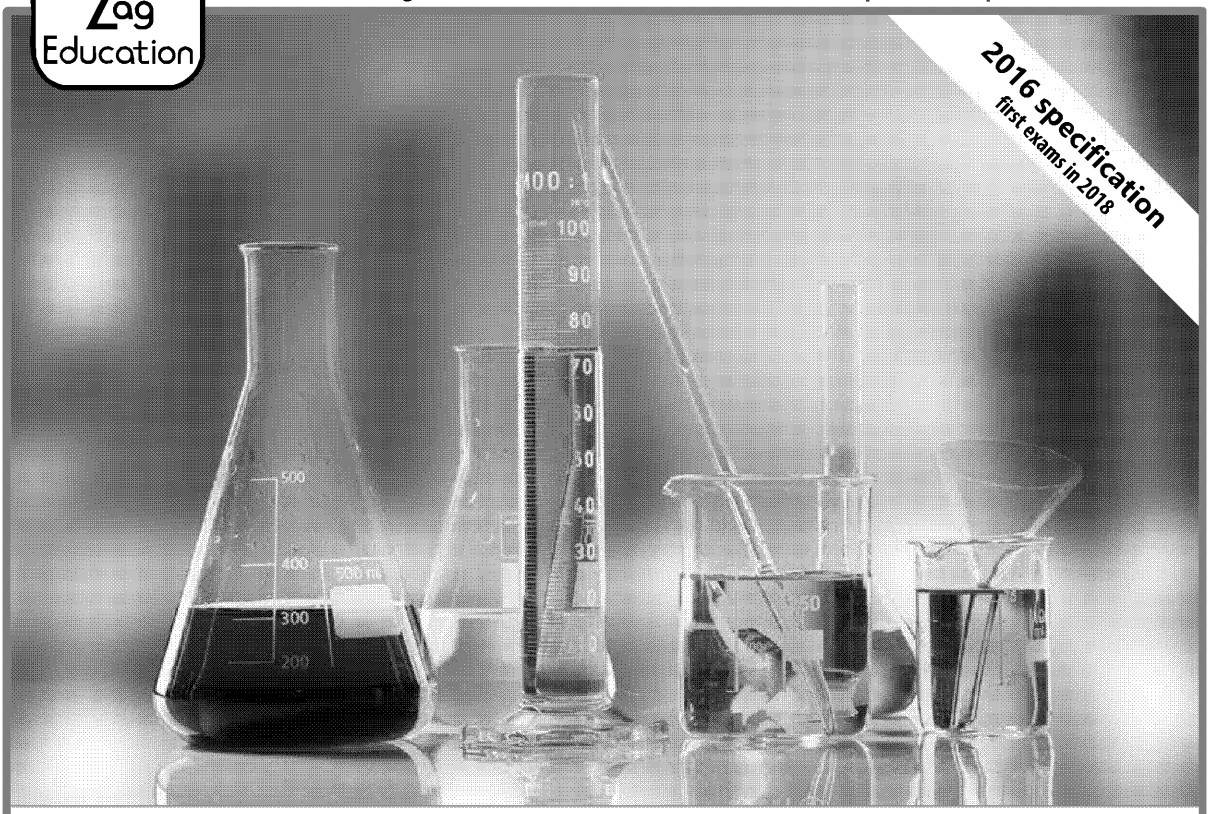
Zig Zag Education

Chemistry GCSE (9–1) | AQA | 8462/8464



Multiple-Choice Practice Questions

for GCSE (9–1) AQA Chemistry Topics 1–5 (Paper 1)

zigzageducation.co.uk

POD 9792

Contents

Teacher's Introduction

The return of multiple-choice questions!

The GCSE reformation has seen the return of multiple-choice questions on all GCSE Science specifications. Multiple-choice questions now feature on both Paper 1 and Paper 2 of the AQA Chemistry GCSE. Where previously multiple-choice questions may have been viewed as easier questions to answer, the reformed GCSE has led to the cognitive demand on students dramatically increasing. As a result, it is vital that students have a chance to practise answering more multiple-choice questions.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Save on marking!

Multiple-choice questions have been included in the new linear GCSE exams as they allow exam boards to access a greater breadth of content across their exams. This also makes them excellent tools for teachers! Multiple-choice questions are an excellent formative assessment for students and teachers alike. By setting pupils questions with a high demand, it allows teachers to identity misconceptions in students' understanding through less-onerous marking. Through setting carefully designed questions to truly assess learning, such as within this resource, you can gauge students' progress in a shorter amount of time than setting open questions.

A carefully designed resource to be useful to both pupils and teachers

This resource closely links to the AQA GCSE Chemistry specification for Paper 1, assessing areas of the course in which there are common misconceptions. The questions have been designed to test students at a higher level of demand to 'unpick' learning. There are also questions on most of the required practical activities for topics 1–5 and opportunities to assess working scientifically and mathematical skills.

This resource is split into two parts: Bank A and Bank B. Each part contains approximately 100 multiple-choice questions. Bank A includes fully explained answers, describing either the correct method or, for incorrect choices, where the student has gone wrong. Bank B provides an opportunity to repeat the same skills to test the student's understanding after completing the first set of questions.

A versatile and formative resource

This resource would be best used when students have already covered and revised the content, so that they can fully focus on practising the skills needed to get the multiple-choice section right. They could be provided with the full set of questions from Part A and the solutions with the commentary. The students should be encouraged to make notes from those questions they got wrong so that they can then review and reflect on particular skills or areas of content, ready to try similar questions in Part B. Encouraging students to reflect in between can help develop their growth mindset and, therefore, likelihood of making progress.

Alternatively, some of the questions could be used throughout teaching as part of formative assessment, or within tests as part of summative assessments. You could review any common areas of weakness in class, using the commentary to help you, and then give the students the resource at the end of the course as an opportunity to practise the skills again. Then provide them with Part B as further practice.

September 2019

Students' Introduction

The new GCSE reformation has seen the return of multiple-choice questions on al
Multiple-choice questions now feature on both Paper 1 and Paper 2 of the AQA C

You might view multiple-choice questions as easier questions on the paper, and, i
However, multiple-choice questions are being used by the exam board to assess a
can be tricky! Many of the multiple-choice questions link lots of different topics to
therefore, it is vital that you have a chance to practise answering more multiple-c

How to use this resource

This resource has been written to closely match the specification you are studying
to practise answering questions relating to some of the more demanding skills and

- If you are completing the foundation tier paper, ignore questions which start
- If you are completing the combined science course, ignore questions which s

We recommend you use this resource when you have already covered and revised
this resource as a way of practising skills and identifying any areas for developme

Bank A comes with a mark scheme with a full commentary on it. If you get an ans
commentary carefully to look at how you should have approached the question. M
and spend time reviewing content if lack of knowledge is a problem. If you get the
commentary as it will still act as part of your revision!

Once you have completed Bank A and reviewed any necessary content or skills, co
Then, review any content or skills you need to develop further.

When you have finished Bank B, complete both sections again until you get 100 %
much practice!

Good Luck

62. The law of conservation of matter is a very important concept in chemistry.

The law of conservation of matter:

A states that no new substances are formed in a chemical reaction ☐
B is the reason chemical equations must be ☐
C only applies in a system exposed to ☐
D only applies to reactions in ☐

63. Hydrog rns with oxygen, O_2, to form water, H_2O.

The corr nced equation for the formation of water is:

A $H_2 + O_2 \rightarrow H_2O_2$ ☐
B $H_2 + O_2 \rightarrow 2H_2O$ ☐
C $2H_2 + O_2 \rightarrow 2H_2O$ ☐
D $H_2 + O \rightarrow H_2O$ ☐

64. Calcium hydroxide has the formula $Ca(OH)_2$.

Which of the following is the relative formula mass of calcium hydroxide?

[H = 1, O = 16, Ca = 40]

A 58 ☐
B 73 ☐
C 74 ☐
D 114 ☐

65. Which of the following re w a decrease in mass when carried out in op ?

A Na $Cl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$ ☐
B $ZnO_{(}$ $O_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + H_2O_{(l)}$ ☐
C $Pb(NO_3)_2 + 2KI_{(aq)} \rightarrow PbI_{2(s)} + 2KNO_{3(aq)}$ ☐
D $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$ ☐

66. **(Higher**

Iron oxi
the reac

2Al + Fe

[O = 16,

If 80 g o

A 28 g
B 56 g
C 28 g
D 56 g

67. Which o
of mole

A 4.0
B 1.5
C 2.0
D 4.0

68. **(Higher**

Which o

[C = 12,

A 35.2
B 44.8
C 55.0
D 56.0

69. (Higher tier only)

How many moles of hydrogen atoms are present in 0.6 mol of phosphoric acid, H_3PO_4?

