CHEMISTRY 200
Final

Spring 96-97
1½ Hours

Family Name _____
First Name _____
ID No _____

Instructions

Answer all questions
All answers must be clearly indicated by a vertical line in the box of your choice on the answer sheet as indicated below:

If you make a mistake cross it out, as indicated below:

There is only one correct answer per question
There is no penalty for a wrong answer
If more than one box is filled per question (except to cross out mistakes), then that question will not be graded

Constants and data

R= 0.082 L.atm/K.mol
Avogadro's number 6.023×10^{23} amu/g
Molar volume of ideal gas at STP =22.4 L

1. Convert 75.2mg to Kg
   a 7.52×10^{-2}
   b 75.2×10^{-5}
   c 7.52×10^{-5}
   d $75.2\ 10^{-3}$

2. The correct structure of chlorous acid is

   a $HClO_3$
   b HCl
   c $HClO_2$
   d $HClO$

3. Xenon has a freezing point of 133 K. What is its freezing point on the Fahrenheit scale?

   a -140
   b -220
   c -96
   d -150

4. Find the number of moles of atoms in 0.14g of nitrogen

   a 0.10
   b 0.05
   c 0.02
   d 0.01

5. The crystal with dimensions a=b=c and angles $\alpha=\beta=90^\circ$ and $\gamma\neq90^\circ$ represents

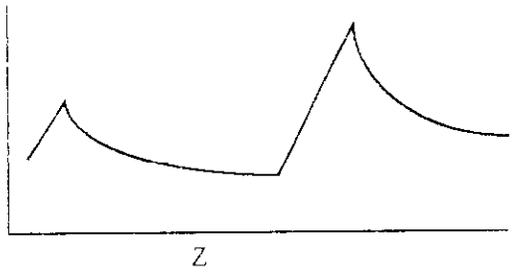
   a triclinic
   b hexagonal
   c monoclinic
   d orthorhombic

6. A gas at 27°C occupies 1000 mL of space. What will be its volume at 127°C.
   a 4703 mL
   b 1333 mL
   c 14814 mL
   d 1465 mL

7. The process of separating two liquids is called
   a volatilization
   b evaporation
   c condensation
   d distillation

8. Calculate the solubility of the salt $BaSO_4$ in g/L , given that $K_{sp}=1.5\times10^{-9}$
   a 3.9×10^{-5}
   b 6.18×10^{-11}
   c 9.2×10^{-7}
   d 2.35×10^{-5}

9. The graph below represents_____ Vs atomic number



a atomic radius
b ionization
c electron affinity
d electrostatic force

10. Determine the pH of a 0.0001 M NaOH solution
a 4
b 8
c 12
d 10

11. Calculate ΔH° for the combustion of 1 mole of methane given the following information

	ΔHf°(Kcal/mol)
$CH_{4(g)}$	-17.9
$CO_{2(g)}$	-94.1
$H_2O_{(l)}$	-68.3

a -212.8
b -144.5
c -248.6
d 248.6

12. If 35.4g of $CHCl_3$ reacts with 6.40g of O_2 in the reaction below, what is the limiting reagent.

$2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$
a $COCl_2$
b O_2
c HCl
d $CHCl_3$

13. For the redox reaction
$Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$
which substance is reduced

a Cr^{3+}
b H^+
c Cr^{6+}
d Fe^{3+}

14. Commercial tomato juice has a hydrogen concentration of 25×10^{-6} mol/litre. Calculate its pOH

a 4.6
b 6.0
c 9.4
d 1.4

15. Which of the following is a Bronsted-Lowry acid

a HSO_4^-
b NaH
c SO_4^{2-}
d none of the above

16. The formal charges on the Carbon and Oxygen atom in carbon monoxide are

	C	O
a	0	0
b	+1	-1
c	-1	+1
d	0	+1

For question 17 and 18 the following information for benzene is given:

