PEOPLES´ FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

RUDN UNIVERSITY

Tests for RUDN University Open Olympiad for Foreign Citizens

CHEMISTRY (M)

Variant 1

Test questions (1 point each)

1. The element (E) whose atomic electron configuration is $ls^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$ forms the following acid in its highest oxidation state

1) H_2EO_4 2) H_2EO_3 3) HEO_4
4) HEO_3

Answer

2. **No** hydrogen bond is formed between the following molecules

1) CH_3CHO 2) H_2O 3) NH_3 4) CH_3CH_2OH

Answer:

3. How does the rate of the forward reaction change when the ammonia concentration triples?

$N_{2(g)} + 3\ H_{2(g)} \Leftrightarrow 2NH_{3(g)} + Q$

A) it triples	C) it increases by 9 times
B) it decreases by 9 times	D) it decreases by 27 times
E) it increases by 27 times	F) it does not change

Answer:

4. What is the pH of a solution of the strong electrolyte LiOH if the concentration of the solution is 0.001 mol/l.

A) 14 C) 10

B) 3 D) 11

Answer:

5. Determine the nature of the medium of the aqueous solutions with the same concentration (mol/l) for the substances listed below.

1) sodium acetate
2) strontium hydroxide
3) potassium dichromate
4) aluminum (III) nitrate

Write down the numbers of the substances in the ascending order of the pH of their aqueous solutions.

Answer:

6. In what order will the following ions be discharged at the cathode:

1) Ag^{+}, 2) Pb^{2+}, 3) Mn^{2+}, 4) Cd^{2+}?

Give your answer as a sequence of four numbers.

Answer:

7. Choose from the proposed reagents the one which can be used to separate $Mg(OH)_2$ and $Fe(OH)_3$ mixture:

a) HCl; b) NH_3; c) NH_4Cl; d) H_3PO_4.

Answer:

8. Acid properties are more pronounced in

1) water
2) phenol
3) ethanol
4) methanol

Answer:

9. According to their state of aggregation, the following colloidal systems are:

A) water and oil	1) suspension
B) blood	2) aerosol
C) smoke	3) emulsion
D) exhaust gas	4) sol

Answer:

A	**B**	**C**	**D**

10. Match the chemical reaction with the organic substance predominantly formed in this reaction. Choose the corresponding position indicated by a number for each position indicated by a letter.

REACTION	REACTION PRODUCT
A) trimerization of acetylene B) hydrogenation of 1,3-butadiene C) dehydrogenation of cyclohexane D) hydration of 1-butene	1) CH_3-CH_2-CH_2-CH_3 2) CH_3-CO-CH_2-CH_3 3) cyclohexane 4) CH_3-CH(OH)- CH_2-CH_3 5) CH_3-CH(OH)-CH(OH)- CH_3 6) benzene

Write down the numbers in the answer arranging them in the order corresponding to the letters:

A	B	C	D

Part 2

1 Determine the heat of formation of copper (II) oxide (in kJ/mol) if 60.75 kJ of energy was released when burning 24 g of copper to copper (II) oxide.

1) 152 2) 162
3) 172 4) 182

2. The equilibrium constant of the reaction: $AgCl + 2\ NH_3 \rightarrow [Ag(NH_3)_2]^+ + Cl^-$ is calculated by the formula:

a) $K_p = K_S^o(AgCl) \cdot \beta_2(Ag(NH_3)_2^+)$; b) $K_p = \frac{1}{K_S^o(AgCl) \cdot \beta_2(Ag(NH_3)_2^+)}$;

c) $K_p = \frac{\beta_2(Ag(NH_3)_2^+)}{K_S^o(AgCl)}$; d) $K_p = \frac{K_S^o(AgCl)}{\beta_2(Ag(NH_3)_2^+)}$.

3. *AgI* sol is obtained by adding *$AgNO_3$* solution to *NaI* solution. Write the formula of a micelle of the sol in excess of silver salt.

4. Write reaction equations which can be used to carry out the following transformations, indicate the conditions for the reactions:

$C_2H_2 \rightarrow CH_3CHO \rightarrow CH_3COOH \rightarrow CH_3COOC_2H_5 \rightarrow CH_3COONa \rightarrow CH_4$

5. The molar mass of the equivalent of potassium carbonate when titrated with hydrochloric acid in the presence of methyl orange (pT=4) is equal to:

a) $M(K_2CO_3)$; b) $M(K_2CO_3)/2$; c) $M(K_2CO_3)/3$; d) $2\ M(K_2CO_3)$.