A 0.2 mol
B 0.6 mol
C 1.8 mol
D 4.8 mol

70. (Higher tier only)

The chemical equation for the reaction between manganese dioxide, MnO_2, and hydrochloric acid, HCl, is shown below.

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

Complete the following sentence:

2 mol of manganese dioxide will…

A … react exactly with 4 mol of HCl.
B … form a maximum of 2 mol of $MnCl_2$.
C … form a maximum of 2 mol of water.
D … form a maximum of a total of 4 mol of products.

71. (Higher tier only)

The Avogadro constant of particles, 6.02×10^{23}, is an important idea in chemistry.

How many electrons are contained in 0.2 mol of electrons?

Give your answer to three significant figures.

A 1.204×10^{23}
B 1.20×10^{23}
C 3.01×10^{24}
D 3.010×10^{24}

72. (Higher

What m
complet

$2CuO +$

[C = 12,

A 1.6
B 3.2
C 4.0
D 6.4

73. (Higher

In an ex
1.6 g of

Use this
the corr

[O = 16,

The equ

A Ca +
B 2Ca
C Ca +
D 2Ca

74. In an ex
of magn

Which o

A 1.38
B 1.43
C 4.29
D 5.52

75. (Higher tier only)

Heating iron oxide with aluminium produces iron according to the equation:

$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$

In an experiment, 0.1 mol of iron oxide was reacted with 0.3 mol of aluminium.

Which of the following changes to the experiment would have produced more iron?

A using more moles of iron oxide ☐
B using fewer moles of iron oxide ☐
C using more moles of aluminium ☐
D using fewer moles of aluminium ☐

76. (Higher tier only)

Which of the following reactions results in an increase in the number of gas moles?

A $2NO_{(g)} + 2CO_{(g)} \rightarrow 2CO_{2(g)} + N_{2(g)}$ ☐
B $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$ ☐
C $NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl_{(s)}$ ☐
D $CuCO_{3(s)} \rightarrow CuO_{(s)} + CO_{2(g)}$ ☐

77. Iron oxide reacts with carbon monoxide according to the equation shown below:

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

In which of the following reactions is iron oxide the limiting factor?

[Relative formula masses: Fe_2O_3 = 160, CO = 28]

A heating 8 g of iron oxide with 1.8 g of carbon monoxide ☐
B heating 8 g of iron oxide with 2.9 g of carbon monoxide ☐
C heating 8 g of iron oxide with 3.0 g of carbon monoxide ☐
D heating 8 g of iron oxide with 4.2 g of carbon monoxide ☐

78. Saline s

A saline

How mu

A 0.0
B 0.2
C 2.7
D 27.0

79. Nitroge
accordi

$N_{2(g)} + 3H$

Which o
100 % a

A The
B The
C The
D It is

80. (Chemis

Calculat

$CH_4 + H_2$

[Relative

A 6.7
B 17.6
C 20
D 75

81. Which o

A To
B Co
C Low
D Che

82. In a chemical reaction the calculated yield of a product is 4.80 g whereas the actual yield was 3.84 g.

Which of the following is the percentage yield in the reaction?

A 0.80 %
B 1.25 %
C 80 %
D 125 %

83. When taking measurement[illegible] chemical reactions which is the best way of increasing the precision of the results?

A Take [illegible]ad[illegible]gs.
B Take a range of readings.
C Use a balance reading to more decimal places.
D Check the balance does not have a zero error.

84. A chemical reaction had a 72 % yield and 14.4 g of the product was obtained.

Which of the following was the theoretical amount of product?

A 0.20 g
B 5.0 g
C 10.37 g
D 20.0 g

85. Which of the following would contribute to increasing the percentage yield in a chemical reaction?

A the reaction being reversible
B loss of product during separation from the reactants
C side reactions occurring
D the [illegible]eing weighed when not properly dry

86. **(Chemis**

A solutio

What is

A 0.0
B 0.0
C 15.7
D 22.7

87. A techni
0.25 mo

The erro

Which o
concentr

A 0.22
B 0.24
C 0.26
D 0.28

88. **(Chemis**

The con
1.0 mol/

What m
this solu

[Cl = 35.

A 18.6
B 37.3
C 74.5
D 186

89. What volume of 1.5 mol/dm^3 sulfuric acid solution would exactly neutralise 25.0 cm^3 of 2.0 mol/dm^3 sodium hydroxide solution?

The equation for the reaction is:

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

A 16.7 cm^3 ☐
B 33.3 cm^3 ☐
C 37.5 cm^3 ☐
D 75.0 cm^3 ☐

90. Which of the following masses would occupy a volume of 6 dm^3 at room temperature and pressure?

1 mol of any gas occupies 24 dm^3 at room temperature and pressure.

A 16 g of sulfur dioxide [Molar mass = 64] ☐
B 9.2 g of nitrogen dioxide [Molar mass = 46] ☐
C 10.0 g of oxygen [Molar mass = 32] ☐
D 8.0 g of nitrogen [Molar mass = 28] ☐

91. The reaction between nitrogen (II) oxide, NO, and oxygen, O_2, to form nitrogen (IV) oxide, is given by the equation:

$2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$

Under the same conditions of temperature and pressure, 40 cm^3 of NO is reacted with 20 cm^3 of O_2.

The volume of gas remaining after reaction would be:

A 0 cm^3 ☐
B 20 cm^3 ☐
C 40 cm^3 ☐
D 60 cm^3 ☐

92. **X**, **Y** and **Z** are three metals. These are not their correct symbols.

- Metal **X** reacts vigorously with both dilute acid and water.
- Metal **Y** reacts vigorously with dilute acid but does not react with water.
- Metal **Z** does not react with dilute acid or water.

Which of the following can be deduced from the reactions above?

A **X** will not react with the sulfate of **Y** dissolved in water. ☐
B **Z** will displace **X** from the sulfate of **X** dissolved in water. ☐
C **Z** will displace water from the sulfate of **Y** dissolved in water. ☐
D **Y** will displace **Z** from the sulfate of **Z** dissolved in water. ☐

93. Magnesium reacts with copper (II) oxide on strong heating according to the word equation:

magnesium + tin oxide → magnesium oxide + tin

Which of the following statements is true about this reaction?

A Magnesium has been reduced. ☐
B Tin oxide has been reduced ☐
C Tin has been oxidised. ☐
D Tin has a greater liking for oxygen than magnesium has. ☐

94. Below is

Which of

A silve
B iron
C zinc
D alum

95. This que

Which of
series is

A Silve
B Mag
C Calc
D Alum

96. This question relates to the reactivity series shown in question 94.

In the extraction of copper, its ores are often converted into copper sulfate solution.

Which of the following methods could be used to extract copper from the solution?

A Add scrap iron. ☐
B Heat the solution with carbon. ☐
C Add potassium metal. ☐
D Distil the copper sulfate. ☐

97. **(Higher** 

The equa[illegible] zinc reacting with silver nitrate solution is:

$Zn_{(s)} + 2Ag(NO_3)_{(aq)} \rightarrow Zn(NO_3)_{2(aq)} + 2Ag_{(s)}$

Which of the following ionic equations occurs in this reaction?

A $Zn + 2e^- \rightarrow Zn^{2+}$ ☐
B $Ag^+ + e^- \rightarrow Ag$ ☐
C $Zn^{2+} + 2e^- \rightarrow Zn$ ☐
D $Ag \rightarrow Ag^+ + e^-$ ☐

98. In the reaction between zinc and copper chloride:

zinc + copper chloride → zinc chloride + copper

the copper ions undergo the following reaction: $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$ where e^- stands for an electron.

Which of the following statements is t[illegible] copper in this reaction?