bp 80.10 °C
fp 5.5 °C
Kb 2.53 °C/m
Kf 5.12 °C/m

17. Calculate the bp of a solution of 9.75g of nitrobenzene ($C_6H_5NO_2$) in 175g of benzene

a 1.15
b 81.25
c 82.4
d 77.57

18. Calculate the fp of a solution of 9.75g of nitrobenzene ($C_6H_5NO_2$) in 175g of benzene

a 7.8
b 4.36
c 5.5
d 3.18

19. Calculate the percent by mass of a 6.0 M aqueous sulphuric acid solution (density 1.34 g/ml)

a 13
b 56
c 44
d 6

20. Which of the following statement is correct about the kinetic theory of gases

a The forces of attraction between gas molecules decrease as the molecules move closer together
b All gases are composed of molecules
c Gas molecules move faster when the temperature rises and slower when the temperature drops
d none of the above

21. What is the empirical formula of a compound that has 23.8% C, 5.9% H and 70.3% Cl by weight

a $C_2H_4Cl_2$
b $C_2H_2Cl_4$
c $C_2H_3Cl_3$
d CH_3Cl

22. Predict which of the following reactions can occur

a $Cu + 2HCl \rightarrow CuCl_2 + H_2$
b $2Al + 3Zn(NO_3)_2 \rightarrow 2Al(NO_3)_3 + 3Zn$
c $Ni + AlCl_3 \rightarrow NiCl_2 + Al$
d none of the above

23. The following materials can be classified into one of the four types of crystalline solids. Which is the correct order

	Ionic	Molecular	Atomic-Metallic	AtomicNonmetallic
a	calicum	diamond	CsF	sucrose
b	sucrose	calicum	diamond	CsF
c	CsF	sucrose	calcium	diamond
d	diamond	CsF	sucrose	calicum

24. If the Ksp of CaF_2 is 1.7×10^{-10} at 25°C then the concentration of the fluoride ion in a saturated aqueous solution of CsF_2 at 25°C is given by

a $Ksp=x^2$
b $Ksp=2x^2$
c $Ksp=4x^2$
d $Ksp=4x^3$

25. The hydrofluoride acid in a 0.040 M solution is 13.4 % ionized. Calculate Ka for HF

a 1.2×10^{-3}
b 1.5×10^{-1}
c 7.2×10^{-4}
d 8.3×10^{-4}

26. How many carbon atoms are there in 0.44g of carbon dioxide

a 1.2×10^{22}
b 6.023×10^{-25}
c 6.023×10^{23}
d 8.21×10^{-10}

27. The specific heat of aluminium is 0.214 cal/g.deg . Calculate the heat necessary to raise the temperature of 40.0g of aluminium from 20°C to 32.3°C

a 105 cal
b 171 cal
c 276 cal
d 95 cal

28. Dalton's law states that

a at constant temperature a fixed mas of gas occupies a volume inversely proportional to the pressure exerted on it

b at constant pressure the volume occupied by a fixed mass of gas is directly proportional to the absolute temperature

c the total pressure exerted by a mixture of gases is equal to the sum of the partial pressures of the various gases

d none of the above

29. How many ^{17}O atoms are there in a sample containing 1×10^{7} oxygen atoms if the natural abundance of ^{17}O is 0.037%.

a 37

b 370

c 3700

d 37000

30. Which represents a basic SI unit

a candela

b ounces

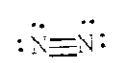
c feet

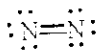
d none of the above

31. Which is the correct answer showing the maximum number of electrons in a sublevel

	d	p	s	g	f
a	2	6	10	18	14
b	18	10	14	6	2
c	10	6	2	18	14
d	10	6	2	14	18

32. The Lewis structure for N_2 is represented by

a 

b 

c 

d none of the above

33. Determine the number of grams of H_2 gas present in a 2.0 litre container at a temperature of 127°C and a pressure of 2280 torr

a 0.36g

b 0.12g

c 28.4g

d 0.018g

34. For the Deacon process used in the preparation of chlorine gas, using Le Chatelier's principle which of the following is the correct statement

$$4HCl_{(g)} + O_{2(g)} \rightleftharpoons 2Cl_{2(g)} + 2H_2O_{(g)}$$

a concentration of O_2 increased; equilibrium shifts to the left

b concentration of H_2O decreased; equilibrium shifts to the left

c volume increased; equilibrium shifts to the right

d pressure increased; equilibrium shifts to the right

35. Suppose we collect a sample of oxygen gas over water at 27°C and at a pressure of 750 torr. The gas fills a 500 mL container but has water vapour mixed in with it. What would be the volume of the dry gas at STP if the vapour pressure of water at 27°C is 26.74 torr.

