



# ARMY BURN HALL COLLEGE FOR BOYS

## Entry Test – Class AS Level

### SUBJECT: CHEMISTRY

**Time allowed: 1 hour**

**Maximum Marks: 50**

#### INSTRUCTIONS

- Write your Roll Number only on the top right corner.
- Do not write your name or any other information.
- Do not use lead pencil.
- Avoid erasing, cutting, overwriting, etc.
- Any sign, mark, name, etc written on Answer Script to disclose your identity will disqualify you for admission to the College.

#### ATTEMPT ALL QUESTIONS (Marks 20)

**Note: Objective should be solved in first 20 minutes.**

**Q. 1 Circle the correct option i.e. A/B/C/D.**

i. Which row correctly identifies the gas?

	gas	test	observation
A	$Cl_2$	damp litmus paper	the litmus paper turns blue
B	$NH_3$	damp litmus paper	the litmus paper turns red
C	$O_2$	limewater	no change is observed
D	$SO_2$	acidified aqueous potassium manganate(VII)	the colour of the solution changes from purple to colourless

ii. Which statement about the isotopes of bromine is correct? They are atoms with the same number of

- A electrons and a different number of protons.
- B neutrons and the same number of electrons.
- C protons and the same chemical properties.
- D protons and the same physical properties.

iii. Compound Z is made from element X and element Y. Compound Z is a good conductor of electricity when molten but not when solid. Which statement is correct?

- A Compound Z has strong forces of attraction between electrons and positive ions.
- B Compound Z has strong forces of attraction between negative ions and positive ions.
- C Elements X and Y are both metals.
- D Elements X and Y are both non-metals.

iv. Which statement shows that graphite and diamond are different forms of the element carbon?

- A Both graphite and diamond have giant molecular structures.
- B Complete combustion of equal masses of graphite and diamond produces equal masses of carbon dioxide and no other products
- C Graphite and diamond have different melting points.
- D Graphite conducts electricity, whereas diamond does not.

v. Ethene,  $C_2H_4$ , is a covalent compound with a simple molecular structure. Which statement about ethene is correct?

- A Ethene is a liquid at room temperature and pressure.
- B Liquid ethene conducts electricity.
- C One ethene molecule contains sixteen protons.
- D The total number of shared pairs of electrons in ethene is five.

vi. A student plans two experiments.

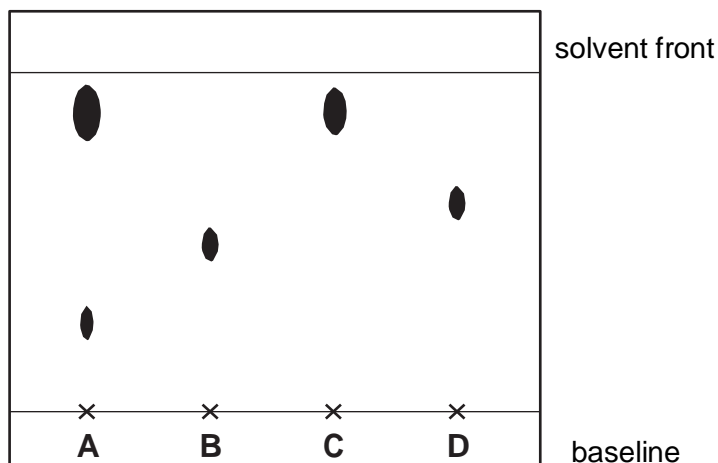
experiment 1 find the concentration of a solution of sodium hydroxide by titration with dilute hydrochloric acid

experiment 2 find the rate of the reaction between pieces of calcium carbonate and dilute hydrochloric acid by measuring the volume of gas given off every minute

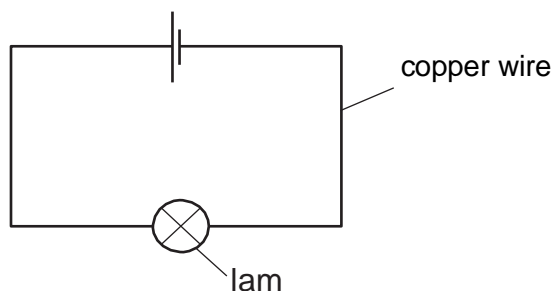
A flask is provided. Which other apparatus is needed?

	experiment 1	experiment 2
A	balance, measuring cylinder, thermometer	gas syringe, clock
B	burette, pipette	balance, measuring cylinder, thermometer
C	burette, pipette	gas syringe, clock
D	gas syringe, clock	burette, pipette

vii. Q is a pure sample of a substance that has a single  $R_f$  value of 0.9. In the chromatogram shown, which letter represents Q?



