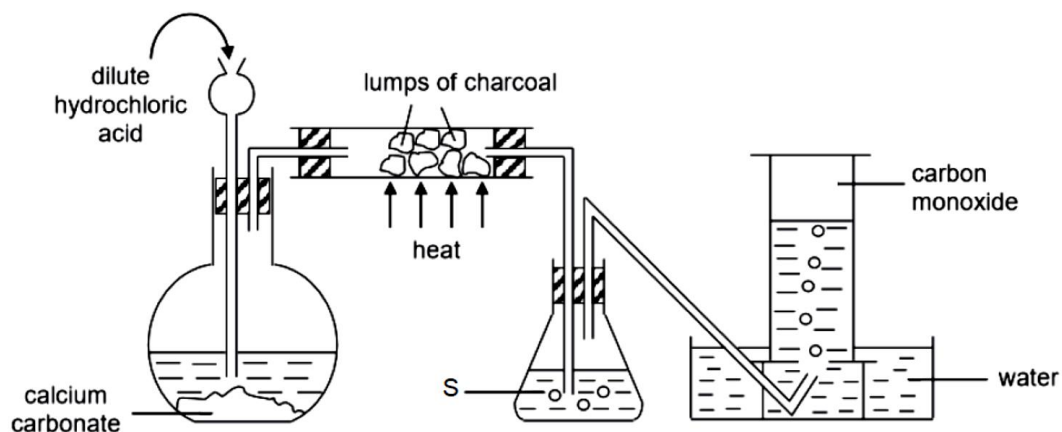Name: _____   Date:_____

Take your time to understand the questions. Read the words properly and annotate wherever needed.

1. The diagram shows a set-up to obtain carbon monoxide

   What is the purpose of S?

   a. To remove hydrogen chloride gas
   b. To remove water vapour
   c. To remove carbon dioxide gas
   d. To remove calcium carbonate

2. Potassium has 2 major isotopes – K-39 and K-41

   If potassium has a relative atomic mass of 39.14, what are the relative abundance of the 2 major isotopes?

	^{39}K	^{41}K
A	7%	93%
B	25%	75%
C	75%	25%
D	93%	7%

3. The following table shows 4 elements with their proton numbers.

elements	P	Q	R	S
proton number	6	8	17	19

Which of the following chemical formulae and type of compounds are most likely?

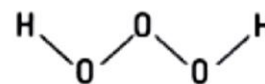|	ionic compound	covalent compound
A	PR_4	SR
B	S_2Q	PQ_2
C	SP	PR_4
D	SR	RQ

4. Trioxidance has the formula H_2O_3
   Which of the following could most possibly be its structure?
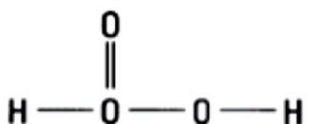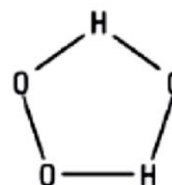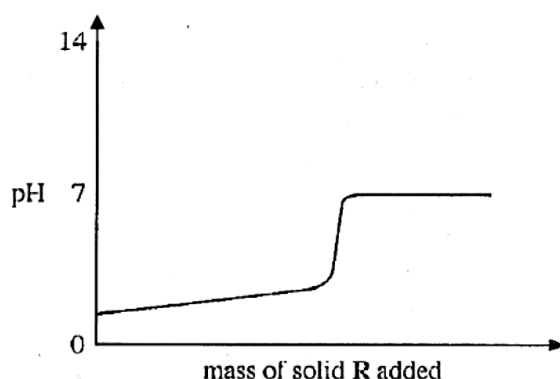
A

B

C

D

5. A sample of flue gas from the power station is bubbled into different solutions and the results are shown in the table.

solution	observation
acidified potassium manganate (VII)	purple solution turns colourless
acidified potassium iodide	colourless solution turns brown
red litmus solution	turns blue
blue litmus solution	turns red

Which are the possible gases present in the sample?

A   sulfur dioxide gas and chlorine gas
B   chlorine gas, hydrogen gas and carbon monoxide gas
C   ammonia gas, sulfur dioxide and oxygen gas
D   ammonia gas, nitrogen monoxide gas and oxygen gas

6. Which is the best method to prepare a high yield of lead (II) sulfate salt?

A   Adding excess dilute sulfuric acid to lead(II) hydroxide.
B   Adding excess lead(II) carbonate to dilute sulfuric acid.
C   Adding excess lead metal to dilute sulfuric acid, filter and collect the residue.
D   Adding excess lead metal to dilute nitric acid, filter, and followed by adding dilute sulfuric acid to filtrate.

