

TEORETICKÉ ÚLOHY

Chemická olympiáda – kategória Dz – 49. ročník – šk. rok 2012/13

Krajské kolo

Helena Vicenová

Maximálne 60 bodov Doba riešenia: 60 minút

Poznámka

Pri riešení úloh môžu žiaci používať kalkulačky a periodickú tabuľku, ktorá je uvedená v texte.

Úloha 1 (20 b)

Napíšte:

- a) čo sú chemické reakcie,
- b) názvy častíc H a H₂, a oxidačné číslo atómu vodíka v nich,
- c) akou farbou sú označené nádoby, v ktorých sa prepravuje vodík,
- d) názov H₃O⁺,
- e) čo znamená údaj 96 % na štítku kyseliny sírovej,
- f) k akej tepelnej zmene dochádza v priebehu riedenia kyseliny vodou,
- g) vzorec a názov trojprvkovej zlúčeniny síry, ktorá obsahuje atóm síry s oxidačným číslom IV,
- h) počet elektrónov v poslednej vrstve atómu Al a svoje tvrdenie zdôvodnite,
- i) čím sa líši minerálna voda od pitnej vody z vodovodu.

Úloha 2 (20 b)

Železo sa zlučuje s s chlórrom na chlorid železitý. Napíšte:

- a) chemickú rovnicu reakcie,
- b) jej vyjadrenie pomocou počtu častíc.
- c) jej vyjadrenie pomocou látkových množstiev,
- d) aké látkové množstvo molekúl chlóru zreaguje, ak sa na reakciu použije 1 mol atómov železa,
- e) koľko atómov železa sa nachádza v 1 móle atómov železa,

- f) hmotnosť 1 mólu atómov železa.
- g) či je uvedená rovnica zápisom redoxnej reakcie a svoje tvrdenie zdôvodnite.
 $M(\text{Fe}) = 55,85 \text{ g/mol}$

Úloha 3 (8 b)

Vyberte správne tvrdenia.

- a) Kyselina sírová *je/nie* je prchavá.
- b) V priebehu neutralizačnej reakcie sa *uvoľňuje/spotrebuje* teplo.
- c) Redukovadlo je látka, ktorá sa oxiduje, čiže *prijíma/odovzdáva* elektróny.
- d) Mól je *názov /značka* jednotky látkového množstva.

Úloha 4 (12 b)

V 500 cm^3 roztoku sa nachádza presne 42 g KCl.

Napíšte:

- a) chemický názov KCl.

Vypočítajte:

- b) koncentráciu KCl v roztoku,
- c) hmotnostný zlomok KCl v roztoku.

$M(\text{K}) = 39,10 \text{ g/mol}$, $M(\text{Cl}) = 35,46 \text{ g/mol}$, $\rho(\text{roztok KCl}) = 1,050 \text{ g/cm}^3$

PRAKTICKÉ ÚLOHY

Chemická olympiáda – kategória Dz – 49. ročník – šk. rok 2012/13

Krajské kolo

Pavol Bernáth

Maximálne 40 bodov
Doba riešenia: 60 minút

Príprava hydroxidu železitého

Úloha 1 (20 b)

1. Na hodinovom sklíčku máte navážené 3,00 g FeCl_3 .
2. Látku rozpustíte v 60 cm^3 vody.
3. K roztoku pridajte po malých množstvách (po sklenej tyčinke) 50 cm^3 roztoku NaOH, ktorý máte v kadičke. Po každom prídavku roztok pomaly premiešajte tyčinkou.
4. Zostavte aparatúru na filtráciu.
5. Vzniknutú zrazeninu odfiltrujte, premyte na filtri destilovanou vodou a vodu nechajte odkvapkať.
6. Filtračný papier so získanou látkou položte na hodinové sklíčko a nechajte vysušiť voľne na vzduchu.
7. Do skúmavky vložte malé množstvo získaného produktu, pridajte vodu výšky asi 2 cm. Obsah skúmavky premiešajte pretrepaním, pomaly prikvapkávajte 5 % roztok kyseliny sírovej a pozorujte.

Úloha 2 (20 b)

Do odpovedového hárka doplňte požadované údaje.

Autori: RNDr. Helena Vicenová (vedúca autorského kolektívu),

PaedDr. Pavol Bernáth

Recenzenti: RNDr. Jana Chrappová, PhD., Jaroslav Baričák

Vydal: IUVENTA – Slovenský inštitút mládeže, Bratislava 2012

Odpoved'ový hárok

Chemická olympiáda – kategória Dz – 49. ročník – šk. rok 2012/13

Krajské kolo

Štartové číslo:

Názov práce: Príprava hydroxidu železitého (20 b)

1. Napíšte názvy všetkých laboratórnych pomôcok, ktoré ste použili.

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2. Napíšte názvy látok, ktoré ste pri práci použili.

