CC1a- States of matter

1 **What are the three states of matter?**

solid, liquid, gas

2 **In which state are the particles arranged regularly?**

solid

3 **In which state do particles move quickly in all directions?**

gas

4 **What state change happens when a substance melts?**

solid to liquid

5 **What state change happens when a substance condenses?**

gas to liquid

6 **In general, which state of matter has particles with the highest energy?**

gas

7 **What is the melting point of water in °C?**

0

8 **What is the boiling point of water in °C?**

100

9 **When a substance is melted, is energy transferred to or from the surroundings?**

from

10 **The melting point of sodium is 97.7°C. What is the state of sodium at 25.0°C?**

solid

CC2a- Mixtures

1 **Gold is a pure substance.**

True

2 **Air is a mixture.**

True

3 **Carbon dioxide is a mixture.**

False

4 **Pure substances only have one type of atom present.**

False

5 All mixtures are made up of compounds.

False

6 Pure substances have a sharp melting temperature.

True

7 A metal alloy is likely to melt over a range of temperatures.

True

8 The temperature changes as a pure substance melts.

False

9 When a substance melts, its particles move around and become less ordered.

True

10 A heating curve with an upward sloping gradient during melting indicates a pure substance is present.

False

CC2b- Filtration and Crystallisation

1 **What is a mixture?**

different elements and/or compounds that are not chemically joined together

2 Which is a mixture, air or water or both?

air

3 Which of a 'mixture' or a 'pure substance' has a fixed composition?

pure substance

4 Name a pure substance.

any suitable

5 Why can't a pure substance be separated into other substances using physical means?

it has the same fixed composition in all of its parts

6 **Is melting a physical process or a chemical process?**

physical

7 **Is a material that melts over a range of temperatures likely o be a mixture or a pure substance?**

mixture

8 Give one safety precaution to take when heating substances.

any suitable

9 **What do we call the change of state from a liquid to a gas?**

evaporation

10 Name a mixture that could be separated by filtration?

any suitable

CC2c- Paper Chromatography

1 What is a pure substance?

any from: cannot be separated by physical means; same composition throughout; same properties throughout; constant chemical composition

2 What is the difference between a mixture and a compound?

in a compound, different elements are joined chemically

3 Is salty water a mixture or a compound?

mixture; strictly, a mixture of two compounds

4 How can you separate sand mixed with salty water?

filtration

5 Why can't you use this method to get the salt from salty water?

salt has dissolved; pieces are too small

6 How can you get salt from salty water?

evaporate the water; crystallisation

7 **What is the scientific name for a mixture like salty water?**

solution

8 What is the term used for the liquid in a solution?

solvent

9 **What is the term for the substance that has dissolved in the solution?**

solute

10 **How can you identify a pure substance on a chromatogram?**

only one spot/colour

CC2d – Distillation

1 **What are the three states of matter?**

solid, liquid, gas

2 **What word describes a solid that dissolves in a liquid?**

solute or soluble

3 **What name is given to a liquid that will dissolve a particular solid?**

solvent

4 **What is the boiling point of water?**

100 °C

5 **How can we separate an insoluble solid from a liquid?**

filtration

6 **What word describes the clear liquid that comes through the filter paper?**

filtrate

7 **Is mineral water pure or impure?**

impure

8 **What process takes place when a liquid turns into a gas?**

evaporation

9 **What process takes place when a gas turns into a liquid?**

condensation

10 **What process takes place when a liquid is changing from a liquid to a gas throughout its volume (not just at its surface)?**

boiling

CC2e – Drinking Water

1 **Which of these, if any, is pure water? Mineral water, tap water, sea water.**

none of them

2 **Give an everyday use of tap water.**

drinking/cooking/washing/cleaning/flushing toilets

3 **Which of these is soluble in water – sand or salt?**

salt

4 **What separation method is used to remove insoluble solids from a liquid?**

filtration

5 **What is the boiling point of water in degrees Celsius?**

100

6 **What separation method could you use to separate water from ink?**

distillation/simple distillation

7 **Name the two state changes involved in distillation.**

boiling/evaporating, condensing

8 **Why does sand sink to the bottom of a bucket of water?**

it is denser than water/does not dissolve

9 **What gas with a sharp smell is used to kill bacteria in swimming pool water?**

chlorine

10 **Why does sea water taste salty?**

it contains dissolved salt

CC3a – Structure of an atom

1 **What 'A' is all matter made of?**

atoms

2 **Which scientist first came up with a model of what atoms look like?**

Dalton

3 **How did Dalton describe atoms?**

tiny indestructible spheres

4 **How did he use his model to explain elements?**

all the atoms in an element were identical (and different from other elements)

5 **What is the difference between an atom and a molecule?**

molecules contain two or more atoms chemically joined together in a group

6 **How did Dalton explain what happened when compounds were formed?**

atoms of different elements joined together to form the compound

7 **What tiny particles flow in an electric current?**

electrons

8 **What charge do these particles have?**

negative

9 **What other particles are found in an atom?**

protons and neutrons

10 **What is the nucleus of an atom?**

tiny central part of an atom made up of protons and neutrons

CC3b – Atomic number and mass number

1 **How have Dalton's ideas about atoms changed?**

atoms are not indestructible but are made up of smaller particles

2 **What are the names of the three main subatomic particles?**

protons, neutrons, electrons

3 **What is the nucleus of an atom made up of?**

protons and neutrons

4 **How are electrons arranged in an atom?**

circling/orbiting the nucleus in regions called shells

5 **How do protons and electrons compare in terms of relative charge?**

protons have a positive (+1) charge and electrons have a negative (−1) charge

6 **Why are most atoms neutral?**

they have the same number of protons and electrons – and so equal positive and negative charges

7 **What is the fundamental difference between atoms of different elements?**

they contain different numbers of protons

8 **How does the size of a nucleus compare to the size of the atom?**

the nucleus is tiny compared to the size of the atom

9 **How many protons are there in an atom with an atomic number of 26?**

26

10 **How many neutrons are there in an atom with an atomic number of 26 and a mass number of 56?**

