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

Wednesday 4 March 2009 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

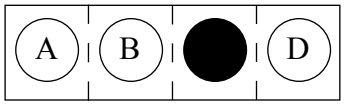
Instructions to Candidates

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

At the barbecue

1. Charcoal is used as a fuel for some barbecues.

When charcoal burns heat is produced.
This means that the reaction is

A neutralisation
B reversible
C exothermic
D endothermic

2. Small pieces of charcoal burn faster than the same mass of large pieces.
This is because small pieces

A burn at a lower temperature
B have a larger surface area
C fit closer together
D contain more concentrated charcoal

3. Burgers are cooked on the barbecue.
The burgers contain unsaturated fat.
Unsaturated fats can be monounsaturated or polyunsaturated.
A molecule of polyunsaturated fat contains

A no double bonds
B one double bond
C more than one double bond
D single bonds only

4. Burgers are stored in a fridge to prevent decay.
Decay is caused by the action of enzymes.
Enzymes are

A bacteria
B small animals
C microscopic plants
D biological catalysts

5. Some oils are reacted with hydrogen to change them into solids.
The reaction with hydrogen is

A hydration
B hydrogenation
C dehydration
D dehydrogenation

6. The burgers were in a plastic container.
Plastics can cause environmental problems because they

A do not burn
B are biodegradable
C do not rot
D are toxic

7. Poly(ethene) is a plastic.
Ethene is reacted to form poly(ethene).
In this reaction ethene is a

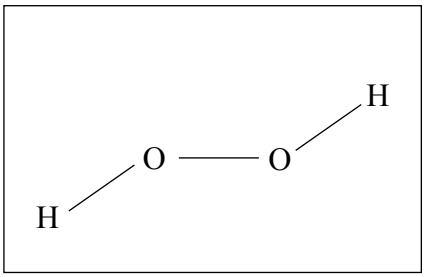
A large molecule
B monomer
C cross linked material
D plasticiser

8. Ethene is obtained from

A crude oil
B sea water
C methane
D air

Hydrogen peroxide

9. The diagram shows a molecule of hydrogen peroxide, H_2O_2.



The atoms are joined by covalent bonds.

The covalent bonds contain

A protons
B electrons
C ions
D atoms

10. Hydrogen peroxide is a simple molecular, covalent compound.
Which of these substances is most likely to be hydrogen peroxide?

substance	melting point (°C)	boiling point (°C)
A	808	1465
B	0	150
C	455	1550
D	1610	2230

11. What is the relative formula mass of hydrogen peroxide, H_2O_2?
(Relative atomic masses: H = 1, O = 16)

A 17
B 18
C 34
D 36

12. Hydrogen peroxide decomposes to form water and oxygen.
The equation is

$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

Which row of the table correctly shows the states of the products?

	water	**oxygen**
A	gas	liquid
B	solid	liquid
C	liquid	gas
D	liquid	solid

13. Tom has a solution of hydrogen peroxide that is decomposing very slowly.
He adds 1 g of zinc oxide, which is insoluble. This acts as a catalyst.
At the end of the reaction, he filters off the insoluble zinc oxide and dries it.
He should find that the mass of zinc oxide is

A 0 g because it has all reacted
B less than 1 g but not 0 g
C more than 1 g
D 1 g

Chlorine: a very reactive gas

14. A chlorine atom is represented by Cl.
A chloride ion is represented by Cl^-.
A chlorine atom forms a chloride ion by

A losing a proton
B losing an electron
C sharing an electron
D gaining an electron

15. The formula of a chlorine molecule is

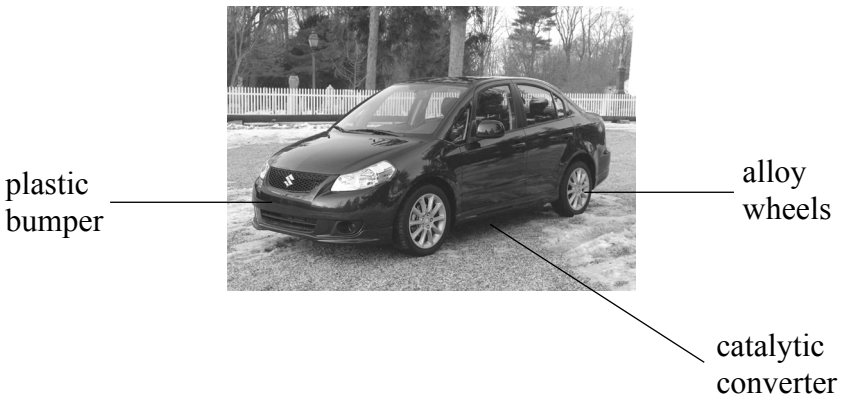
A Cl
B Cl^2
C Cl_2
D 2Cl

16. Which row of the table correctly describes the positions of protons, neutrons and electrons in a chlorine atom?

	protons in	**neutrons in**	**electrons in**
A	nucleus	nucleus	shells
B	shells	nucleus	nucleus
C	nucleus	shells	shells
D	nucleus	nucleus	nucleus