7. Solid R is gradually added to aqueous solution S. The change in pH are shown in the graph below.

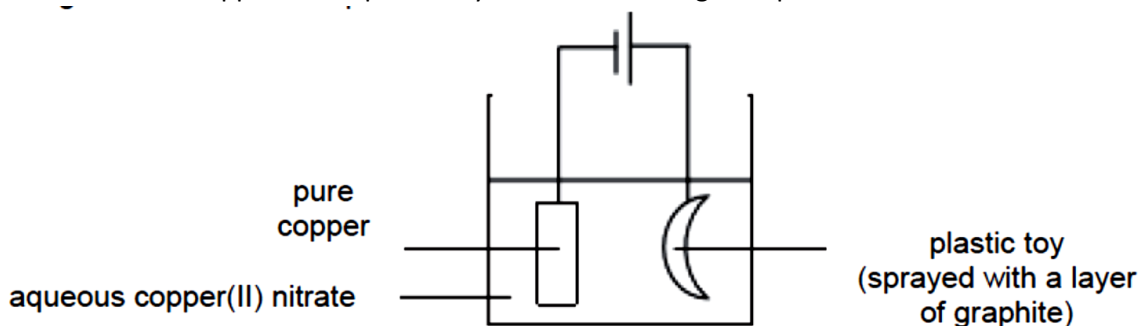
What are R and S?

	R	S
A	insoluble metal oxide	hydrochloric acid
B	insoluble non-metal oxide	sodium hydroxide
C	soluble metal oxide	hydrochloric acid
D	soluble non-metal oxide	sodium hydroxide

8. 8g sample of oxygen atoms contains the same number of atoms as 16 g of element X. What is X?

   What is X?

   A   helium
   B   sodium
   C   sulfur
   D   xenon

9. Which of the following would produce the greatest number of electrons when they are completely discharged during electrolysis?

   A   4 mol of aluminium ions
   B   5 mol of hydroxide ions
   C   6 mol of copper(II) ions
   D   7 mol of oxide ions

10. A student decides to copper-coat a plastic toy with the following set-up:

pure
copper

aqueous copper(II) nitrate

plastic toy
(sprayed with a layer
of graphite)

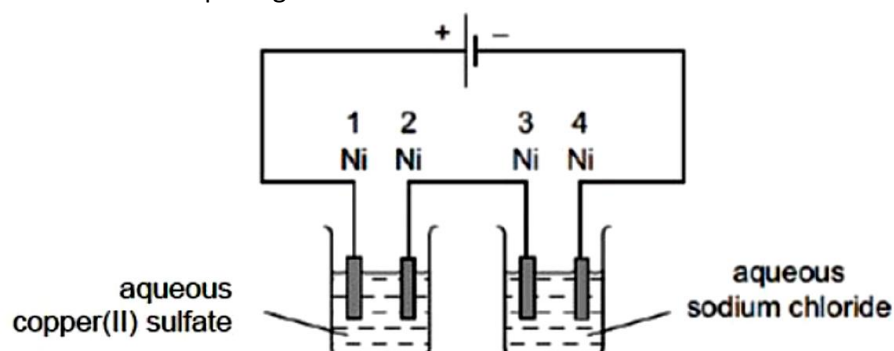   The experiment failed and no copper was deposited on the plastic toy.

   Which statement best explains why the experiment failed?

   A   The electrolyte used should be aqueous silver nitrate.
   B   The plastic toy should not be submerged in the electrolyte.
   C   The plastic toy should not be sprayed with a layer of graphite.
   D   The pure copper strip should be attached to the positive electrode.

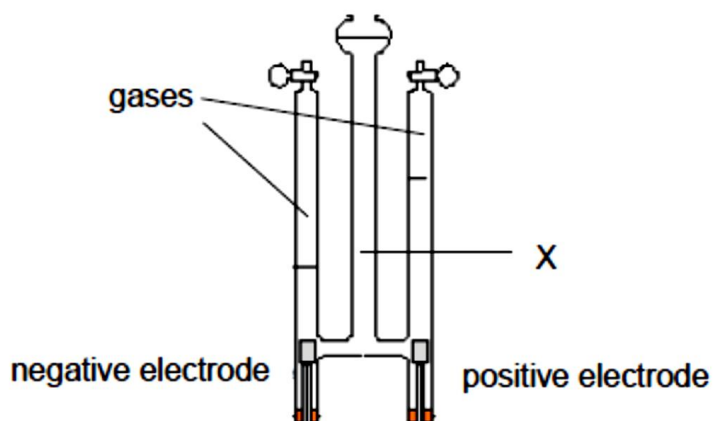11. The diagram shows the electroplating of nickel with a different metal.

Which nickel electrode(s) is/ are plated with a metal?

