

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

考試日期：0301，節次：2

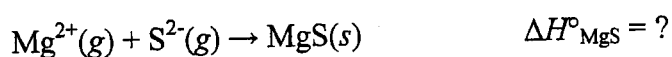
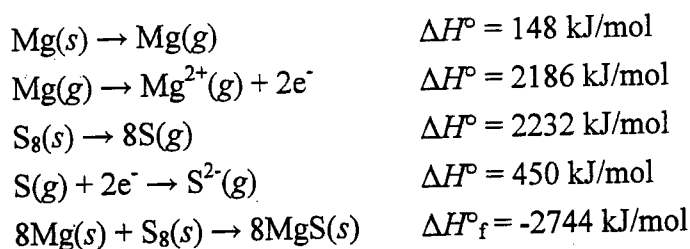
1. (8, single choice) A system which undergoes an adiabatic change (i.e., $q = 0$) and does work on the surroundings has

A. $w = \Delta E$; B. $w = -\Delta E$; C. $w > 0, \Delta E < 0$; D. $w < 0, \Delta E > 0$; E. $w > \Delta E$

2. (9) Line spectra from all regions of the electromagnetic spectrum, including the Paschen series of infrared lines for hydrogen, are used by astronomers to identify elements present in the atmospheres of stars. Calculate the wavelength of the photon emitted when the hydrogen atom undergoes a transition from $n = 5$ to $n = 3$. ($R = 1.096776 \times 10^7 \text{ m}^{-1}$)

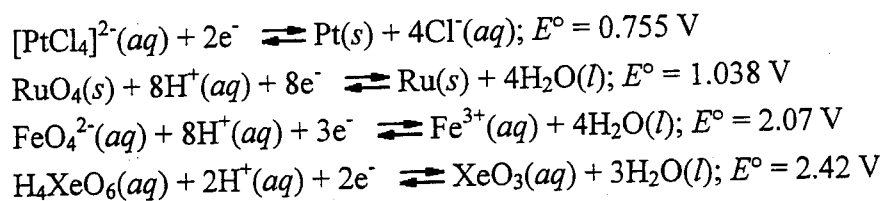
3. (9) Write the correct set of quantum numbers (n, l, m_l, m_s) for the highest energy electron in the ground state of potassium, K.

4. (10) Calculate the lattice energy of magnesium sulfide.



5. (10) Draw the best Lewis structure for ClCN.

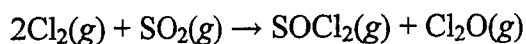
6. (8) Examine the following half-reactions and select the strongest oxidizing agent among the substances.



(背面仍有題目,請繼續作答)

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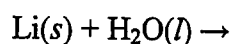
7. (9) Use the given data at 298 K to calculate ΔG° for the reaction

Substance:	$\text{Cl}_2(g)$	$\text{SO}_2(g)$	$\text{SOCl}_2(g)$	$\text{Cl}_2\text{O}(g)$
ΔH°_f (kJ/mol):	0	-296.8	-212.5	80.3
S° (J/K·mol):	223.0	248.1	309.77	266.1

8. (9) Write the organic product for the reaction of 2-pentanol with sulfuric acid.



9. (9) Predict the products for the following set of reactants.

10. (9) The chemist, Anna Lytic, must prepare 1.00 kg of 15.0% (w/w) acetic acid using a stock solution which is 36.0% (w/w) acetic acid ($d = 1.045$ g/mL).

Calculate the gram of the stock solution and the distilled water that need to be mixed in order to prepare such solution.

11. (10) Indicate the bonding type for the following solids. (*ionic, network ...*) P_4 ; Na; SiO_2 ; NaCl; diamond