Knowledge Quizzes

Triple Chemistry

June 2022

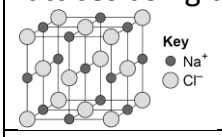
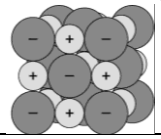
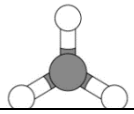
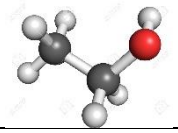
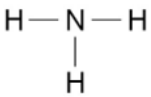
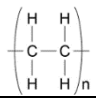
Tips:

- Learn one quiz at a time. Cover the right hand side and go through each question, checking the answers as you go.
- Get a friend or family member to quiz you – in random order
- When you are feeling confident, cover the right side and write the answers to all the ones you can, then check.

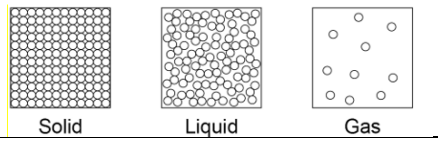
4.1.2 Periodic Table

Question	Answer
1. What is used to order the elements in the modern periodic table?	Atomic number / proton number
2. What was used in early versions of the periodic table?	Atomic weight
3. What do all elements in the same group have in common?	Same number of electrons in the outer shell
4. What did Mendeleev do in his periodic table?	Left gaps for undiscovered elements
5. What do we call atoms with the same number of protons but different numbers of neutrons?	Isotopes
6. What do we call the elements that react to form positive ions?	Metals
7. What type of elements form negative ions?	Non-metals
8. Give 3 properties of metals	Conduct electricity, conduct heat, shiny when fresh cut
9. Give 3 properties of non-metals	Don't conduct electricity, low melting and boiling points, dull
10. Why are group 0 elements unreactive?	They have full outer shells so do not need to gain or lose any electrons
11. What happens to the melting and boiling points of group 0 as you come down the group?	The melting and boiling points increase down the group
12. What are the group 1 metals called?	Alkali metals
13. What happens to reactivity coming down group 1?	Reactivity increases down the group
14. Why does this happen?	The outer shell electron is further away from the nucleus and more shielded, so is more easily lost
15. What are the two products when a group 1 metal reacts with water?	An alkali and hydrogen gas
16. What can be added to the solution to prove an alkali has formed?	Universal indicator
17. What are the group 7 elements called?	Halogens
18. How many electrons are in their outer shells?	7
19. What happens to melting and boiling point coming down group 7?	It increases
20. Why does this happen?	The molecules get bigger, so the intermolecular forces are stronger and so it takes more energy to overcome the forces
21. What happens to reactivity coming down group 7?	Reactivity decreases down the group
22. Why does this happen?	The outer shell is more shielded and further away, so it gets harder to attract an electron into the outer shell
23. When a more reactive halogen is added to a solution of a compound of a less reactive halogen, what happens?	The more reactive halogen displaces the less reactive one
24. What sort of compounds do group 7 elements form with metals?	Ionic
25. Describe 2 properties of these compounds	White crystalline solids, high melting points

