

I'm not robot!

ADVANCED PLACEMENT CHEMISTRY EQUATIONS AND CONSTANTS

Throughout the test the following symbols have the definitions specified unless otherwise noted.

L, mL = liter(s), milliliter(s)	mm Hg = millimeters of mercury
g = gram(s)	J, kJ = joule(s), kilojoule(s)
nm = nanometer(s)	V = volt(s)
atm = atmosphere(s)	mol = mole(s)

ATOMIC STRUCTURE

$$E = h\nu$$

$$c = \lambda\nu$$

E = energy
 ν = frequency
 λ = wavelength

Planck's constant, $h = 6.626 \times 10^{-34}$ J s
 Speed of light, $c = 2.998 \times 10^8$ m s⁻¹
 Avogadro's number = 6.022×10^{23} mol⁻¹
 Electron charge, $e = -1.602 \times 10^{-19}$ coulomb

EQUILIBRIUM

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, \text{ where } aA + bB \rightleftharpoons cC + dD$$

$$K_p = \frac{(P_C)^c(P_D)^d}{(P_A)^a(P_B)^b}$$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$K_b = \frac{[OH^-][BH^+]}{[B]}$$

$$K_w = [H^+][OH^-] = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

$$= K_a \times K_b$$

$$\text{pH} = -\log[H^+], \text{ pOH} = -\log[OH^-]$$

$$14 = \text{pH} + \text{pOH}$$

$$\text{pH} = \text{p}K_a + \log \frac{[A^-]}{[HA]}$$

$$\text{p}K_a = -\log K_a, \text{ p}K_b = -\log K_b$$

Equilibrium Constants

- K_c (molar concentrations)
- K_p (gas pressures)
- K_a (weak acid)
- K_b (weak base)
- K_w (water)

KINETICS

$$\ln[A]_t - \ln[A]_0 = -kt$$

$$\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$$

$$t_{1/2} = \frac{0.693}{k}$$

k = rate constant
 t = time
 $t_{1/2}$ = half-life

AP Biology Reference Tables

8. Unpolarised light is incident from air on a plane surface of a material of refractive index μ . At a particular angle of incidence i , it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?
- (1) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
 - (2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
 - (3) Reflected light is polarised with its electric vector parallel to the plane of incidence
 - (4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$
9. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5890 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to
- (1) 2.1 mm
 - (2) 1.9 mm
 - (3) 1.8 mm
 - (4) 1.7 mm
10. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of
- (1) large focal length and large diameter
 - (2) large focal length and small diameter
 - (3) small focal length and large diameter
 - (4) small focal length and small diameter
11. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is
- (1) 2 : -1
 - (2) 1 : -1
 - (3) 1 : 1
 - (4) 1 : -2
12. An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is
- (1) $\lambda_0 t$
 - (2) $\lambda_0 \left(1 + \frac{eE_0 t}{mV_0}\right)$
 - (3) $\lambda_0 \left(1 - \frac{eE_0 t}{mV_0}\right)$
13. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is
- (1) 30
 - (2) 10
 - (3) 20
 - (4) 15
14. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2 . The ratio of v_1 to v_2 is
- (1) 4 : 1
 - (2) 1 : 4
 - (3) 1 : 2
 - (4) 2 : 1

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Surname	Other names
Centre Number	Candidate Number
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Pearson Edexcel International Advanced Level	
Chemistry Advanced Unit 5: General Principles of Chemistry II – Transition Metals and Organic Nitrogen Chemistry (including synoptic assessment)	
Tuesday 17 June 2014 – Afternoon	Paper Reference WCH05/01
Time: 1 hour 40 minutes	
You must have: Data Booklet	Total Marks
Candidates may use a calculator.	

Instructions

- Use black ink or ball-point pen.
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all questions.
- Answer the questions in the spaces provided – there may be more space than you need.

