Surname	Initial(s)
Signature	

Paper Reference(s)

5017 5037

Edexcel GCSE

Additional Science (5017)

Chemistry (5037)

C2 – Topics 5 to 8

Foundation and Higher Tier

Thursday 4 March 2010 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	Nil

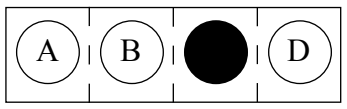
Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:
Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:
For each question, choose the right answer, A, B, C or D and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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Turn over

Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Metals

1. Zinc is a metal.
It is likely to

A have a low melting point
B have a low boiling point
C be brittle
D be a good conductor of heat

2. Zinc is used to make alloys.
Alloys are used instead of pure metals because they are usually

A less reactive
B softer
C stronger
D more malleable

3. Zinc reacts with dilute sulphuric acid.
The equation for the reaction is

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

The equation shows that, in this reaction, zinc is a

A solution
B suspension
C solid
D gas

4. When zinc reacts with dilute sulphuric acid, the temperature of the solution increases.
This is because

A hydrogen is colourless
B the zinc dissolves
C the reaction is exothermic
D the reaction is endothermic

5. John reacted zinc with dilute sulphuric acid.
He repeated the experiment using the same volume of a slightly more concentrated sulphuric acid.
The reaction with the more concentrated acid will

A produce a smaller temperature increase
B not produce a temperature increase
C be faster
D not produce any hydrogen

Properties of substances

6. Which of these is a good conductor of electricity?

A diamond
B carbon dioxide
C methane
D graphite

7. Copper is a metal which is used as an electrical conductor.
During conduction, particles move through the copper.
The particles that move to conduct the current are

A atoms
B electrons
C ions
D electrodes

8. Simple molecular, covalent compounds

A conduct an electric current when molten
B contain ions
C have high boiling points
D have low melting points

9. Substances with giant ionic structures

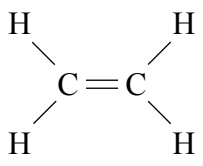
A conduct an electric current when solid
B conduct an electric current when molten
C have low melting points
D have low boiling points

Carbon chemistry

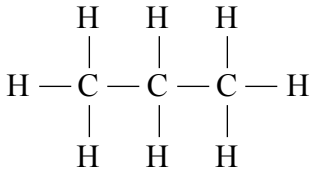
10. Which of these is the formula of a hydrocarbon molecule?

A C_2H_4
B CH_3COOH
C H_2O
D CH_3OCH_3

11. Which of these shows the structure of an ethane molecule?



A



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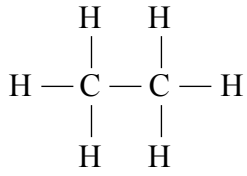
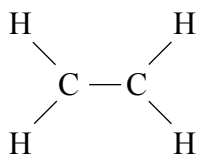


C



D

12. Many polymers contain carbon atoms in their molecules.
All polymers

A contain ionic bonds
B are formed by the combination of many small molecules
C break down easily
D are unsaturated

13. Polymers are often used as packaging material.
Disposing of this packaging can cause problems because most polymers

A are made from crude oil
B are biodegradable
C burn readily
D do not rot

Compounds

14. Some compounds contain ions.
The symbol for an iodide ion is

A I
B I_2
C I^-
D I^2

15. Ammonia is a covalent compound.
The bonds in an ammonia molecule are formed by

A sharing electrons
B transfer of electrons from nitrogen to hydrogen
C transfer of electrons from hydrogen to nitrogen
D sharing neutrons

16. Ammonium sulphate is used as a fertiliser.
Fertilisers are used to

A provide nutrients for plant growth
B kill weeds
C stop insects damaging plants
D help dead plant material to decompose

Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Making new substances

17. Some unsaturated vegetable oils are made into solids for use in the food industry.
In this process, the unsaturated oils react with

A butter
B saturated hydrocarbons
C hydrogen
D saturated fat

18. A chemist has to synthesise an important new substance to be used as a drug.
He produced the substance by one method but it contained a highly toxic by-product.
He should

A try to make the substance by a different method
B not tell anyone that the by-product is toxic
C use a catalyst to prevent the formation of the toxic by-product
D test the by-product on humans

19. John made sodium nitrate by reacting sodium hydroxide solution with nitric acid.
To make sodium sulphate safely, he could react

A sodium nitrate solution with dilute hydrochloric acid
B sodium with dilute sulphuric acid
C sodium hydroxide solution with dilute hydrochloric acid
D sodium hydroxide solution with dilute sulphuric acid

20. Zinc reacts with dilute hydrochloric acid to form zinc chloride.
During the reaction zinc ions, Zn^{2+}, are formed.
To form zinc ions, the zinc atoms must

A gain protons
B gain electrons
C lose electrons
D share electrons

Atoms and molecules

Use the following information to answer questions 21 and 22.

