

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 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$ forms the following acid in its highest oxidation state

1) H_2EO_4
4) HEO_3

2) H_2EO_3

3) HEO_4

Answer

2. No hydrogen bond is formed between the following molecules

1) CH_3CHO

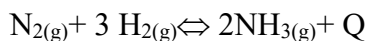
2) H_2O

3) NH_3

4) CH_3CH_2OH

Answer:

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



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.

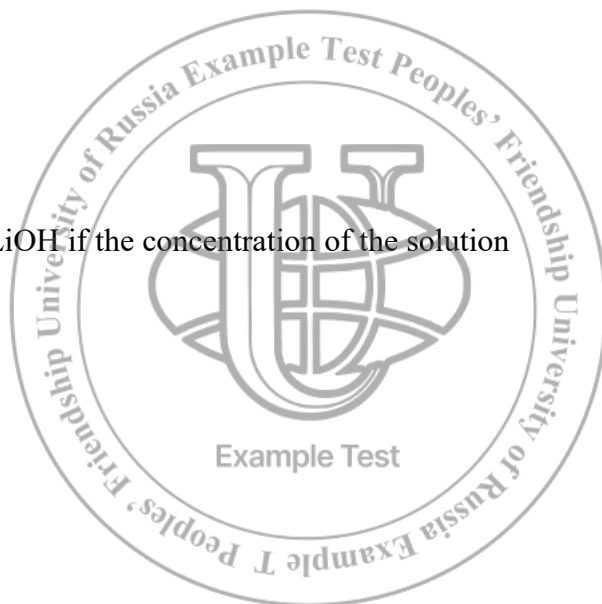
A) 14

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:

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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:

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7. Choose from the proposed reagents the one which can be used to separate $\text{Mg}(\text{OH})_2$ and $\text{Fe}(\text{OH})_3$ 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	1) CH ₃ -CH ₂ -CH ₂ -CH ₃
B) hydrogenation of 1,3-butadiene	2) CH ₃ -CO-CH ₂ -CH ₃
C) dehydrogenation of cyclohexane	3) cyclohexane
D) hydration of 1-butene	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:

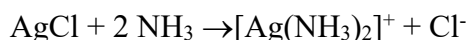
A	B	C	D

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:
is calculated by the formula:



- a) $K_p = K_s^\circ(\text{AgCl}) \cdot \beta_2(\text{Ag}(\text{NH}_3)_2^+)$; b) $K_p = \frac{1}{K_s^\circ(\text{AgCl}) \cdot \beta_2(\text{Ag}(\text{NH}_3)_2^+)}$;
c) $K_p = \frac{\beta_2(\text{Ag}(\text{NH}_3)_2^+)}{K_s^\circ(\text{AgCl})}$; d) $K_p = \frac{K_s^\circ(\text{AgCl})}{\beta_2(\text{Ag}(\text{NH}_3)_2^+)}$.

3. *AgI* sol is obtained by adding *AgNO₃* 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:



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) $M(\text{K}_2\text{CO}_3)$; b) $M(\text{K}_2\text{CO}_3)/2$; c) $M(\text{K}_2\text{CO}_3)/3$; d) $2 M(\text{K}_2\text{CO}_3)$.