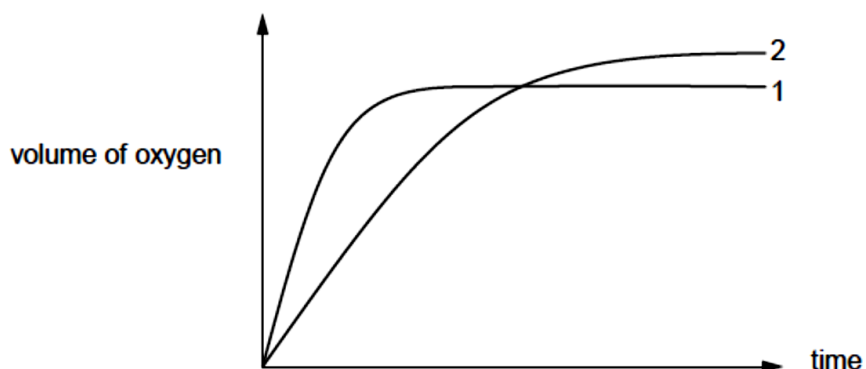A   1 only
B   1 and 3 only
C   2 only
D   2 and 4 only

12. The diagram shows the electrolysis of substance X after a few hours:

What substance could X be?

A   copper(II) sulfate solution
B   concentrated hydrochloric acid
C   silver nitrate solution
D   sodium chloride solution

13. In the graph, curve 1 was obtained when 100 cm^3 of 1.0 mol/dm^3 of hydrogen peroxide solution was decomposed and catalysed by manganese (IV) oxide.

Which alteration to the original experimental conditions would produce curve 2?

A   adding some 0.1 mol/dm^3 hydrogen peroxide solution
B   lowering the temperature
C   using a different catalyst
D   using less manganese(IV) oxide

A Parting Note

I hope you had fun doing these questions! This is what we do in Aspire Thinking – we take a look at questions that challenge our understanding of concepts and we discuss about them in class.

Over time, doubts and misunderstandings get cleared and we become more familiar with laws, formulae and applications. As a result, we get better at answering questions and thus, students score a better grade over time.

Keep looking for challenging questions to do and discuss them with your teachers or friends. Or you can come for our classes as well. Every time you work on questions, you are one step closer to scoring better.

In the next page, you will the answer key with brief explanation. Read the explanation thoroughly, especially for those questions that were answered wrongly. Sometimes you may need to read more than once. That is normal. At the end of it, you will feel yourself becoming more familiar with topic and that is what learning is about.

Contact us at 8749 8157 to find out more on class fees and schedules

Text "AspireT" and get 50% off for first 4 lessons!

Ans Key with Brief Explanation

1. C. When charcoal reacts with carbon dioxide, carbon monoxide is produced (you can check this under metals – blast furnace extraction of iron). However, some carbon dioxide may not have reacted and would move on to the next section. Thus, S will be used to remove the unreacted carbon dioxide gas.

   What could S be? Ans: Limewater.

   What about the other answers? It is not possible for hydrogen chloride to escape from the flask and even if it did, it would have dissolved in the water to form hydrochloric acid. Also, calcium carbonate, being a solid, could not have travelled through the tubes.

2. D. Since we are given the relative atomic mass and asked to find the relative abundance, we will use algebra to work backwards and solve this.

   Let the relative abundance of K-39 be X and K-41 would be 1-X. (X)39 + (1-X) 41 = 39.14, therefore X = 0.93 or 93%

   Oftentimes, we will encounter questions asking us to find the relative atomic mass but we may also encounter questions asking us to find relative abundance instead. Algebra is a good way to work backwards.

3. B. The first thing to do is to determine the electronic configuration of all the elements – P is 2.4, Q is 2.6, R is 2.8.7, S is 2.8.8.1

   You will then find that S is the only metal and its ion has a charge of 1+. Q ion has a charge of 2- so it takes 2 S ions to bond with 1 Q ion. So S_2Q makes sense and it is definitely ionic since it's compound that has anion and cation.

   P needs 4 more electrons to be stable whereas Q only needs 2 more electrons. So 1 P atom will require 2 Q atoms to share electrons and form a covalent compound.

4. B. A hydrogen atom only needs 1 more electron to be stable so it can only form a maximum of 1 bond whereas an oxygen needs 2 more electrons to be stable so it can form a maximum of 2 bonds. B is the only one that makes sense because each H has only 1 bond and each O has 2 bonds.

5. C. The flue gas mixture has to contain an alkaline and an acidic gas due to the litmus change in color. In addition, C has oxygen gas which is an oxidising agent which would cause the potassium iodide to turn brown. Sulfur dioxide and ammonia are reducing agents which would cause the potassium maganate (VII) to turn colorless.