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

Materials for cars



17. The car bumper is made of a thermoplastic polymer.
Which row of the table describes this type of polymer?

	cross links between chains	**softened by heating**
A	no	yes
B	yes	no
C	yes	yes
D	no	no

18. The car wheels are made of an alloy of aluminium.
The main reason for using an alloy instead of pure aluminium is that the alloy is

A stronger
B heavier
C shinier
D softer

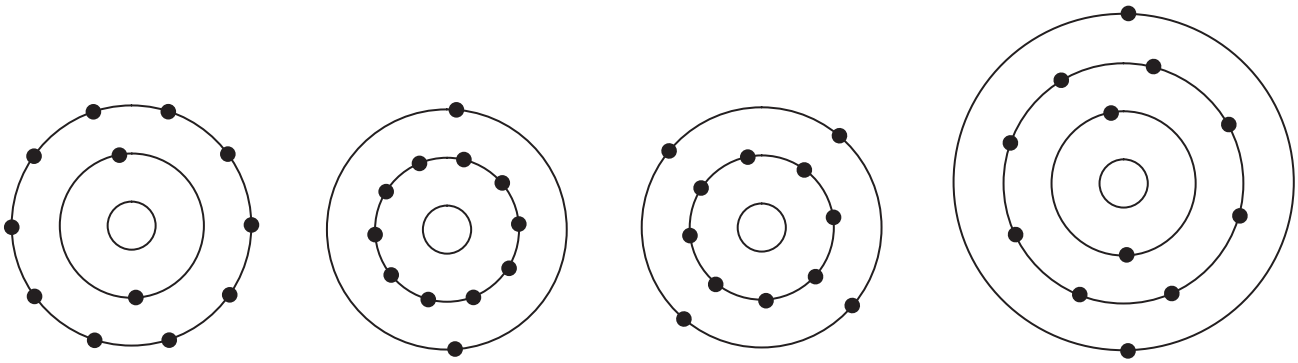
19. Magnesium is a metal that is used in alloys.
It has an atomic number of 12 and several stable isotopes.
The table shows the numbers of protons, neutrons and electrons in particles P, Q, R, S, T and U.

particle	number of		
	protons	**neutrons**	**electrons**
P	12	12	12
Q	13	12	12
R	12	13	13
S	12	13	12
T	14	12	14
U	12	14	12

Which of these particles are atoms which are magnesium isotopes?

A P, Q and T
B P, Q, S and U
C P, S and U
D P, R and S

20. Which of these shows the electronic configuration of a magnesium atom?
(atomic number of magnesium = 12)



A **B** **C** **D**

21. The catalytic converter prevents some harmful gases escaping from the exhaust.
Inside the converter harmful gases are converted into less harmful gases using a catalyst.
The catalyst in the converter

A filters out the harmful gases
B speeds up the chemical reactions taking place
C produces steam as the only product
D slows down the rate of combustion

22. Graphite is used as a lubricant.
This use of graphite is possible because graphite

A conducts electricity
B has weak attractive forces between layers of atoms
C has very small molecules
D is a liquid

23. Graphite is a form of carbon.
Diamond and Buckminsterfullerene are also forms of carbon.
The physical properties of these three substances are different.
The three substances have different properties because

A they are not all pure forms of carbon
B they do not all contain the same isotopes of carbon
C the atoms of carbon are arranged in different ways in each substance
D these exist in different states at room temperature

24. Copper wires and carbon nanotubes can both be used as electrical conductors.
Which row of the table shows the particles that move to conduct the electricity in these two substances?

	copper wires	**carbon nanotubes**
A	electrons	ions
B	ions	electrons
C	ions	ions
D	electrons	electrons

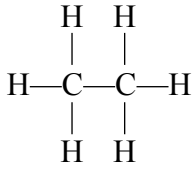
TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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.

