FOR GOD AND COUNTRY

Submitted by
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Sub: Chemistry   **Class:** 11   **F.M:** 70
Duration:3 hrs 15 mins   **Date:** 15/1/2019

ANSWER KEY

Section – I

(Multiple choice type questions)

Answer the following questions(Multiple choice questions):   (1*14=14)

1.1 Isobers have
   a) same atomic number
   b) same mass number
   c) same number of neutrons
   d) same number of nucleons

1.2 The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$.where it exhibits tetravalency ,the 4 electrons involved in chemical bond formation will be
   a) $3p^6$
   b) $3p^6, 4s^2$
   c) $3p^6, 3d^2$
   d) $3d^2, 4s^2$

1.3 which of the following species are diamagnetic ?
   a) N_2
   b) N_2^{2-}
   c) O_2
   d) O_2^{2-}

1.4 What happens to the surface tension of a liquid with the increase of temperature?
   a) Decrease
   b) Increase
   c) Remains unchanged
   d) Irregular variation

1.5 Which of the following are not a state function?
   a) Heat capacity of gas
   b) Work
   c) Heat of reaction at constant T,P
   d) ΔS

1.6 In an exothermic reaction heat is evolved and system loses heat to the surroundings. For such system
   a) qp will be negative
   b) qp will be positive
   c) ΔH will be positive
   d) ΔH will be negative

1.7 The relationship between Kc and Kp is $Kp = Kc(RT)^{\Delta n}$. What would be the value of Δn for the reaction $CaCO_3(s) = CaO(s) + CO_2(g)$
   a) 1
   b) 0.5
   c) 1.5
   d) 2

1.8 Which of the following is least soluble in water?
   a) NaF
   b) KF
   c) LiF

- d) CsF

1.9 The formula of soda ash is
   a) **Na2CO3**
   b) Na2CO3.5H2O
   c) Na2CO3.10H2O
   d) Na2CO3.2H2O

1.10 Nucleophile is a specis
   a) Which can donate a pair of electrons
   b) **Which may be neutral or carry a negative** charge
   c) That neutralises the charge on an electrophile
   d) That contains vacant orbitals in its valence shell

1.11 which of the following compounds contain all the carbon atoms in the same hybridisation state?
   a) Buta-1,3-diyne
   b) Ethenone
   c) **Propa-1,2-diene**
   d) **Buta1,3-diene**

1.12 which of the following reagents may be used to distinguish between ethane and ethyne?
   a) Ammoniacal AgNO2
   b) KMnO4
   c) **Br2/CCl4**
   d) AlCl3

1.13 C2H2 A
   a) An acid
   b) **An aldehyde**
   c) Acetone
   d) Ethanol

1.14 Which of the following is not a component of classical smog?
   a) Fog
   b) Smoke
   c) **Peroxyacetyl nitrate**
   d) Sulphur dioxide

Section –II

2.1 Calculate the number of atoms in the following a)0.5 mole atoms of N2   (1*4=4)

Ans. 1mole atoms of $N_2 = 6.023 \times 10^{23}$ atoms

   0.5 mole atoms of $N_2 = 6.023 \times 10^{23} \times 0.5$

   $= 3.01 \times 10^{23}$ atoms

2.2 Arrange Cl,Ci-,Cl+ in the increasing order of their size.

Ans. $Cl^+ < Cl < Cl^-$

2.3 For the reaction $2Cl(g) = Cl_2(g)$ what will be the signs of ΔH and ΔS?

Ans. ΔH is negative because energy is released in bond formation

   ΔS is negative because entropy decreases when atoms combine to form molecules

OR

What is the S.I unit of entropy?

Ans. JK^{-1}

2.4 $CH_3CH=CH_2 + HBr$ ------ A+B

Ans. A=2-bromopropane

B=1-bromopropane

OR

$CH_2=CH_2 + H_2$ ---------- C

Ans. ethane

Section II

3.1 Deduce the relationship between molecular mass of the gas and vapour density.   (2)

Ans. Vapour density(D)=density of gas/density of H2

=mass of some volume of gas at STP/mass of some volume of H2 gas at STP

=mass of N molecule of gas /mass of N molecule of H2

=mass of 1 gas molecule/mass of 1 H2 molecule

=mass of one molecule of gas/2×mass of H2 atom

=(1/2)×molecular mass of gas(M)

M=2D

OR 1.375g of cupric oxide was reduced by heating in a current of hydrogen and the weight of copper thet remained was 1.098g. In another experiment 1.179g of copper was dissolved in the HNO3 and the resulting copper nitrate converted into cupric oxide by ignition . The weight of cupric oxide formed was 1.476g.show that these results illustrate the law of constant composition.