A It is neither oxidised n[illegible] ce oxygen is not involved. ☐
B It is red[illegible]d, s[illegible] electrons. ☐
C It is [illegible] it gains electrons. ☐
D It is [illegible] since its mass goes down. ☐

99. Magnesi[illegible]

Which o[illegible]

magnesi[illegible]

A mag[illegible]
B mag[illegible]
C mag[illegible]
D mag[illegible]

100. Magnesi[illegible]
water tre[illegible]

How can[illegible]

It can be[illegible]

A in a[illegible]
B by r[illegible]
C by r[illegible]
D by r[illegible]

101. Which o[illegible]
hydroxid[illegible]

A The[illegible]
B Hyd[illegible]
C It is[illegible]
D Oxy[illegible]

102. Hydrochl[illegible]

Hydrochl[illegible]
solution[illegible]

A hyd[illegible]
B chlo[illegible]
C oxid[illegible]
D hyd[illegible]

103. In order to prepare pure, dry, well-formed crystals of copper sulfate in the laboratory, excess copper oxide is first added to warm sulfuric acid solution.

Which of the following statements about this preparation is correct?

A The sulfuric acid solution is heated to evaporate some water. ☐
B Excess copper oxide is added to ensure all the acid reacts. ☐
C The excess copper oxide is removed by crystallisation. ☐
D The solution of copper sulfate forms a saturated solution. ☐

104. The pH of a solution is responsible for a lot of its chemistry.

Which of the following statements is correct?

A The pH of a solution can be determined relatively accurately with a pH probe. ☐
B The pH of a solution can be determined accurately using universal indicator. ☐
C A pH of between 8 and 14 means the solution is acidic. ☐
D The pH of a substance dissolved in water is always seven. ☐

105. Water is formed in neutralisation reactions.

Which of the following is the essential ionic equation for neutralisation?

A $2H_{2(g)} + O_{2\,(g)} \rightarrow 2H_2O_{(l)}$ ☐
B $2H^+_{(aq)} + O^{2-}_{(aq)} \rightarrow H_2O_{(l)}$ ☐
C $2H^-_{(aq)} + O^{2+}_{(aq)} \rightarrow H_2O_{(l)}$ ☐
D $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$ ☐

106. Which of the following general equations about acids is **not** correct?

A acid + reactive metal → salt + hydrogen ☐
B acid → salt + water ☐
C acid → salt + water ☐
D acid + metal carbonate → salt + carbon dioxide ☐

107. **(Chemist**

Which of

A The
B The
C The
D The
2 cm

108. The follo
of alkali

Which of

A 18.1
B 18.5
C 23.9
D 41.9

109. **(Higher t**

A studen
acid, one

Choose t

The solut

A have
B turn
C have
D rele

110. (Higher tier only)

In order to increase the pH of a solution by one unit, the hydrogen ion concentration must be changed from:

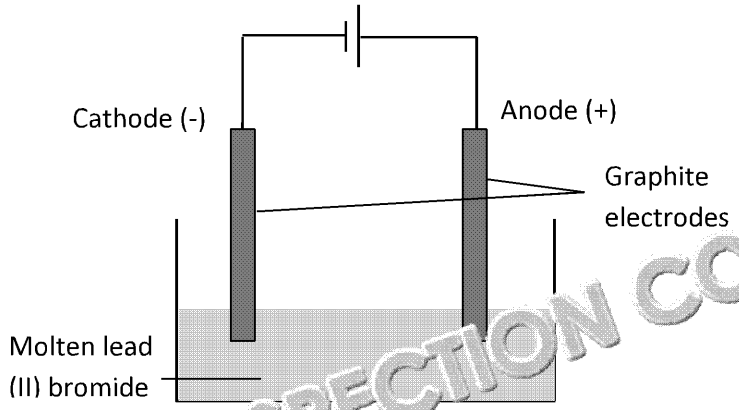
A 1×10^{-2} to 1×10^{-1} ☐
B 1×10^{-2} to 1 ☐
C 1×10^{-2} to 1×10^{-3} ☐
D 1×10^{-2} to 1×10^{-4} ☐

111. Why do compounds like lead [illegible] conduct electricity when solid?

In the solid [illegible] th

A elec[illegible] not move ☐
B ions [illegible] move ☐
C molecules cannot move ☐
D electrodes cannot move ☐

112. The diagram below shows the electrolysis of molten lead bromide.



Which of the following is the reason why graphite is used as the electrod[illegible] ele[illegible]lysis of lead bromide?

A Grap[illegible] very good conductor of electricity. ☐
B Graphite is an unreactive element. ☐
C Graphite has a very high melting point. ☐
D Graphite is a good conductor of heat. ☐

113. The tabl[illegible] electroly[illegible]

Which r[illegible]

A	
B	
C	S di
D	S di

114. (Higher t[illegible]

In the el[illegible]

are Pb^{2+} [illegible] bromine[illegible]

Which o[illegible]

A Pb^{2+}
B Pb^{2+}
C 2Br
D 2Br

115. Which of the following statements explains why metals above hydrogen are **not** formed at the **negative** cathode during the electrolysis of their compounds in water?

A The metals form at the cathode but then react with the water. ☐
B Metal ions carry negative charges and repel from the cathode. ☐
C Hydrogen ions are attracted to the cathode rather than the metal ions. ☐
D Oxide ions are attracted to the cathode rather than the metal ions. ☐

116. Which of the following substances can be electrolysed?

A magnesium ☐
B potassium bromide ☐
C bromine ☐
D ethanol ☐

117. Aluminium is manufactured by the electrolysis of a molten mixture of aluminium oxide and cryolite using carbon as the positive anode.

Which of the following statements is correct about the extraction?

A Cryolite is used as the catalyst for the extraction. ☐
B Electrolysis is cheaper to use than carbon reduction. ☐
C The carbon anodes react over time forming carbon dioxide. ☐
D The mixture conducts because aluminium metal is present. ☐

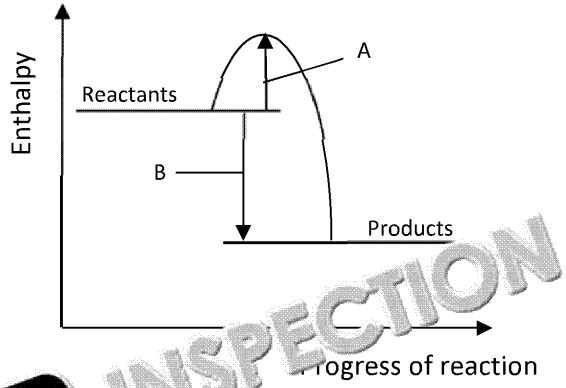
118. Which of the following processes absorbs heat energy from the surroundings?

A lighting a match
B setting off an explosion
C using a self-heating can
D using a sports injury pack

119. Which of [illegible] best description for the activation energy of a che[illegible]?

A the n[illegible]um temperature required to start a reaction
B the minimum temperature each particle needs to start moving
C the minimum energy each particle needs to start moving
D the minimum energy to start a reaction

120. The diagram below represents the energy level profile for a reaction.



Which [illegible] statements is correct?

A The [illegible] is endothermic.
B The products have more energy than the reactants.
C A is highest temperature reached for the reaction.
D B is the overall energy change of the reaction.

121. **(Higher**

Which o[illegible] happens

A Ene[illegible]
B Bon[illegible]
C Ene[illegible]
D Bon[illegible]

122. **(Higher**

The equ[illegible] shown b[illegible]

H–H + Cl[illegible]

The rele[illegible]

Which o[illegible] reaction

A 185[illegible]
B 247[illegible]
C 111[illegible]
D 154[illegible]

123. (Higher tier only)

When 1 mol of hydrogen reacts with 1 mol of fluorine gas according to the equation given below:

$H_2 + F_2 \rightarrow 2HF$

542 kJ of energy are **given out**.

Suggest which of the following would be the energy change when 1 mol of hydrogen fluoride changes into hydrogen and fluorine.

A 271 kJ of energy are given out ☐
B 542 kJ of energy are given out ☐
C 271 kJ of energy are taken in. ☐
D 542 kJ of energy are taken in. ☐

124. It is estimated that 200 g of sugar broken down in our body will release 1700 kJ of energy, which is used for movement, etc.

Calculate how much energy 1 g of sugar taken in tea or coffee would release.

A 8.5 kJ ☐
B 200 kJ ☐
C 1700 kJ ☐
D 5312.5 kJ ☐

125. The following results were obtained while measuring the temperature changes in four reactions. The same apparatus was used for all four experiments.

