

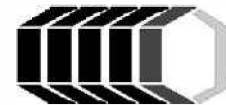


AKCS
Purrfect Chemistry

2049 FCC CHEMISTRY

Practice

EXAM #4



Prepared by the Fresno City College Faculty Practice Examination Task Force

FCC EXAMINATIONS TASK FORCE

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DIRECTIONS TO THE EXAMINER

This test is designed to be taken with an answer sheet on which the student records his or her responses. All answers are to be marked on that sheet, not written in the booklet. Each student should be provided with an answer sheet and scratch paper, both of which must be turned in with the test booklet at the end of the examination. Each Local Section may use an answer sheet of its own choice.

The full examination consists of 20 multiple-choice questions representing a fairly wide range of difficulty. Students should be permitted to use non-programmable calculators. A periodic table and other useful information are provided on page two of this exam booklet for student reference.

Suggested Time: ## questions—## minutes

DIRECTIONS TO THE EXAMINEE

DO NOT TURN THE PAGE UNTIL DIRECTED TO DO SO.

This is a multiple-choice examination with four choices for each question. There is only one correct or best answer to each question. When you select your choice, blacken the corresponding space on the answer sheet with your pencil. Make a heavy full mark, but no stray marks. If you decide to change your answer, be certain to erase your original answer completely.

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DIRECTIONS

- When you have selected your answer to each question, blacken the corresponding space on the answer sheet using a soft, #2 pencil. Make a heavy, full mark, but no stray marks. If you decide to change an answer, erase the unwanted mark very carefully.
- There is only one correct answer to each question. Any questions for which more than one response has been blackened **will not be counted**.
- Your score is based solely on the number of questions you answer correctly. **It is to your advantage to answer every question.**

ABBREVIATIONS AND SYMBOLS

amount of substance	<i>n</i>	Faraday constant	<i>F</i>	molar mass	<i>M</i>
ampere	A	free energy	<i>G</i>	mole	mol
atmosphere	atm	frequency	<i>v</i>	Planck's constant	<i>h</i>
atomic mass unit	u	gas constant	<i>R</i>	pressure	<i>P</i>
Avogadro constant	<i>N_A</i>	gram	g	rate constant	<i>k</i>
Celsius temperature	°C	hour	h	reaction quotient	<i>Q</i>
centi- prefix	c	joule	J	second	s
coulomb	C	kelvin	K	speed of light	<i>c</i>
density	d	kilo- prefix	k	temperature, K	<i>T</i>
electromotive force	<i>E</i>	liter	L	time	<i>t</i>
energy of activation	<i>E_a</i>	measure of pressure mm Hg		vapor pressure	VP
enthalpy	<i>H</i>	milli- prefix	m	volt	V
entropy	<i>S</i>	molal	<i>m</i>	volume	<i>V</i>
equilibrium constant	<i>K</i>	molar	M		

CONSTANTS

$$R = 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$R = 0.0821 \text{ L} \cdot \text{atm} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$1 F = 96,500 \text{ C} \cdot \text{mol}^{-1}$$

$$1 F = 96,500 \text{ J} \cdot \text{V}^{-1} \cdot \text{mol}^{-1}$$

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$c = 2.998 \times 10^8 \text{ m} \cdot \text{s}^{-1}$$

$$0^\circ \text{C} = 273.15 \text{ K}$$

PERIODIC TABLE OF THE ELEMENTS

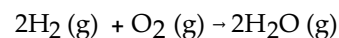
1 1A																	18 8A
1 H 1.008	2 2A											13 3A	14 4A	15 5A	16 6A	17 7A	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)	111 Rg (272)	112 Cn (277)	113 (Uut)	114 (Uuq)	115 (Uup)	116 (Uuh)	117 (Uus)	118 (Uuo)

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

CHEMISTRY TEST PARTS A and B

- How many moles of chlorine gas are needed to make 0.6 moles of sodium chloride?
Given the reaction: $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
A) 1.2 B) 3.6 C) 0.6 D) 0.3
- Consider the reaction: $2\text{N}_2\text{O}(\text{g}) \rightleftharpoons \text{O}_2(\text{g}) + 2\text{N}_2(\text{g})$. Which of the following will cause a shift in the equilibrium to the left?
 - Remove N_2O
 - Remove O_2
 - Add N_2
 A) 2 and 3 only
B) 1 and 2 only
C) 1 and 3 only
D) All of 1, 2, and 3
- A 35.0 mL sample of 0.225 M sulfuric acid was titrated with 42.3 mL of sodium hydroxide. What is the concentration of the sodium hydroxide?
A) 0.186 M B) 0.372 M
C) 0.136 M D) 0.0931 M
- A 24.0 g sample of nitrogen gas reacts with an excess of hydrogen gas to give an actual yield of 3.85 g NH_3 . What is the percent yield for this reaction?
Reaction: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
A) 86.8% B) 13.2%
C) 26.4% D) 73.6%
- What is the conjugate base of H_2O ?
A) O^{2-} B) NaOH
C) H_3O^+ D) OH^-
- The Bronsted-Lowry definition of an acid is:
A) produces OH^- in solution.
B) a proton acceptor.
C) a proton donor.
D) none of the above

- Water can be formed according to the equation:



If 0.357 mol H_2 is reacted at STP, exactly how many liters of oxygen at STP atm would be needed to allow complete reaction?