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3. Opíšte vlastnosti získaného produktu (skupenstvo, sfarbenie).

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4. Napíšte chemickú rovnicu zrážacej reakcie:

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5. Napíšte, čo ste pozorovali po pridaní roztoku kyseliny sírovej do skúmavky so zrazeninou.

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6. Napíšte rovnicu reakcie zrazeniny s kyselinou sírovou:

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7. Medzi aký typ reakcie môžeme zaradiť reakciu vzniknutej zrazeniny s kyselinou sírovou: a) redoxná reakcia, b) neutralizácia, c) chemický rozklad.

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8. Za predpokladu, že zrážacou reakciou ste získali 1,0 g zrazeniny, vypočítajte výťažok chemickej reakcie.

$M(\text{FeCl}_3) = 162,3 \text{ g/mol}$, $M(\text{zrazenina}) = 106,8 \text{ g/mol}$

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Periodická tabuľka chemických prvkov

Periodická tabuľka chemických prvkov

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18														
I A	II A	III B	IV B	V B	VI B	VII B	VIII B					II B	III A	IV A	V A	VI A	VII A	VIII A													
1 ¹ H 1.01 HYDROGEN	2 ⁴ Li 6.94 LITHIUM	3 ¹¹ Na 22.99 SODIUM	4 ²⁰ Ca 40.08 CALCIUM	5 ²³ V 50.94 VANADIUM	6 ²⁴ Cr 52.00 CHROMIUM	7 ²⁵ Mn 54.94 MANGANESE	8 ²⁶ Fe 55.85 FERUM	9 ²⁷ Co 58.93 COBALT	10 ²⁸ Ni 58.69 NICKEL	11 ²⁹ Cu 63.55 COPPER	12 ³⁰ Zn 65.38 ZINC	13 ³¹ Ga 69.72 GALLIUM	14 ³² Ge 72.64 GERMANIUM	15 ³³ As 74.92 ARSEN	16 ³⁴ Se 78.96 SELENIUM	17 ³⁵ Br 79.90 BROMINE	18 ³⁶ Kr 83.80 KRYPTON														
5 ⁸⁷ Rb 85.47 RUBIDIUM	6 ⁸⁸ Sr 87.62 STRONTIUM	7 ⁸⁹ Y 88.91 YTIUM	8 ⁹⁰ Zr 91.22 ZIRKONIUM	9 ⁹¹ Nb 92.91 NIOB	10 ⁹² Mo 95.94 MOLYBDEN	11 ⁹³ Tc 98.91 TECHNETIUM	12 ⁹⁴ Ru 101.07 RUTHENIUM	13 ⁹⁵ Rh 102.91 RHODIUM	14 ⁹⁶ Pd 106.42 PALADIUM	15 ⁹⁷ Ag 107.87 STRÉBRO	16 ⁹⁸ Cd 112.41 KADMIUM	17 ⁴⁹ <th>In</th> <td>18 ⁵⁰<th>Sn</th><td>19 ⁵¹<th>Sb</th><td>20 ⁵²<th>Te</th><td>21 ⁵³<th>I</th><td>22 ⁵⁴<th>Xe</th></td></td></td></td></td>	In	18 ⁵⁰ <th>Sn</th> <td>19 ⁵¹<th>Sb</th><td>20 ⁵²<th>Te</th><td>21 ⁵³<th>I</th><td>22 ⁵⁴<th>Xe</th></td></td></td></td>	Sn	19 ⁵¹ <th>Sb</th> <td>20 ⁵²<th>Te</th><td>21 ⁵³<th>I</th><td>22 ⁵⁴<th>Xe</th></td></td></td>	Sb	20 ⁵² <th>Te</th> <td>21 ⁵³<th>I</th><td>22 ⁵⁴<th>Xe</th></td></td>	Te	21 ⁵³ <th>I</th> <td>22 ⁵⁴<th>Xe</th></td>	I	22 ⁵⁴ <th>Xe</th>	Xe								
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	⁸² Th	THOR Thorium	⁸³ Pa	PROTACTINIUM Protactinium	⁸⁵ U	URANIUM Uranium	⁸⁷ Np	NEPTUNIUM Neptunium	⁸⁹ Pu	PLUTONIUM Plutonium	⁹¹ Am	AMERICIUM Americium	⁹³ Cm	CURIUM Curium	⁹⁵ Bk	BERKELIUM Berkelium	⁹⁷ Cf	CALIFORNIUM Californium	⁹⁹ Es	EINSTEINIUM Einsteinium	¹⁰¹ Fm	FERMIUM Fermium	¹⁰³ Md	MADAGASCARIUM Madagascar	¹⁰⁵ Lr	LEWISIIUM Lewisium
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