CHEMISTRY 30S EXAM Name_____

1.

Specific heat capacity is measured by recording the amount of heat needed to raise the temperature of a substance by

A. 10°C
B. 1°C
C. 1 J
D. 1 g

2.

Heat of fusion involves phase changes from

A. solid to liquid with a temperature change
B. liquid to solid with a temperature change
C. solid to liquid with no temperature change
D. liquid to solid with no temperature change

3.

Use these examples to answer the question.

1. Rusting of iron
2. Flowing of lava
3. Boiling of water
4. Burning of paper

The examples of chemical properties are

A. 1 and 2
B. 1 and 4
C. 2 and 3
D. 3 and 4

4.

When two elements combine to form a compound, the compound will have properties that are

A. the same as the elements both physically and chemically
B. different from the elements both physically and chemically
C. the same as the elements physically but different chemically
D. different from the elements physically but the same chemically

5.

The properties that are characteristic of metals are

A. dull, brittle, conductors
B. dull, brittle, non-conductors
C. malleable, ductile, conductors
D. shiny, malleable, non-conductors

6.

The mass number of an atom is the number of

A. protons, neutrons and electrons
B. neutrons and electrons
C. protons and electrons
D. protons and neutrons

7.

An isotope is the atoms of an element that have the same number of

A. protons but a different number of neutrons
B. neutrons but a different number of protons
C. protons but a different number of electrons
D. electrons but a different number of protons

8.

What happens to non-metal atoms in the formation of ionic compounds?

A. They lose electrons and form positive ions.
B. They gain electrons and form positive ions.
C. They lose electrons and form negative ions.
D. They gain electrons and form negative ions.

9.

A substance is classified as neutral when its pH level is

A. above 7
B. below 7
C. exactly 7
D. from 0 to 14

10.

Use the unbalanced chemical equation to answer the question.

$$Al_{(s)} + H_2SO_{4(aq)} \rightarrow Al_2(SO_4)_{3(aq)} + H_{2(g)}$$

The type of reaction represented by this chemical equation is

A. simple decomposition
B. simple composition
C. double replacement
D. single replacement

11.

The molar mass in grams per mole of solid calcium sulphate is

A. 88.14
B. 136.14
C. 144.22
D. 176.22

12.

The number of moles of solid sodium bicarbonate in a 12.5 g sample is

A. 0.15
B. 0.24
C. 0.35
D. 0.48

13.

How many moles of solute are dissolved in 150 mL of 0.200 mol/L $Al_2(SO_4)_{3(aq)}$?

A. 3.42×10^2 mol
B. 30.0 mol
C. 10.3 mol
D. 0.0300 mol

14.

A technician used 200 mL of distilled water to dilute 300 mL of 0.500 mol/L $Cu(NO_3)_{2(aq)}$ solution. Calculate the concentration of the dilute solution.

A. 0.300 mol/L
B. 0.330 mol/L
C. 0.750 mol/L
D. 1.33 mol/L

15.

What occurs when solutions of silver nitrate and calcium chloride are mixed?

A. Calcium deposits will form.
B. All products will be soluble.
C. Solid silver will be produced.
D. Silver chloride will precipitate.