30

CC3c – Isotopes

1 **Which subatomic particles are found in the nucleus of most atoms?**

protons and neutrons

2 **What does the atomic number of an atom tell you about its structure?**

the number of protons in an atom

3 **What does the mass number of an atom equal?**

the number of protons plus the number of neutrons

4 **What will be the same about atoms of the same element?**

they have the same atomic number and same number of protons

5 **Where is most of the mass of an atom found?**

in the nucleus

6 **Which subatomic particles in an atom have negligible mass?**

electrons

7 **How many electrons are in an atom with a mass number of 56 and an atomic number of 26?**

26

8 **How many protons, neutrons and electrons are in an atom that has an atomic number of 13 and a mass number of 27?**

13 protons, 14 neutrons, 13 electrons

9 **What are isotopes?**

atoms with the same atomic number but different mass numbers

10 **What type of atom is used as the standard for comparing masses and working out relative atomic masses of elements?**

carbon-12

CC4a – Elements and the periodic table

1 **Which element has the chemical symbol O?**

oxygen

2 **What is the chemical symbol for carbon?**

C

3 **Which element has the chemical symbol Mg?**

magnesium

4 **What is the chemical symbol for sodium?**

Na

5 **Which type of substance is found in the periodic table – elements, compounds or mixtures?**

elements

6 **What is a vertical column in the periodic table called?**

group

7 **What is a horizontal row in the periodic table called?**

period

8 **What do we use to compare the masses of atoms of different elements?**

relative atomic masses

9 **Name the Russian chemist who developed a periodic table in 1869.**

Mendeleev/Dmitri Mendeleev

10 **In general, what is a scientific prediction?**

what you think will happen and why you think this

CC4b – Atomic number and the periodic table

1 **In what year did Mendeleev first develop a periodic table?**

1869

2 **About how many elements are there in the modern periodic table?**

about 100–118

3 **Where are the non-metals placed in the modern periodic table?**

right-hand side/top right

4 **Which number tells you how many protons there are in a nucleus?**

atomic number/proton number

5 **Sodium atoms have 11 electrons. How many protons do they have?**

11

6 **Where are electrons found in an atom?**

around the nucleus/in shells/in energy levels

7 **What is a period in the modern periodic table?**

a row of elements

8 **What is a vertical column in the modern periodic table called?**

group

9 **Which element's position was swapped with tellurium by Mendeleev?**

iodine

10 **What property did Mendeleev use to order the elements?**

atomic weight/relative atomic mass

CC4c – Electronic configurations and the periodic table

1 **What did Mendeleev's atomic numbers show?**

an element's position in the periodic table

2 **What do modern atomic numbers tell you about an atom?**

the number of protons in the nucleus

3 **Where are elements with similar properties placed in the periodic table?**

in groups/columns

4 **Where do the atomic numbers increase by 1 each time in the periodic table?**

in a period

5 **Where are the shells found in an atom?**

around the nucleus

6 **Why might a modern periodic table have gaps in it?**

for as yet undiscovered/synthesised elements

7 **Name a group 0 element.**

helium/neon/argon/krypton/xenon/radon/ununoctium

8 **Is an atom a zero-, one-, two- or three-dimensional object?**

three-dimensional

9 **Name the physicist who discovered a relationship between atomic number and X-rays emitted by atoms bombarded by electrons.**

Moseley/Henry Moseley

10 **The atomic number of chlorine is 17. How many electrons do its atoms have?**

17

CC5a – Ionic Bonds

1 **What can link two atoms together?**

a bond

2 **Which group of elements is stable and doesn't form compounds easily?**

noble gases/group 0 in the periodic table

3 **How is an element's electron arrangement linked to its position in the periodic table?**

Elements in the same group have the same number of electrons in their outer shell.

4 **How do positive and negative charges affect each other?**

The attract each other.

5 **Which sub-atomic particles of atoms take part in chemical reactions?**

electrons

6 **How many protons, neutrons and electrons are in an atom that has a mass number of 22 and an atomic number of 10?**

10 protons, 12 neutrons and 10 electrons

7 **How are the 12 electrons arranged in an atom of magnesium?**

They are arranged in shells in order 2.8.2.

8 **What does the notation $^{30}_{14}Si$ tell you about an atom?**

It is a silicon atom with 14 protons, 16 neutrons and 14 electrons.

9 **What is an ion?**

an atom that is charged because it has lost or gained one or more electrons

10 **What happens when an ionic bond is formed?**

One atom loses electrons to another atom to form oppositely charged ions that attract each other.

CC5b – Ionic lattices

1 **What kinds of elements are usually involved in the formation of ionic bonds?**

metals and non-metals

2 **What is an ion?**

an atom that has become charged (by the loss or gain of electrons)

3 **How is a positive ion formed and what is it called?**

formed by the loss of electrons; cation

4 **How is a negative ion formed and what is it called?**

formed by the gain of electrons; anion

5 **What are the forces called that hold ions together?**

electrostatic forces

6 **Why do atoms form ions?**

to become more stable (like a noble gas)

7 **Explain why group 1 elements like sodium and lithium form a 1+ ion.**

They both have one electron in their outer shell and lose it to become stable.

8 **What are the charges on calcium, oxide and chloride ions?**

2+, 2– and 1–

9 **What structure of regularly repeating ions do ionic compounds form?**

lattice structure

10 **What is the formula of the nitrate ion?**

NO_3^-

CC5c – Properties of ionic compounds

1 **What is the general name for a positive ion?**

cation

2 **What is the general name for a negative ion?**

anion

3 **What is the charge on the ions of elements in group 1 of the periodic table?**

+1

4 **What is the charge on the ions of elements in group 6 of the periodic table?**

–2

5 **What happens to the electrons in the outer shell of metal atoms when they form ions?**

they are lost

6 **How many protons are there in one ion of $^{27}_{13}\mathbf{Al3+}$?**

13

7 **How many neutrons are there in one ion of $^{27}_{13}\mathbf{Al3+}$?**

14

8 **How many electrons are there in one ion of $^{27}_{13}\mathbf{Al3+}$?**

10

9 **What is the name of the ionic compound containing calcium and bromine only?**

calcium bromide

10 **What is the name of the ionic compound containing potassium, chlorine and oxygen?**

potassium chlorate

CC6a – Covalent compounds

1 **What does a bond do in an element or compoun**d?