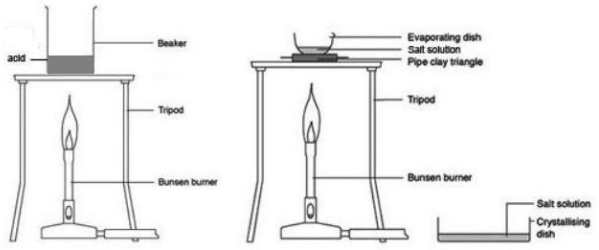
4.2.1 Chemical Bonds

Question	Answer
1. What are the 3 types of bonds?	Ionic, covalent, metallic
2. What type of particles form ionic bonds?	Metals and non-metals
3. What is a covalent bond?	A shared pair of electrons
4. What type of particles form covalent bonds?	Non-metal atoms
5. What do the particles share in metallic bonding?	Delocalized electrons
6. Where is metallic bonding found?	Metals and alloys
7. What type of elements lose electrons to form positive ions?	Metals
8. What type of elements gain electrons to form negative ions?	Non metals
9. What type of force holds the ions together in the ionic lattice?	Electrostatic
10. Which group in the periodic table do ions resemble?	The noble gases
11. Name one problem with representing ionic lattices using this diagram: 	It looks like there is space between the ions
12. Name one problem with representing ionic lattices using this diagram: 	The ions look like solid spheres
13. Name one problem with representing covalent molecules using this diagram: 	The atoms look like solid spheres and they all look the same size
14. How would you use the diagram below to write the formula for the compound it represents? 	Count the number of each type of atom and then use it to write the formula, eg C_2H_5OH
15. What is the problem with using a diagram like the one below to represent covalent molecules? 	There is no indication of the shape of the molecule
16. What are the two types of covalent substance?	Simple molecular and giant
17. What holds metals together in metallic bonding?	Attraction between the metal ions and the delocalized electrons
18. What does the 'n' represent in polymer diagrams? 	A large number

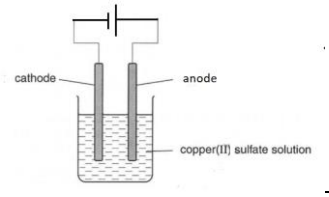
4.2.2 and 4.2.3 bonding and properties

Question	Answer
1. What does an (s) in an equation mean?	Solid (insoluble)
2. What state of matter is represented by (l)?	Liquid
3. How would a gas be represented in an equation?	(g)
4. What two changes of state can happen at the melting point?	Melting and freezing
5. What two changes of state can happen at the boiling point?	Boiling and condensing
6. What does (aq) mean?	Aqueous solution – dissolved in water
7. What forces of attraction are found in ionic compounds?	Electrostatic
8. Why are the melting and boiling points of ionic compounds so high?	The electrostatic forces are strong so it takes lots of energy to overcome all of them in the ionic lattice
9. Name a limitation with using the particle model shown below: 	• There are no forces shown between the particles • No movement is shown • Particles are represented as solid spheres
10. Why are carbon dioxide and oxygen gases at room temperature?	Because their boiling point is lower than room temperature (they are simple covalent molecules)
11. Why do small molecules have low melting and boiling points?	The forces between the molecules are weak and don't need much energy to overcome
12. What happens to melting and boiling points as molecules get bigger and why is this?	They increase because the intermolecular forces get stronger
13. Why do simple covalent molecules not conduct electricity?	The molecules have no overall charge
14. What sort of bonding is found in polymers?	Covalent
15. Why are polymers normally solids at room temperature?	Because they are large molecules so the forces of attraction are fairly strong
16. What sort of structures are diamond, graphite and silica examples of?	Giant covalent structures
17. Why do they have high melting and boiling points?	Lots of energy is needed to break all the strong covalent bonds
18. What sort of bonding is found in metals like gold and silver?	Metallic
19. Why do metals conduct electricity?	Because they have delocalized electrons that are able to move through the metal
20. Why are pure metals easily bent and shaped?	The layers of atoms are able to slide over each other easily
21. What is an alloy?	A mixture of metals
22. Why are alloys stronger than pure metals?	Because the layers are disrupted so they cannot slide
23. How many other carbon atoms is each carbon bonded to in diamond?	4
24. Why is diamond hard?	Giant structure of very strong covalent bonds
25. How many bonds does each carbon make in graphite?	3
26. Why does graphite conduct electricity?	It has delocalized electrons that can move through the graphite
27. Why is graphite slippery?	Graphite is in layers and they are able to move over each other
28. What is graphene?	A single layer of graphite
29. What type of molecules is shown? 	Fullerene
30. What type of structure is shown in the diagram: 	nanotube

