10th grade answers

1)

a) i) K and Ca both have 20 neutrons but only K reacts with water highly energetically.
A = K, potassium
ii) B = KOH, potassium hydroxide

b) oxide **C:** D_2O

$16g/mol \leftrightarrow 6,9\%$
$2*M(D) \leftrightarrow 93,1\%$, $M(D) = \frac{16*93,1}{6,9*2} = 107,9g/mol$

D = Ag, silver
C = Ag_2O, silver(I)oxide

c) $2K + 2H_2O \rightarrow 2KOH + H_2\uparrow$
$Ag_2O + H_2 \rightarrow 2Ag + H_2O$

d)

$$\underset{232g/mol}{\overset{58g}{Ag_2O}} + H_2 \rightarrow 2Ag + \underset{18g/mol}{\overset{xg}{H_2O}} \Rightarrow x = \frac{58*18}{232} = 4,5g(H_2O)$$

$$2K + \underset{2*18g/mol}{\overset{4,5g}{2H_2O}} \rightarrow \underset{2*56g/mol}{\overset{y}{2KOH}} + H_2 \Rightarrow y = \frac{4,5*2*56}{2*18} = 14g(KOH)$$

2)

a) A = F_2, fluorine
B = HF, hydrogen fluoride
C = HF(aq), hydrofluoric acid
E = OF_2, oxygen difluoride
F = NaF, sodiumfluoride

b) i) $F_2 + H_2 \rightarrow 2HF$
ii) $SiO_2 + 6HF \rightarrow H_2SiF_6 + 2H_2O$
iii) $2F_2 + 2NaOH \rightarrow NaF + 2OF_2 + H_2O$

3)

$a) Br_2 + H_2 \rightarrow 2HBr$

$b) 6HBr + 2Al \rightarrow 2AlBr_3 + 3H_2 \uparrow / Al(OH)_3 + 3HBr \rightarrow AlBr_3 + 3H_2O$

$c) AlBr_3 + 3KOH \rightarrow Al(OH)_3 \downarrow + 3KBr$

$d) Al(OH)_3 + 3HNO_3 = Al(NO_3)_3 + 3H_2O$

$e) 4Al(NO_3)_3 \xrightarrow{t^0} 2Al_2O_3 + 12NO_2 + 3O_2$

$f) Al_2O_3 + 3H_2 \rightarrow 2Al + 3H_2O$

$g) Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$

$h) 2Fe + 3Cl_2 \rightarrow 2FeCl_3$

4)

a) i)

D:

$$6g \Leftrightarrow \frac{5,6l}{2*22,4mol/l} mol$$

$x \Leftrightarrow 1mol$

x=48g/mol

D=Ti, titanium

A: $Ti^{4+}O_z^{2-} \rightarrow z = 2 \rightarrow TiO_2$, titanium(IV) oxide

C: $M_r(C) = 2,375*80 = 190 \rightarrow M_r(C) = 48 + 4x = 190 \rightarrow x = 35,5 = M_r(Cl)$

$TiCl_4$-titanium(IV) chloride

G: $M_r(G) = 1,55*80 = 124 \rightarrow M_r(G) = 48 + 4y = 124 \rightarrow y = 19 = M_r(F)$

TiF_4 - titanium(IV) fluoride

ii)

B = HCl, hydrochloric acid

E = $MgCl_2$, magnesium chloride

F = HF, hydrofluoric acid

b)

$i) TiO_2 + 4HCl \rightarrow TiCl_4 + 2H_2O$

$ii) TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$

$iii) Ti + 4HF \rightarrow TiF_4 + 2H_2 \uparrow$

c) HCl is a stronger acid than HF, because of the larger atomic radius of Cl or any other correct answer.