- A) 2.00 L B) 1.00 L
C) 8.00 L D) 4.00 L
- What happens to the equilibrium position of an endothermic reaction when you remove heat?
 - shifts to the left
 - shifts to the right
 - does nothing
 - doubles
 - What is the concentration of H^+ in 2.0 M acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$?
 - >2.0 M
 - <2.0 M
 - 1.0 M
 - 2.0 M
 - Which of the following is not an acid-base conjugate pair?
 - H_2CO_3 and HCO_3^-
 - NH_4^+ and NH_3
 - H_2O and OH^-
 - H_2S and OH^-
 - The first experiment that converted one element to another was performed in 1919 by Ernest Rutherford. An isotope of nitrogen was bombarded with a type of particle to get an oxygen atom as shown:

$${}^{14}_7\text{N} + ? \rightarrow {}^{17}_8\text{O} + {}^1_1\text{H}$$
 Complete the nuclear equation above to find the type of particle that was used to bombard the nitrogen atom.
 - positron
 - alpha
 - gamma
 - beta
 - Calculate the pH of a solution made by mixing a 4.56 g $\text{Sr}(\text{OH})_2$ in 0.500 L total solution.
 - 13.18
 - 7.0
 - 0.41
 - 0.82
 - 1.13

13. What is the $[\text{OH}^-]$ in a solution that has a pH of 9.65?

- A) $9.8 \times 10^{-1} \text{ M}$ B) $2.2 \times 10^{-10} \text{ M}$
C) $4.5 \times 10^{-9} \text{ M}$ D) $4.5 \times 10^{-5} \text{ M}$

14. Zinc dissolves in hydrochloric acid to yield
 $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$

What mass of hydrogen gas is produced when a 7.35-g sample of zinc dissolves in 500.mL of 1.200 M HCl?

- A) 0.113 g B) 0.227 g
C) 0.605 g D) 0.453 g

15. How many grams of chlorine gas are needed to make 117 grams of sodium chloride?

Given the reaction: $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$

- A) 48.2 B) 71.0
C) 35.5 D) 142

16. The highly exothermic thermite reaction, in which aluminum reduces iron(III) oxide to elemental iron, has been used by railroad repair crews to weld rails
 $2\text{Al(s)} + \text{Fe}_2\text{O}_3\text{(s)} \rightarrow 2\text{Fe(s)} + \text{Al}_2\text{O}_3\text{(s)}$

heat of reaction = -847.6 kJ

What mass of iron is formed if 725 kJ of heat are released?

- A) 47.8 g
B) 95.5 g
C) 65.3 g
D) 112 g
E) 23.9 g

17. What is the concentration of sodium chloride in the final solution if 25.34 mL of 0.113 M BaCl_2 completely reacts and the total volume of the reaction is 110.4 mL, given the reaction:

$\text{BaCl}_2\text{(aq)} + \text{Na}_2\text{SO}_4\text{(aq)} \rightarrow \text{BaSO}_4\text{(s)} + 2\text{NaCl(aq)}$

- A) 0.0259 M B) 0.226 M
C) 0.0519 M D) 0.667 M

18. If the $^{232}_{90}\text{Th}$ isotope emits an alpha particle, what would be the atomic number of the resulting atom?

- A) 88
B) 236
C) 90
D) 92
E) 228

19. What is the excess reactant for the following reaction given we have 3.4 moles of calcium nitrate and 2.4 moles of lithium phosphate?

Reaction: $3\text{Ca(NO}_3)_2 + 2\text{Li}_3\text{PO}_4 \rightarrow 6\text{LiNO}_3 + \text{Ca}_3(\text{PO}_4)_2$

- A) $\text{Ca}_3(\text{PO}_4)_2$ B) $\text{Ca(NO}_3)_2$
C) Li_3PO_4 D) LiNO_3

20. Which equilibrium constant represents a reaction that favors the formation of the products to the greatest extent?

- A) $K_{eq} = 100$
B) $K_{eq} = 1.0 \times 10^{-18}$
C) $K_{eq} = 1.0 \times 10^{-3}$
D) $K_{eq} = 1.0 \times 10^8$

21. What mass of KClO_3 must be decomposed to produce 126 L of oxygen gas at STP?

$2\text{KClO}_3\text{(g)} \rightarrow 2\text{KCl(s)} + 3\text{O}_2\text{(g)}$

- A) 460. g B) 612 g
C) 24.6 g D) 408 g

22. In the following reaction:

$\text{NH}_4^+\text{(aq)} + \text{H}_2\text{O(aq)} \rightarrow \text{NH}_3\text{(aq)} + \text{H}_3\text{O}^+\text{(aq)}$

- A) NH_4^+ is an acid and H_3O^+ is its conjugate base
B) H_2O is a base and H_3O^+ is its conjugate acid
C) NH_4^+ is a base and H_2O is its conjugate acid
D) NH_4^+ is an acid and H_2O is its conjugate base

23. If the half-life of a radioactive isotope is 32 days, how many half-lives must pass before a 3.0 gram sample is less than 0.03 g?