holds atoms together

2 **What are electrostatic forces of attraction?**

attractions between positive and negative charges

3 **Which part of an atom's structure is most involved when two atoms react?**

the electrons

4 **How many electrons are in the outer shell of the elements in groups 5, 6 and 7?**

5, 6 and 7

5 **What kind of electron arrangement is most stable?**

a complete/full outer shell

6 **What is the molecular formula of the very common compound formed between hydrogen and oxygen?**

H_2O

7 **How many more electrons does an oxygen atom need to get a complete outer shell?**

2

8 **What are molecules?**

groups of atoms held together by (covalent) bonds

9 **What kinds of elements usually form molecules?**

non-metals

10 **What kinds of bonds are found in molecules?**

covalent

CC7a – Molecular Compounds

1 **What type of compound is formed by the loss and gain of electrons?**

ionic compound

2 **What type of forces hold atoms together within molecules?**

electrostatic forces

3 **What is the name of the type of bond formed by sharing electron pairs within molecules?**

covalent

4 **What term describes the number of atoms of each element bonded together in molecule?**

molecular formula

5 **In oxygen and carbon dioxide, the atoms share two pairs of electrons. How do we describe these bonds?**

double bonds

6 **How strong are the forces of attraction between molecules compared to the bonds within molecules?**

They are relatively weak.

7 **Are simple molecules usually good conductors of electricity at room temperature?**

No, they are poor conductors of electricity.

8 **What is the name for lots of monomers joined together to form large molecular chains?**

polymers

9 **What simple molecule joins to form the large molecule poly(ethene)?**

ethene

10 **Why might simple molecules, such as methane, have low melting points?**

because they have weak intermolecular forces of attraction between them

CC7b – Allotropes of carbon

1 What are monomers?

small, simple molecules that can be joined to make polymers

2 What is poly(ethene) made of?

hydrogen and carbon or ethene monomers

3 What are polymers?

many monomers joined together

4 In what types of bonds are pairs of electrons shared?

covalent bonds

5 What is the monomer unit in poly(propene)?

propene

6 **Which has the higher melting point: poly(ethene) or the monomer it is made from?**

poly(ethene)

7 What are intermolecular forces?

forces of attraction between molecules

8 Do simple molecules have strong intermolecular forces between them?

No. They are described as weak.

9 Why are simple molecules poor conductors of electricity?

There are no charge carriers.

10 What can you say about the formula of small, simple molecules?

They are fixed.

CC7c – Properties of metals

1 What type of bonding is between the atoms in a molecule of water?

covalent

2 What type of structure does water have?

simple molecular

3 What strength of forces are there between different molecules of water?

weak

4 Does pure water conduct electricity?

no

5 **Which element can exist as diamond, graphite and fullerenes?**

carbon

6 **How are the carbon atoms arranged in a polymer?**

chains

7 **What type of structure do diamond and graphite have?**

(covalent), giant molecular

8 **What property of graphite enables it to be used in making electrodes?**

conducts electricity

9 **What is a typical property of a metal?**

high melting point, shiny when polished, malleable, high density, conducts electricity

10 **What does the term malleable mean?**

can be hammered or bent into a different shape

CC7d – Bonding models

1 **What type of bonding involves sharing electrons?**

covalent

2 **What kind of bonding and structure tends to be associated with low melting points and boiling points?**

covalent, simple molecular

3 **Which kind of bonding and structure allows substances to conduct electricity when solid?**

metallic

4 **What happens in terms of subatomic particles when ionic bonds are formed?**

loss and gain of electrons

5 **Why does sodium chloride conduct electricity when molten but not when solid?**

Ions are free to move when molten and the charged ions can carry the current.

6 **Name a substance that has a very high melting point and is a non-conductor of electricity in any state.**

diamond

7 **Why do lattice structures usually have high melting points?**

Lots of energy is needed to break so many (strong) bonds.

8 **Why does sodium metal conduct electricity?**

It contains freely moving outer electrons, and the charged electrons can carry the current.

9 Name two types of bonding model.

from: molecular formula; structural formula; dot and cross diagram all shells; dot and cross diagram outer shell only; 3D ball and stick; 2D space-filling; or 3D space-filling (other answers are possible)

10 Name a type of bonding model that is used to show what happens to the electrons in a covalent bond.

a dot and cross model

CC8a – Acids, alkalis and indicators

1 What term describes a substance that attacks metals, stonework and skin?

corrosive

2 Name an acidic solution found in the kitchen.

vinegar, fruit juice, etc

3 Name an alkaline solution used in the kitchen.

bleach, oven cleaner, soap, etc

4 What type of substance turns litmus paper red?

acid

5 How does an indicator show the acidity or alkalinity of solutions?

by changing colour

6 What pH values represent alkaline solutions?

above 7, or 8 to 14

7 What happens in all chemical reactions?

New substances are formed.

8 What kind of reaction occurs between an acid and an alkali?

neutralisation

9 What do you call a solution which is neither acidic nor alkaline?

neutral

10 Give the name and formula of a common laboratory acid.

hydrochloric acid (HCl), nitric acid (HNO_3), sulfuric acid (H_2SO_4), etc

CC8b – Looking at acids

1 Which ion is in excess in all acid solutions?

hydrogen ions or H^+ ions

2 Which ion is in excess in all alkali solutions?

hydroxide ions or OH^- ions

3 **What scale is used for measuring acidic and alkaline properties?**

the pH scale

4 **Name three examples of acid/alkali indicators apart from universal indicator.**

litmus, methyl orange and phenolphthalein

5 **What would you use to measure pH to one decimal place?**

a pH meter

6 **What pH values are acidic?**

below 7

7 **What colour is phenolphthalein in a solution with a pH of 2?**

colourless

8 **What happens to the pH as the H^+ ion concentration increases?**

it decreases

9 **If a solution has the same concentration of hydrogen ions as hydroxide ions, how is it described?**

neutral or pH = 7

10 **If 2 g of salt is dissolved in 250 cm^3 of solution, what is its concentration in g dm^{-3}?**

8 g dm^{-3}

CC8c- Bases and salts

1 **What word describes a solution that contains a large amount of solute in a small volume of solvent?**

concentrated

2 **How can a solution be made more dilute?**

by adding solvent/water

3 **If 24 g of acid is dissolved in 600 cm^3 of solution, what is its concentration in g dm^{-3}?**

40 g dm^{-3}

4 **What happens when strong acid molecules dissolve in water?**

They dissociate completely into ions.