Reaction	Starting temperature (°C)	Final temperature (°C)
A + B	18.0	27.5
C + D	19.1	33.4
E + F	18.1	28.4
G + H	19.0	43.1

Which of the following statements about the experiments is correct?

A The resolution of the thermometer used was 1 °C. ☐
B The range of the final temperatures was 16.1 °C ☐
C The results should be plotted on a line graph. ☐
D The experiment was not fair, since the starting temperatures were not the same for each reaction. ☐

126. (Chemis

Hydroge

The hyd

Which o
than run

A A hy
bur
B Hyd
C Hyd
D A hy

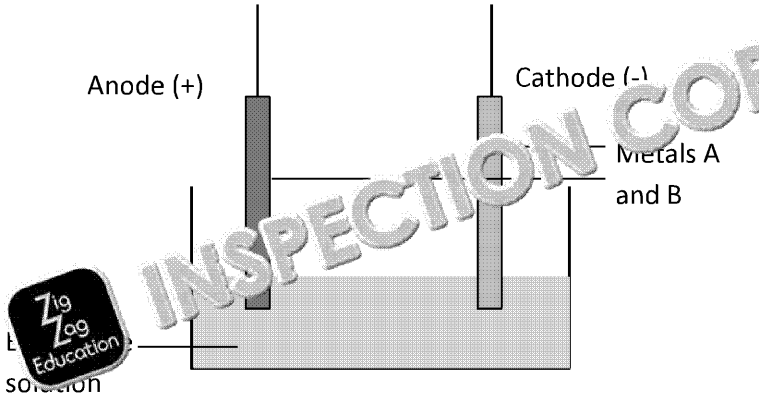
127. (Chemis

Which o
hydroge

A $2H_2$
B $2H^+$
C $O_2 +$
D $2H_2$

128. (Chemistry only)

The diagram below shows the apparatus to test the voltage produced by placing two different metals, A and B, in an electrolyte such as salt water.



Using the reactivity series of metals shown below, decide which of the pairs of metals listed would produce the greatest voltage.

potassium	most reactive
sodium	
calcium	
magnesium	
aluminium	
carbon	decreasing reactivity
zinc	
iron	
lead	
copper	
silver	
gold	

A magnesium and

B zinc

C lead

D alum and zinc

129. (Chemis

Which o

A Alka

B Batt

C Rec

D A si

Answers to Multiple-choice Quest

Atomic Structure and the Periodic Table

Q1	A		Compounds are normally formed in reactions involving large heat c The periodic table lists the known elements and many compounds
	B		
	C		
	D	✓	
Q2	A	✓	There are about 100 known elements a[illegible] one has its own sy The symbol for an oxygen atom is O an[illegible]e formula of a chlorine m
	B		
	C		
	D		
Q3	A		[illegible]or[illegible]s as molecules, Cl_2, and the formula for sodium chlori
	B		[illegible] the third equation has the correct symbols and formulae and i
	C	✓	[illegible]odium atoms on each side as well as two chlorine atoms on each s
	D		
Q4	A		The fractionating column ensures the mixture is constantly re-boile liquids. The near-horizontal Liebig condenser is used to efficiently c
	B	✓	
	C		
	D		
Q5	A		As the hot, concentrated solution of common salt is cooled it beco – a process called crystallisation. The crystals are normally removed by filtration.
	B		
	C	✓	
	D		
Q6	A		Mixtures do not have chemical bonds between their components a physical methods. Their variable composition means they do not h points.
	B	✓	
	C		
	D		
Q7	A		The group of compounds is classed as a categoric variable and, the with the names along the horizontal axis.
	B		
	C		
	D	✓	
Q8	A		The so-called plum pudding mo[illegible] [illegible]tom was thought to hav sphere of positive charg[illegible] It was only later di[illegible]cov[illegible]d that it was a positive nucleus surrounde
	B		
	C		
	D	✓	
Q9	A		[illegible]conclusions drawn from the alpha scattering experiment were but had a central massive nucleus that was positively charged. At this stage protons and neutrons were unknown.
	B	✓	
	C		
	D		
Q10	A		The number of electrons in the outermost filled shell gives the grou element is in group 7. The element is, in fact, chlorine.
	B		
	C	✓	
	D		

Q11	A	✓	Protons carry a charge of +1, neutrons have no charge and electron the nucleus containing protons and neutrons is positively charged.
	B		
	C		
	D		
Q12	A		All atoms of an element contain the same number of protons and e is independent of the numbers of protons and electrons.
	B	✓	
	C		
	D		
Q13	A	✓	The lower number in the representation of atoms is the proton nur beryllium this is four. The upper number is the mass number, i.e. th number of neutrons. For this isotope it is 4 + 5, i.e. 9.
	B		
	C		
	D		
Q14	A		The nucleus of an atom is very small compared to the size of the at Students are expected to know it is about 10,000 times smaller.
	B		
	C		
	D	✓	
Q15	A		Isotopes of the same element have the same number of protons ar of neutrons. They have the same chemistry because their electrons
	B	✓	
	C		
	D		
Q16	A		The relative atomic mass of an element is the weighted average ma option D. It is important for students to learn this.
	B		
	C		
	D	✓	
Q17	A		The first electron shell holds a maximum of two electrons but hydr first shell. The second shell of electrons holds a maximum of eight e The number of electrons in the outer filled shell is the group numbe the element's group number.
	B		
	C		
	D	✓	
Q18	A	✓	The modern periodic table has the elements arranged in vertical gr have atoms with the same number of electrons in the outer shell, g Horizontal periods of elements have atoms with increasing number
	B		
	C		
	D		
Q19	A		Metals are found to the left of the periodic table and are high melti Only iron is magnetic. They are good conductors of heat (and elect
	B		
	C	✓	
	D		
Q20	A		The modern periodic table has the elements arranged in increasing number, and all the elements in the first 100 have now been identi
	B		
	C	✓	
	D		
Q21	A	✓	The boiling points do increase down the group. The range of the bo 184 – (-35) °C = 219 °C. A graph of the boiling points should be a ba involved. Iodine cannot be a gas at 25 °C, since its boiling point is ab
	B		
	C		
	D		

Q22	A		The electronic arrangement (2.8.1) suggests it is the group 1 metal, Group 1 metals are soft, very reactive and solids.
	B		
	C	✓	
	D		
Q23	A		The noble gases exist as single atoms and find a number of industri reactivity. All have eight electrons in their outer shell except helium down the group as their atoms get bigger.
	B		
	C	✓	
	D		
Q24	A		The halogens are toxic elements made up of diatomic molecules. Th form negative ions in ionic compounds.
	B	✓	
	C		
	D		
Q25	A		The group 1 metals get more reactive down the group and, therefo in solution. The group 7 non-metals get less reactive down the group and, ther than bromine. The more reactive metal reacting with the more reactive non-meta
	B		
	C	✓	
	D		
Q26	A		The halogens get less reactive down the group and, therefore, a ha a lower halogen from one of its salts dissolved in water. Hence bromine will displace iodine from sodium iodide solution.
	B	✓	
	C		
	D		
Q27	A		When sodium is added to water it floats on the surface and melts d solution turns purple as sodium hydroxide is formed and bubbles o
	B	✓	
	C		
	D		
Q28	A	✓	Transition metals (and their compounds) have catalytic properties and form a range of coloured compounds in which the metals carry Generally, transition metals are unreactive and group 1 metals ver
	B		
	C		
	D		
Q29	A		Transition metals like copper find many uses because of their lack o Copper forms positive ions, coloured compounds and is high boilin
	B		
	C	✓	
	D		