- A) 2 B) 7 C) 5 D) 9

24. For the reaction $\text{S}_2\text{F}_6(\text{g}) = 2\text{SF}_2(\text{g}) + \text{F}_2(\text{g})$, the equilibrium concentrations are as follows:

$[\text{S}_2\text{F}_6] = 0.000430 \text{ M}$, $[\text{SF}_2] = 2.08 \text{ M}$,

$[\text{F}_2] = 1.32 \text{ M}$. The equilibrium constant is:

- A) 8.43×10^3 B) 1.33×10^4
C) 7.53×10^{-5} D) 1.19×10^{-4}

25. What is the pH of a solution that has a H^+ concentration equal to $1.7 \times 10^{-5} \text{ M}$?

- A) 4.77 B) 0.22
C) 10.20 D) 5.20

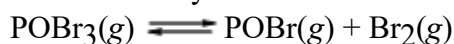
26. For the reaction $2\text{N}_2\text{O}(\text{g}) = \text{O}_2(\text{g}) + 2\text{N}_2(\text{g})$, what happens to the equilibrium position if the pressure decreases?

- A) shifts to the left
B) shifts to the right
C) does nothing
D) doubles

27. What is the concentration of the hydroxide ion given that the concentration of the hydronium ion is $1.5 \times 10^{-5} \text{ M}$?

- A) $6.7 \times 10^{-10} \text{ M}$ B) $1.0 \times 10^{-19} \text{ M}$
C) $1.5 \times 10^9 \text{ M}$ D) $1.0 \times 10^{-14} \text{ M}$

28. The reaction system



is at equilibrium. If POBr is added to the container, which of the following describes how the system will react to ree:

- A) The forward reaction (right) will proceed.
B) The concentration of bromine will increase while the partial pressure of POBr decreases.
C) The concentration of bromine remains steady while the concentrations of POBr₃ and POBr increase.
D) The concentration of POBr and Br₂ will decrease and POBr₃ will increase.

29. How many protons and neutrons are in

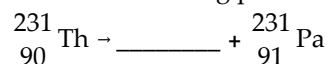
$^{119}_{50}\text{Sn}$?

- A) 50 n and 69 p B) 50 p and 69 n
C) 50 n and 119 p D) 50 p and 169 n

30. Iodine-131 has a half-life of 8 days. How much of a 1000 milligram sample of iodine-131 would be left after 32 days?

- A) 62.5 milligram B) 250 milligram
C) 125 milligram D) 500 milligram

31. What is the missing particle?



- A) alpha particle B) beta particle
C) positron D) gamma particle

32. The chemical equation that would generate the equilibrium expression $K_{eq} = \frac{[B]^2 [C]}{[A]^3}$ is _____ . (Assume all substances are gases in this reaction.)

- A) $C + 2B \rightleftharpoons 3A$
- B) $3A \rightleftharpoons 2B + C$
- C) $\frac{1}{2} B + C \rightleftharpoons \frac{1}{3} A$
- D) $A \rightleftharpoons B + C$

33. Which solution below has the highest concentration of *hydroxide* ions?

- A) pH = 7.00
- B) pH = 12.49
- C) pH = 7.93
- D) pH = 10.12

34. Identify the equation for which

$$K_{eq} = [Cu^+]^2 [S^{2-}].$$

- A) $\frac{1}{2} Cu_2S(s) \rightleftharpoons Cu^+(aq) + \frac{1}{2} S^{2-}(aq)$
- B) $Cu_2S(s) \rightleftharpoons Cu^+(aq) + 2S^{2-}(aq)$
- C) $Cu_2S(s) \rightleftharpoons 2Cu^+(aq) + S^{2-}(aq)$
- D) $CuS(s) \rightleftharpoons Cu^{2+}(aq) + S^{2-}(aq)$

Answer Key

Testname: PEXAM4- CH11-14

1. D
2. C
3. B
4. B
5. D
6. C
7. D
8. A
9. B
10. D
11. B
12. A
13. D
14. B
15. B
16. B
17. C
18. A
19. C
20. D
21. A
22. B
23. B
24. B
25. A
26. B
27. A
28. D
29. B
30. A
31. B
32. B
33. B
34. C