Ethane

25. The structure of an ethane molecule is



Which row of the table correctly describes ethane?

	saturated molecule	**hydrocarbon**
A	no	no
B	no	yes
C	yes	no
D	yes	yes

26. If ethane is bubbled into bromine water, the bromine water will

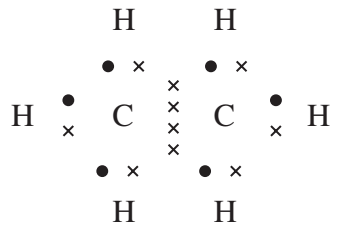
A turn orange
B turn colourless
C remain orange
D remain colourless

27. Which of these dot and cross diagrams correctly represents a molecule of ethane?

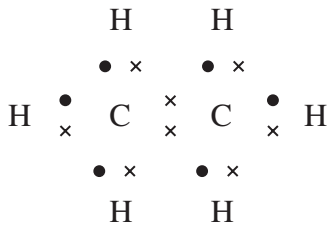
× represents an outer electron of a carbon atom

• represents the electron of a hydrogen atom

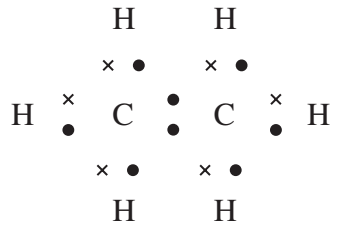
A



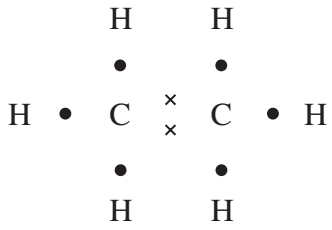
B



C



D



28. Ethane has a boiling point of –88 °C.
Which row of the table is correct for ethane?

	strength of bonds between atoms	**strength of forces between molecules**
A	strong	weak
B	strong	strong
C	weak	strong
D	weak	weak

Halogens and their compounds

29. The table shows the physical state of four halogens at room temperature.

halogen	physical state
fluorine	gas
chlorine	gas
bromine	liquid
iodine	solid

Here are two statements about these halogens.

1 fluorine is a gas because it exists as monatomic molecules
2 iodine is a solid because the forces of attraction between its molecules are stronger than the forces between molecules in fluorine, chlorine and bromine

Which of these statements are correct?

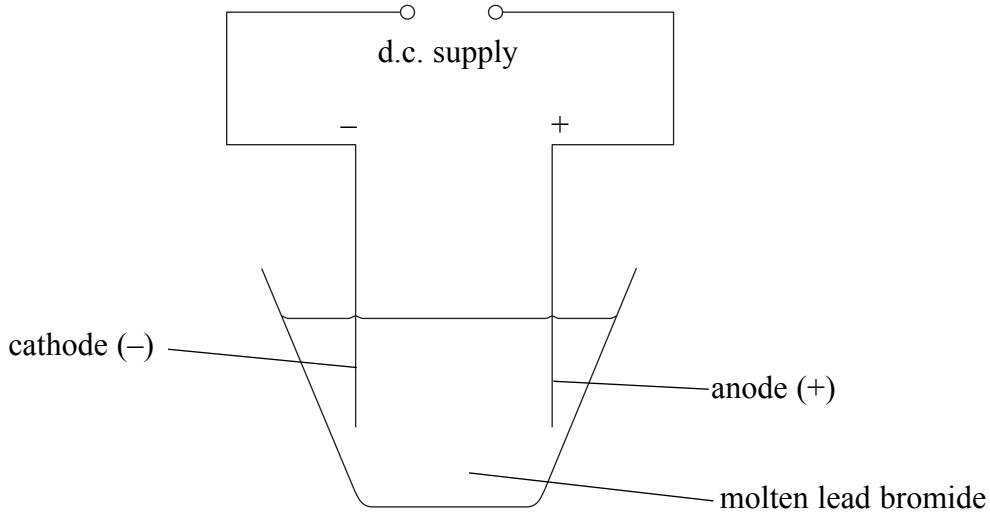
A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

30. All the halogens have similar chemical reactions because their atoms contain the same number of

A electron shells
B electrons
C electrons in the outer shell
D electrons in the shell closest to the nucleus

Use this information to answer questions 31 and 32.

When a direct electric current is passed through molten lead bromide, lead and bromine are produced.