Q30	A		Ionic bonding occurs between metals and non-metals producing so
	B		
	C	✓	conduct electricity at room temperature (because the ions are not
	D		
Q31	A		The structure is that of a binary ionic compound, i.e. a giant lattice.
	B		
	C		The ions always carry opposite charges, which creates the electrost
	D	✓	
Q32	A		Ionic compounds carry no ... charge. The formula is normally w
	B		number of each ty... o... cancel the charges out.
	C		In this cas... Mg^{2+} ion and one O^{2-} form MgO.
	D	✓	
Q33	A	✓	...onic bonding, one or more electrons is transferred from the met
	B		outer shells of electrons.
	C		In the case of sodium chloride, sodium gives its only outer shell ele
	D		outer shell.
Q34	A		All compounds are electrically neutral. Therefore, each one of the t
	B		electron (x) to an oxygen atom with six electrons in its outer shell (
	C	✓	oxide O^{2-} ion.
	D		
Q35	A		The idea of electrons in circular orbits around the centre of an aton
	B		Rutherford model put forward by Bohr.
	C	✓	
	D		
Q36	A		The nitrogen atom has five electrons in its outer shell. By forming th
	B	✓	hydrogen atoms it has obtained a share in eight electrons, i.e. a sha
	C		
	D		
Q37	A	✓	Water has a relatively low boiling point because it is made of small
	B		molecules are weak and easily overcome at l... temperatures.
	C		
	D		
Q38	A	✓	The diagra... ...at an ethanol molecule contains two carbon a
	B		...ge... ...The formula must reflect this fact.
	C		
	D		
Q39	A		The structure is the normal way of representing a polymer. It is the
	B	✓	contains a vast number of ethene monomers represented by the 'n
	C		
	D		

Q40	A		Metals like gold are composed of layers of metal ions surrounded b
	B		
	C		
	D	✓	
Q41	A		If one group does an experiment and other groups get the same re results are said to be reproducible.
	B		
	C		
	D	✓	
Q42	A	✓	Particles are represented as inelastic spher the model, althoug Gases have very weak forces betwe the particles, leading to the Liquids have short-range d nd solids have highly ordered struc
	B		
	C		
	D		
Q43	A		°C is above the boiling point of bromine and, therefore, bromi
	B		
	C	✓	
	D		
Q44	A		Since both reactants have (aq) after their formulae then the reactio chloride forms in solution along with liquid water represented by (l The only solid to form is sulfur, represented by (s).
	B	✓	
	C		
	D		
Q45	A		Ionic compounds will only conduct electricity when the ions are fre This can only happen when the compounds are molten or dissolved
	B		
	C	✓	
	D		
Q46	A		Small molecules always have their atoms held together by covalent They can be elements or compounds with low melting (and boiling) conduct electricity, since no charge carriers are present.
	B		
	C		
	D	✓	
Q47	A	✓	Thermosoftening polymers are made up of separate polymer chain covalent bonds, but between the chains are weak forces of attracti
	B		
	C		
	D		
Q48	A	✓	Metal alloys have giant str metals but held together by the remainder hav gia ctures of atoms held by covalent bon
	B		
	C		
	D		
Q49	A		Some metals are soft and need to be alloyed to make them harder alloying process prevents the layers sliding as easily.
	B		
	C	✓	
	D		
Q50	A	✓	Substance A is a metal because it has a high melting point and cond and molten. B and C are non-metals and D is ionic.
	B		
	C		
	D		

Q51	A		Metals conduct heat by the movement of electrons past each othe ions.
	B		
	C	✓	
	D		
Q52	A		Only graphene (a form of graphite) and metals contain delocalised
	B	✓	
	C		
	D		
Q53	A		The high melting point of aluminium is re son for choosing it malleability (ease of shaping), l (more fuel efficient) and
	B	✓	
	C		
	D		
Q54	A		'sticks' in the structure represent covalent bonds. Diamond is a atoms are held together in a giant structure.
	B		
	C	✓	
	D		
Q55	A		The diamond structure does not have delocalised electrons and, th electricity. Diamonds glisten and have high melting and boiling poi
	B	✓	
	C		
	D		
Q56	A		Graphite is made up of layers of carbon atoms. There are weak forces of attraction between the layers, which allo other allowing graphite to act as a lubricant.
	B		
	C		
	D	✓	
Q57	A		The diagram represents a carbon nanotube. A carbon nanotube is a tube-shaped material, made of carbon, hav scale.
	B	✓	
	C		
	D		
Q58	A		Nanoparticles range in size between 1 nm and 100 nm, making the Their very large surface area / volume ration makes them more rea particles.
	B		
	C	✓	
	D		
Q59	A		Graphene is a form of or consisting of planar sheets which are
	B	✓	
	C		
	D		
Q60	A		Decreasing the side of a cube by a factor of 10 increases the surface of 10. This is why nanoparticles which are very small have such lar
	B	✓	
	C		
	D		
Q61	A	✓	Nanoparticles find use in medicine to deliver drugs, heat, light or ot cells (such as cancer cells). Their small size makes them useful for d such small particles may ultimately present a danger to human hea
	B		
	C		
	D		

Atomic Structure and the Peri

1. Which statement correctly describes chemical compounds?

Chemical compounds are:

A formed from their elements in variable pro...

B represented by chemical formula...

C only formed between no...

D formed in reaction... ...ng ...all energy changes

2. Which o... ...wing statements is correct?

A There are about 200 formulae representing chemical elements.

B The symbol for a carbon atom is C.

C The formula for an oxygen molecule is O.

D The symbol for a boron atom is Br.

3. Which of the following equations represents the balanced equation for the reaction between potassium and fluorine?

A $K + F_2 \rightarrow KF_2$

B $K + F \rightarrow KF$

C $2K + F_2 \rightarrow K_2F_2$

D $2K + F_2 \rightarrow 2KF$

4. In the ap... which of...

A Lieb...

B frac...

C deli...

D boil...

5. The proc... concentr...

A sim...

B filtr...

C crys...

D chr...

6. Which o...

Mixture...

A are...

B hav...

C are...

D alw...

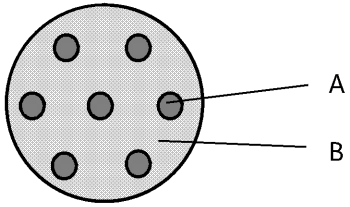
7. As part of a class exercise, a teacher gave her students a list of non-metals and told them to find their boiling points on the Internet and also to record their position in the periodic table.

She then told the students to record their boiling points along with their position in the periodic table in the most suitable way.

The students should have plotted:

A a line graph ☐
B a scatter graph ☐
C a pie chart ☐
D a ba[illegible] ☐

8. The diagram shown below represents the so-called plum pudding model of atomic structure.



Which of the following statements was believed to be true about this early model?

A The particles labelled A carried no charge. ☐
B The particles labelled A were negatively charged. ☐
C The area labelled B carried no charge. ☐
D The atom had an overall positive charge. ☐

9. Which of the following conclusions was drawn from the results of the alpha scattering experiments carried out by Rutherford?

Atoms:

A had [illegible]ll positive charge ☐
B contained little empty space ☐
C had structures that confirmed the plum pudding model ☐
D had a small, dense centre ☐

10. Which o[illegible]

This is a[illegible]

A gro[illegible]
B gro[illegible]
C gro[illegible]
D gro[illegible]

11. Which o[illegible]

A a pr[illegible]
B a ne[illegible]
C an [illegible]
D an [illegible]

12. **(Chemis[illegible]**

Which o[illegible] atoms o[illegible]

A The[illegible]
B The[illegible]
C The[illegible]
D The[illegible]

13. An atom of lithium contains three protons, four neutrons and three electrons.

Which of the following represents this atom of lithium?

A $^{7}_{3}Li$
B $^{10}_{3}Li$
C $^{7}_{4}Li$
D $^{10}_{4}Li$

14. Atoms are very small. The radius of an atom is 0.1 nm and the radius of the nucleus of an atom is about 1×10^{-14} m.

Approximately how many times bigger is the radius of an atom than the radius of its nucleus?

Tick **one** box.

A 10
B 100
C 1000
D 10 000

15. What was Mendeleev's main contribution to the periodic table put forward by him in 1869?

A He did not always arrange elements in strict order of atomic mass.
B He realised that isotopes could explain anomalies in his table.
C He removed spaces for undiscovered elements.
D He realised that the noble gases were missing from other periods.

16. Which o

They ha

A ato
B mas
C pos
D ele

17. Lithium

Which o of lithiu

A (6 +
B (7.5
C [(7.
D [(7.

18. Which o group 7

A 1.8.
B 2.6.
C 2.8.
D 2.8.