5 **What kind of reaction occurs between an acid and a base?**

neutralisation

6 **What happens to the pH of an acid as it reacts with a neutraliser?**

The pH increases.

7 **What is formed when an acid reacts with a base like a metal oxide?**

salt + water

8 **What acid would be used to make zinc sulfate from zinc oxide?**

sulfuric acid

9 **What process can be used to separate an insoluble solid from a liquid?**

filtration

10 **How can a sample of a dissolved salt be obtained from a salt solution?**

evaporation of the water

CC8d Alkalis and balancing equations

1 **In general, what is the pH of an alkaline solution?**

greater than 7

2 **Which ions, hydrogen ions or hydroxide ions, are released by alkalis in solution?**

hydroxide ions

3 **What colour is litmus solution in acidic solutions?**

red

4 **What name is given to substances that react with acids to form a salt and water only?**

bases

5 **Which salt is formed when copper oxide reacts with sulfuric acid?**

copper sulfate

6 **What type of reaction happens between an acid and a base?**

neutralisation

7 **What type of solution has a pH of 7?**

neutral

8 **Name the acid that has the formula HCl.**

hydrochloric acid

9 **What colour is phenolphthalein in alkaline solutions?**

pink

10 **What is the formula for sulfuric acid?**

H_2SO_4

CC8e Alkalis and neutralisation

1 **Name the salt produced when sodium hydroxide reacts with hydrochloric acid.**

sodium chloride

2 **Which ions, hydrogen ions or hydroxide ions, are released by acids in solution?**

hydrogen ions

3 **What substance, other than a salt, is produced when an alkali neutralises an acid?**

water

4 **What name is given to substances that are soluble bases?**

alkalis

5 **What is the formula for hydrochloric acid?**

HCl

6 **What type of solution has a pH above 7?**

alkaline

7 **What colour is phenolphthalein in acidic solutions?**

colourless – not 'clear'

8 **Name a piece of apparatus used to measure volumes of liquid.**

measuring cylinder/pipette/burette

9 **Name the separation method used to produce crystals from a solution.**

crystallisation

10 **Name the acid needed to make ammonium nitrate.**

nitric acid

CC8f Reactions of acids with metals and carbonates

1 **Which acid is needed to make copper sulfate?**

sulfuric acid

2 **Which base is needed to make copper sulfate?**

copper oxide

3 **Which substance is needed to complete the general equation: acid + base makes salt + …?**

water

4 **What is the formula of nitric acid?**

HNO_3

5 **What is the name of the salt formed from zinc oxide and hydrochloric acid?**

zinc chloride

6 **What is the formula of the salt formed from calcium oxide and hydrochloric acid?**

$CaCl_2$

7 **Which ions are present in large quantities in aqueous solutions of all acids?**

H^+

8 **Which ions are present in large quantities in aqueous solutions of all alkalis?**

OH^-

9 **Which gas is formed when dilute hydrochloric acid reacts with magnesium?**

hydrogen

10 **Which gas is formed when dilute hydrochloric acid reacts with magnesium carbonate?**

carbon dioxide

CC8g Solubility

1 **Which acid is needed to make copper chloride?**

hydrochloric acid

2 **Which gas is given off when magnesium reacts with dilute sulfuric acid?**

hydrogen

3 **How do you identify the gas in question 2?**

It gives a squeaky pop with a lighted splint.

4 **What is seen when magnesium is added to dilute sulfuric acid?**

effervescence/fizzing/bubbles

5 **What is the formula of magnesium sulfate?**

$MgSO_4$

6 **Which gas is produced when copper carbonate is added to dilute nitric acid?**

carbon dioxide

7 **How do you test for the gas produced in question 6?**

It turns limewater milky.

8 **What is the formula of the salt produced when copper carbonate reacts with nitric acid?**

$Cu(NO_3)_2$

9 **Sodium chloride dissolves in water to form a solution. Which is the solute?**

sodium chloride

10 What do we call the liquid that dissolves a solute to form a solution?

solvent

CC9a Masses and empirical formulae

1 What is the formula of water?

H_2O

2 What is the formula of sodium chloride?

NaCl

3 What is the formula of carbon dioxide?

CO_2

4 The formula of magnesium chloride is $MgCl_2$. What is the ratio of magnesium ions to chloride ions?

1:2

5 The formula of sulfuric acid is H_2SO_4. How many atoms of each element are in the formula?

H = 2, S = 1, O = 4

6 The formula of calcium nitrate is $Ca(NO_3)_2$. How many calcium, nitrogen and oxygen atoms are in the formula?

Ca = 1, N = 2, O = 6

7 There are two numbers alongside chlorine in the periodic table, 17 and 35.5. What does the number 17 represent?

atomic number

8 What does the number 35.5 represent?

relative atomic mass

9 Sodium chloride has the formula NaCl. The relative atomic mass of sodium is 23 and that of chlorine is 35.5. What is the relative formula mass of NaCl?

58.5

10 A water molecule has the formula H_2O. The relative atomic mass of hydrogen is 1 and that of oxygen is 16. What is the relative formula mass of a molecule of water?

18

CC9b Conservation of mass

1 What is the symbol for relative atomic mass?

A_r

2 What is the symbol for relative formula mass?

M_r

3 The relative atomic mass of hydrogen is 1. What is the relative formula mass of hydrogen molecules?

2

4 Sodium chloride has the formula NaCl; the relative atomic mass of sodium is 23 and that of chlorine is 35.5. What is the relative formula mass of NaCl?

58.5

5 A water molecule has the formula H_2O; the relative atomic mass of hydrogen is 1 and that of oxygen is 16. What is the relative formula mass of water?

18

6 A carbon dioxide molecule has the formula CO_2; the relative atomic mass of carbon is 12 and that of oxygen is 16. What is the relative formula mass of carbon dioxide?

