

Abschlussklausur zur Vorlesung
Chemie für Physiker

Ankündigungen

Bitte schreiben Sie auf jedes Ihrer Lösungsblätter **in Druckschrift** oben rechts **Name, Vorname, Matrikelnummer** und Fachrichtung. Beginnen Sie jede Aufgabe auf einer neuen Seite. Behandeln Sie alle Aufgaben unter Angabe aller Zwischenschritte.

Schalten Sie Ihr Handy aus. Die Benutzung von MP3-Playern und ähnlichen Geräten ist nicht erlaubt.

Erlaubte Hilfsmittel: Ein Taschenrechner, der weder programmierbar noch graphikfähig sein darf. Jede Benutzung nicht erlaubter Hilfsmittel wird als Täuschungsversuch geahndet.

Geben Sie Ergebnisse mit mindestens 3 signifikanten Stellen korrekt an.

Klausuraufgaben

1. Eigenschaften von Atomen

- (a) Geben Sie die Elektronenkonfiguration von S, Sc und Kr an. Wieviele ungepaarte Elektronen hat jedes Element? (*3 Punkte*)
- (b) Welches Atom der folgenden Atompaare ist größer? (*4 Punkte*)
 - Al, P
 - Ba, B
 - Cs, Cd
 - Ga, Ge
- (c) Bei welchem Atom der folgenden Atompaare ist die höhere Ionisierungsenergie zu erwarten? (*3 Punkte*)
 - S, Ar
 - Sn, As
 - I, Xe

2. Moleküle

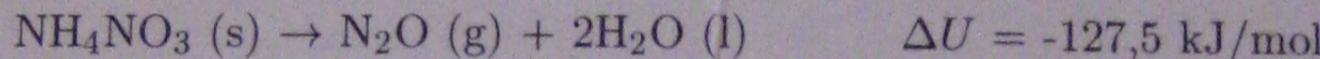
- (a) Welche Formeln haben die Verbindungen, die aus Magnesiumionen (Mg^{2+}) mit folgenden Ionen gebildet werden: Cl^- , SO_4^{2-} , N^{3-} ? (3 Punkte)
- (b) Wieviele Mol und wieviele Moleküle sind in 75,0 g H_2SO_4 enthalten? (2 Punkte)
- (c) Zeichnen Sie die Valenzstrichformeln folgender Moleküle einschließlich der Formalladungen: $OSCl_2$, NCCN, HCCH (6 Punkte)

3. Reaktionen

48

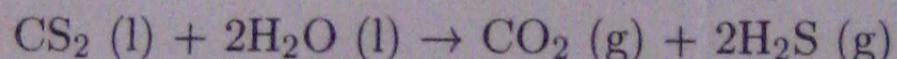
- (a) Beim Erhitzen zersetzt sich Natriumazid NaN_3 zu Na und N_2 . (3 Punkte)
- Formulieren Sie die Reaktionsgleichung.
 - Wie viel Mol NaN_3 werden zur Herstellung von 1,00 Mol N_2 benötigt?
 - Welche Masse N_2 entsteht bei der Zersetzung von 2,50 g NaN_3 ?

- (b) Bei der Reaktion (2 Punkte)

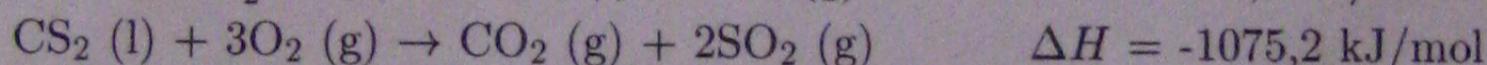
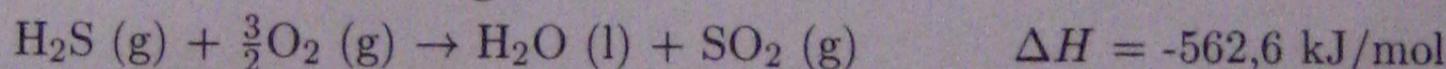


wird bei einem Druck $p=95,00 \text{ kPa}$ 1 Mol N_2O mit einem Volumen von 26,09 l gebildet.
Wie groß ist die Reaktionsenthalpie?