19. Which o modern

Element

A ver out
B hor out
C ver out
D hor out

20. Select the statement about the elements in the modern periodic table that is **not** correct.

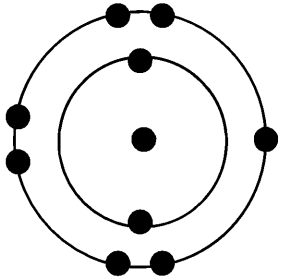
The first 100 elements in the table are arranged so that:

A They are in order of increasing atomic number. ☐
B Elements with similar properties occur at regular inter[illegible]als. ☐
C Their properties can be predicted from their p[illegible]ns. ☐
D Spaces are left for undiscovered el[illegible] ☐

21. Which of the follow[illegible]ts about metal and non-metals is correct?

A Me[illegible]low melting points and boiling points. ☐
B Met[illegible]conduct electricity when molten. ☐
C Non-metals are good conductors of heat. ☐
D Non-metals do not generally conduct electricity in any state. ☐

22. The atoms of an element have the electronic structure shown below.



Use the periodic table to decide which of the follow[illegible]ta[illegible]m[illegible]nts is correct.

The element:

A is very [illegible]eac[illegible] ☐
B is a[illegible]al ☐
C is a[illegible] ☐
D will r[illegible]ct by loss of electrons ☐

23. Argon is [illegible] noble ga[illegible]

Which o[illegible]

A Arg[illegible]
B Arg[illegible]
C Arg[illegible]
D Arg[illegible]

24. The elen[illegible]

Which o[illegible]

A The[illegible]
B The[illegible]
C The[illegible]
D The[illegible]

25. Which o[illegible]

A lithi[illegible]
B lithi[illegible]
C sod[illegible]
D sod[illegible]

26. In which[illegible]

A chl[illegible]
B bro[illegible]
C chl[illegible]
D bro[illegible]

27. Which of the following occurs when potassium is added to a trough of water containing universal indicator liquid?

A The potassium fails to react. ☐
B The indicator turns red. ☐
C The potassium sinks to the bottom. ☐
D The potassium catches fire. ☐

28. Chromium is a typical transition [illegible].

Select the correct st[illegible] about chromium:

A Ch[illegible] likely to be very reactive. ☐
B Chr[illegible]ill form coloured compounds. ☐
C Chromium cannot act as a catalyst. ☐
D Chromium will have a low melting point. ☐

29. **(Chemistry only)**

Which of the following statements correctly compares the properties of transition metals with those of group 1 metals?

Transition metals are generally:

A more reactive with water than group 1 metals ☐
B less dense than group 1 metals ☐
C harder than group 1 metals ☐
D more reactive with oxygen than group 1 metals ☐

30. An element has a very high melting po[illegible] conducts electricity when solid.

Which of the follow[illegible] be?

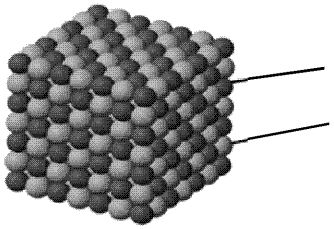
A iod[illegible] ☐
B pota[illegible] ☐
C iron ☐
D argon ☐

31. Which of the following correctly describes ionic compounds?

Ionic compounds are:

A always solids at room temperature ☐
B contain positive and negative mole ☐
C form simple, two-dimensi uctu s ☐
D made up of two me ☐

32. Which o wing statements correctly describes the structure of the comp d shown in the diagram below?



A The structure could represent the metal sodium. ☐
B Particles A and B are atoms of the same element. ☐
C Particles A and B carry the same charge. ☐
D The structure could represent sodium chloride. ☐

33. Magnesium chloride is composed of Mg^{2+} i s mc s.

Which of the following represe form of magnesium chloride?

A $MgCl_2$ ☐
B Mg ☐
C $2M_{\ }$ ☐
D $(MgC_{\ })$ ☐

34. Which o its elem

A Eac iod
B Eac
C Eac
D Eac

35. A compo for the e

Given th represe

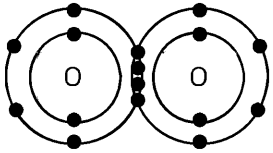
A A
B A^+
C A^{2+}
D A^{3+}

36. Which o ionic co

Their m

A low bet
B low bet
C hig bet
D hig bet

37. The structure of an oxygen molecule is shown below.



Which of the following is a correct statement about an oxygen molecule?

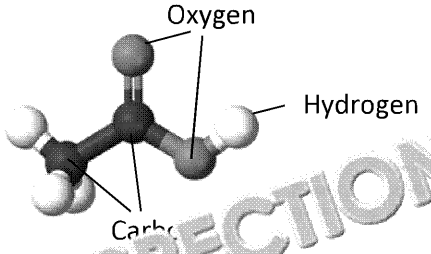
A It shows that oxygen is in group 8.
B Each molecule contains four covalent bonds.
C It involves the sharing of electrons.
D It shows that the formula of oxygen gas is 2O.

38. Which of the following is a correct statement about water boiling?

The boiling point of water is relatively low because water:

A is made of simple molecules
B has a giant structure
C contains strong hydrogen-to-oxygen covalent bonds
D conducts heat well

39. The diagram below shows a ball and stick model of an ethanoic acid molecule.



Which of the following is the formula of ethanoic acid?

A CH_2
B C_2H_3
C C_2H_4O
D $C_2H_4O_2$

40. The stru

Which o
or its str

A n st
B The
car
C The
D The

41. Silver is

Which o

A It is
eac
B It is
cha
C It h
the
D It is

42. A group

The stud
same re

The resu

A ver
B sho
C rep
D rep

43. Which of the following statements about the particle model for the three states of matter is correct?

A The particles are represented as elastic spheres.
B There are weak forces between solid particles.
C The particles in a liquid are not free to move.
D The particles are most disordered in a gas.

44. Phosphorus melts at 44 °C and boils at 280 °C.

What will be the physical state of phosphorus at 100 °C?

A a solid
B a liquid
C a gas
D a solution

45. The equation below shows the reaction between barium and water.

$Ba_{(s)} + 2H_2O_{(l)} \rightarrow Ba(OH)_{2(aq)} + H_{2(g)}$

Which of the following statements can be deduced from the equation for the reaction?

A Solid barium hydroxide would be seen forming.
B Barium would be seen dissolving in the water.
C Barium would melt during the reaction.
D No bubbles would be seen during the reaction.

46. Methanol is made up of small molecules. Which of the following properties is methanol likely to have?

Complete the following sentence.

Methanol is ...

A ... a high melting solid.
B ... a good conductor of electricity.
C ... have strong forces between its molecules.
D ... have covalent bonds within its molecules.

47. The diag

Which o
one sho

These p

A are
B are
C wil
D are

48. How ma

A 1
B 2
C 3
D 4

49. Coins ar

Copper i

To make

A hig
B ma
C ma
D allo

50. The table below lists the properties of four substances.

Substance	Melting point (°C)	Conducts electricity	
		when solid	when molten
A	1085	✓	✓
B	115	×	×
C	-0.5	×	×
D	80[illegible]	×	✓

Which of the substances A to D is an ionic compound?

A Substance A ☐
B Substance B ☐
C Substance C ☐
D Substance D ☐

51. Metals are good conductors of electricity. How can charge be transferred in a metal?

Complete the following sentence.

Charge can be transferred in a metal by...

A ... layers of atoms sliding past each other. ☐
B ... layers of atoms vibrating. ☐
C ... delocalised electrons moving past each other. ☐
D ... oppositely charged ions moving past each other. ☐

52. How many of the substances listed in the box below contain delocalised electrons?

graphite	diamond	silicon dioxide	poly(butene)

A 1 ☐
B 2 ☐
C 3 ☐
D 4 ☐

53. Steel is [illegible]

Which [illegible]

A Ste[illegible]
B Ste[illegible]
C Ste[illegible]
D Ste[illegible]

54. Part of [illegible]

Which [illegible] diamond [illegible]

A It h[illegible]
B Eac[illegible]
C It h[illegible]
D It h[illegible]

55. Which [illegible]

Diamond [illegible]

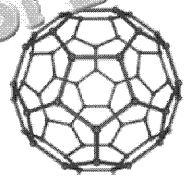
A lubr[illegible]
B the [illegible]
C elec[illegible]
D the [illegible]

56. Which of the following is a property of graphite?

Graphite is:

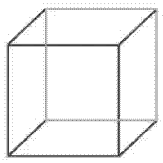
A low melting
B an insulator
C very soft
D very shiny

57. Which is the name of the carbon-based structure shown in the diagram?



A a nanoparticle
B a nanotube
C buckminsterfullerene
D graphene

58. The diagram below shows a cube of side 0.012 cm.



0.012 cm

Which of the following gives the surface area of the cube in cm^3 and in standard form to two significant figures?

