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| 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

Monday 10 March 2008 – 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.

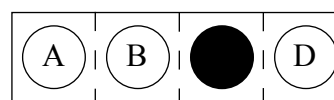
Before the test begins:

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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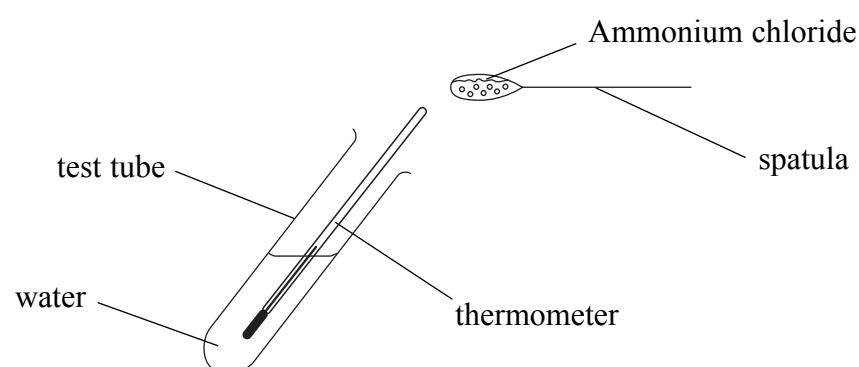
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Turn over

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

Solutions



Alice measured the temperature of water in a test tube.
She added lumps of solid ammonium chloride to the water.
The solid dissolved to form a solution.
After one minute she measured the temperature of the solution.

initial temperature of the water = 26 °C
temperature of solution after one minute = 19 °C

- The temperature
 - increased
 - stayed the same
 - decreased
 - halved
- The dissolving of ammonium chloride in water is an example of
 - an exothermic process
 - a neutralisation
 - an electrolysis
 - an endothermic process
- Alice repeated the experiment using powdered ammonium chloride instead of lumps. What would happen?
 - The temperature of the solution after one minute would be 25 °C
 - The solid would dissolve faster
 - The temperature of the solution would increase
 - The solid would not dissolve

4. The symbol of a chloride ion is

- A Cl
- B Cl₂
- C Cl⁻
- D $\frac{1}{2}$ Cl

Wayne's bicycle



5. The seat of Wayne's bicycle is made of a polymer. Polymers are

- A metals
- B large molecules
- C elements
- D small molecules

6. The frame of the bicycle is made of metal. Which row of the table shows the conductivity and malleability of a metal?

| | conductivity | malleability |
|---|--------------|--------------|
| A | good | good |
| B | good | poor |
| C | poor | poor |
| D | poor | good |

7. The wheels of Wayne's bicycle are made from an alloy of aluminium. The alloy is used instead of pure aluminium because it is

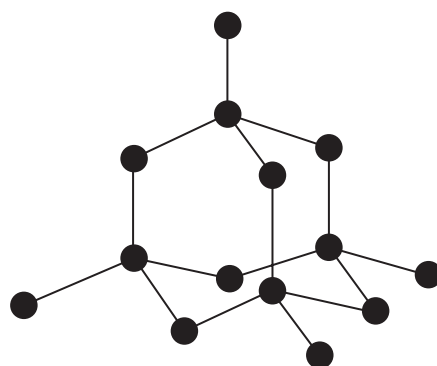
- A heavier
- B stronger
- C more reactive
- D softer

8. The pedals on the bicycle are made of plastic. Disposal of most plastics can cause problems because they

- A are heavy
- B do not burn
- C are transparent
- D do not rot

Carbon chemistry

Diamond is a form of carbon.
The structure of diamond is shown.



9. In this diagram ● represents a carbon

- A atom
- B electron
- C molecule
- D proton

10. A property of diamond is that it

- A has a low boiling point
- B is hard
- C has a low melting point
- D is a good conductor of electricity

11. Another form of pure carbon is

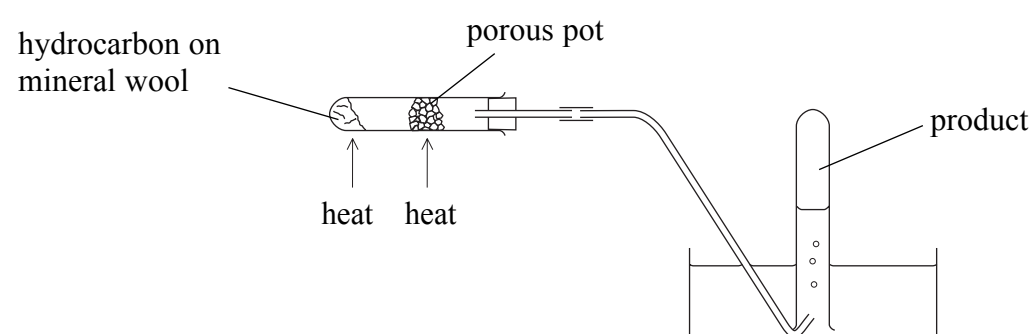
- A plastic
- B buckminsterfullerene
- C carbon dioxide
- D zirconium

12. Which of these is a formula of a hydrocarbon?

- A CO_2
- B H_2O
- C CH_4
- D C

Making new substances

The apparatus below is used to convert large hydrocarbon molecules into new molecules.