44

7 What is the empirical formula of a compound with molecular formula C_2H_4?

CH_2

8 What is the empirical formula of a compound with molecular formula C_3H_8?

C_3H_8

9 A sample of magnesium carbonate was heated in an open test tube. Why did it lose mass?

gas/carbon dioxide escaped

10 100 cm^3 of a solution contained 2 g of salt. What is the concentration of the salt in g dm^{-3}?

20

CC9c Moles

1 A sample of copper carbonate was heated in an open test tube. Why did it lose mass?

gas/carbon dioxide escaped

2 Why does magnesium increase in mass when it is heated in air?

combines with oxygen

3 **How many cm^3 are there in 1 dm^3?**

1000

4 What is 250 cm^3 expressed in dm^3?

0.25

5 **What is 0.5 dm^3 expressed in cm^3?**

500

6 100 cm^3 of a solution contains 1.5 g of salt. What is the concentration of the salt solution in g dm^{-3}?

15

7 250 cm^3 of a solution contains 5 g of sugar. What is the concentration of sugar solution in g dm^{-3}?

20

8 A solution of copper sulfate has concentration 10 g dm^{-3}. What mass of copper sulfate will be dissolved in 100 cm^3 of solution?

1g

9 2 g of hydrogen reacts with oxygen to form 18 g of water. What mass of water will be formed from 1 g of hydrogen?

9g

10 $2H_2 + O_2 \rightarrow 2H_2O$. How many molecules of hydrogen are needed to react with 1 dozen molecules of oxygen to form water?

2 dozen

<u>CC10a Electrolysis</u>

1 What name is given to an atom that has gained or lost electrons?

ion

2 What type of charge is on metal and hydrogen ions?

positive

3 What type of charge is on most non-metal ions?

negative

4 What is another name for a positive ion?

cation

5 What is another name for a negative ion?

anion

6 What is the symbol for a sodium ion?

Na^+

7 What is the symbol for a magnesium ion?

Mg^{2+}

8 What is the symbol for a chloride ion?

Cl^-

9 What is the symbol for a sulfate ion?

SO_4^{2-}

10 In what states do ionic compounds conduct electricity?

when molten or dissolved in water

CC10b – Products from electrolysis

1. Which of these is *not* an electrolyte: solid sodium chloride, molten sodium chloride, aqueous sodium chloride?

solid sodium chloride

2 What is the name of the positively charged electrode?

anode

3 What type of ions are attracted to the positively charged electrode?

anions / negative ions

4 What is the name of the negatively charged electrode?

cathode

5 What type of ions are attracted to the negatively charged electrode?

cations / positive ions

6 What process takes place when a substance gains electrons?

reduction

7 In terms of subatomic particles, what happens to a substance when it is oxidised?

It loses electrons.

8 What type of reaction takes place at the anode during electrolysis?

oxidation

9 What are inert electrodes made from?

graphite / platinum

10 What is produced at the cathode when molten lead bromide is electrolysed?

lead

CC11a- Reactivity

1 What gas is formed when sodium reacts with water?

hydrogen

2 What solution is formed when sodium reacts with water?

sodium hydroxide

3 What colour is universal indicator when added to the solution in question 2?

blue or purple

4 What gas is formed when magnesium is added to dilute sulfuric acid?

hydrogen

5 What solution is formed when magnesium reacts with dilute sulfuric acid?

magnesium sulfate

6 What would you see when magnesium is added to dilute sulfuric acid?

effervescence/fizzing/bubbles/magnesium disappears

7 Name a metal that does not react with water or dilute acids.

copper/silver/gold/platinum

8 What products are formed when zinc is added to copper sulfate solution?

zinc sulfate and copper

9 What type of reaction takes place when zinc is added to copper sulfate solution?

displacement

10 Magnesium reacts with chromium nitrate solution to form magnesium nitrate and chromium. Which metal is more reactive?

magnesium

CC11a – Reactivity

1 Name a metal that reacts vigorously with cold water.

potassium/sodium/rubidium/caesium/lithium/calcium

2 What gas is produced when a metal reacts with water?

hydrogen

3 How do you test for the gas produced in question 2?

It pops with a lighted splint.

4 What type of solution is formed when a metal reacts with water – acidic, alkaline or neutral?

alkaline

5 What salt is formed when zinc reacts with hydrochloric acid?

zinc chloride

6 Complete the word equation, magnesium + copper sulfate makes …

copper + magnesium sulfate

9 Name a metal that occurs uncombined in the Earth's crust.

gold/silver/platinum

10 Name a metal that could be extracted from its metal oxide by heating with carbon.

zinc/iron/copper

CC11c – Oxidation and reduction

1 Name a metal that occurs uncombined in the Earth's crust.

gold/silver/platinum

2 Name a metal, other than iron, that could be extracted from its metal oxide by heating with carbon.

zinc/copper

3 What compound of carbon is formed during the reaction in question 2?

carbon dioxide/carbon monoxide

4 Why is electrolysis not used to extract iron from iron oxide?

too expensive/too much energy needed

5 Why is aluminium not extracted by heating aluminium oxide with carbon?

aluminium is more reactive than carbon/carbon is not reactive enough to remove the oxygen

6 What is the aluminium oxide dissolved in to form the electrolyte for electrolysis?

molten cryolite

7 What are the electrodes made from?

carbon/graphite

8 At which electrode is the aluminium produced?

cathode/negative electrode

9 What type of reaction takes place when a metal is extracted from its ore?

reduction/redox

10 What type of reaction takes place when a metal corrodes?

oxidation/redox

CC11d- Life cycle assessment and recycling

1 What is the definition of oxidation, in terms of oxygen?

gain of oxygen

2 What is the definition of oxidation, in terms of electrons?

loss of electrons

3 **What type of reaction takes place when metals are extracted from their ores?**

reduction/redox

4 **What is the specific name for the corrosion of iron?**

rusting

5 **Which of these metals will corrode most quickly – iron, sodium, copper?**

sodium

6 **Give a reason for your answer to question 5.**

most reactive metal corrodes most quickly

7 **Which substance has been oxidised in this reaction – copper oxide + hydrogen → copper + water?**

hydrogen

8 **Which substance has been reduced in question 7?**

copper oxide

9 **What name is given to a process that converts an unwanted product into a new, useful product?**

recycling

10 **Name a type of substance that can be recycled.**

metal, plastic, paper, cardboard, glass etc.