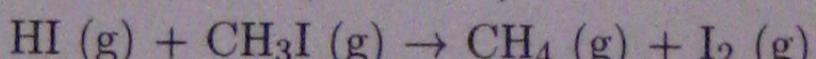
- (c) Berechnen Sie ΔH für die Reaktion (2 Punkte)



mit Hilfe der Gleichungen

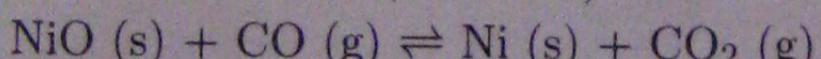


- (d) Die Reaktion (2 Punkte)



ist erster Ordnung bezüglich HI und bezüglich CH_3I und insgesamt zweiter Ordnung. Bei 430 K ist $k=1,7 \cdot 10^{-5} \text{ l}/(\text{mol s})$ und bei 450 K ist $k=9,6 \cdot 10^{-5} \text{ l}/(\text{mol s})$. Wie groß ist die Aktivierungsenergie?

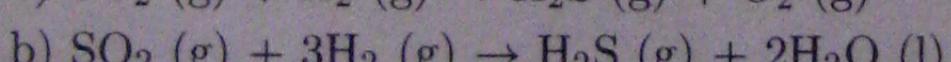
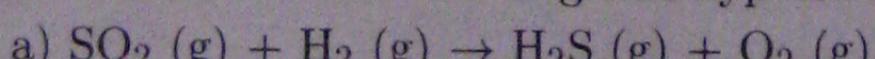
- (e) Für die Reaktion (2 Punkte)



ist $K = 4540$ bei 936 K und 1580 bei 1125 K.

- Ist die Reaktion exotherm oder endotherm?
- Wie wird das Gleichgewicht beeinflusst, wenn der Druck erniedrigt wird?

- (f) Berechnen Sie ΔG^0 für folgende hypothetische Reaktionen: (3 Punkte)

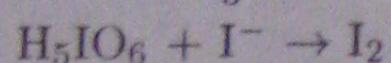
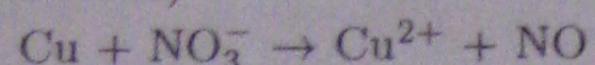


Welche der beiden Reaktionen sollte bei 25°C ablaufen?



4. Redoxreaktionen, Säuren, Basen

- (a) Geben Sie die Oxidationszahl an für Sn in K_2SnO_3 und Br in BrF_6^- . (2 Punkte)
(b) Vervollständigen Sie folgende Gleichungen, die in saurer wässriger Lösung ablaufen: (4 Punkte)



5. Elektrochemie

- (a) Bei der Elektrolyse einer sauren Pb^{2+} -Lösung wird PbO_2 an der Anode abgeschieden. a) Formulieren Sie die Anodenreaktion. b) Wie viel Gramm PbO_2 scheiden sich bei einer Stromstärke von 0.750 A in 25,0 Minuten ab? (4 Punkte)
- (b) Wie groß ist die elektromotorische Kraft der Zelle $Ni|Ni^{2+}||Cu^{2+}|Cu$? Formulieren Sie die Zellenreaktion. Welche Elektrode ist der Pluspol? (3 Punkte)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Hydrogen 1 H 1.007967 Boron 3 Li 6.94117 Boron 5 Be 9.0121823 Magnesium 12 Na 22.9897702 Magnesium 11 Mg 24.309165 Cobalt 19 K 39.094913 Cobalt 20 Ca 40.07814 Cobalt 37 Rb 55.910552 Cobalt 38 Sr 56.93811 Cobalt 55 Cs 12.99452 Cobalt 56 Ba 137.3227 Cobalt 87 Fr 122 Cobalt 88 Ra 122 57-70 ** Lanthan 21 Sc 44.9594198 Yttrium 22 Ti 47.98211 Yttrium 23 V 50.94151 Manganese 24 Cr 51.99616 Manganese 25 Mn 54.9384596 Manganese 26 Fe 55.84521 Iron 27 Co 58.932048 Iron 28 Ni 58.93483 Nickel 29 Cu 63.94644 Copper 30 Zn 65.40644 Zinc 31 Ga 69.92361 Gallium 32 Ge 72.6471 Germanium 33 As 74.9816021 Arsenic 34 Se 75.98121 Selenium 35 Br 76.98111 Bromine 36 Kr 83.79821 Krypton 37 Y 88.90582 Yttrium 38 Zr 91.22412 Zirconium 39 Nb 92.909812 Niobium 40 Mo 95.94111 Molybdenum 41 Tc 96.99411 Technetium 42 Ru 101.0712 Ruthenium 43 Rh 101.0712 Rhodium 44 Pd 101.96611 Palladium 45 Ag 102.90611 Silver 46 Cd 105.94111 Cadmium 47 In 111.91811 Indium 48 Sn 114.91811 Tin 49 Sb 118.71911 Antimony 50 Te 121.96011 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