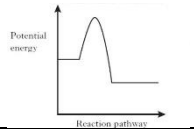
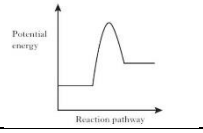
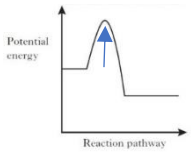
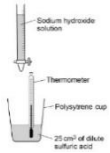
4.4.1 and 4.4.2

Question	Answer
1. What is oxidation?	Combining with oxygen OR loss of electrons
2. What is reduction?	Loss of oxygen OR gain of electrons
3. What makes one metal more reactive than another?	How easily it forms an ion
4. Which element is used to extract less reactive metals from their ores?	Carbon
5. What are the products when metals react with acids?	Salt and hydrogen gas
6. What is produced when acids react with bases?	Salt and water
7. What is an alkali?	A soluble base – contains OH^- ions
8. What type of salt is formed if hydrochloric acid is neutralized?	Chloride
9. What type of salt is formed if sulfuric acid is neutralized?	Sulfate
10. What type of salt is formed if nitric acid is neutralized?	Nitrate
11. How can soluble salts be obtained from solutions?	Crystallization / evaporation
12. Which particle makes a solution acidic?	H^+
13. Which particle makes a solution alkaline?	OH^-
14. Write the ionic equation for neutralization	$H^+ + OH^- \rightarrow H_2O$
15. What is the range of pH in the pH scale?	0-14
16. How can pH be measured?	Using universal indicator or a pH probe
17. What is the pH of a neutral solution?	7
18. What is the pH of an acid?	0-6.9
19. What is the pH of an alkali?	7.1-14
20. What is a strong acid?	One that fully ionizes/dissociates in solution
21. Why do weak acids have higher pH than strong ones?	They do not fully dissociate in solution and weaker acids have a pH closer to 7
22. When the pH changes by 1, what is the change in H^+ ion concentration?	X 10
Q 23 –31 relate the equipment below which can be used to make copper chloride 	
23. Which acid should be used?	Hydrochloric (to give a chloride)
24. Why is the acid heated?	To speed up the reaction
25. Name a suitable base to neutralize the acid	Copper oxide or copper carbonate
26. Why can copper metal not be used?	Copper does not react with acids
27. Why is the base added in excess?	To make sure the acid is fully neutralized
28. How would you know when the base is in excess?	Solid collects at the bottom of the beaker
29. How could the excess base be removed?	Filter
30. How would the salt be obtained from the solution?	Crystallization / evaporation
31. Name a piece of equipment that the dish could be placed in to crystallise the solution safely	Drying oven

