

Core 1

The word acid comes from the Latin word, *acidus*, meaning sour. Acids corrode reactive metals and produce an effervescence of carbon dioxide gas with carbonates.

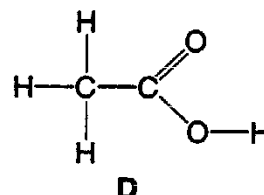
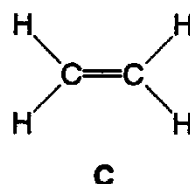
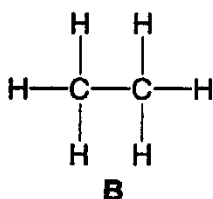
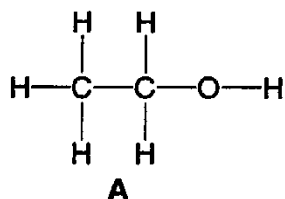
(a) State the meaning of

(i) *corrode*, .....

(ii) *effervescence*. .....[2]

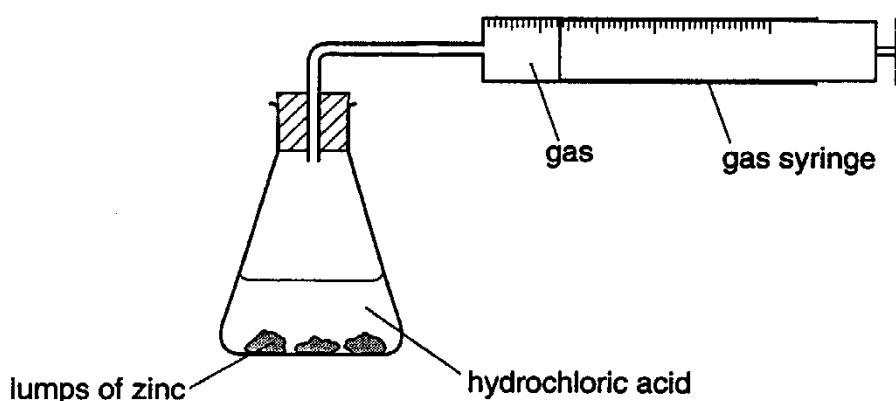
(b) Which one of the organic compounds, A, B, C or D is an acid?

Put a ring around the correct letter.



[1]

(c) The apparatus below was used to measure the volume of gas produced when zinc reacted with hydrochloric acid.



A student measured the volume of gas produced during the first minute of the reaction. The student repeated the experiment altering one condition at a time.

What effect would each of the following have on the volume of gas produced during the first minute of the reaction.

(i) decreasing the concentration of acid

.....

(ii) increasing the temperature

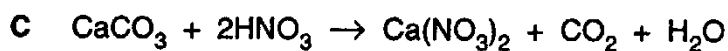
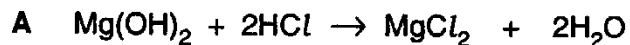
.....

(iii) using finely divided zinc instead of lumps of zinc

.....[3]

Core 1

(d) The equations A, B, C and D show some reactions of acids.



Answer the following questions by choosing from equations A, B, C or D.  
You may use each letter once, more than once or not at all.

(i) Which reaction produces an explosive gas?

(ii) Which reaction forms a sulphate?

(iii) Which reaction gives off a gas which turns lime water cloudy?

(iv) Which is a reaction between a hydroxide and an acid?

(v) Which reaction involves a transition element?

[5]

(e) Describe how crystals of sodium chloride can be made in the laboratory from hydrochloric acid and aqueous sodium hydroxide.

.....  
.....  
.....[3]

## Core 2

Many buildings are made of concrete. Concrete is a mixture of cement, sand, water and small stones.

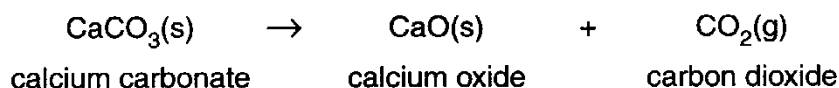
(a) Explain what is meant by the term *mixture*.

.....  
.....[2]

(b) Sand is largely silicon(IV) oxide. Pure silicon(IV) oxide is a compound. Explain what is meant by the term *compound*.

.....  
.....[2]

(c) Cement is made by roasting clay with crushed chalk. Chalk is largely calcium carbonate. When cement is made, some of the calcium carbonate breaks down to calcium oxide.



(i) What type of chemical reaction is this?