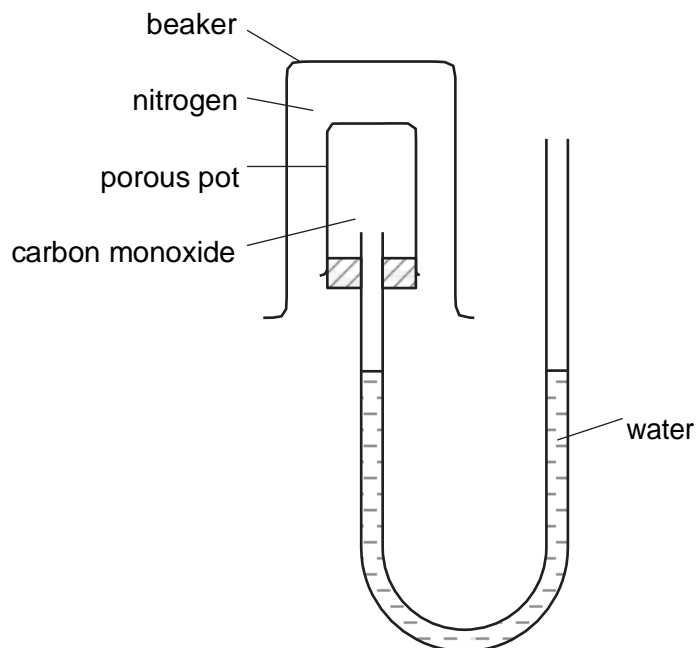
viii. Copper wire is used to complete an electrical circuit.



What happens in the copper wire?

- A Electrons move along the wire to the negative terminal. Positive ions stay in position.
- B Electrons move along the wire to the positive terminal. Positive ions move to the negative terminal.
- C Electrons move along the wire to the positive terminal. Positive ions stay in position.
- D Negative ions move along the wire to the positive terminal. Positive ions move to the negative terminal.

- ix. An organic compound has the molecular formula  $C_8H_{16}O_4$ .  
What is the empirical formula of the compound?
- A.  $C_2H_4O$                       B.  $C_4H_8O_2$                       C.  $C_6H_{12}O_3$                       D.  $C_8H_{16}O_4$
- x. Compound P is the only substance formed when two volumes of ammonia gas react with one volume of carbon dioxide gas (both volumes being measured at r.t.p.).  
What is the formula of P?
- A.  $NH_2CO_2NH_4$                       B.  $(NH_2)_2CO$                       C.  $NH_4CO_2NH_4$                       D.  $(NH_4)_2CO_3$
- xi. Copper is purified by electrolysis. Which statement is not correct?
- A Both electrodes contain copper.  
B Copper is both oxidised and reduced in the process.  
C Pure copper is deposited on the positive electrode.  
D The electrolyte is aqueous copper(II) sulfate.
- xii. Concentrated aqueous sodium chloride is electrolysed using inert electrodes until no more chlorine gas is evolved. What could be the pH of the resulting solution?
- A. 1                                      B. 4                                      C. 7                                      D. 11
- xiii. Gases can diffuse through porous pots. The diagram shows a beaker full of nitrogen inverted over a porous pot containing carbon monoxide.

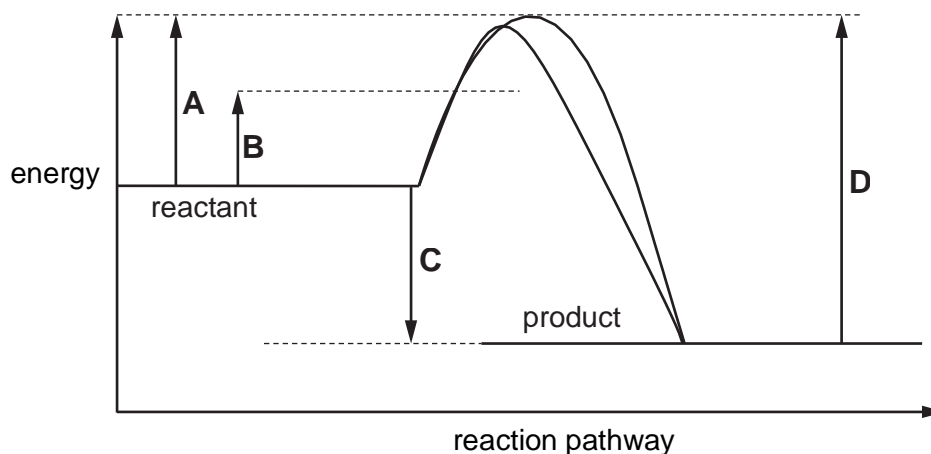


- The water level does not move. Which statement explains this?
- A Nitrogen is almost inert.  
B The two gases have equal molecular masses.  
C Both gases have two atoms in a molecule.  
D Neither gas is soluble in water.
- xiv. Ammonia can be produced industrially from nitrogen and hydrogen.
- $$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$
- The forward reaction is exothermic. Which change would not alter the yield of ammonia?
- A adding a catalyst  
B decreasing the pressure  
C decreasing the temperature  
D removing some ammonia during the reaction