Information

- The total mark for this paper is 90.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Questions labelled with an asterisk (*) are ones where the quality of your written communication will be assessed – you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over >

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PEARSON

Chemistry Formulas and Constants

ATOMIC STRUCTURE

$$E_n = \frac{-2.178 \times 10^{-18} \text{ joule}}{n^2}$$

$$\Delta E = -2.178 \times 10^{-18} \text{ joule} \left(\frac{1}{n_f} - \frac{1}{n_i} \right)$$

$$\lambda = \frac{h}{m\nu}$$

EQUILIBRIUM

$$K_c = [\text{OH}^-][\text{H}^+] = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

$$= K_a K_b$$

$$\text{pH} = \text{p}K_a + \log \frac{[\text{base}]}{[\text{acid}]}$$

THERMODYNAMICS/KINETICS

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G^\circ = -RT \ln K = -2.303RT \log K$$

$$= -nFE^\circ$$

$$\ln \frac{[A]}{[A]_0} = -kt \quad \frac{1}{[A]} - \frac{1}{[A]_0} = kt$$

$$\ln k = \frac{-E_a}{R} \left(\frac{1}{T} \right) + \ln A$$

$$\ln P = \frac{\Delta H_{\text{vap}}}{RT} + C$$

$$\ln \frac{P_2}{P_1} = \frac{-\Delta H_{\text{vap}}}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

ELECTROCHEMISTRY

$$E_{\text{cell}} = E - \frac{RT}{nF} \ln Q = E_{\text{cell}}^\circ - \frac{0.0592}{n} \log Q \text{ at } 25^\circ\text{C}$$

CONSTANTS

Mass of electron = 9.10956×10^{-31} kg
 Mass of proton = 1.67262×10^{-27} kg
 mass of neutron = 1.67493×10^{-27} kg
 Planck's constant: $h = 6.63 \times 10^{-34}$ J s
 Boltzmann's constant: $k = 1.38 \times 10^{-23}$ J K⁻¹
 Electron charge = -1.602×10^{-19} coulombs
 1 electric volt per atom = 96.5 kJ mol⁻¹
 1 amu = 1.6605×10^{-24} g
 1 cal = 4.184 J
 1 eV = 1.602×10^{-19} J
 Faraday's constant: $F = 96,500$ coulombs per mole of electrons
 Gas Constant: $R = 8.31$ J mol⁻¹ K⁻¹
 $= 0.0821$ L atm mol⁻¹ K⁻¹
 $= 62.4$ L torr mol⁻¹ K⁻¹

GASES/SOLUTIONS

$$P_x = P_{\text{total}} \times X_x \text{ where } X_x = \frac{\text{moles } A}{\text{total moles}}$$

$$\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$$

$$\Delta T_f = K_f \times \text{molality}$$

$$\Delta T_b = K_b \times \text{molality}$$

$$\pi = MRT$$

$$A = abc$$

$$\text{Absorbance} = abc = \epsilon(bc)$$

Chemistryselect reference style.