4.4.3 Electrolysis

Question	Answer
1. Why can ionic compounds conduct electricity when molten or in solution?	The IONS can move
2. Why can ionic compounds NOT conduct electricity when they are solids?	The ions are unable to move as they are stuck in the lattice
3. What is an electrolyte?	A solution or liquid that is able to conduct electricity
4. What is electrolysis?	Splitting (NOT separating) a compound using electricity
5. What is the name of the negative electrode?	Cathode
6. What is the name of the positive electrode?	Anode
7. What happens to positive ions at the cathode?	They gain electrons (reduced) to become atoms
8. What happens to negative ions at the anode?	They lose electrons (oxidized) to become atoms
9. What is the gain of electrons called?	reduction
10. Which metals are extracted by electrolysis?	Metals that are too reactive to be reduced using carbon
11. Why does electrolysis use a lot of energy?	Lots of energy is needed to melt ionic compounds and then the production of the electric current
12. Why is graphite used in the electrodes?	Because it has delocalized electrons that can move and so it conducts electricity
13. Why is cryolite added to aluminium oxide before electrolysis?	To lower the melting point
14. What is formed at the cathode in the electrolysis of aluminium oxide?	Aluminium
15. What is the product at the anode in the electrolysis of aluminium oxide?	Oxygen
16. Why do the anodes need to be continually replaced?	The oxygen produced reacts with the carbon electrodes to make carbon dioxide
17. What does (aq) mean?	Dissolved in water – an aqueous solution
18. Which ions are also present if an ionic compound is dissolved in water and then electrolysed?	H^+ and OH^- ions
19. Why does hydrogen form at the cathode when solutions are electrolysed?	If the metal in the solution is more reactive than hydrogen, then hydrogen will be released
20. What is formed at the anode if solutions are electrolysed?	Oxygen or, if a halogen is present, the halogen (group 7 element)
21. What is the ionic equation for the formation of oxygen at the anode?	$4OH^- - 4e^- \rightarrow O_2 + 2H_2O$
Questions 22-27 are about the following equipment, used to electrolyse a solution of copper sulphate 	
22. Complete the diagram to label the other electrode and to complete the supply of electricity	
23. Which ions are present in the solution?	Cu^{2+} H^+ SO_4^{2-} OH^-
24. What will be formed at the cathode and why?	Copper – as it less reactive than hydrogen
25. What will be formed at the anode and why?	Oxygen – there is no halogen present
26. Name a solution that could be used instead of copper sulphate to produce hydrogen at the cathode	Potassium sulphate (substitute any metal that is more reactive than copper)
27. Name a solution that could be used instead of copper sulphate to produce chlorine at the anode	Copper chloride

4.5.1 Endothermic and exothermic reactions

Question	Answer
1. What is activation energy?	The minimum amount of energy needed to get a reaction started
2. What is an exothermic reaction?	One in which energy is transferred to the surroundings
3. Give 3 examples of exothermic reactions	Combustion, neutralization, oxidation reactions
4. Give an everyday use of exothermic reactions	Self heating cans and hand warmers
5. What is an endothermic reaction?	One in which energy is transferred from the surroundings to the reaction
6. Give 2 examples of endothermic reactions	Photosynthesis, thermal decomposition
7. What is energy needed for in a reaction?	In order to break bonds in the reactants
8. When is energy released during a reaction?	When new bonds are made in the products
9. When is a reaction exothermic overall?	If more energy is released when bonds are made than was needed to break bonds
10. When would a reaction be endothermic overall?	When more energy was required to break bonds than was released when bonds were made
11. How do you use a bond energy table like the one below to calculate the energy transferred? $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI(g)$ Bond: H-H, Average Bond Energy / kJmol^{-1}: + 436 Bond: I-I, Average Bond Energy / kJmol^{-1}: + 151 Bond: H-I, Average Bond Energy / kJmol^{-1}: + 298	Add up the energy used in breaking bonds and subtract the amount of energy released when bonds are made in the products, e.g: 436 + 151 = 587 required 2 x 298 = 596 released 587-596 = -9kJ
12. What type of reaction is represented by the diagram shown: 	Exothermic
13. What type of reaction is represented by the diagram shown: 	Endothermic
14. Draw an arrow on the diagram to represent the activation energy	 Do NOT just draw an arrow pointing to the tip of the slope – it should be from the level of the reactants line
Questions 15 – 19 relate to the equipment below which can be used to investigate the variables that affect temperature change by testing 'The temperature change in the solution depends on the volume of sodium hydroxide added' 	
15. Why is a polystyrene cup used for the reaction instead of a beaker?	To **reduce** energy transfers (don't say 'stop')
16. How could energy losses be reduced further?	Put a lid on the cup
17. If the reaction is exothermic, what happens to the temperature?	It will increase
18. A digital temperature probe can be used instead of a thermometer. How could this affect the readings' a) accuracy b) resolution	a) It would increase the accuracy as the digital readout is easier to read b) resolution could be increased if the probe can measure to 1 or two decimal places
19. Name 3 control variables for the experiment	Concentration of both acid and alkali, volume of acid, starting temperature of the liquids (NOT the 'temperature of the room')