- xv. Which process does not involve the use of a catalyst?
- A the extraction of iron from haematite in a blast furnace  
 B the manufacture of sulfur trioxide  
 C the production of ammonia from nitrogen and hydrogen  
 D the redox reactions that remove combustion pollutants from car exhausts
- xvi. Which statement does not describe a reduction reaction?
- A Electrons are gained during the reaction.  
 B Hydrogen is gained during the reaction.  
 C It takes place at the negative electrode during electrolysis.  
 D Oxygen is gained during the reaction.
- xvii. The pH of an aqueous solution of hydrochloric acid is 2.  
 What will be the pH of the acid after the addition of 10 g of sodium chloride?
- A. 1                      B 2                      C. 7                      D 9
- xviii. One mole samples of each of the solid carbonates of lead, calcium, barium and magnesium are reacted in turn with excess dilute sulfuric acid.



- Which sample of carbonate will release the greatest volume of carbon dioxide?
- A. barium                      B calcium                      C. lead                      D magnesium
- xix. The diagram shows an energy profile diagram for a chemical reaction, both with and without a catalyst. Which energy change is the activation energy for the catalysed reaction?



- xx. Oil floats on water. Which statement is not true of oil and water?
- A Oil and water are immiscible.  
 B Oil is less dense than water.  
 C Some molecules in oil have a higher relative molecular mass than water.  
 D The type of bonding within water molecules is different from the type of bonding within molecules in oil.

**ATTEMPT ALL QUESTIONS (Marks 30)**

**Q. 2** Choose from the following chlorides to answer the questions.

ammonium  
chloride  
calcium  
chloride  
carbon  
tetrachloride  
copper(II)  
chloride  
hydrogen  
chloride  
magnesium  
chloride zinc  
chloride

Each chloride can be used once, more than once or not at all. Which chloride

- (a) is a coloured solid,  
 (b) reacts with warm aqueous sodium hydroxide to produce a gas that turns damp red litmus paper blue,  
 (c) reacts with water to form a strong acid,  
 (d) contains a cation with a charge of +1,  
 (e) has a simple molecular structure similar to methane?

**Q. 3** The table shows some information about six particles.

(a) Complete the table.

particle	proton (atomic) number	number of neutrons in particle	number of electrons in particle
$^{35}\text{Cl}$	17	18	.....
.....	17	20	17
$^{39}\text{K}^+$	19	.....	18
$^{79}\text{Br}^-$	.....	44	36
$^{81}\text{Br}$	35	.....	35
.....	37	48	36

[6]

- (b) (i) What is meant by the term *isotopes*?  
 (ii) Identify two **atoms** which are isotopes of the same element.

..... and .....[1]

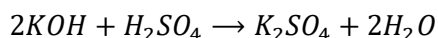
**Q. 4** Acids are neutralised by insoluble bases.

- (a) Magnesium chloride is a soluble salt that can be prepared from an insoluble base.
- (i) Name the acid and an insoluble base that can be used to make magnesium chloride.
- (ii) Describe the experimental method used to prepare pure crystals of magnesium chloride from this acid and base.

- (b) Aqueous barium chloride and aqueous potassium sulfate can be used to prepare barium sulfate in a precipitation reaction.

Write the ionic equation, including state symbols, for this reaction.

- (c) Potassium sulfate can be prepared by reacting aqueous potassium hydroxide with dilute sulfuric acid.



In an experiment, 20.0 cm<sup>3</sup> of 0.650 mol/dm<sup>3</sup> sulfuric acid is just neutralised by aqueous potassium hydroxide.

- (i) Calculate the maximum mass of potassium sulfate, K<sub>2</sub>SO<sub>4</sub>, that could be prepared. [The relative formula mass of K<sub>2</sub>SO<sub>4</sub> is 174.]

maximum mass of potassium sulfate = ..... g [3]

- (ii) After crystallisation, 1.72 g of dry potassium sulfate was obtained. Calculate the percentage yield of potassium sulfate.

percentage yield of potassium sulfate = ..... % [1]

**Q. 5** Sodium oxide, Na<sub>2</sub>O, is an ionic compound.

- (a) State the electronic configuration for each of the ions in sodium oxide  
sodium ion .....  
oxide ion ..... [2]
- (b) When **molten** sodium oxide is electrolysed, sodium and oxygen are formed. Construct equations for the two electrode reactions.  
reaction at the negative electrode  
reaction at the positive electrode
- (c) Explain how molten sodium oxide conducts electricity.
- (d) Sodium oxide reacts with water to give sodium hydroxide. Construct the equation for this reaction.