Ans**. In first experiment**

CuO=1.375g

Cu left=1.098g

O2 present=(1.375-1.098)=0.277g

Hence % of O2 in CuO=(0.277×100)/1.375

=20.14

In second experiment

Cu taken=1.179g

CuO formed=1.476g

O2 present=(1.476-1.179)

=0.297

Hence % of O2 of CuO=(0.297×100)/1.476

=20.12

As the % of O2 is same for both the above case,so the law of constant composition is illustrated

3.2) If the velocity of the electron in Bohr's first orbit is 2.19×10^6 ms-1, calculate the de-Broglie wavelength associated with it.   (2)

Ans. $V=2.19\times10^6$ms-1

$M=9.11\times10^{-31}$kg

Lemda $=h/mv =(6.626\times10^{-34})/(9.11\times10^{-31}\times2.19\times10^6)$

$=3.32\times10^{-10}$m=332pm

OR

Give the electronic configuration of scandium and chromium

Ans. Sc=1s22s22p63s23p64s23d1

Cr=1s22s22p63s23p64s13d5

3.3) Give one methods of preparation of diborane.   (2)

2BF3(g)+6LiH(s)-----B2H6(g)+6LiF

OR

Explain:BBr3 is a stronger lewis acid than BF3

Ans. This is because backdonation of electrons into empty 2p orbital of B atom from filled p orbital of Br atom is much less than that by F atom due to larger size of Br atom than F atom.

3.4) Give the IUPAC names of the following compounds: (2)

a) Cl2CHCH2OH= 2,2-dichloroethanol

b)COOHC(H)=C(OH)COOH

3.5) What are the differences between classical smog and photochemical smog.   (2)

Classical smog	Photochemical smog
Formed due to presence of SO2 moisture and particulates in air.	Formed as a result of photochemical reaction between NOx and hydrocarbon in the presence of sunlight.
Also known as London smog.	Also known as losangeles smog.

Short answer questions

(EACH CARRIES 3 MARKS)   (3*9=27)

4.1 Calculate the wavelength of the first and the last line in the balmer series of hydrogen spectrum.(3)
For the first line of balmer series n1=2 and n2=3
$1/\lambda f=109677[(1/n12)-(1/n22)]$
    $=15232.9cm-1$
$\lambda f=6.565\times10-5cm=656.5nm$
for the last line in balmer series n1=2 and n2=infinity
$1/\lambda l=109677[(1/n12)-(1/n22)]$
    $=27419.3cm-1$
$\lambda l=364.7nm$

OR

Write the electronic configuration of Fe^{+2} and Fe^{+3} ions.Which of these has more number of unpaired
electrons?   (2+1)
Ans. The electronic configurations are:
$Fe^{+2}:1s^22s^22p^63s^23p^63d^6$
$Fe^{+3}:1s^22s^22p^63s^23p^63d^5$
Fe^{+2} has 4 unpaired electrons while Fe^{+3} has 5 unpaired electrons. therefore Fe^{+3} has more number of
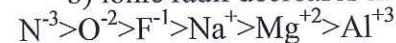unpaired electrons.
4.2 Consider the following species : $N^{-3},O^{-2},F^-,Na^+,Mg^{+2}$ and Al^{+3}.   (1+1+1)
a) what is common in them?
b) arrange them in order of increasing ionic radii?
Ans. a) Each one of these ions contains 10electrons and hence they are isoelectronic ions.
    b) ionic radii decreases in the order:
$N^{-3}>O^{-2}>F^{-1}>Na^+>Mg^{+2}>Al^{+3}$
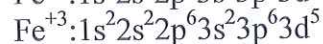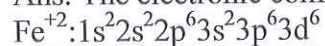
OR

