Nam	e:		( )	Class:	Date:
			WORKSHEI Chapter 14: Me		
14.1	Metals and Alloys				
Meta	als				
1.	Metals are characterise	d by norr	nally being shir	ny, strong soli	ds with
	melting points, which a	re	conducto	rs of heat and	·
2.	Metals are	conducto	rs of electricity	because the _	electrons in
	metallic atoms are not l	ound to	any particular a	atom. The	ions of the metal
	are surrounded by a		Me	obile electrons	allow metals to conduct
	and		•		
3.	Metals have high	,_		and	. This
	is because the atoms in	metal are	e packed	in	and held together by
			. A large amou	nt of	_ is required to break
	these bonds.				
4.	Metals are	and	becau	se their atoms	are of the same size and
	are closely packed in no	eat	When a	is	applied, the layers
		over one	another.		
Alloy	ys				
1.	The properties of a part	icular me	tal can be impr	roved if it is m	ixed with another element.
	We call these mixtures				
2.	Compared to pure meta	ıls,	are	and	, have a better
	, have		_ melting poin	its and are	resistant to
	corrosion.				



3.	The atoms of a r	metal are arranged in	regular	However if another element is
	added, this prev	ents the atoms from _		one another. Thus, alloys
	tend to be	and	_ than pure metals.	
				Different sized atom of another element prevents atoms from one another.

4.	When zinc is added to copper the alloy formed is much	than pure copper.
	This alloy is called	

5.	Another of copper is _		which consists of copper (90%) and tin		
	(10%). The pro	esence of	_ makes the copper	and less likely to	
	corrode.				

## 14.2 The Reactivity Series

1.	In the reactivity series, metals are arranged from the	reactive to the
	reactive.	

## 2. Reaction of metals with cold water:

Potassium	Reacts Highly H <sub>2</sub> burns with a flame. $2K(s) + 2H_2O(\mathit{l}) \rightarrow 2_{}_{}_{}_{}_{}_{}_{}_{}_{}_{}_{}_{}_{}_$
Sodium	Reacts Highly H <sub>2</sub> burns with a flame. $2Na(s) + 2H2O(l) \rightarrow 2 (aq) + H2(g)$
Calcium	Reacts $Ca(s) + 2H_2O(l) \rightarrow \underline{\hspace{1cm}}$
Magnesium	Reacts $Mg(s) + 2H_2O(l) \rightarrow $
No reaction w	ith zinc, iron, lead, copper and silver.



## 3. Reaction of metals with steam:

Potassium		
Sodium	Reacts explosively. This reaction should not be carried out in the school laboratory.	
Calcium		
Magnesium	Reacts to produce a white glow. $Mg(s) + H_2O(l) \rightarrow + H_2(g)$	
Zinc	Reacts ZnO formed is yellow when hot, white when cold. $Zn(s) + H_2O(l) \rightarrow$	
Iron	Reacts $Fe(s) + 4H2O(l) \rightarrow Fe3O4(s) + H2(g)$	
No reaction w	ith lead, copper and silver.	

# 4. Reaction of metals with dilute hydrochloric acid:

Potassium Sodium	Reacts $2K(s) + 2HCl(aq) \rightarrow 2KCl(aq) + H_2(g)$ $2Na(s) + 2HCl(aq) \rightarrow$	
Calcium	Reacts $Ca(s) + 2HCl(aq) \rightarrow CaCl_2(aq) +$	
Magnesium	Reacts $Mg(s) + 2HCl(aq) \rightarrow + H_2(g)$	
Zinc	Reacts $Zn(s) + 2HCl(aq) \rightarrow$	
Iron	Reacts	
No reaction with lead, copper and silver.		

**#LIVEWORKSHEETS** 

5.	Metals at the top of the reactivity series, li	ike and	react
	violently with cold water. As you go down	n the series metals like _	and
	will only react with steam. Me	etals below lead, like	, have no
	reaction at all with water or steam and wil	l not displace	from water or
	steam.		
	reactive	potassium	
	Λ		
		calcium	
		magnesium	
		iron	
		(300-0300H00.))	
		lead	
		hydrogen	
	reactive	silver	
	reactive	Silver	
6.	With dilute hydrochloric acid, the metals	at the top of the series re	act verv
0.	As we go down the series, they react with		
	the series, like, will not displa		SO 124 USASS NO SANDY
	are series, fixe, will not displa	ee nyarogen nom anace	nyaroemorie aeia.
	W		
14.3	Using the Reactivity Series		
1.	The reactivity series is related to the	of a metal to form	ıions.
	Reactive metals tend to form	ions easily by	_ electrons and
	forming compounds. Unreactive metals pr	refer to remain uncombin	ned as of
	the element.		
2.	One application of the reactivity series is	100 5	
	a metal. A metal is capable of displacing a	another metal	in the reactivity
	series from its, or from its	solution.	



© 2013 Marshall Cavendish International (Singapore) Private Limited

3.	Metal oxides that are in the reactivity series are easier to reduce to the meta with carbon or hydrogen.
4.	The a metal is, the it is to decompose its carbonate by heat. Carbonates of reactive metals are stable to heat. Carbonates of metals decompose to form oxides of the metals and
14.4	Extracting Metals
1.	Most metals are found in the ground combined with non-metals like, sulfur or carbon. These compounds are called
2.	Metals in their combined states, such as metal oxides, metal sulfides, metal chlorides and metal carbonates can be extracted by:  • with carbon, i.e the metal compound with carbon;  •, which is using to decompose the molten metal compound.
3.	The stability of an ore of a metal higher up the reactivity series is than one which is lower down. Therefore, it is much more to extract sodium metal from its ore than it is to extract copper metal from its ore.
4.	Every time a metal is extracted from its ore it involves of the metal because the metal has to electrons.
5.	Metals which are up in the reactivity series require strong reduction of their ores. This is usually achieved by Middle order metals, such as, can be reduced by heating strongly with Metals at the bottom of the reactivity series can be extracted from their ores simply by
6.	Some metals like are so unreactive they occur in the ground as the metal itself.



