Marking Guide

Question 1

 (a) N2O4 2NO2 [2]

Initial concentration=0.625 mol/dm3

Equilibrium concentration=0.625-0.075 =0.55\*2

N2O4 2NO2

O.O75mol/dm3 1.10 mol/dm3 [3]

(b) KC= [NO2] [1]

 [N2O4]

KC=(1.10)2

 0.075

KC=1.21

 0.075

KC=16.13mol/dm3  [2]

(c)Kc for the backward reaction, find the reciprocal of the forward reaction 1/16.13 =0.062mol/dm3

(d)calculate the Kp for the reaction

Kp=Kc(RT)n [2]

Kp=16.13 ×8.31 ×300

 =40212.09 J/dm3

Question 2

(a) liquids have a fixed volume

 -liquids have no fixed shape

-liquids are non- compressible [3]

(b) when the liquid molecules gain energy they become mobile as a result they are able to overcome the attractive forces and they are lost. [3]

(c)(i)mercury, water, benzene [3]

 (ii)mercury will have the highest boiling point. This is because in mercury the amount of heat needed to break the forces of attraction is high [3]

(d)(i)the speed will be the same because the temperature is constant [1]

(ii)the rate of collision will increase because the volume has been increased [2]

ANSWERS TO QUESTION 3

(a) Number of electrons in outer shells

(b)(i)Readiness or ability of an atom to accept electrons.

 (ii)(a) B

 (b)-more electronegative

 -more number of electrons in the outermost shells.

 -bigger atom.

(c)(i)Group I have low melting and boiling points compared to group II

 Group I are soft metals than group II

 Group I are silvery and group II are white

 (ii)- M2CO3

 -NCO3

(iii) M is more stable than N and they do not easily decompose on heating.

 NCO3→NO + CO2 while M2CO3 does not decompose

(d)(i) is a reaction where a forward and backward reaction take place at the same time.

ANSWERS TO QUESTION 5

(a)(i) Al and S

 (ii) Same number of shells

(b)(i) S

 (ii)It increase the radius for an extra electron to have enough room for electron spin.

(c)(i) K-

 (ii)It needs a lot of energy to release an extra electron from the third shell.

 It has a stable structure like that of a noble gas.

(d)(i)24g of Mg→6×1023 atoms

 3g→x

X=7.5×1022atoms

(ii)32g of O→6×1023atoms

 4g→x

X=7.5×1022atoms

(iii)0.015×6×1023=9×1021atoms

(e)(i)2 ions

 (ii)27×2=54

 32×3=96

 16×12=192

 342

=0.0096g

ANSWERS TO QUESTION 6

(a) An acid is an electron-pair acceptor.

(c)C6H5COOH→C6H5COO- + H+

 [H+]=√Ka×[C6H5COOH]

 [H+]=7.937×10-3mol/dm3 [3]

 pH= -log[H+]

 =2.1 [2]

(d) pOH= -log√Kb×[NH3]

 =-log√1.7×10-5×0.1

 pOH=2.88

pH=14-pOH

 14-2.88=11.12

(e)

 

ANSWERS TO QUESTION 7

(a)(i)(1×2)+(-2×7)+2Cr=0

 Cr=+6

 (ii) (-1×3)×Sb=-3

 Sb=0

(b) MnO4-→MnO

 N2H4→N2

3H2O+MnO4-→MnO+6OH-

4OH-+ N2H4→N2 +4H2O

3H2O+MnO4-+5e-→MnO+6OH- ×4

4OH-+N2H4→N2+4H2O+4e- ×5

4MnO4-+5N2H4→4MnO+5N2+8H2O+4OH-

(c)Cu +H++NO3-→Cu2++2NO-3+H2O+ NO

 Cu→Cu2+

NO-3→NO

Cu→Cu2+

4H++ NO-3→NO+2H2O

3Cu→3Cu2++6e

6e+8H++NO-3→2NO+H2O

3Cu+2NO-3+8H+→3Cu2++2NO+ H2O

(d)



x/100=10.8×36.5/1.19×1000

x=33.1%

ANSWERS TO QUESTION 8



 =10.811 of natural boron

(b)mass of C=1.33g of C,mass of H=0.22g of H,mass of oxygen=0.45g of O

 C H O

 1.33/12 0.22/1 0.45/16

C=4,H=7 and O=1

Empirical formula C4H7O

(c)mass of C=0.75g, mass of hydrogen=2.75-0.75=2.0g of H [2]

C H

0.75/12=0.0625/0.0625=1 2.0/1=2/0.0625=32 [1]

Empirical formula CH32

Molecular formula=empirical formula × n n=molar mass/empirical=88/44=2

 =(CH32)n

 =(CH32)2

 =C2H64

(d)(i) K+ has greater nuclear attraction parent atom K causing shrinkage in the size of K+ as compared to K.

(ii)Cl- has more attraction cloud causing it to bulge than Cl.

(e)(i)NH4+=10 electrons (ii)[(NH3)4Na]+