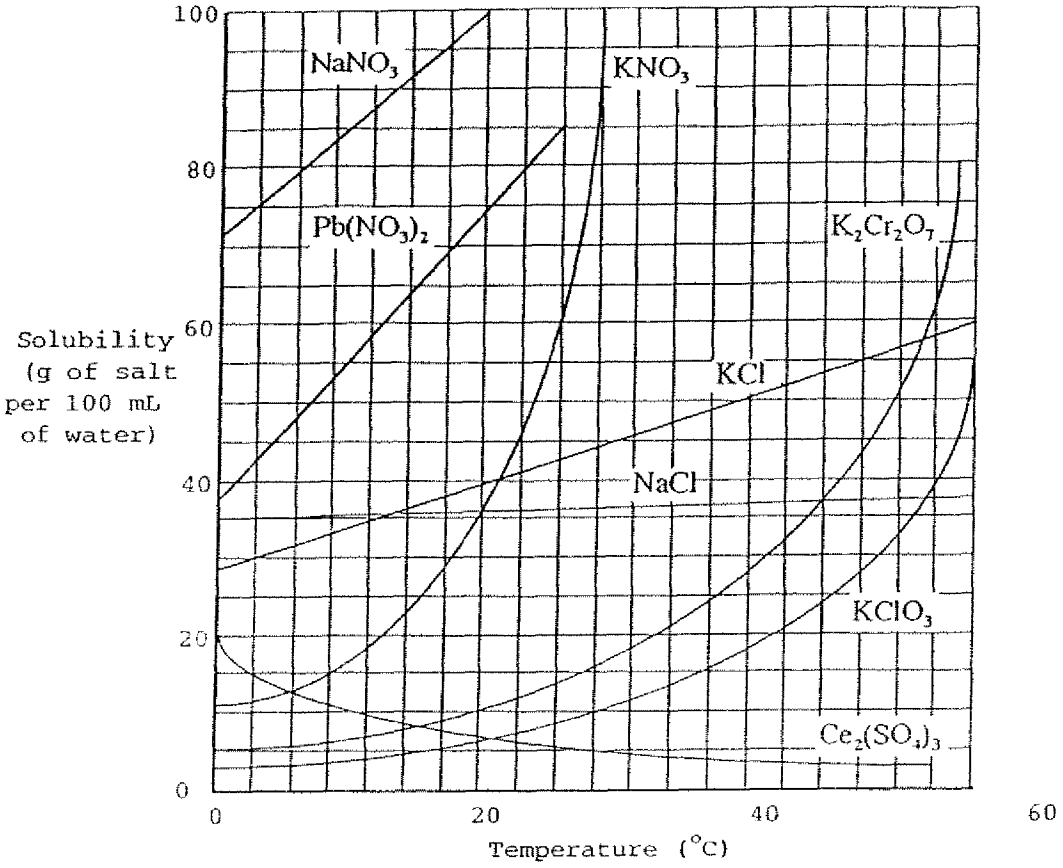
16.

Which pair of aqueous solutions would produce a precipitate when mixed?

A. $KF_{(aq)}$ and $NiBr_{2(aq)}$
B. $KCl_{(aq)}$ and $Mg(NO_3)_{2(aq)}$
C. $MgCl_{2(aq)}$ and $Na_2SO_{4(aq)}$
D. $Na_2S_{(aq)}$ and $Cr(NO_3)_{3(aq)}$

Use the graph to answer the next 1 questions.

The Solubility of Several Common Ionic Solids as a Function of Temperature



17.

In reference to the graph, if 100 mL of KCl solution is cooled from 40 °C to 20 °C, what mass of solid will crystallize?

A. 10 g
B. 28 g
C. 45 g
D. 55 g

18.

What is a true statement about acids?

A. A weak acid ionizes completely in water.
B. A weak acid does not ionize at all in water.
C. An acid ionizes to produce hydroxide ions in solution.
D. An acid reacts with a base to produce a salt and water.

19.

A student pipetted 10 mL of 0.10 mol/L $HCl_{(aq)}$ into 90 mL of distilled water. The pH of the dilute solution was

A. −1.00
B. 1.00
C. 1.95
D. 2.00

20.

Students made the following statements in describing the gas phase.
1. Gas particles do not attract or repel each other.
2. Molecules of different gases at the same temperature have the same average speed.
3. Collisions of gas particles are perfectly elastic and no energy is lost during collisions.
4. Molecules of gases are particles of negligible volume compared to the spaces between them.

Which statements are postulates of the kinetic molecular theory?

A. 2, 3, and 4
B. 1, 3, and 4
C. 1, 2, and 4
D. 1, 2, and 3

21.

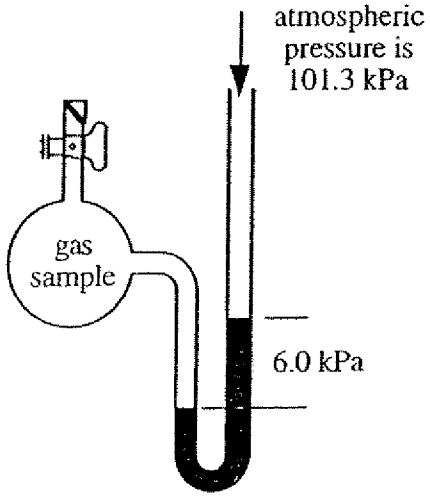
The pressure of a confined gas can be measured with a

A. ammeter
B. barometer
C. manometer
D. thermometer

22.

Use the diagram to answer the question.

A Gas Sample in a Manometer



According to the diagram, the pressure of the gas in the manometer is

A. 6.0 kPa
B. 95.3 kPa
C. 101.3 kPa
D. 107.3 kPa

23.

The boiling point of liquid nitrogen is –196°C. An equivalent temperature in the Kelvin scale is

A. –196 K
B. 77 K
C. 153 K
D. 273 K

24.

