CHEMISTRY 200 Spring 995/96
Final 2 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

Give answers for questions 1 and 2 to the correct significant figures

1. 25.1 + 22.11 =

a 47.21
b 47.2
c 47
d 47.210

2. 24.78 -- 0.065 =

a 24.715
b 24.72
c 24.720
d none of the above

3. Convert 75.2mg to Kg

a 7.52×10^{-5}
b 75.2×10^{-5}
c 7.52×10^{-3}
d 75.2×10^{-3}

4. Convert 25°C to °F

a 77
b 298
c 248
d -77

5. 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

6. Which scientist first calculated the mass of the electron

a Thompson
b Chadwick
c Dalton
d Millikan ✓

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

a 0.10
b 0.05
c 0.02
d 0.01

8. The crystal with dimensions $a\neq b\neq c$ and angles $\alpha=\beta=90°$ and $\gamma=90°$ represents

a triclinic ✓
b hexagonal
c monoclinic
d orthorhombic

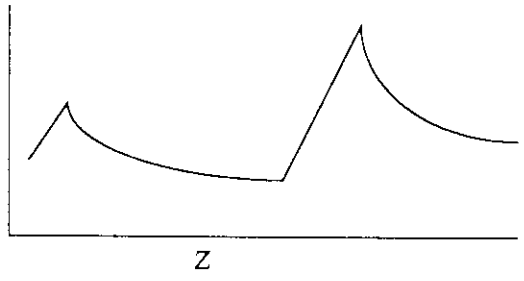
9. A gas at 27°C occupies 1000 mL of space. What will be its volume at 127°C.
   a 4703 mL
   b 1333 mL
   c 14814 mL
   d 1465 mL

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

11. The _____ of a solution is the number of moles of solute per Kg of solution
   a normality
   b molarity
   c molality
   d equivalence

12. 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^{-10}
   c 9.2×10^{-3}
   d 2.35×10^{5}

13. The graph below represents_____ Vs atomic number



   a atomic radius
   b ionization
   c electron affinity
   d electrostatic force

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

15. The oxidation of chromium in $CrPO_3$ is
   a +1
   b +3
   c -3
   d +2

16. 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

17. 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 $CHCl_3$

18. 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^{2+}

19. 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

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

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

21. 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 22 and 23 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

22. 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

23. 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

24. 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

25. 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

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

a $C_2H_6Cl_2$
b $C_4H_{12}Cl_4$
c $C_3H_9Cl_3$
d CH_3Cl

27. Predict which of the following reactions can occur

a $Cu + 2{+}HCl \rightarrow CuCl_2 + H_2$
b $2Al + 3Zn(NO_3)_3 \rightarrow 2Al(NO_3)_3 + 3\,Zn$
c $Ni + AlCl_3 \rightarrow NiCl_3 + Al$
d none of the above

28. 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	CsF	diamond	calicum	sucrose
b	sucrose	calicum	diamond	CsF
c	CsF	sucrose	calcium	diamond
d	diamond	CsF	sucrose	calicum

29. 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 $Ksp=x^3$
b $Ksp=2x^2$
c $Ksp=4x^2$
d $Ksp=4x^3$

30. 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}

31. 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^{21}
d 8.21×10^{18}

32. 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

33. 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

34. If 20 ml of 1.0 M $CaCl_2$ and 60 ml of 0.2 M $CaCl_2$ are mixed, what will be the molarity of the final solution?

a 0.01 M
b 0.60 M
c 0.032 M
d 0.40 M

35. How many ^{17}O atoms are there in a sample containing 1×10^{6} oxygen atoms if the natural abundance of ^{17}O is 0.037%.

a 37
b 370
c 3700
d 37000

36. Which represents a basic SI unit

a candela
b ounces
c feet
d none of the above

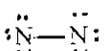
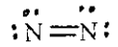
37. Which scientist suggested the ' plum-pudding' theory as a model of the atom

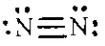
a Rutherford
b Dalton
c Bohr
d Thomson

38. 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

39. The Lewis structure for N_2 is represented by

a  b 

c  d none of the above

40. 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

41. 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

42. 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

43. 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

44. Calculate the oxidation number of Cr in H_2CrO_4

a 6
b 10
c 3
d 2

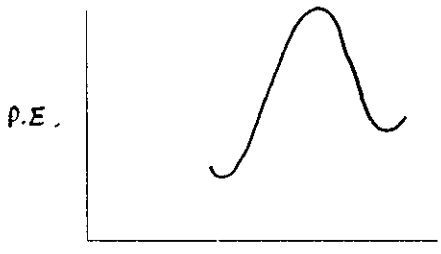
45. The density of a certain gas is 1.3 g/L at STP. Calculate the g/molecular mass of the gas

a 58.2
b 0.058
c 17.2
d 29.1

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

a combination
b single displacement
c double displacement
d decomposition

47. The energy diagram below represents a



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

48. Give the answer of $4.20\times10^{-3} + 1.2\times10^{-4}$ to the correct significant figure

a 4.32×10^{-3}
b 4.3×10^{-3}
c 4.3×10^{-4}
d 4.32×10^{-7}

49. You add 5.85g of NaCl 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

50. Calculate the equilibrium concentration of CH_3CO_2H in a 0.50M acetic acid solution at 25°C ($Ka=1.8\times10^{-5}$)

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

ANSWER SHEET

Family Name _____

First Name _____

ID No _____

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