   What is flue gas? Flue gas is the gas exiting to the atmosphere via a flue, which is a pipe or channel for conveying exhaust gases from a fireplace, oven, furnace, boiler or steam generator. Quite often, the flue gas refers to the combustion exhaust gas produced at power plants. The composition of the flue gas depends on what is being burned at the plant.

6. D. The key to this question is that if one of your reactants is a solid, you are going to get a low yield. Why? Because lead (II) sulfate is a solid and so it will form an impervious layer around any solid reactant, preventing the latter from reacting with substances such as acids. This will then stop the reaction which will not be the best to get a salt.

   For option A, lead (II) hydroxide is insoluble and so is a solid. In B, lead (II) carbonate is insoluble. In C, lead is a solid. In D, you will get lead (II) nitrate from the reaction with nitric acid which is soluble as all nitrate salts are soluble. When added with sulfuric acid, lead (II) sulfate will be produced via precipitation reaction which will give a high yield since there is no solid reactant for lead (II) sulfate to form a layer around.

7. A. Since the pH started low, S must be an acid. The pH increased and stayed flat at 7 so, R must be an insoluble metal oxide as soluble metal oxides will form hydroxides and increase the pH level.

8. C. If both have the same number of atoms, it means they have the same number of moles (Avogadro's number). Thus no. of moles oxygen atoms = 8/16 = no. of moles X atoms. 0.5 = 16/Ar of X, therefore, Ar of X = 32 which is sulfur.

   Why do we just divide by 16 for oxygen and not 32 (which is the Mr of oxygen)? Because these are oxygen ATOMS and not oxygen MOLECULES.

9. D. The discharge of hydroxide ions is as follows: $4OH^-$ (aq) $\rightarrow 2H_2O$ (l) + O_2 (g) + $4e^-$. Based on this equation, 5 mols of hydroxide ions would produce 5 moles of electrons.

   The discharge of oxide ions: $2O^{2-} \rightarrow O_2 + 4e^-$, so 7 mols of oxide ions would produce 14 mols of electrons.

   Metals do not discharge electrons as they need to take in electrons in order to be discharged or neutral.

10. D. This is a question on anodizing. In order to electroplate the toy, the toy must be connected to the negative terminal so that the positive copper (ii) ions can be attracted to the toy.

    Why must the toy be covered with graphite layer? So that it is conductive, allowing the copper (ii) ions to be discharged upon contact. What are the other conditions for anodizing? Refer to your school notes.

11. C. Don't let the word 'electroplate' throw you off. You would be wondering why the anode isn't copper and then think that this question doesn't make sense. However, electroplating can happen so long a metal is discharged at the cathode and is 'coated' onto another material.

    Copper is below hydrogen in the electrochemical series. Thus, it travels to the lower potential nickel electrode and is discharged to form copper solid which is coated on the electrode. Sodium, on the other hand, is highly reactive and above hydrogen in the

9

electrochemical series. Thus, it is not discharged and so no other electrodes are plated.

12. D. Observe the volume of the gases collected. The ratio is about 2:1. Only option D will produce gases in the 2:1 ratio.

As sodium and chlorine are high in the electrochemical series, none of their ions get discharged and only the hydrogen and hydroxide ions get discharged. Thus, the overall electrolysis equation is: $2H_2O \rightarrow 2H_2 + O_2$, due to the mole ratio of $H_2:O_2$ being 2:1, the volume of gases collected will also be 2:1.

Why are we able to compare moles ratio directly to volume ratio without using any formula? This is because all gases occupy a standard molar volume at room temperature and pressure. We will not be able to do this if they were solids.

13. A. The keyword is 'alteration'. By adding some more hydrogen peroxide of lower concentration, we are diluting the mixture which will then decrease the speed of reaction due to lower number of reactants per unit volume.

However, by adding in more hydrogen peroxide, we are increasing the number of moles of it which will then cause the curve to 'flat' at a higher point due to higher yield. The other options do not increase yield. You need to have more reactants in order to increase yield.

How did you score?

If you scored between 50-70%, it means you have will be learning or have learned quite a lot from this simple exercise. Good for you. You have progressed in chemistry with greater knowledge of the chemical reactions. But there is much more for you to do. I recommend that you finish all the questions in TYS at the very least and then work on school paper questions after that.

If you scored between 70-90%, it means you are doing well in chemistry and you just need to find more challenging questions. Keep grinding and you will work your way to an A grading. Be sure to work more on your paper 2 questions such as those that require you to answer with the right keywords as well as the data-based ones.

If you scored a 100%, then good for you. You have good mastery of the fundamentals. Be sure of to work more on your paper 2 questions such as those that require you to answer with the right keywords as well as the data-based ones.

Keep working hard and have fun while learning! We have more questions like these every week during our lessons.