Assign the position of the element having outer electronic configuration: (1+1+1)
i) ns^2np^4 for n=3
ii) $(n-1)d^2ns^2$ for n=4
iii) $(n-2)f^7(n-1)d^1ns^2$ for n=6 in the periodic table
Ans. i) n=3 indicates that the element belongs to 3rd period,since last electron enters the p orbital hence the
given element is a p block element. Group number =10+6=16
ii) n=4 indicates that the element lies in the 4th period.since d orbital is incomplete,so it is d block element.
Group number of the element=no of (n-1)d electrons +number of ns electrons=2+2=4
iv)   n=6 indicates that the element lies in the 6th period ,since the last electrons goes to the f orbital
          element,all f block elements lie in group3.
4.3 why H2O is liquid whereas H_2S is gas at room temperature?Give the electron dot structure of
H_2SO_4.(2+1)
Ans. H2O molecules are associated with one another by strong interparticle H bonds,where as the
interparticle forces in liquid H_2S are weak dipole dipole forces.As a result the boiling point of H2S is much
lower than that of H_2O.at ordinary temperature H_2O is liquid whereas H_2S is gas.

4.4 When a ship is sailing in pacific ocean where temperature is 23.4^0C,a ballon is filled with 2.0L of
air.What will be the volume of balloon when the ship reaches indian ocean,where temperature is 26.1^0C. (3)
Ans. T1=23.40c=23.4+273.15=296.55K
      T2=26.10c=26.1+273.15=299.25K
V1=2.0L
Applying Charle's law,V1/T1=V2/T2
V2=(V1T2)/T1=2.0L*299.25K/296.55K
=2.018L

OR

What are the differences between evaporation and boiling ?What is the unit of surface energy.   (2+1)

Evaporation	Boiling
It occures at the surface of the liquid.	It involves the formation of bubbles even below the surface within the bulk of the liquid.
It occures spontaneously at all temperatures.	Occures at a specific temperature at which vapour pressure equals the imposed pressure on the liquid surface.
It is a slow phenomenon.	It is a rapid phenomenon.

S.I unit of surface energy Jm^{-2} or Nm^{-1}.

4.5 For a water gas reaction

$C(s)+H_2O(g)$-------$CO(g)+H_2(g)$
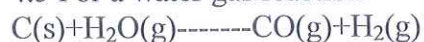
At 1000K the standerd Gibbs energy change is -8.1KJmol^{-1}.Calculate the value of equilibrium constant. (3)

Ans. Delta G^0=-2.303RTlogK
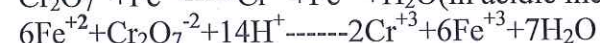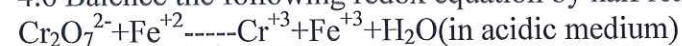
logK=-deltaG/(2.303*8.314*1273)

=0.3323

K=2.149

OR

In a process ,701J of heat is absorbed by a system and 394J of work is done by the system.what is the change in internal energy for the process? (3)

Ans. Heat absorbed by the system q=701J

Work done by the system w=-304J

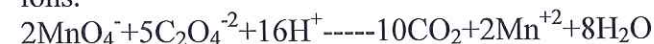Change in internal energy delta U=q+w=701-394=307J

4.6 Balence the following redox equation by half reaction method: (3)

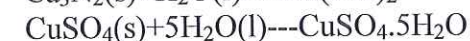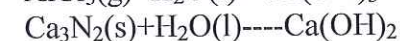$Cr_2O_7^{2-}+Fe^{+2}$-----$Cr^{+3}+Fe^{+3}+H_2O$(in acidic medium)

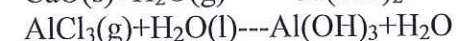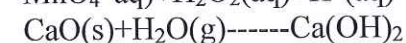$6Fe^{+2}+Cr_2O_7^{-2}+14H^+$-------$2Cr^{+3}+6Fe^{+3}+7H_2O$

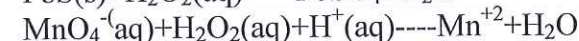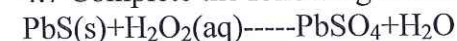OR

Permanganate ion oxidises oxalate ions in acidic medium to carbon dioxide and gets reduced itself to Mn+2 ions.