A $1.4 \times$
B 1.4
C 8.6
D 8.64×10^{-4}

59. Which o

A Gra
B Gra
C Gra
D Gra

60. A nanop

Complet

As the si
volume

A dec
B dec
C incr
D incr

61. Complet

Nanopar

A ... n
B ... n
C ... d
tran
D ... n

62. The law of conservation of matter is a very important concept in chemistry.

The law of conservation of matter means:

A the physical state of the reactants and product[illegible]

B the total number of particles stays c[illegible] during a reaction

C the total number of compou[illegible]ays c[illegible]tant during a reaction

D the total mass of re[illegible] is the total mass of products

63. Potassi[illegible]ns [illegible] chlorine, Cl_2, to form potassium chloride, KCl.

The corre[illegible]lanced equation for the formation of potassium chloride is:

A $K + Cl \rightarrow KCl$

B $K_2 + Cl_2 \rightarrow 2KCl$

C $2K + Cl_2 \rightarrow K_2Cl_2$

D $2K + Cl_2 \rightarrow 2KCl$

64. Aluminium hydroxide occurs in its impure form as the ore bauxite.

The formula of aluminium hydroxide is $Al(OH)_3$.

Which of the following is the relative formula mass of aluminium hydroxide?

[H = 1, O = 16, Al =27]

A 44

B 46

C 78

D 132

65. Which of the follow[illegible] reactions would appear to show a change in mass w[illegible]ed [illegible] in an open container?

A $KOH_{(aq)} + [illegible]_{(aq)} \rightarrow KCl_{(aq)} + H_2O_{(l)}$

B $ZnCO_{3(s)} + 2HNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$

C $Pb(NO_3)_{2(aq)} + H_2SO_{4(aq)} \rightarrow PbSO_{4(s)} + 2HNO_{3(aq)}$

D $MgO_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_2O_{(l)}$

66. **(Higher**

Iron oxi[illegible]
accordin[illegible]

$Fe_2O_3 +$ [illegible]

[C = 12, [illegible]

If 80 g o[illegible]
then:

A 28 g

B 28 g

C 112

D 56 g

67 Which o[illegible]
of mole[illegible]

A 3.0 [illegible]

B 4.0 [illegible]

C 5.0 [illegible]

D 6.0 [illegible]

68. **(Higher**

Which o[illegible]

[O = 16, [illegible]

A 36.[illegible]

B 64.[illegible]

C 84.[illegible]

D 112

69. (Higher tier only)

How many moles of oxygen atoms are present in 0.2 mol of sulfuric acid, H_2SO_4?

A 0.2 mol
B 0.4 mol
C 0.8 mol
D 1.4 mol

70. The chemical equation for the decomposition of sulfur trioxide is given by:

$2SO_{3(g)} \rightarrow 2SO_{2(g)} + O_{2(g)}$

2.4 mol of sulfuric trioxide gas on decomposition will form a maximum of:

A 1.2 mol of O_2
B 2 mol of SO_2
C 4.8 mol of SO_2
D 5.8 mol of products

71. (Higher tier only)

The Avogadro constant of particles, 6.02×10^{23}, is an important concept in chemistry.

Which of the following statements is correct?

A The large Avogadro constant suggests atoms are very large.
B 6.02×10^{23} ions are contained in 2 mol of CO_2.
C 6.02×10^{23} carbon atoms are contained in 1 mol of CO_2.
D 6.02×10^{23} chlorine molecules are present in 2 mol of Cl_2.

72. (Higher

What m

[H = 1, C

$CH_4 + 2C$

A 2.0
B 4.5
C 9.0
D 36.0

73. (Higher

In an ex
with 1.6

The equ

A Mg
B 2Mg
C 2Mg
D 2Mg

74. In an ex
copper

Which o
to 2 d.p.

A 1.49
B 1.51
C 3.52
D 4.81

75. (Higher tier only)

Heating iron oxide with carbon monoxide produces iron according to the equation:

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

In an experiment, 0.2 mol of iron oxide was reacted with 0.6 mol of carbon monoxide.

Which of the following changes to this experiment would have produced more iron?

A using more moles of iron oxide ☐
B using more moles of carbon monoxide ☐
C using more moles of iron oxide ☐
D using more moles of carbon monoxide ☐

76. (Higher tier only)

Which of the following reactions results in an increase in the number of gas moles?

A $2SO_{3(g)} \rightarrow 2SO_{2(g)} + O_{2(g)}$ ☐
B $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$ ☐
C $NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl_{(s)}$ ☐
D $2CO_{(g)} + 2NO_{(g)} \rightarrow 2CO_{2(g)} + N_{2(g)}$ ☐

77. (Higher tier only)

Aluminium reacts with oxygen according to the equation shown below.

$2Al + 3O_2 \rightarrow Al_2O_3$

In which of the following is aluminium the limiting factor?

[O = 16]

A heating of aluminium with 4.8 g of oxygen ☐
B heating 5.4 g of aluminium with 9.6 g of oxygen ☐
C heating 8.1 g of aluminium with 14.4 g of oxygen ☐
D heating of 11.2 g of aluminium with 19.2 g of oxygen ☐

78. Mineral

The ave
dissolve

What w
an avera

A 0.0
B 0.0
C 175
D 700

79. Which o

A 2SO
B C_6H
C 4NH
D Fe_2

80. (Chemis

Calculat

C_2H_5OH

[Relative

A 21.8
B 27.9
C 50.0
D 78.2

81. (Chemis

Which o

A High
B High
C Che
D Che

82. In a chemical reaction the theoretical mass of a product was 6.71 g whereas the actual mass obtained was 4.70 g.

Which of the following is the percentage yield in the reaction?

A 0.70 %
B 1.43 %
C 70.0 %
D 142.8 %

83. Using a digital balance with zero error will mean that:

A the measured masses would be too high
B a systematic error will be introduced
C the error would be negligible
D no error would be introduced

84. A chemical reaction had a 72 % yield and 16.4 g of the product was obtained.

Which of the following was the theoretical amount of product?

A 4.4 g
B 11.8 g
C 22.8 g
D 118.1 g

85. Which of the following would contribute to increasing the percentage yield in a chemical reaction?

A using more of each reactant
B loss of product during separation from the reactants
C fewer reactions occurring
D making the reaction faster

86. **(Chemis**

Which o
tempera

1 mole c

A 11 g
B 256
C 10.0
D 284

87. **(Chemis**

The reac

chloride

$H_{2(g)}$ + Cl

Under th
reacted

The volu

A 10 c
B 60 c
C 70 c
D 130

88. **(Chemis**

A soluti

What is

A 0.00
B 9.8 g
C 98 g
D 980

89. A student measured the volume of a liquid as 55 cm^3 using a measuring cylinder.

The uncertainty in measuring the volume by this method is ± 1 cm^3.

The percentage error in taking this measurement to two decimal places is:

A 1.8 %
B 1.82 %
C 3.6 %
D 3.64 %

90. **(Chemis[illegible] Higher tier only)**

The concentration of a solution of sodium hydroxide, NaOH, was 2.0 mol/dm^3.

What mass of sodium hydroxide would be present in 200 cm^3 of this solution?

[H = 1, O = 16, Na = 23]

A 8 g
B 16 g
C 80 g
D 160 g

91. Zinc reacts with copper (II) oxide on strong heating according to the word equation:

zinc + copper oxide → zinc oxide + copper

Which of the following substances has been oxidised in this reaction?

A zinc ☐
B copper oxide ☐
C zinc ☐
D copper ☐

92 Below is a reactivity series of some common metals, as well as carbon.

potassium	most reactive
sodium	
calcium	
magnesium	
aluminium	
carbon	decreasing reactivity
zinc	
iron	
lead	
copper	
silver	
gold	least reactive

Which of the following reactions would be the least vigorous?

A lead heated with zinc oxide ☐
B magnesium heated with zinc oxide ☐
C calcium heated with iron oxide ☐
D aluminium heated with copper oxide ☐

93. This question

Which of the series is

A Gold
B Calcium
C Iron
D Aluminium

94. **(Higher tier)**

In the reaction

magnesium

the magnesium where electrons

Which of

The magnesium

A neither
B reduced
C oxidised
D reduced

95. Zinc powder

Which of

zinc + hydrochloric

A zinc
B zinc
C zinc
D zinc

96. Nickel is an unreactive transition metal. However, many water soluble salts of nickel exist, such as nickel chloride.

