UNIT7-DAY8-LaB11am

Tuesday, April 09, 2013
8:42 AM

Thinking Like a Chemist UNIT 7 EXAM

RAQ

UNIT 7 DAY 8

ke Spring 2013

IMPORTANT INFORMATION

UNIT 7 EXAM Wed 7:00 -9:00 PM

DVB 930 am (51540)
WEL 2.224 version 1-230
WEL 2.122 version 231 - 330
WEL 3.502 version 331+

LAB 11 am (51535)
BUR 106 version 1-260
WEL 1.308 version 261+

LAB 1230 pm (51525)
WCH 1.120 version 1-150
JGB 2.324 version 151+

CH302 Vanden Bout/LaBrake Spring 2013

RULES

Students MUST take correct exam (professor AND time) that you are registered for

No bags, no graphing calculators, no extra calculators provided

Write name 3 places on exam (MC, FR and signature on scantron)

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Students must be prepared to turn the exam in when they get in line:

scratch pages stuffed into MC, photo ID out

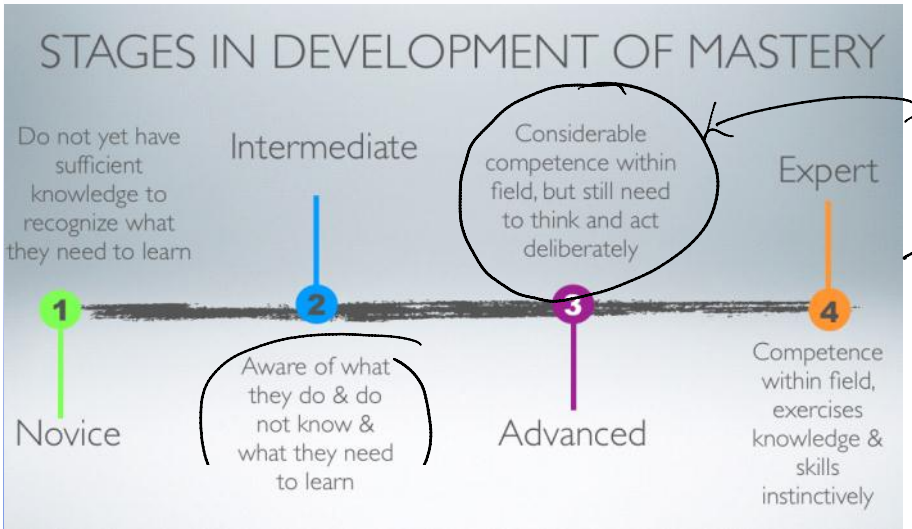
For a quieter exam, bring earplugs

Poll: Clicker 1

At this point, I understand almost all of the material in this unit.

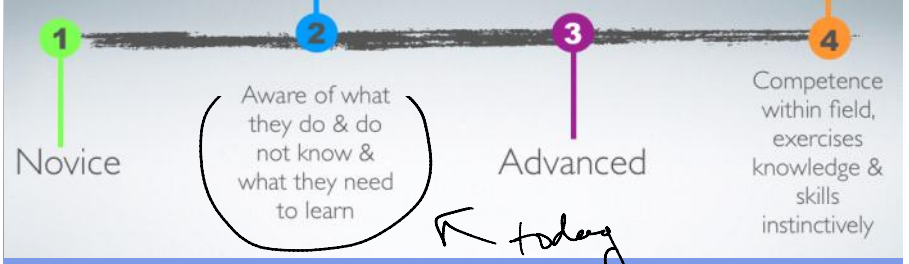
A) NOT True of me at all
B) Somewhat NOT True of me
C) Somewhat true of me
D) Very True of Me

Why developing conceptual understanding matters…



for tomorrow

test yourself today!



How Learning Works by Ambrose et al (2011)

WORK THROUGH THE RAQ

CLICKER QUESTION EVERY 5 MINUTES

Poll: Clicker 2

Q1: The correct beta decay equation for Pt-200 is:

assume this is $^{0}_{-1}e$ negative!

A. $^{200}_{78}Pt + {}^{0}_{-1}e \rightarrow {}^{200}_{77}Ir$

B. $^{200}_{78}Pt \rightarrow {}^{200}_{77}Ir + {}^{0}_{-1}e$

C. $^{200}_{78}Pt + {}^{0}_{-1}e \rightarrow {}^{200}_{79}Au$

D. $^{200}_{78}Pt \rightarrow {}^{200}_{79}Au + {}^{0}_{-1}e$

Radioactivity

macroscopic
- nothing seems to change (chunk of rock)
→ need gieger counter to "see"

microscopic model
nucleus IS changing
mass of particles change

Nuclear vs Chemical
↳ more energy

Poll: Clicker 3

Q2: The rate law and integrated rate law for all nuclear ~~change~~ decay is first order.

A. True
B. False

Poll: Clicker 4

Q3: The half-life of Pt-200 is 12 hours. Assuming you start with 2.0 Ci, how many Ci will be left after 2 hours?