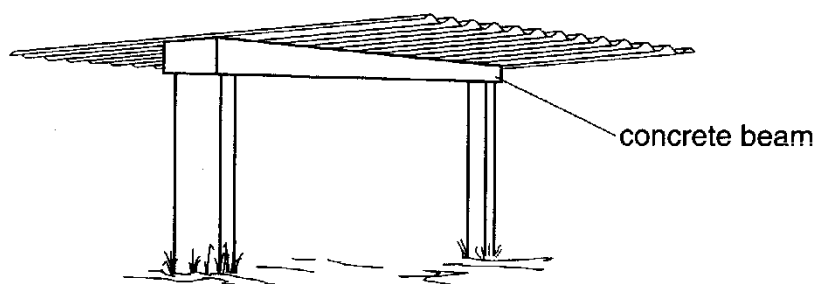
.....[1]

(ii) Which of the three chemicals in this reaction (calcium carbonate, calcium oxide or carbon dioxide) has the lowest relative formula mass?

.....[1]

## Core 2

(d) The diagram shows a concrete beam supporting the roof of a shelter.



Concrete is quite porous. When rainwater soaks through it, some of the calcium oxide slowly dissolves to form aqueous calcium hydroxide. This solution is strongly alkaline.

(i) What is another name for calcium hydroxide?  
Put a ring around the correct answer.

limestone

quicklime

slaked lime

soda

[1]

(ii) Suggest a value for the pH of aqueous calcium hydroxide.

.....[1]

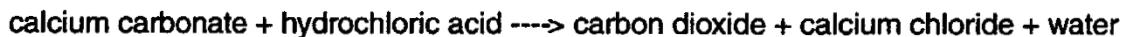
(iii) How would you use litmus paper to show that aqueous calcium hydroxide is alkaline?

.....

.....[2]

**Alternative to practical 1**

Indigestion tablets contain calcium carbonate. The tablets work by neutralising the excess of acid in the stomach.



You are provided with 2 different brands of indigestion tablet, **F** and **G**, dilute hydrochloric acid and common laboratory apparatus.

Plan an investigation to find which brand of indigestion tablet is best at neutralising acid. Your answer should include details of the apparatus to be used and the main practical steps in the investigation.

apparatus .....

.....

plan of investigation .....

.....

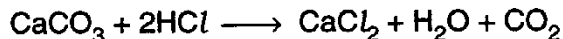
.....

.....

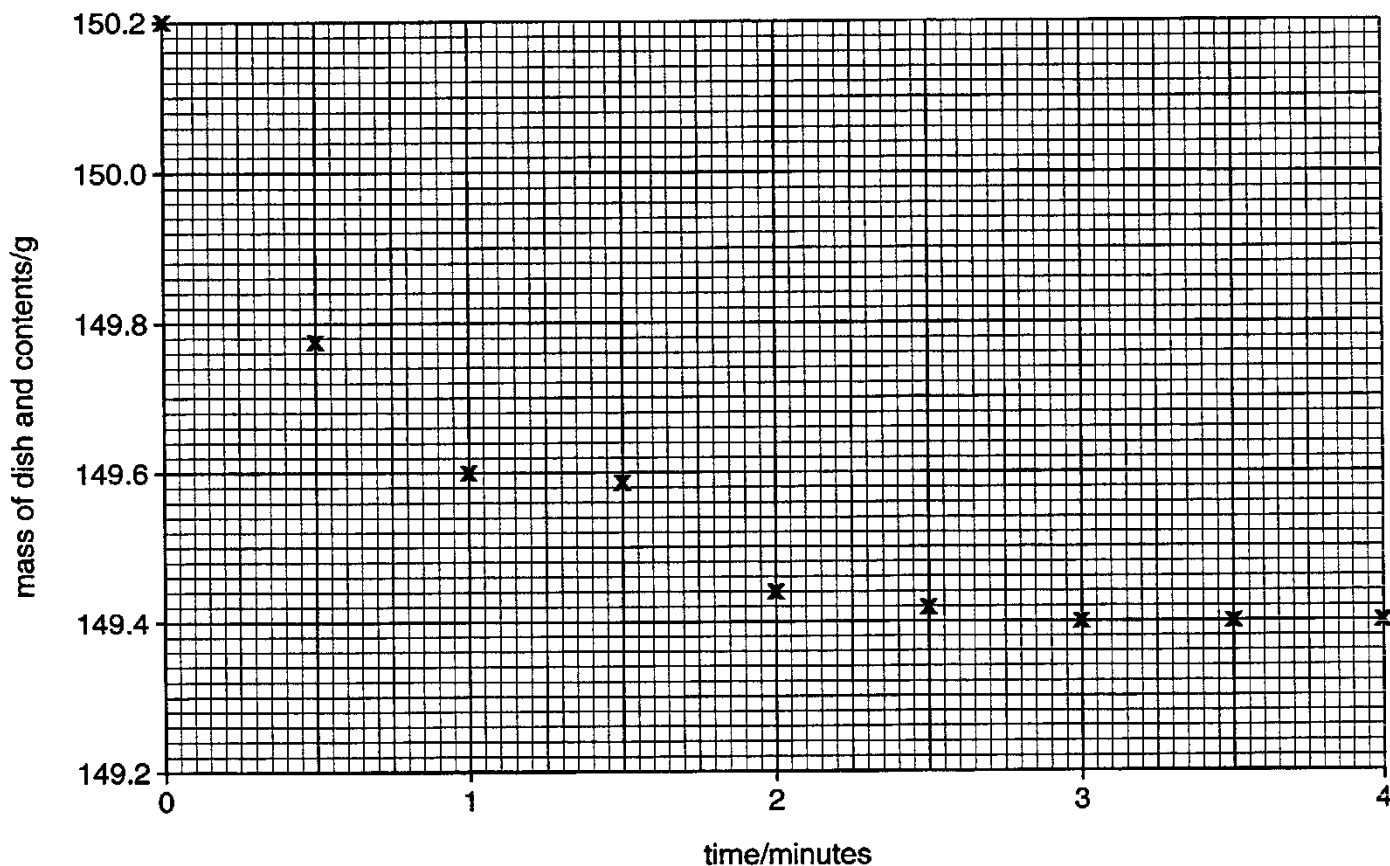
.....[5]