Oxygen gas would be expected to deviate the most from ideal behaviour under conditions of

A. low temperature and low pressure
B. high temperature and low pressure
C. low temperature and high pressure
D. high temperature and high pressure

25.

Which quantity represents the greatest mass of acetylene, $C_2H_{2(g)}$?

A. 3.01×10^{23} molecules of $C_2H_{2(g)}$
B. 6.72 L of $C_2H_{2(g)}$ at STP
C. 0.800 mol of $C_2H_{2(g)}$
D. 16.0 g of $C_2H_{2(g)}$

26.

Which compound is an isomer of hexane?

A. Cyclohexene
B. 2-methylpentene
C. 2, 2-dimethylbutane
D. 2, 4-dimethylbutane

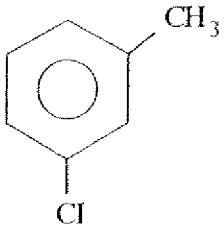
27.

If the benzene ring is a branch on an alkane, it is called a/an

A. ethyl
B. methyl
C. phenyl
D. propyl

28.

Refer to the ring structure for 3-chlorotoluene to answer the question.



What is another name for this compound?

A. θ-chloromethyl benzene
B. Φ-chlorotoluene
C. *m*-chlorotoluene
D. *p*-chlorotoluene

29.

The structural formula of the ester formed by reacting ethanoic acid and methanol is

A. $CH_3-O-\overset{\overset{O}{\|}}{C}-CH_3$

B. $H-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

C. $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

D. $CH_3CH_3-O-CH_3$

30.

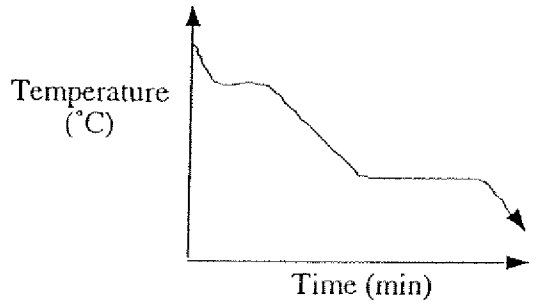
A chemistry student wrote the balanced equation for the reaction between iron(III) chloride and sodium sulphide. The coefficient that would appear before the precipitate in the equation would be

A. 1
B. 2
C. 3
D. 6

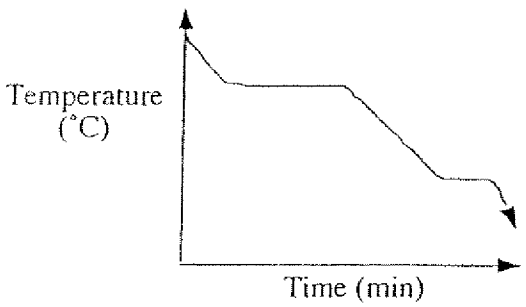
31.

Which graph best represents water vapour at 110°C changing to ice at – 10°C?

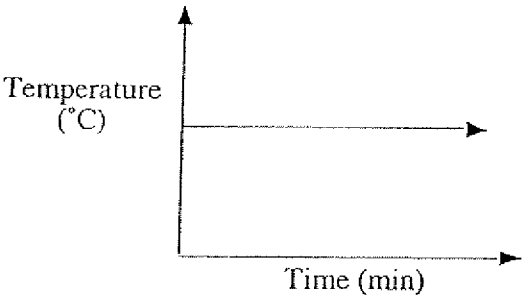
A.



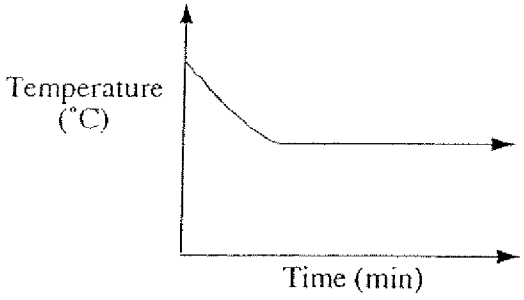
B.



C.



D.



32.

The correct balanced equation for the dissolving of sodium nitrate in water is

A. $Na_3N_{(s)} \rightarrow 3\ Na^+_{(aq)} + N^{-3}_{(aq)}$
B. $NaNO_{(s)} \rightarrow Na^+_{(aq)} + NO^-_{(aq)}$
C. $NaNO_{2(s)} \rightarrow Na^+_{(aq)} + NO_2^-{}_{(aq)}$
D. $NaNO_{3(s)} \rightarrow Na^+_{(aq)} + NO_3^-{}_{(aq)}$

33.