A. 0.3 Ci
B. 0.6 Ci
C. 1.4 Ci
D. 1.7 Ci

Poll: Clicker 5

Q4: Assume you have acquired 0.12 g of Pt-200. Assume that each time a certain mass of Pt-200 undergoes decay, 0.1 % of the mass is converted to energy. How much energy in units of KJ will be given off over one 24-hour period?

$.12 - .03 = .09$ g

$(.001)(.09)(10^3)$

$\Delta E = \Delta m c^2$

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$\Delta E = \Delta m c^2$

$Kg \cdot \frac{m^2}{s^2}$

$\downarrow$

J

A. 2.7×10^{10} KJ
B. 2.7×10^{6} KJ
C. 8.1×10^{6} KJ
D. 8.1×10^{10} KJ

Poll: Clicker 6

Q5: Can you determine the rate law by inspecting this reaction? Why or Why not

$2NO + O_2 \rightarrow 2NO_2$

A. Yes, because the reaction is provided
B. Yes, because the reaction can only proceed by one mechanism
C. No, because there is no mechanism that matches a reaction with three reactants.
D. No, because you can never predict the rate law simply by inspecting the overall reaction.

Need: data mechanism information!

Poll: Clicker 7

Q6: Predict the rate law based on the initial rate data given on the worksheet

A. rate = k[NO][O_2]
B. rate = k[NO]^2[O_2]
C. rate = k[NO][O_2]^2
D. rate = k[NO]^2[O_2]^y

$$\frac{Rate_1}{Rate_2} = \frac{k[NO]^x[O_2]^y}{k[NO]^x[O_2]^y}$$

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Poll: Clicker 8

Q7: Calculate the rate constant from the determined rate law and the data given on the worksheet.

A. Impossible to determine
B. 2.0 x 10^6 $\mu M^{-2}s^{-1}$
C. 2.0 x 10^{-6} Ms^{-1}
D. 2.0 x 10^{-6} $\mu M^{-2}s^{-1}$
E. 2.0 x 10^{-6}

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Poll: Clicker 9

Q9: Which of the following rate laws is supported by the data?

a) NO + NO → N_2O_2 (slow)
N_2O_2 + O_2 → 2NO_2 (fast)
rate = k[NO]^2

b) NO + O_2 → NO_3 (slow)
NO_3 + NO → 2NO_2 (fast)
rate = k[NO][O_2]

c) NO + O_2 ← → NO_3 (fast, eq)
NO_3 + NO → 2NO_2 (slow)
rate = k[NO]^2[O_2]

All based on slow step

b) $NO + O_2 \rightarrow NO_3$ (slow)
$NO_3 + NO \rightarrow 2NO_2$ (fast)

c) $NO + O_2 \leftarrow\rightarrow NO_3$ (fast, eq)
$NO_3 + NO \rightarrow 2NO_2$ (slow)

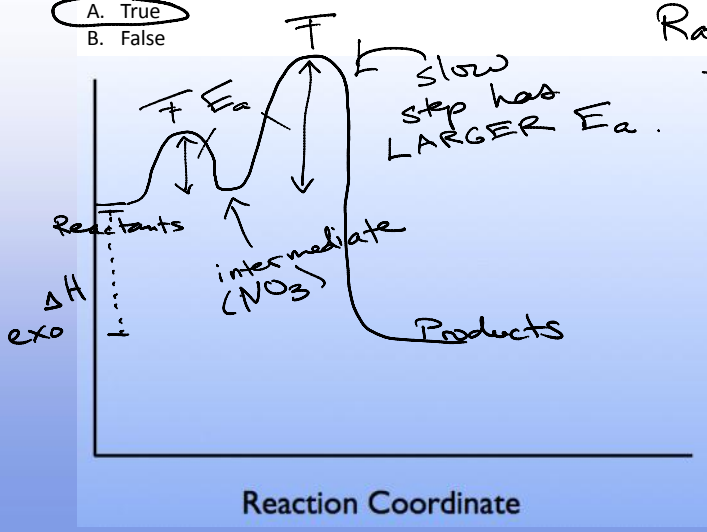
rate = $k[NO]^2[O_2]$

intermediate cannot be in final rate law

Poll: Clicker 10

Q10: The following reaction coordinate supports the proposed mechanism.

A. True
B. False



Rate law has 2 steps — need 2

What is the transition state?
We don't know!
(but we can label it on this graph)
need to study it

Poll: Clicker 11

Q11: When Pt metal is used as a catalyst for this reaction, the mechanism changes and the reaction is much faster. With the catalyst the activation energy is found to be 80 kJ mol^{-1}. ~~How much would you have to raise the temperature to get the reaction to run~~ 100 times faster than it does at room temperature with the catalyst?

What would the temperature have to be to

A. 25.3 ° C
B. 74 ° C
C. 300 ° C
D. 346 ° C

$\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$\ln 100 =$

Arrhenius Law

The rate constant k is a function of temperature

$$k = A\, e^{-Ea/RT}$$

The higher the temperature the more molecules that have enough energy to make it over the barrier

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Principles of Chemistry II CH302 Vanden Bout/LaBrake Spring 2018