ammonia
2) pyridine is less reactive than benzene in electrophilic aromatic substitution reactions
3) amides form stable salts in reaction with acids
4) pyrrole has properties of secondary amines

13. What is molecular formula of the product obtained in reaction of a single molecule of methanol and a single molecule of phosphoric acid:

1) CH_5O_4P
2) $C_3H_9O_4P$
3) CH_7O_5P
4) CH_4O_3P

14. Reduction of pyridine by H_2 in the presence of catalyst affords:

1) pyrrolidine
2) tertiary amine
3) the product more basic than pyridine
4) purine derivative

15. Mark the **incorrect** statement related to uronic acids:

1) in solution they may form β–anomer in pyranose form
2) in reaction with alcohols they form acetals
3) they do not show reducing properties
4) they are formed by oxidation of the primary alcoholic group of aldoses