CC12a – Dynamic equilibrium

1 **What happens in all chemical reactions but never happens in physical changes?**

new substances are formed

2 **What must happen to reacting particles before they can react?**

they must collide with sufficient energy/speed

3 **What is the minimum energy needed for a reaction called?**

activation energy

4 **How can you increase the energy or speed of the particles of a substance?**

by increasing the temperature

5 **What change to gas pressure could increase the rate of a reaction?**

increasing the pressure

6 **Why do higher concentrations of acid react faster?**

because there are more collisions

7 **How can solid lumps of reactants be made to react faster?**

by making them smaller

8 **What is the name of a substance that speeds up a chemical reaction without being permanently changed itself, and which does not alter the products of the reaction?**

a catalyst

9 **What can happen in a reversible reaction?**

the products can reform the reactants

10 **What does the term 'equilibrium' describe?**

a position of balance

CC13a – Group 1

1 **What do atoms of the same element have in common?**

their atomic number/number of protons

2 **Roughly how many elements are found naturally?**

90 to 100

3 **In what order are elements arranged in the periodic table?**

atomic number

4 **What do you call the columns in the periodic table?**

groups

5 **What is special about the elements that are in the same group of the periodic table?**

similar properties

6 **What is similar about the electronic configuration of elements in the same group?**

same number of outer electrons

7 **What is formed when a group 1 element reacts with water?**

an alkali/metal hydroxide + hydrogen

8 **What is the charge on the ions of elements in group 1?**

1+

9 **The first two elements in group 1 are lithium and sodium. What is the third element?**

potassium

10 **What is the name given to the elements in group 1 in the periodic table?**

alkali metals

CC13b – Group 7

1 **What name is given to group 1 elements?**

the alkali metals

2 What happens to the reactivity of the group 1 elements as you go down the group?

it increases

3 What is produced when lithium reacts with water?

lithium hydroxide and hydrogen

4 Why do alkali metals get more reactive as you go down the group?

the outermost electron is further and further away, and so more easily removed

5 What name is given to group 7 elements?

the halogens

6 State an example of a group 7 element.

one of: fluorine, chlorine, bromine, iodine or astatine

7 What is the state of a substance at room temperature, if it has a melting point of −7 °C and a boiling point of 59 °C?

liquid

8 What ion is in all acid solutions?

hydrogen ion/H^+ ions

9 Do metals usually form ionic compounds with other metals, non-metals, neither or both?

non-metals

10 State the formula of the compound formed when calcium reacts with bromine.

$CaBr_2$

CC13c – Halogen reactivity

1 What is the name and colour of the only liquid halogen?

bromine, brown

2 What does chlorine look like?

pale green gas

3 How is the appearance of iodine different from the three halogens above it in group 7?

solid and darker/black in colour

4 Name the compound formed when hydrogen reacts with chlorine.

hydrogen chloride

5 What kind of solution is formed when hydrogen fluoride dissolves in water – acidic, neutral or alkaline?

acidic

6 **Complete the equation: $Ca(s) + Cl_2(g)$?**

$CaCl_2(s)$

7 **What ions are present in potassium fluoride?**

K^+ and FI^-

8 **State one similarity in the electronic configurations of fluorine and chlorine.**

same number of outer electrons

9 **Describe the trend in reactivity of group 7 elements.**

decreasing down the group

10 **What type of reaction occurs between chlorine and potassium bromide?**

displacement or redox

CC13d – Group 0

1 **What is formed when chlorine water is added to sodium bromide solution?**

sodium chloride + bromine

2 **What type of reaction is the reaction between chlorine water and sodium bromide solution an example of?**

displacement, redox

3 **Fluorine atoms are more reactive than chlorine atoms. What does fluorine have fewer of that explains this?**

electron shells

4 **Describe reduction in terms of electron transfer.**

gain of electrons

5 **Where is group 0 found in the periodic table?**

last column on right-hand side

6 **What name is given to group 0 elements?**

the noble gases

7 **Name a group 0 element.**

one of: helium, neon, argon, krypton, xenon or radon

8 **What is similar about the electronic configuration of all group 0 elements?**

full outer shell

9 **How are noble gases similar in terms of chemical properties?**

all unreactive

10 Describe the trend in the boiling points of the elements, down group 0.

Increasing

CC14a – Rates of reaction

1 What happens to the reactants during a chemical reaction?

They are changed into new substances/products/used up.

2 What happens to the rate of most reactions as the reaction proceeds?

It slows down.

3 In reactions involving solutions, what happens to the rate if the concentrations at the start are decreased?

They become slower.

4 What size of solid lumps reacts fastest in chemical reactions: small, medium or large?

small

5 Apart from concentration and surface area, name one other variable that can change the speed of a chemical reaction.

temperature or pressure or catalyst

6 What happens in a precipitation reaction?

A solid forms.

7 What does it mean if effervescence is seen during a reaction?

A gas is being produced.

8 What happens to the concentration of reactants as a reaction proceeds?

It decreases.

9 What happens to the concentration of products as a reaction proceeds?

It increases.

10 Why is there a loss in mass during the reaction between calcium carbonate and hydrochloric acid?

A gas is given off/lost.

CC14b – Factors affecting the rate of reaction

1 What usually happens to the rate of a reaction as the reaction proceeds?

It slows down.

2 What happens to the concentration of reactants as a reaction proceeds?

It decreases.

3 **In a graph of concentration of products against time, how do you know when the reaction is finished?**

The graph levels off.

4 **A reaction is followed by measuring the volume of gas produced. What other measurement could be used?**

measuring mass lost

5 **What usually happens to the speed of a reaction as the temperature is decreased?**

It gets slower.

6 **How does increasing the concentration of a solution affect the rate of reaction?**

It increases the rate.

7 **What is the link between the size of the solid lumps and the surface area of a fixed mass of solid?**

The smaller the lumps, the larger the surface area.

8 **What type of solid lumps will react fastest?**

the smallest lumps or powders

9 **In reactions involving gases, how does gas pressure affect the reaction rate?**

Increased pressure increases the rate.