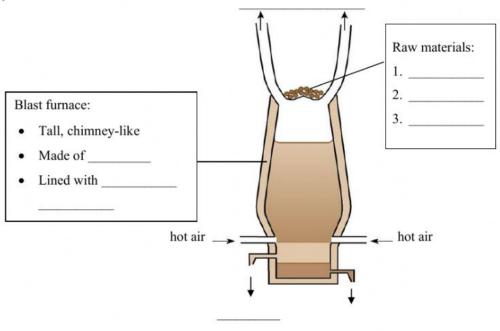
#### **Extraction of Iron**

1. Iron is extracted from its ores like \_\_\_\_\_ (Fe<sub>2</sub>O<sub>3</sub>) in the blast furnace.

2. The furnace is charged at the top with three raw materials — \_\_\_\_\_\_, \_\_\_\_\_\_\_,

and \_\_\_\_\_.

3.



### Chemical Reactions in the Blast Furnace

1. Production of carbon dioxide

Coke burns in hot air. Carbon dioxide is produced. Heat is given off as the reaction is highly \_\_\_\_\_ and the temperature in this part of the furnace rises to 1900°C.

$$C(s) + O_2(g) \rightarrow$$

2. Production of carbon monoxide

Carbon dioxide reacts with hot \_\_\_\_\_\_ to produce \_\_\_\_\_\_.

$$CO_2(g) + C(s) \rightarrow$$

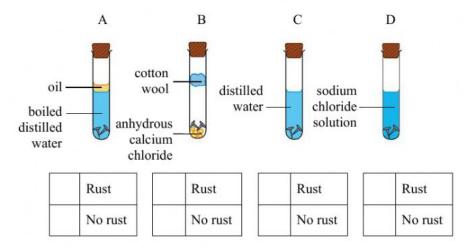
© 2013 Marshall Cavendish International (Singapore) Private Limited



3.	Reduction of iron ore
	Carbon monoxide gas is a powerful and it reduces the iron ore at
	the top of the furnace to molten iron. The molten iron falls to the bottom of the furnace
	where it is tapped off.
	$Fe_2O_3(s) + 3CO(g) \rightarrow $
4.	Removal of impurities
	The present in the furnace helps to remove impurities. The main impurity
	in the iron is sand (). Inside the furnace, the
	(calcium carbonate) decomposes to (calcium oxide) and
	·
	$CaCO_3(s) \rightarrow $
	Calcium oxide reacts with from sand in iron ore to form calcium
	silicate, also known as Slag floats on top of and is
	used in
	$CaO(s) + SiO_2(s) \rightarrow$
	Carbon dioxide escapes as from the top of the furnace together
	with and
14.5	Uses of Steel
1.	The iron produced in the blast furnace is and contains impurities of mainly
	and other non-metals. It is called or pig iron. Such iron
	is very brittle and has limited uses. Most of this iron is converted into
2.	Steel is produced in a is
	blown into the molten cast iron. This oxidises the like carbon and sulfur
	blown into the molten cast iron. This oxidises the like carbon and sulfur to gases which then escape. Other impurities like phosphorus and silicon are converted

3.	When all the impurities have been we are left with a very pure form of iron called				
4.	Calculated amounts of are then added to produce the various steels.				
	is low carbon steel and contains about carbon. It is				
	and therefore easy to shape. It is ideal for making				
	and machinery.				
5.	The more carbon that is added, the the steel becomes. This is because the carbon impurity strengthens the iron lattice, making it more difficult for the atoms to				
	one another. High carbon steel contains between 0.5 to 1.5% carbon and is but It is used for making and				
	tools.				
6.	Other alloys of steel are also made by the addition of the correct amount of the appropriate metal. Stainless steel contains iron, carbon, and				
	is attractive and very resistant to It is therefore useful in making				
	, and equipment in chemical plants.				
14.6	Rusting				
1.	The essential conditions for the rusting () of iron are the presence of				
	and This results in the flaky brown coating, commonly called rust but chemically known as (Fe <sub>2</sub> O <sub>3.x</sub> H <sub>2</sub> O). The				
	presence of and substances speed up rusting.				
	$4Fe(s) + 3O_2(g) + 2xH_2O(l) \rightarrow$				

2. In which test tube will the nails be most heavily rusted after one week?



The nails in test tube \_\_\_ will be most heavily rusted.

2.	Prevention of rusting can be achieved by placing a barrier around the metal. Examples			
	are	, greasing, covering with	and	

- 3. An alternative way of preventing rusting is by \_\_\_\_\_\_\_. A more reactive metal (like magnesium or \_\_\_\_\_\_) is attached to the iron object. The more reactive metal \_\_\_\_\_ in preference to the iron.
- 4. Sacrificial protection is useful with underground steel or iron objects like \_\_\_\_\_\_ or \_\_\_\_ in petrol stations. These are difficult to paint and grease, but it is easy to attach a piece of \_\_\_\_\_ or \_\_\_\_ to such objects.
- Rusting can also be prevented by using rust-resistant alloys such as .