31. During this process

A bromine atoms move to the anode and lose electrons
B bromide ions move to the anode and lose electrons
C bromine atoms move to the cathode and gain electrons
D bromide ions move to the cathode and lose electrons

32. Which of these is the balanced half equation for the production of lead?

A $Pb^{2+}(aq) + 2e \rightarrow Pb(s)$
B $Pb^{2+}(l) + 2e \rightarrow Pb(l)$
C $Pb^{2+}(s) \rightarrow Pb(s) + 2e$
D $Pb(s) \rightarrow Pb^{2+}(l) + 2e$

33. 2.09 g of a chloride of iron contain 0.92 g of iron.
What is the empirical formula of the compound?
(Relative atomic masses: Cl = 35.5, Fe = 56.0)

A $FeCl_2$
B $FeCl_3$
C Fe_2Cl
D Fe_2Cl_7

Fertilisers

34. Which of these statements about fertilisers are correct?

1 artificial fertilisers are not as good as natural fertilisers for increasing crop yield because they are not real
2 artificial fertilisers that contain nutrients needed by specific crops, can be produced

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

35. Ammonium sulphate is used as an artificial fertiliser.
It is made by reacting ammonia with sulphuric acid.
The balanced equation for the reaction is

A $NH_3 + HSO_4 \rightarrow NH_4SO_4$
B $NH_3 + H_2SO_4 \rightarrow NH_5SO_4$
C $NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
D $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$

Use this information to answer questions 36 and 37.

One stage in the manufacture of sulphuric acid involves the reaction of sulphur dioxide with oxygen to produce sulphur trioxide.

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

This reaction is exothermic.

36. The reaction is reversible and can reach a dynamic equilibrium.
At equilibrium

A the reaction begins to reverse
B the reaction stops
C the amounts of reactants and products are equal
D the amounts of reactants and products remain constant

37. Here are two statements about the reaction.

1 The atom economy of the reaction producing sulphur trioxide is 100%
2 An increase in temperature will increase the equilibrium yield of sulphur trioxide

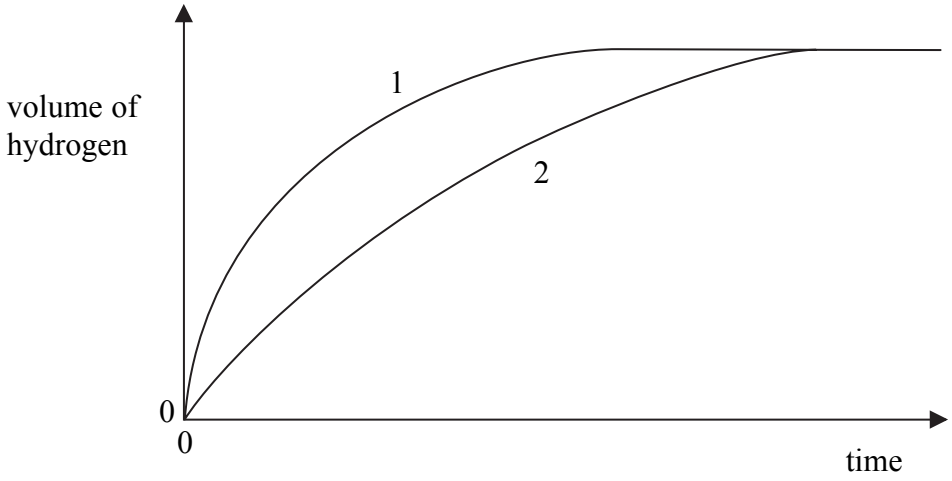
Which of these statements are correct?

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

Reactions of hydrochloric acid

38. Two experiments were carried out to investigate the reaction between excess hydrochloric acid and magnesium powder. No catalyst was used in either of the experiments.

- In each experiment the temperature of the acid was 25 °C
- The total volume of hydrogen produced was measured at regular intervals
- The results are shown on the graph



Which of these statements are correct?

1 the concentration of the acid used was the same in experiments 1 and 2
2 the mass of magnesium used in experiment 2 was less than the mass used in experiment 1

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

39. The rate of chemical reactions can be increased by increasing the temperature and by increasing the concentration of reactants.
Which row of the table correctly describes the effect on particle collisions of increasing the temperature and of increasing the concentration of reactants?

	effect on collisions of increasing the temperature	**effect on collisions of increasing the concentration**
A	same frequency but of higher energy	increased frequency but of same energy
B	increased frequency and of higher energy	increased frequency and of higher energy
C	increased frequency but of same energy	increased frequency and of higher energy
D	increased frequency and of higher energy	increased frequency but of same energy

40. Hydrochloric acid reacts with calcium carbonate.
The equation for the reaction is

$$2HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$

What is the maximum mass of calcium chloride formed when 1 g of calcium carbonate reacts with excess acid?
(Relative atomic masses: C = 12; O = 16; Cl = 35.5; Ca = 40)

A 0.74 g
B 0.76 g
C 1.11 g
D 1.51 g

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END