Alternative to a practical 2

3 Hydrochloric acid reacts with marble chips (calcium carbonate).



A 50 cm<sup>3</sup> sample of dilute hydrochloric acid was added to a large quantity of marble chips in an evaporating dish, which was placed on the pan of a balance. The mass of the dish and its contents was recorded every 30 seconds. The results are shown in the graph below.



- (a) (i) Draw a smooth curve through the points on the grid.  
 (ii) Which result appears to be incorrect? Why have you selected this result?  
 .....  
 .....[3]
- (b) Use the graph to answer the following questions.  
 (i) How long did the reaction last?  
 .....  
 (ii) What mass of carbon dioxide was produced?  
 .....[2]
- (c) Sketch on the grid the curve you would expect if 50 cm<sup>3</sup> of more concentrated hydrochloric acid had been used in the experiment. [2]
- (d) What apparatus could be used, instead of an evaporating dish, to reduce any loss of acid by splashing? [1]

Extension 1

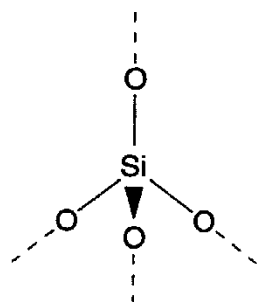
(iii) Complete the table that shows the reaction, if any, of the oxides with acid and alkali. Indicate a reaction with "R" and no reaction with "NR".

oxide	type of oxide	reaction with acid	reaction with alkali
magnesium oxide	basic		
aluminium oxide	amphoteric		
silicon(IV) oxide	acidic		

[3]

Extension 2

(c) Two of the chemicals used to make concrete are limestone and sand. Limestone is an ionic compound, containing the ions  $\text{Ca}^{2+}$  and  $\text{CO}_3^{2-}$ . Sand is mainly an oxide of silicon which is macromolecular.



(i) What is the valency of  
 calcium in calcium carbonate, .....

silicon in this oxide? .....

(ii) What is the electron distribution in one atom of  
 calcium, .....

silicon? .....

(iii) Explain why the metal calcium forms ionic bonds but the non-metal silicon forms covalent bonds.

.....

.....

[6]

## Core 1

- a(i) idea of metals being eaten away, reacting but not rusting
- (ii) bubbling /foaming / gas produced
- b D
- c(i) decreases volume / less gas produced
- (ii) increases volume / more gas produced
- (iii) increases volume / more gas produced
- d(i) B
- (ii) B
- (iii) C
- (iv) A
- (v) B
- e add hydrochloric acid to sodium hydroxide until neutralised / idea of titrating / neutralising  
boil off / evaporate (some) water  
leave to crystallise / allow to cool



## Core 2

- a several different substances present (not elements or compounds) which can be separated by physical means / not chemically bonded
- b two (or more) elements / more than one type of atom, not substances chemically combined / bonded / joined
- c(i) (thermal) decomposition
- (ii) carbon dioxide /  $\text{CO}_2$
- d(i) slaked lime
- (ii) pH above 7
- (iii) turns red litmus paper blue

## Alternative to Practical 1

Plan to include five of the following points.

- Measured equal amounts of tablets
- Added specified volume of acid to tablet e.g. drop by drop until stops fizzing / indicator is neutral
- Repeated
- Compared with other tablet
- Concluded the most effective tablet requires the most acid

## Alternative to Practical 2

- a(i) single smooth curve
- (ii) Incorrect at 1 1/2 minutes  
It does not lie on the curve.
- b(i) 3 minutes
- (ii) 0.8 g
- c a curve parallel to the original curve  
levelling out at 149.8 g
- d narrow-necked apparatus e.g. conical flask / container with absorbent wool in neck

### Extension 1

R	NR
R	R
NR	R

## Extension 2

- (i) 2 (not 2+)  
4
- (ii) 2.8.8.2  
2.8.4
- (iii) calcium can lose 2e (to have a noble gas distribution)  
or bonds by electrical transfer  
Silicon cannot lose 4e or gain 4e or has to share electrons