10 **What must the reacting molecules do for a reaction to occur?**

They must collide with enough energy.

CC14c – Catalysts and activation energy

1 **What has to happen before a reaction takes place?**

Reacting molecules must collide with enough energy.

2 **Describe two ways of measuring reaction rates in a reaction that produces a gas.**

measuring volume of gas formed and mass lost by reactants

3 **Explain how increasing concentrations increases the rate of a reaction.**

More collisions occur.

4 **What change in condition increases the speed of the reacting molecules?**

increasing temperature

5 **How can you increase the surface area of a solid?**

Divide the solid into smaller pieces.

6 **Explain how increasing the surface area of a solid increases the rate of reaction.**

More collisions can occur.

7 **Which change in condition only affects reactions involving gases?**

pressure

8 **What is the activation energy in a reaction?**

minimum energy needed by reactants for them to react

9 **What does a catalyst do?**

speeds up a chemical reaction

10 **What do you call a biological catalyst?**

an enzyme

CC15a – Exothermic and endothermic reactions

1 **What do we call any substance that dissolves in a solvent to form a solution?**

solute

2 **What products form when an acid is neutralised by an alkali?**

a salt and water

3 **What do we call an insoluble substance that can form when two solutions are mixed?**

precipitate

4 **Which substance, polystyrene or copper, is the better heat insulator?**

polystyrene

5 **Energy is transferred by heating in three ways: convection, radiation and what else?**

conduction

6 **Zinc reacts with copper sulfate solution. What solid product forms?**

copper

7 **What gas is needed for fuels to burn?**

oxygen

8 **Fuels may ignite if a spark hits them. What else can make a fuel ignite?**

a flame/heating strongly

9 **Is energy transferred to or from the electrolyte during electrolysis?**

to

10 **Give two ways by which energy is transferred to the surroundings in an explosion.**

two from: by heating, by sound, by light, by a force

CC15b – Energy changes in reactions

1 **What type of reaction takes in energy from the surroundings?**

endothermic

2 **What happens to the temperature of an acid when an alkali is added to it?**

It goes up/increases.

3 **What simple piece of apparatus is used to measure temperature?**

thermometer

4 **What unit is used for energy?**

J/joule/kJ/kilojoule

5 **What type of bond (ionic, covalent or metallic) exists between non-metal atoms?**

covalent

6 **In combustion reactions, is energy taken in from the surroundings or given out?**

given out

7 **How is energy transferred between reactants and surroundings during dissolving?**

by heating

8 **Which of these reactions, displacement or precipitation, always heats up the surroundings?**

displacement

9 **The temperature goes down when ammonium nitrate dissolves in water. Is this an exothermic process or an endothermic process?**

endothermic

10 **Energy is taken in so that bonds can be broken. Is this an exothermic or an endothermic process?**

endothermic

CC16a – Hydrocarbons in crude oil and natural gas

1 **What are the chemical symbols for the elements carbon and hydrogen?**

C; H

2 **What type of bond (ionic, metallic or covalent) is found in simple molecules?**

covalent

3 **What state (solid, liquid or gas) is crude oil at room temperature?**

liquid

4 **How many shared electrons are there in a covalent bond?**

two

5 **Which element forms long chains in simple polymers such as poly(ethene)?**

carbon

6 **Which type of compound only contains hydrogen and carbon atoms?**

hydrocarbon

7 **Are 'petrochemicals' made from petrol, rock or crude oil?**

crude oil

8 **How many years (hundreds, thousands or millions) does it take for crude oil to form?**

millions

9 **If something is not being made any more, is it described as 'finite' or as 'non-renewable'?**

finite

10 **About how many litres of crude oil does the world use each second (180, 1800 or 180 000)?**

180 000

CC16b – Fractional distillation of crude oil

1 **Name the two elements found in hydrocarbons.**

carbon; hydrogen

2 **Crude oil is forming extremely slowly. Does this make it a finite resource or a non-renewable one?**

finite

3 **Petrol comes from crude oil. Give one use for petrol.**

fuel for cars

4 **Name the main hydrocarbon found in natural gas.**

methane

5 **Diesel oil is being used up faster than crude oil forms. Does this make it a finite resource or a non-renewable one?**

non-renewable

6 **Name the polymer formed from ethene, which comes from crude oil.**

poly(ethene)

7 **Name the state change that occurs when a gas becomes a liquid.**

condensing/condensation

8 **What bonds or forces exist between molecules (ionic, covalent or intermolecular)?**

intermolecular

9 **Compared with metals, do simple molecules typically have high boiling points or low ones?**

low

10 **Name the method used to separate a mixture of two or more liquids with different boiling points.**

fractional distillation

CC16c – The alkane homologous series

1 **Give one typical use of fuel oil.**

fuel for large ships/fuel for some power stations

2 **Crude oil is a source of feedstock. Give one other type of useful substance from crude oil.**

fuels

3 **Is crude oil described as a finite resource or an infinite resource?**

finite

4 **Name a non-renewable fossil fuel obtained from crude oil.**

petrol/kerosene/diesel oil/fuel oil

5 **Name the main non-renewable fossil fuel in natural gas.**

methane

6 **What process is used to separate crude oil into useful mixtures?**

fractional distillation

7 **Give one use for the gases fraction from crude oil.**

domestic heating/cooking

8 **Which fraction is more easily ignited, bitumen or kerosene?**

kerosene

9 **Which fraction is more viscous, bitumen or kerosene?**

bitumen

10 **Which hydrocarbons have the greater boiling points, the ones with larger molecules or the ones with smaller molecules?**

larger molecules

CC16d – Complete and incomplete combustion

1 **Which elements are present in hydrocarbon molecules?**

carbon; hydrogen

2 **What is the most abundant element in air?**

nitrogen/N_2

3 **Which gas reacts with hydrocarbons when they burn?**

oxygen/O_2

4 **Name one fossil fuel used in cars.**

petrol/diesel oil

5 **Name a gas produced when carbon burns.**

carbon monoxide/carbon dioxide

6 **What compound forms when hydrogen burns in air?**

water

7 **What is the main fossil fuel in natural gas?**

methane

8 **To get a roaring blue Bunsen burner flame, do you open or close the air hole?**