The atomic number of neon is 10.

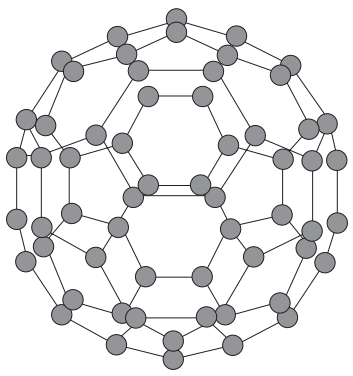
21. All atoms of neon must contain

A 5 protons and 5 neutrons
B 5 protons and 5 electrons
C 10 protons, 10 neutrons and 10 electrons
D 10 protons and 10 electrons

22. Neon does not react to form compounds because neon atoms

A have two electrons in their outer shell
B form stable molecules
C have only two shells containing electrons
D have eight electrons in their outer shell

23. The diagram shows the structure of a molecule of buckminsterfullerene.
It has the formula C_{60}.



Chemists discovered buckminsterfullerene whilst trying to make long chain molecules.
Buckminsterfullerene is

A an unstable substance that was discovered by chance
B a stable compound that chemists intended to make
C a form of the element carbon that was discovered by chance
D a form of the element carbon that scientists intended to make

24. Sodium chloride is formed when sodium reacts with chlorine.
The reaction is exothermic.
During this reaction

A energy is needed to break bonds
B energy is needed to form bonds
C no bonds are broken but new bonds are formed
D the bonds broken are stronger than the bonds formed

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

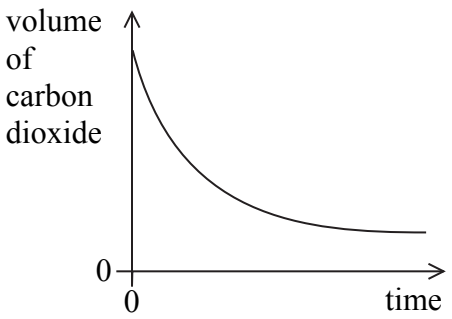
Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Chemical reactions

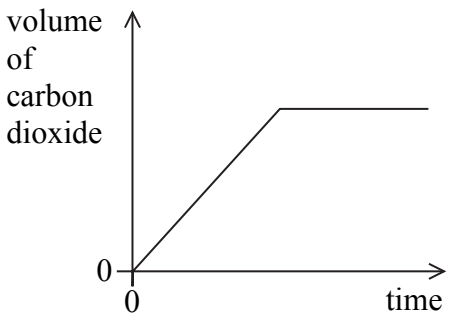
25. Hydrogen peroxide decomposes to form water and oxygen.
This reaction is catalysed by manganese(IV) oxide.
The manganese(IV) oxide catalyst

A decomposes to form additional oxygen
B prevents the reverse reaction from taking place
C increases the rate of reaction
D causes the reaction to start

26. A student investigated the rate of reaction of calcium carbonate with dilute hydrochloric acid.
Every minute, the student recorded the total volume of carbon dioxide produced, until some time after the reaction was complete.
Which graph shows the correct results?



A



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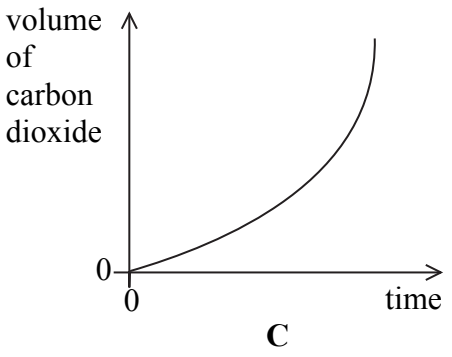

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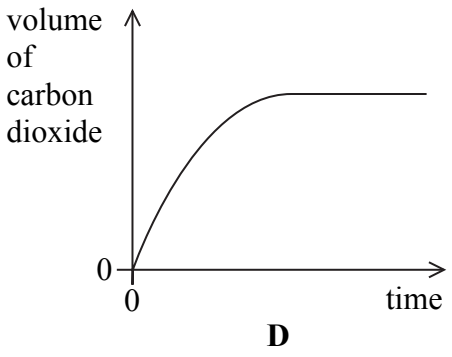


D

27. The balanced equation for the reaction between calcium carbonate and dilute hydrochloric acid is

A $CaCO_3 + H_2Cl \rightarrow CaCl + H_2O + CO_2$
B $Ca(CO_3)_2 + 2HCl \rightarrow CaCl_2 + H_2O + 2CO_2$
C $CaCO_3 + H_2Cl_2 \rightarrow CaCl_2 + H_2O + CO_2$
D $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

28. Which row of the table shows the effect of a lower temperature on the frequency and energy of particle collisions during a chemical reaction?