Nickel chloride **cannot** be made by reacting dilute hydrochloric acid with:

A nickel carbonate
B nickel hydroxide
C nickel oxide
D nickel

97. Which of the following statements is correct?

Adding [illegible]ide to an acid:

A will lo[illegible]e pH of the solution
B will cause an insoluble salt to form
C is called neutralisation
D will cause oxygen gas to form

98. Sulfuric acid, $H_2SO_{4(aq)}$, is a typical acid.

Sulfuric acid has the typical properties of an acid because its solution contains:

A hydrogen ions
B sulfate ions
C sulfide ions
D hydroxide ions

99. In order to prepare pure, dry, well-form[illegible]ls of zinc chloride in the laboratory, zinc oxide is first ad[illegible] warm hydrochloric acid solution.

Which of the following statements about this preparation is correct?

A The [illegible]oric acid is warmed to remove some acid.
B Hydr[illegible]acid is used in excess.
C The zinc oxide slowly dissolves in the warm acid.
D The solution of zinc chloride formed is boiled to dryness.

100. Which of

A The
B The hydr
C It ca
D It ch

101. Water is

Which of

A $H^+_{(aq}$
B $2H_{(aq}$
C $2H^-_{(a}$
D $2H^+_{(a}$

102. Which of

A acid
B acid
C acid
D acid

103. **(Chemist**

Which of is correct

A The
B The
C A be
D The

104. (Higher tier only)

Which of the following statements about weak and strong acids is correct?

A solution of a strong acid compared to that of a weak acid of the same concentration will:

A be less ionised ☐
B contain more hydrogen atoms in ☐
C have a lower hydrogen ion concentration ☐
D release gas at a faster rate with a reactive metal ☐

105. In order to increase the pH of a solution by one unit the hydrogen ion concentration must be changed from:

A 1×10^{-2} to 5×10^{-2} ☐
B 1×10^{-2} to 1×10^{-1} ☐
C 1×10^{-2} to 2×10^{-3} ☐
D 1×10^{-2} to 1×10^{-3} ☐

106. Compounds like lead bromide conduct electricity when molten but not when solid.

The reason for this is that in the molten state:

A the electrons in the bonds can move ☐
B all substances conduct electricity ☐
C the ions are free to move ☐
D the molecules become charged ☐

107. The diag

Molte
brom

What sh

(It is assu

A Zinc,
B Mag
C Grap
D Sodi

108. (Higher t

In the el
and Cl^-.

The prod

Which of

A Zn^{2+}
B Zn^{2+}
C $2Cl^-$
D $2Cl^-$

109. In the electrolysis of sodium chloride dissolved in water, which of the following substances will be formed at the **negative** electrode?

A sodium ☐
B chlorine ☐
C hydrogen ☐
D oxygen ☐

110. Which of the following substances can be electrolysed?

A copper ☐
B sulf[illegible] ☐
C alun[illegible]de ☐
D liquid hydrocarbons ☐

111. Aluminium is manufactured by the electrolysis of a mixture of aluminium oxide and cryolite.

Which of the following statements is correct about the extraction?

A Cryolite is added to lower the melting point of the mixture. ☐
B Electrolysis is done below the melting point of the mixture. ☐
C The positive anodes are made of aluminium. ☐
D Electrolysis is used because it is a cheap process. ☐

112. (Higher tier only)

How many of the four half-reactions shown below are [illegible] oxidation?

$Zn^{2+} + 2e^- \rightarrow$ [illegible]

[illegible] $+2e^-$

[illegible] $+ 2e^- \rightarrow H_2$

$2Br^- \rightarrow Br_2 + 2e^-$

A 1 ☐
B 2 ☐
C 3 ☐
D 4 ☐

113. Which of [illegible] electroly[illegible]

A calci[illegible]
B calci[illegible]
C hydr[illegible]
D hydr[illegible]

114. (Higher t[illegible]

Which o[illegible] the left-h[illegible]

A Cu^{2+}[illegible]
B Al^{3+}[illegible]
C $2F^-$[illegible]
D $2O^{2-}$[illegible]

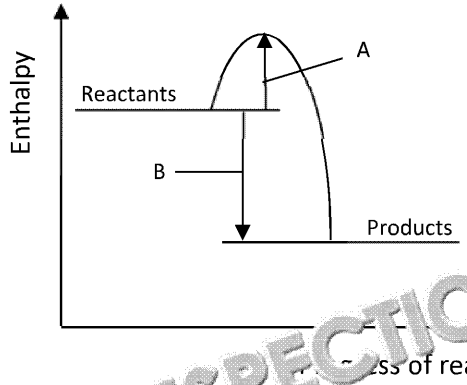
115. Which of the following processes transfers heat energy from the surroundings to the reaction?

A lighting a fire
B boiling water
C melting ice
D setting off a firework

116. Which of the following is the best description for the activation energy of an endothermic reaction?

A The minimum temperature required to stop the reaction.
B The minimum temperature each particle needs to stop moving.
C The minimum energy to start a reaction.
D The minimum energy to stop a reaction.

117. The diagram below represents the energy level profile for a reaction.



Progress of reaction

Which of the following statements is correct?

A The reaction is exothermic.
B The products have more energy than the reactants.
C A is energy change in the reaction.
D B is the activation energy of the reaction.

118. **(Higher t**

Which of

In an end

A Ener brea
B The is eq
C Less in bo
D More in bo

119. Hydroge reaction

2H–I →

The relev

Which of decompo

A 9
B 89
C 885
D 1183

120. (Higher tier only)

When 2 mol of hydrogen gas react with 1 mol of oxygen gas according to the equation given below:

$2H_2 + O_2 \rightarrow 2H_2O$

overall 572 kJ of energy are **given out**.

Suggest which of the following would be the energy change when 1 mol of water is broken up into its elements.

Overall…

A 286 kJ of energy are given out ☐
B 572 kJ of energy are given out ☐
C 286 kJ of energy are taken in ☐
D 572 kJ of energy are taken in ☐

121. Burning 16 g of methane releases 810 kJ of energy.

How much energy would 0.32 kg of methane release?

1 kg = 1000 g

A 16.2 kJ ☐
B 1620 kJ ☐
C 16 200 kJ ☐
D 40 500 kJ ☐

122. The follo
heat cha
four exp

	R

Which o

A The
B The
C The
D The

123. (Chemist

Hydroge
hydroge

Which o
over tho

A hydrog

A prod
B cann
C uses
D uses

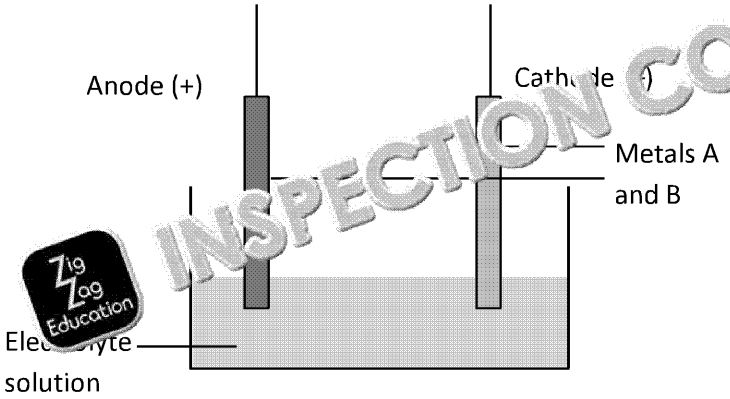
124. (Chemist

Which o
hydroge

A $2H_2$ +
B $2H^+$ +
C O_2 +
D $2H_2$ +

125. (Chemistry only)

The diagram below shows the apparatus to test the voltage produced by placing two dissimilar metals, A and B, in an electrolyte, such as salt water.



By using the reactivity series of metals shown below, decide which of the pairs of metals listed would produce the lowest voltage.

potassium	most reactive
sodium	
calcium	
magnesium	
aluminium	
carbon	decreasing reactivity
zinc	
iron	
lead	
copper	
silver	
gold	least reactive

A and B

A magnesium and copper ☐
B zinc and copper ☐
C copper and silver ☐
D magnesium and lead ☐

126. (Chemist

Which o

A Alka
B Non-
used
C A ba
D Rech