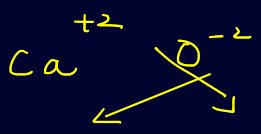
+1	+2	+3	+4	-3	-2	-1
H^{+1}	Be^{+2}	B^{+3}	C^{+4}	N^{-3}	O^{-2}	F^{-1}, Cl^{-1}
Li^{+1}	Mg^{+2}	Al^{+3}		Nitride	Oxide	Flouride ; Chloride
Na^{+1}	Ca^{+2}	Fe^{+3}		P^{-3}	S^{-2}	Br^{-1}
K^{+1}	Sr^{+2}			phosphide	Sulfide	Bromide
Ag^{+1}	Ba^{+2}			$(PO_4)^{-3}$	$(CO_3)^{-2}$	I^{-1}
$(NH_4)^{+1}$	Cu^{+2}			phosphate	Carbonate	Iodide
Ammonium ion	Zn^{+2}			$(NO_2)^{-1}$	$(SO_4)^{-2}$	$(OH)^{-1}$
	Fe^{+2}			Nitrite	Sulphate	Hydroxide
						$(HCO_3)^{-1}$
						Hydrogen Carbonate
						$(NO_3)^{-1}$
						Nitrate

* Calcium Oxide



$Ca_2^{\,2}\,O_2^{\,2}$

$Ca_1O_1 = \underline{CaO}$

* Calcium Chloride

$\underline{CaCl_2}$

* Magnesium Nitride

$Mg^{+2}\ N^{-3}$

$Mg_3\ N_2$

Aluminium Chloride $AlCl_3$.
Aluminium oxide Al_2O_3.
Zinc Carbonate $ZnCO_3$.
Copper Sulphate $CuSO_4$
Sodium oxide Na_2O.
Sodium sulphate Na_2SO_4.
Magnesium nitrate $Mg(NO_3)_2$
Ammonium Carbonate $(NH_4)_2CO_3$
Ammonium Hydroxide NH_4OH.

Solubility rules:

All nitrates are soluble

All chloride are soluble except Pb and Silver

All sulphates are soluble except Ba, Ca and Pb

All carbonates are insoluble except Sodium Na, K and Ammonium

All hydroxides are insoluble except Na, K and Ca (partially soluble)

$AgNO_3$ ✓ $PbCl_2$ × $CaCO_3$ ×

$AgCl$ × Na_2CO_3 ×

Acid + Metal oxide (Basic) ⟶ Neutralization.

* $6HCl + Fe_2O_3 \longrightarrow 2FeCl_3 + 3H_2O$ ($FeCl_3$ (aq))

* $H_2SO_4 + CuO \longrightarrow CuSO_4 + H_2O$ ($CuSO_4$ (aq))

* $2HNO_3 + MgO \longrightarrow Mg(NO_3)_2 + H_2O$ ($Mg(NO_3)_2$ (aq))

Acid + Base ⟶ Salt + water.

1 Salts can be prepared by the reaction of acids with alkalis.

(a) (i) The reactions of acids with alkalis can be represented by the equation below. Choose a substance from the box to complete the equation.

carbon dioxide	hydrogen	oxygen	water

acid + alkali → salt + _____

(1)

(ii) Draw a ring around the word which best describes the reaction.

displacement **neutralisation** oxidation reduction

(1)

Alkali

K_2SO_4 + $NaOH$ ⟶ Na_2SO_4 + KOH ×

Potassium sulfate — Sodium hydroxide — Sodium sulfate — Potassium Hydroxide

(b) Sodium sulphate is an important salt.

The table gives a list of some substances.

Put a tick (✓) next to the names of the acid **and** the alkali that would react to make sodium sulphate.

Substances	(✓)
Hydrochloric acid	
Nitric acid	
Potassium sulphate	
Sodium hydroxide	✓
Sodium nitrate	
Sulphuric acid	✓

H_2SO_4

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Alkali + Acid → Salt + water

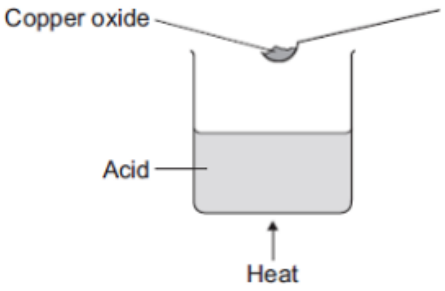
(2)
(Total 4 marks)

2 A student added copper oxide to an acid to make copper sulfate.

The student heated the acid.

The student added copper oxide until no more reacted.

(a) The diagram shows the first stage in the experiment.



(i) Complete the word equation.

Copper oxide + Sulfuric acid → copper sulfate + water

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

(1)

(ii) Which **one** of these values could be the pH of the acid?

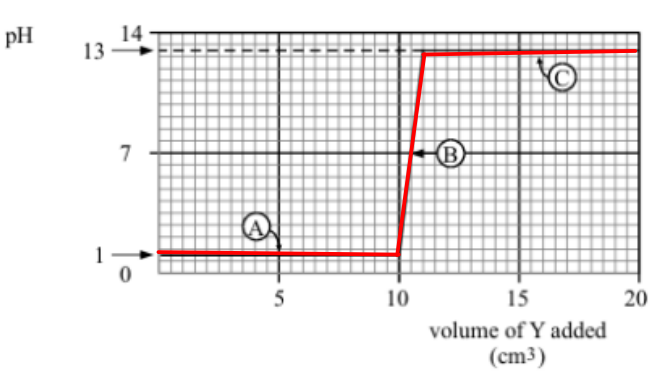
Draw a ring around the correct answer.

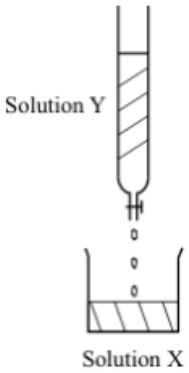
1 ✓ 7 11

(1)

3 Some students slowly add solution Y to solution X.

The graph shows what happens to the pH of the solution in the beaker as they do this.





(a) Choose words from this list to complete the sentences below.

acidic **alkaline** **neutral**

At point A on the graph the solution in the beaker is Acidic

At point B on the graph the solution in the beaker is Neutral

At point C on the graph the solution in the beaker is Alkaline

(2)

(b) Describe, as fully as you can, what happens to the pH of the mixture as solution Y is slowly added.

D. No change to pH initially

Later sudden / rapid increase.

Stays the same

(5)

(Total 7 marks)