open it

9 **Which cells in the blood carry oxygen around the body?**

red blood cells

10 **What is the black solid element found in soot and smoke?**

carbon

CC16e – Combustible fuels and pollution

1 **What are the products of the complete combustion of hydrocarbon fuels?**

carbon dioxide; water

2 **Which gas is produced during incomplete combustion, but not complete combustion, of hydrocarbon fuels?**

carbon monoxide

3 **What solid element is produced during the incomplete combustion of hydrocarbon fuels?**

carbon

4 **Name the fuel used for large ships and some power stations.**

fuel oil

5 **Which gas reacts with hydrocarbon fuels when they burn?**

oxygen

6 **What is the pH of pure water?**

7

7 **Name the gas formed when acids react with metals.**

hydrogen

8 **Name the gas formed when acids react with calcium carbonate.**

carbon dioxide

9 **Name the most abundant gas in the air.**

nitrogen

10 **Name the solid yellow element placed below oxygen in group 6 of the period table.**

sulfur

CC16f – Breaking down hydrocarbons

1 **Name one hydrocarbon fuel used for cars.**

petrol; diesel

2 **Which fraction ignites more easily, kerosene or fuel oil?**

kerosene

3 **Which fraction contains hydrocarbon molecules with the longer molecules, gases or bitumen?**

bitumen

4 **Name the process used to separate crude oil into simpler, more useful mixtures.**

fractional distillation

5 **Name the homologous series to which ethane belongs.**

alkanes

6 **What are the two products of complete combustion of ethane?**

carbon dioxide; water

7 **What type of rain forms when sulfur dioxide, from some hydrocarbon fuels, dissolves in rainwater?**

acid

8 **Name the greenhouse gas released when any hydrocarbon fuel burns.**

carbon dioxide

9 **Which occupies the least volume, 1 kg of hydrogen gas or 1 kg of liquid hydrogen?**

1 kg of liquid hydrogen

10 **Is crude oil a finite resource or a renewable resource?**

finite resource

CC17a – The Early atmosphere

1 **Which common compound of carbon and oxygen is thought to have been an abundant gas in Earth's early atmosphere?**

carbon dioxide

2 **What are the names of the Earth's two nearest neighbouring planets?**

Venus and Mars

3 **Name the biological process that increases oxygen levels and reduces carbon dioxide levels in the atmosphere.**

photosynthesis

4 **What geological feature of a planet's surface can give out large amounts of hot gas?**

volcano

5 **Name the physical process that describes changing a vapour into liquid.**

condensation

6 **What type of reaction occurs when a metal gains oxygen?**

oxidation

7 **How old do scientists think the Earth is:**
4.5 billion years, 4.5 million years or
450 000 years?

4.5 billion years

8 **What sort of rocks are formed from layers of deposited material?**

sedimentary rocks

9 **Which gaseous element forms most of the Earth's atmosphere today?**

nitrogen

10 **Titan is an icy moon of Saturn. What is ice made of?**

water

CC17b – The changing atmosphere

1 **Where were the gases that formed the Earth's early atmosphere released from?**

volcanoes

2 **What two compounds are thought to have formed most of the Earth's early atmosphere?**

water, carbon dioxide

3 **What is the chemical test for carbon dioxide?**

turns limewater milky/cloudy

4 **What element forms most of the Earth's atmosphere today?**

nitrogen

5 **Which element that makes up about 21% of the atmosphere of Earth today was not thought to be present in the atmosphere 4.5 billion years ago?**

oxygen

6 **As the Earth evolved, chemical reactions with what element are thought to have slowed the release of oxygen to the atmosphere?**

iron

7 **What gas given out by volcanoes is thought to have condensed to form oceans?**

water vapour

8 **What factor has caused changes in Earth's atmosphere but is not found on Venus or Mars?**

life

9 **What process in plants releases oxygen?**

photosynthesis

10 **What is the chemical test for oxygen?**

relights a glowing splint

CC17c – The atmosphere today

1 **The relighting of a glowing splint is the test for what gas?**

oxygen

2 **Why did the formation of the Earth's early oceans cause a decrease in atmospheric carbon dioxide concentrations?**

the carbon dioxide dissolved in the water

3 **What do some sea creatures use dissolved carbon dioxide to help them do?**

form shells

4 **What sort of chemical compound are shells made from: an oxide, a carbonate or a chloride?**

carbonate

5 **What is the formula for calcium carbonate?**

$CaCO_3$

6 **What process in plants and algae causes a reduction of atmospheric carbon dioxide concentrations?**

photosynthesis

7 **Photosynthesis affects the concentrations of two gases in the atmosphere – carbon dioxide, and what other gas?**

oxygen

8 **Give the name of some of the earliest photosynthetic microorganisms.**

cyanobacteria

9 **Certain gases in the atmosphere keep the Earth warm. What is this effect called?**

greenhouse effect

10 **Give the name of one of the most common greenhouse gases.**

carbon dioxide, methane, water vapour

CC17d – Climate change

1 **Name three greenhouse gases.**

methane, carbon dioxide, water vapour, CFCs and many others

2 **Energy is transferred from the Sun by what?**

(infrared/electromagnetic) radiation/waves/light

3 **The warm Earth emits what type of (electromagnetic) waves?**

infrared

4 **In an atmosphere containing greenhouse gases, what happens to some of the infrared waves that the Earth emits?**

absorbed (and re-emitted in all directions)

5 **Why do modern thermometers give better quality evidence than those from the 18th century?**

thermometers are now more accurate/have a better resolution

6 **What word (beginning with c) describes the way in which two variables appear to be linked because they show similar patterns of change?**

correlation

7 **What term is used to describe the changes to average weather conditions around the world?**

climate change

8 **Evidence for carbon dioxide variations over the last 800 000 years comes from Antarctica. In what form is this evidence?**

ice cores

9 **What type of human activity has mainly increased the level of greenhouse gases since 1750?**

burning fossil fuels

10 **The acidity of the oceans is increasing due to more carbon dioxide dissolving in the water. What is this doing to the pH of the oceans?**

decreasing it/making it more acidic