A student was asked to prepare 400.0 mL of 0.0600 mol/L acidic iron(II) chloride solution which was to be used later to standardize permanganate solutions for use in titration experiments. How many grams of iron(II) chloride would the 400.0 mL of the solution contain?

A. 2.19 g
B. 3.04 g
C. 7.61 g
D. 50.7 g

34.

According to the Arrhenius theory the characteristic properties of bases are caused by

A. hydrogen ions
B. hydroxide ions
C. hydronium ions
D. alkali metal ions

35.

A solution of sodium hydroxide was prepared for a chemical analysis using 0.65 g in 500 mL. The hydrogen ion concentration in the solution is

A. 3.3×10^{-2} mol/L
B. 1.6×10^{-2} mol/L
C. 3.1×10^{-13} mol/L
D. 1.5×10^{-14} mol/L

36.

A pH meter used to test a freshly opened carbonated soft drink gives a reading of 3.14, corresponding to a $[H^+_{(aq)}]$ of

A. 7.2×10^{-2} mol/L
B. 3.1×10^{-3} mol/L
C. 7.2×10^{-4} mol/L
D. 3.1×10^{-5} mol/L

37.

What volume of 0.150 mol/L NaOH strong base titrant is required to neutralize a 20.0 mL sample of 0.100 mol/L $HCl_{(aq)}$?

A. 7.50 mL
B. 13.3 mL
C. 20.0 mL
D. 30.0 mL

38.

The $[OH^-_{(aq)}]$ in a solution made by mixing 50.0 mL of 0.200 mol/L $HCl_{(aq)}$ with 150.0 mL of 0.200 mol/L $KOH_{(aq)}$ will be

A. 0.200 mol/L
B. 0.150 mol/L
C. 0.100 mol/L
D. 0.050 mol/L

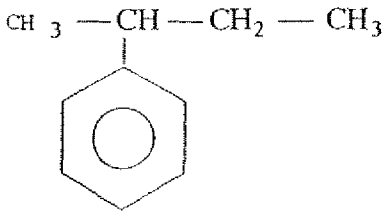
39. Value: 1

A student performed a controlled process in the laboratory where hydrocarbon was broken down into smaller molecules. This process is carried out in the petroleum industry to produce motor fuels. This process is called

A. cracking
B. oxidation
C. distillation
D. substitution

40. Value: 1

Cumene is the starting material in the formation of acetone and phenol. Its ring structure is shown in the diagram.



What is cumene's systemic name?

A. Propylbenzene
B. 2-benzylpropane
C. 2-phenylbutane
D. 1, 1-dimethylbenzene

Part 'B'

show work where possible , all answers should be in scientific notation wheneve possible . MARKS will be given for all questions attempted which are partially correct (60 marks)

1) Given the following information about water being heated from 50°C. to 120 °C

Heat of Vaporization	**9.7 Kcal. / mole**
Specific Heat of liquid water	**1 cal. / gram °C**
Specific Heat of gaseous water	**0.5 cal. / gram °C**
Mass of water	**36.0 grams**

Find the total number of calories needed to heat the 36 grams of water from liquid water at 50°C. to gaseous water at 120 °C (3)

2) WHY DO FARMERS SPRAY WATER ON THEIR CROPS WHEN THERE IS A CHANCE OF FROST ? (1)

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3)How much KCl will be precipitated from a 350 ml saturated solution of KCl at **90°C. if the temperature is lowered to 10 °C** (2)

4) GIVE CORRECT CHEMICAL FORMULAS FOR EACH OF THE FOLLOWING ;

a) Aluminum perchlorate _____
b) Hypophosphorous acid _____
c) Ammonia _____ (8 x 1/2)
d) Tetrabromine pentaoxide _____
e) Hydrotelluric acid _____
f) Zirconium(V)nitrite _____
g) Chlorous acid _____
h) Chromium(III)dichromate _____

5) EXPLAIN WITH AN EXAMPLE OF EACH THE DIFFENCE BETWEEN AN IONIC AND MOLECULAR (COVALENT) BOND . (2)