a 18 mL
b 450 mL
c 433 mL
d 460 mL

36. How many grams of $Ca(OH)_2$ are there in a 50 mL of a 3.0 N solution

a 5.6
b 55.5
c 0.0041
d 11.2

37. Calculate the oxidation number of Cr in H_2CrO_4

a 6
b 10
c 3
d 2

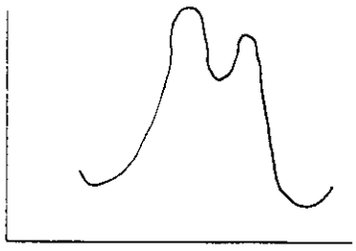
38. The density of a certain gas is 1.3 g/L at STP. Calculate the g-molecular mass of the gas

a 58.2
b 0.058
c 17.2
d 29.1

39. The reaction of a metal oxide + nonmetal oxide is an example of

a combination
b single displacement
c double displacement
d decomposition

40. The energy diagram below represents a



a exothermic reaction
b two-step reaction
c endothermic reaction
d none of the above

41. Which of the following is a polar molecule

a BF_2
b NH_3
c BF_3
d NH_4^+

42. The density of hydrogen gas at STP in g/litre is

a 2.0
b 0.32
c 0.089
d 22.4

43. Which of the following is the symbol used for positrons

a $^{0}_{-1}e$
b $^{0}_{0}\gamma$
c $^{1}_{0}n$
d $^{0}_{+1}e$

44. Approximately 2.5g of strontium-90, was formed in a 1960 atomic explosion. The half-life of strontium-90 is 28 years. In what year will only 0.3125 g of this strontium-90 ~~be~~ remain?

a 2044
b 1988
c 2082
d 2016

45. Calculate the pH of a buffer solution made by adding 0.001 mole sodium hydroxide to 200 ml of 0.50M acetic acid and 0.50M sodium acetate (Ka for acetic acid = 1.8×10^{-5})

a 4.75
b 4.76
c 4.74
d 4.77

46. Calculate the equilibrium concentration of acetic acid in a 0.50M acetic acid solution at 25°C.

a 3×10^{-3} mole/litre
b 6×10^{-3} mole/litre
c 0.497 mole/litre
d 0.994 mole/litre

47. You add 5.85g of sodium chloride to 1000g of water. What is the boiling point of the solution if K_b for water is 0.52 °C/m

a 99.948
b 100.052
c 99.896
d 100.104

48. Give the answer of $4.20 \times 10^{-5} + 1.2 \times 10^{-7}$ to the correct significant figure

a 4.32×10^{-5}
b 4.3×10^{-5}
c 4.3×10^{-7}
d 4.32×10^{-7}

49. Calculate the percent dissociation of acetic acid in a solution containing 0.1M acetic acid and 0.5 M hydrochloroic acid. $Ka = 1.8 \times 10^{-5}$

a 3.6×10^{-5}
b 3.6×10^{-3}
c 3.6×10^{-2}
d 1.8×10^{-6}

50. Which of the following represents a nuclear fission reaction

a $^{4}_{2}He + ^{14}_{7}N \rightarrow ^{1}_{1}H + ^{17}_{8}O$

b $^{82}_{35}Br \rightarrow ^{0}_{+1}e + ^{82}_{36}Kr$

c $^{226}_{88}Ra \rightarrow ^{4}_{2}He + ^{222}_{86}Rn$

d $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{94}_{38}Sr + ^{139}_{54}Xe + 3\,^{1}_{0}n$

ANSWER SHEET

Family Name _____

First Name _____

ID No _____

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				