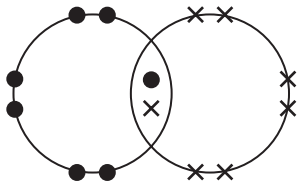
	frequency of particle collisions	**energy of particle collisions**
A	decreased at lower temperature	decreased at lower temperature
B	unchanged at lower temperature	decreased at lower temperature
C	unchanged at lower temperature	unchanged at lower temperature
D	decreased at lower temperature	unchanged at lower temperature

Structures

29. Which row of the table shows the electronic configurations of atoms of three elements in the same group in the periodic table?

	electronic configurations		
A	2.8.1	2.8.2	2.8.3
B	2.4	2.5	2.6
C	2.6.1	2.7.1	2.8.1
D	2	2.8	2.8.8

30. The diagram shows the outer electrons in a molecule of an element.



The element could have an atomic number of

A 7
B 8
C 14
D 17

31. Diamond and graphite have giant molecular, covalent structures.
Which of these statements are correct?

1 In a diamond molecule every carbon atom forms four covalent bonds and diamond does not conduct an electric current
2 In a graphite molecule every carbon atom forms three covalent bonds and graphite does conduct an electric current

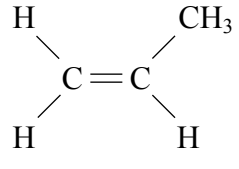
A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

32. Hexane, C_6H_{14}, has a boiling point of 69 ^oC.
The reason why hexane has a low boiling point is that

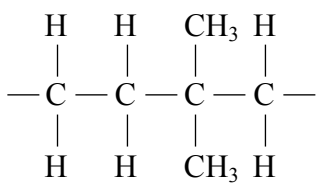
A it is a liquid at room temperature
B it has strong bonds between atoms
C it has weak forces between molecules
D hydrogen has a very low boiling point

Use the following information to answer questions 33 and 34.

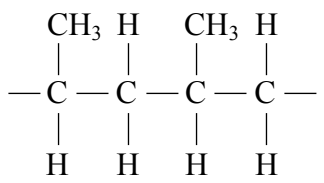
A propene molecule has the structure



33. Which of these shows the structure of poly(propene)?



A



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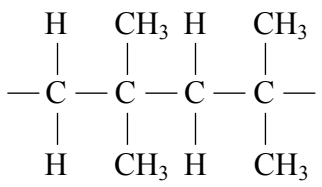

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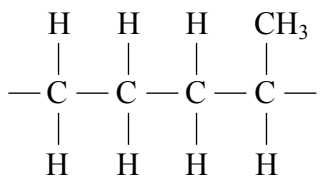

D

34. What is seen when a sample of propene is shaken with a small volume of bromine water?

A no colour change
B a change from orange to clear
C a change from clear to orange
D a change from orange to colourless

35. Here are two statements about the polymer poly(ethene).

1 The properties of the poly(ethene) can be changed by altering the reaction conditions used to produce it

2 When plasticisers are added to poly(ethene) they make the product more rigid

Which of these statements are correct?

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

36. The relative atomic mass of chlorine is 35.5.
There are two types of chlorine atom, chlorine-35 and chlorine-37.
What is the percentage abundance of each isotope in chlorine?

	percentage of chlorine-35	**percentage of chlorine-37**
A	35	37
B	50	50
C	75	25
D	25	75

37. An atom of element **X** has the electronic configuration 2.8.2.
An atom of element **Y** has the electronic configuration 2.8.7.
X and **Y** form an ionic compound.
What is the formula of this compound?

A **XY**
B $\mathbf{XY_2}$
C $\mathbf{X_2Y}$
D $\mathbf{X_2Y_7}$

38. At room temperature bromine is a liquid and iodine is a solid.
Which of these statements are possible reasons for this?

1 The covalent bond between two iodine atoms is stronger than the covalent bond between two bromine atoms
2 The forces between iodine molecules are stronger than the forces between bromine molecules

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

39. Potassium reacts with iodine to form potassium iodide.
The balanced equation for the reaction is

A $K + I \rightarrow KI$
B $K + I_2 \rightarrow KI_2$
C $2K + I_2 \rightarrow 2KI$
D $K_2 + I_2 \rightarrow 2KI$

40. 3.36 g of iron reacted with excess oxygen to produce 4.64 g of an oxide of iron.
What is the empirical formula of this oxide of iron?
(Relative atomic masses: Fe = 56, O = 16)

A Fe_2O_3
B FeO_5
C Fe_3O_4
D Fe_4O_3

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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