Copyright 2001-2018 Castle Software, Inc. All Rights Reserved Students in AP Chemistry need to memorize a lot of information, but we have some good news! During the AP exam, you'll have access to a formula sheet that includes a periodic table as well as useful equations. However, you'll need to have a good sense of what's on the AP Chem formula sheet and how to use it in order to make the most of it during the test. In this guide, we explain everything you need to know about the AP Chemistry reference table. We go over what the formula sheet looks like, what it includes, what important information it doesn't contain but that you should know, and how you can get the most out of it. What's on the AP Chem Formula Sheet? The AP Chemistry reference sheet is actually three pages of information. It will be at the beginning of both the multiple-choice and free-response sections of the test, so you'll have access to it for the entire AP Chemistry exam. This means you don't need to memorize any of the information the formula sheet contains. So what's on this AP Chem reference sheet? Check it out here on pages 2-4, as well as the screenshots below (click on each image to enlarge). The AP Chem equation sheet covers six main topics: Periodic table of elements Atomic structure Equilibrium Kinetics Gases, liquids, and solutions Thermodynamics/electrochemistry Periodic Table of Elements The AP Chem equation sheet includes a complete periodic table. For each element, it includes the element name, symbol, atomic number, and atomic mass. Atomic Structure 2 equations Values for: Planck's constant Speed of light Avogadro's number Electron charge Equilibrium Kinetics Gases, Liquids, and Solutions 9 equations Values for: Gas constant (3) 1 atm STP Ideal gas at STP Thermodynamics/Electrochemistry 9 equations Values for: What Isn't on the AP Chem Formula Sheet That You Need to Know for the Exam? While the AP Chemistry reference table does a good job of covering the majority of equations you need to know for the exam, there is some information it's missing. That's what we cover in this section. Be sure to know these equations for the exam. Rate Law One of the laws you learn in AP Chemistry is that, at a constant temperature, the rate of a chemical reaction depends only on the concentrations of the substances that influence the rate. These substances are typically reactants, but can also include products and catalysts. The rate law formula is: rate=k[A]^a[B]^b [A] and [B] represent molar concentrations of reactants k is the rate constant (which varies depending on the reaction and the temperature) a and b are typically positive integers that must be found experimentally Rate law is used to estimate the relationship between the rate of a reaction and the concentrations of reactants. You may see it on questions related to kinetics. Coulomb's Law Coulomb's Law states that magnitude of electric force between the charges q1 and q2 is directly proportional to the magnitude of the charges and inversely proportional to the square of the distance between them. You may see it on electrochemistry questions. F=k(1/2/r) r= distance of separation Important Percentages You might need to use these equations on any portion of the test. They determine how accurate estimates are compared to actual results. %error = (actual value - theoretical value)/(theoretical value)*100 %yield = (actual yield/theoretical yield)*100 Looking for help studying for your AP exam? Our one-on-one online AP tutoring services can help you prepare for your AP exams. Get matched with a top tutor who got a high score on the exam you're studying for! 4 Tips for Getting the Most Out of the AP Chem Equation Sheet The AP Chemistry formula sheet can be extremely helpful during the exam, but only if you know how to use it properly. Here are four tips for getting the most out of it. #1: Know How to Use Every Equation on the AP Chem Formula Sheet The AP Chem reference sheet contains 32 equations, and you should know how each of them works before test day. The College Board isn't one for including extraneous information on formula sheets, so if a formula is included on the sheet, that means there's a solid chance you'll need to use it on the exam. You don't want to waste your exam trying to learn how to use, say Planck's equation, and hoping you got it right! Well before exam day, be sure to go through every formula on the sheet and make sure you understand it and know how to use it. The keys included in the formula sheet are also helpful for figuring out what different variables represent in the equations, so don't neglect them either. #2: Use Your Calculator Wisely You're allowed a graphing calculator on the free-response portion of the exam, but not the multiple-choice section. You can make good use of your calculator by programming constants and formulas into it so you can solve equations more easily. However, don't think this means you get out of understanding the actual formulas themselves. You still need to know when and how to use each equation on the AP Chemistry reference table, not to mention you won't have your calculator for multiple-choice questions. So know when your calculator is useful, but don't over-rely on it. #3: Take Practice Tests Using the Formula Sheet Answering practice questions and taking practice tests using the AP Chem formula sheet is key to doing well on the exam. You should take several AP Chemistry practice tests before the actual AP exam. For each of them, use the official formula sheet. Your teacher will also likely give you a copy of the AP Chem formula sheet for your in-class exams, so you can get some practice in there too. If you need help finding practice tests, check out our guide specifically on where to find the best AP Chemistry practice questions and tests. #4: Become an Expert on the Periodic Table If there's one guarantee for the AP Chemistry exam, it's that you'll need to look at the included periodic table during the test. The periodic table included in the AP Chemistry equation sheet has all the information you'll need to answer questions about it. However, that doesn't mean you can ignore it until it comes time to take the test. It's very important to be familiar with the periodic table throughout the year. You should know what each value in the table represents, how to use group numbers to determine the number of bonds and valence electrons an element can form, and what the key periodic trends are. Spend the most time on groups 1-8A, as you'll be tested on these elements most often. What's Next? Learn the difference between Physics 1, Physics 2, and Physics C in our guide to AP Physics classes. How many AP courses total should you take? What if you want to get into an Ivy League school? Read our advice on AP course load here. Want to improve your SAT score by 160 points or your ACT score by 4 points? We've written a guide for each test about the top 5 strategies you must be using to have a shot at improving your score. Download it for free now: Copyright 2001-2018 Castle Software, Inc. All Rights Reserved

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