$2MnO_4^-+5C_2O_4^{-2}+16H^+$-----$10CO_2+2Mn^{+2}+8H_2O$

(3)

4.7 Complete the following reaction: (0.5*6=3)

$PbS(s)+H_2O_2(aq)$-----$PbSO_4+H_2O$

$MnO_4^-(aq)+H_2O_2(aq)+H^+(aq)$----$Mn^{+2}+H_2O$

$CaO(s)+H_2O(g)$------$Ca(OH)_2$

$AlCl_3(g)+H_2O(l)$---$Al(OH)_3+H_2O$

$Ca_3N_2(s)+H_2O(l)$----$Ca(OH)_2$

$CuSO_4(s)+5H_2O(l)$---$CuSO_4.5H_2O$

4.8 What is quick lime ,slaked lime &lime water?what happens when CO_2 gas is passed through lime water?(3)

$CaO,Ca(OH)_2$, Diluted and clear solution of calcium hydroxide

Turns milky due to formation of calcium carbonate

4.9 Write resonance structure of the following: (3)

a)$C_6H_5NH_2$ b)CH_3CONH_2 c)CH_3COO^-

SECTION-II

Long answer type question:(EACH CARRIES TOTAL 5 MARKS)

5.1 Define solubility product with an example.The solubility of AgCl is $1.06*10^{-5}$molL^{-1} at 298K.find out its K_{sp} at this temperature. (2+3)

Ans.it is the product of the concentrations of its ions in the saturated solution,with each concentration term raised to the power equal to the number of times the ion occurs in the equation representing the dissociation of the electrolyte.

AB(s)--------- A^+ (aq)+B^+ (aq)
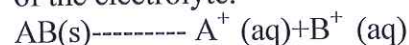
K_{sp}=$[A^+][B^+]$=S*S=S^2

Ksp=$[Ag^+][Cl^-]$=$(1.06*10^{-5})^2$=$1.12*10^{-10}$

5.2 What are the oxidation states exhibited by group 14 elements?   (1+2+2)
Lead is known not to form an iodide PbI_4
Why CCl_4 is resistant to hydrolysis but $SiCl_4$ is readily hydrolysed?
Ans.+4 and -2
Due to inert pair effect Pb exhibit +2 oxidation state so it mainly exist as PbI_2.
Due to absence of vacant d orbital C cannot accommodate water,so it is resistant to hydrolysis.where as Si
has vacant d orbital so easily undergo hydrolysis.
OR
Suggest a reason why the B—F bond lengths in BF_3(130pm)and BF_4^-(143pm)differ?   (2+2+1)
Why does boron trifluoride behave as a lewis acid?
What is the state of hybridization of carbon in graphite?
Ans. for BF_3 there is a backbonding takes place hence B-F bond gets multiple bond character ,so bond length
is shorter where as no such backbonding takes place for BF_4^- hence shows single bond character hance bond
length is longer.
BORON has only 6 electrons in valence shell hence easily accepts a pair of electrons from neucleophile and
thus behaves as a lewis acid.
In graphite it is sp^2 hybridised.
5.3 Complete the following :   (2+3)
a) Acetylene+HCN------------------cyanohydrine

Bring out the following conversion:
c) Ethyne to Ethanoic acid
d)Benzene to m-dinitrobenzoic acid
Ans.c)ethyne reacts with water in presence of H2SO4 and HgSO4 produce acetaldehyde and after oxidation
produce ethanoic acid.
d)benzene reacts with bromine followed by Mg in presence of ether and CO2 in acidic medium followed by
mixed acid nitration.

OR
Write down the IUPAC name of the following: (2+3)
a) CH2=CH-CH=CH2
b) COOH-CH=CH-COOH
Bring out the following conversion:
1. Methane to ethane
2. Ethane to ethene

Ans. a)Buta-1,3-diene
b)bute-2-enedioicacid
1.Methane reacts with chlorine then formation of methyl chloride ane methyl radical and dimerisation of methyl
radical will produce ethane.
2.ethane is treated with bromine followed by alcoholic KOH