_____
_____
_____
_____
_____

6) FIND THE VOLUME OF THE FOLLOWING AT S.T.P. ; (2)

a) 2.24×10^{24} MOLECULES OF CARBON DIOXIDE

b) 8.25 GRAMS OF OXYGEN GAS

7) BALANCE THE FOLLOWING COMPLETELY. TELL WHAT TYPE OF REACTION EACH IS . (3 x 2)

a) SODIUM CHLORIDE + OXYGEN ==========> SODIUM CHLORATE

b) TRIPHOSPHOROUS PENTACHLORIDE ========> PHOSPHOROUS + CHLORINE

c) NIOBIUM (III)BROMIDE + MAGNESIUM OXIDE======>
NIOBIUM (III) OXIDE + MAGNESIUM BROMIDE

8) FOR THE COMPLETE COMBUSTION OF 3,5 Kg. of PENTANE (C_5H_{12})
FIND THE FOLLOWING;

a) BALANCE THE EQUATION (1)

b) NUMBER OF MOLES PENTANE PRESENT (1)

c) MOLES OXYGEN REQUIRED BY THE COMBUSTION OF 3.5 Kg. of PENTANE (C_5H_{12})
(1)

d) VOLUME OF OXYGEN AT S.T.P . NEEDED BY THE COMBUSTION OF 3.5 Kg. of PENTANE
(C_5H_{12}) (1)

e) MOLES CARBON DIOXIDE PRODUCED BY THE COMBUSTION OF 3.5 Kg. of PENTANE
(C_5H_{12}) (1)

f) MOLECULES OF CARBON DIOXIDE PRODUCED BY THE COMBUSTION OF 3.5 Kg. of PENTANE
(C_5H_{12}) (1)

9) What mass of Aluminum Nitrate ($Al(NO_3)_3$) is needed to produce 2 dm^3 of a
0.58 M. solution ? (1)

10) IF 5 grams of SODIUM is allowed to react with 10 grams of CHLORINE to form SODIUM CHLORIDE

a) BALANCE EQUATION (1)

b) FIND MASS OF SODIUM CHLORIDE PRODUCED (CHECK FOR LIMITING FACTOR)
(2)

11) IF WE REACTED 0.250 dm^3 OF A 0.20 M. $Al(NO_3)_3$ SOLUTION WITH 0.35 dm^3 OF A 0.50 M. KOH SOLUTION , COMPLETE THE FOLLOWING ;

a) GIVE BOTH IONIC (DISSOLVING) EQUATIONS (1)

b) NAME THE PRECIPITATE_____ (1)

c) GIVE THE COMBINED IONIC EQUATION . (1)

d) GIVE THE NET IONIC (PREDOMINANT REACTING SPECIES) EQUATION .

_____ (1)

e) FIND THE FINAL CONCENTRATION OF IONS . (2)

f) FIND THE MASS OF PRECIPITATE . (1)

12) HCN + $H_2SO_{3\,(aq)}$ <=========>> $H_3SO_3^{+1}{}_{(aq.)}$ + $CN^{-1}{}_{(aq.)}$

Name all : (3)

a) Arrhenius acids ______________________

b) Arrhenius bases ______________________

c) Bronsted - Lowry acids ______________________

d) Bronsted - Lowry bases ______________________

e) Conjugate acids ______________________

f) Conjugate bases ______________________

13) If 125 mL. OF A 0.55 M. HYDROCHLORIC ACID IS NEUTRALIZED BY 50 mL. OF Magnesium hydroxide , WHAT IS THE CONCENTRATION OF THE BASE ? (3)

14) IF 125 mL. OF A 0.65 M. hydrochloric acid is neutralized by 6.75 g. of a BASE MOH , WHAT IS THE MOLAR MASS OF THE BASE ? (3)

15) a) A strong acid is 0.00425 mol/L HCl , find the [H_30^{+1}] , [OH^{-1}] , pH and pOH . (2)

b) Find the [H_30^{+1}] , [OH^{-1}] , pH and pOH FOR A 0.00022 mol/L $Mg(OH)_2$ solution . (2)

16) If we have 3.25 mol/l. solution of HCl , what volume of this acid solution would we need to make 325 cm^3 of a 0.500 mol/L. solution ? (1)

17) DRAW STRUCTURAL FORMULAS FOR THE FOLLOWING; (4 x 1/2)

a) 2,4-PENTANEDIOL b) HEPTYL BENZOATE

c) 2-ETHYLHEPTANIOC ACID d) 2,2-DIMETHYL-3-ETHYL-4-OCTYNE

18) GIVE THE STRUCTURAL FORMULAS FOR BOTH THE REACTANTS AND PRODUCTS , THEN NAME THE PRODUCTS ACCORDING TO I.U.P.A.C. RULES ; (3 X 2)

a) BENZOIC ACID + 1-HEPTANOL ==========> ???????

b) 2-PENTYNE + EXCESS WATER ==========> ????????

c) 2-OCTENE + HYDROGEN CHLORIDE ==========> ????????

19) Draw and name 4 isomers of C_5H_{10} (4 x ½)