13. Compared to the large hydrocarbon molecules, the new molecules are

- A more dense
- B larger
- C smaller
- D the same size

14. The process of breaking down large hydrocarbon molecules in this way is

- A polymerisation
- B combustion
- C fractional distillation
- D cracking

15. When large hydrocarbon molecules are broken down the products formed could be

- A alkanes only
- B hydrogen only
- C alkanes and alkenes
- D alkenes only

16. The porous pot is heated strongly to

- A increase the rate of breakdown of the large molecules
- B produce oxygen
- C make the process less efficient
- D burn the hydrocarbon

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

Alkali metals and halogens

The tables show the atomic numbers of two alkali metals and two halogens.

| alkali metal | atomic number |
|--------------|---------------|
| lithium | 3 |
| sodium | 11 |

| halogen | atomic number |
|----------|---------------|
| fluorine | 9 |
| chlorine | 17 |

17. The atomic number of an element is equal to the number of
- A neutrons in the nucleus of its atom
 - B electrons in the nucleus of its atom
 - C protons in the nucleus of its atom
 - D protons and neutrons, in total in, the nucleus of its atom

18. Which row of the table shows the electronic configurations of lithium and fluorine?

| | lithium | fluorine |
|---|---------|----------|
| A | 2.7 | 2.1 |
| B | 1.2 | 1.8 |
| C | 2.1 | 2.7 |
| D | 2.1 | 8.1 |

19. Alkali metals react with halogens to form ionic compounds.
 When alkali metal atoms react with halogen atoms, electrons are
- A transferred from the alkali metal atoms to the halogen atoms
 - B shared between the alkali metal atoms and the halogen atoms
 - C transferred from the halogen atoms to the alkali metal atoms
 - D not involved in the bonding

20. Which row of the table describes the change in reactivity of the alkali metals and the halogens?

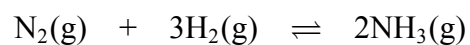
| | reactivity of | |
|---|--|--------------------------------------|
| | alkali metals from lithium to potassium | halogens from fluorine to bromine |
| A | increases | decreases |
| B | decreases | increases |
| C | increases | increases |
| D | decreases | decreases |

Artificial fertilisers

Ammonium nitrate is an artificial fertiliser.

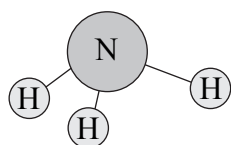
Ammonium nitrate is produced using ammonia.

Ammonia is manufactured by the following reaction, which involves the use of a catalyst.



21. This equation indicates that the reaction is
- A exothermic and involves only gases
 - B reversible and involves gases and solids
 - C irreversible and involves gases and solids
 - D reversible and involves only gases

22. The diagram shows a molecule of ammonia.



What is the total number of shared electrons in all the bonds in an ammonia molecule.

- A 2
 - B 4
 - C 6
 - D 8
23. A disadvantage of artificial fertilisers is that they
- A are only available as solids
 - B can pollute water supplies
 - C only contain one useful element
 - D must be applied only in winter
24. The relative formula mass of ammonium nitrate, NH_4NO_3 , is
(Relative atomic masses: H = 1, N = 14, O = 16)
- A 45
 - B 80
 - C 122
 - D 150

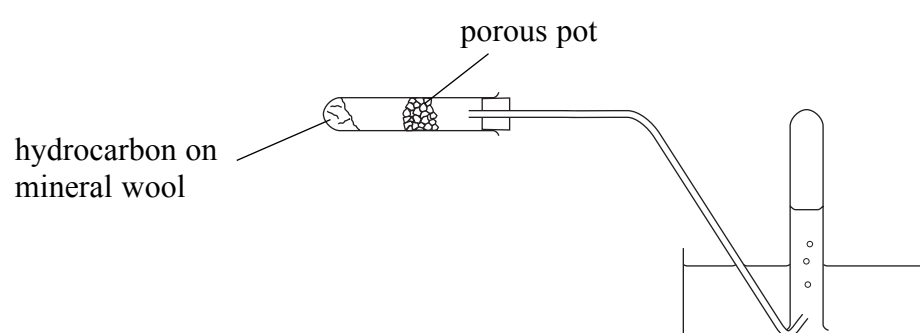
TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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.**

Hydrocarbons

The apparatus below is used to convert large hydrocarbon molecules into new molecules.



The products formed included ethane and ethene.

25. Which row of the table describes the name of the process and the conditions used?

| | name of process | conditions used |
|----------|-------------------------|------------------|
| A | cracking | high temperature |
| B | fractional distillation | high temperature |
| C | cracking | high pressure |
| D | fractional distillation | high pressure |

26. The chemical formula of ethane is

- A** CH₄
- B** C₂H₄
- C** C₂H₆
- D** C₃H₈

27. Ethene can be distinguished from ethane by using bromine water.
With ethene the bromine water changes colour

- A** from orange to colourless
- B** from colourless to purple
- C** from colourless to orange
- D** from purple to colourless

28. Ethane and ethene are simple molecular, covalent substances.
Which row of the table describes the boiling points and conductivities of simple molecular, covalent substances?

| | boiling point | conductivity |
|----------|---------------|--------------|
| A | low | good |
| B | high | poor |
| C | low | poor |
| D | high | good |

Halogens

The table gives information about the halogens.

| name of halogen | appearance at room temperature | melting point (°C) | boiling point (°C) |
|-----------------|--------------------------------|--------------------|--------------------|
| fluorine | yellow gas | -220 | -188 |
| chlorine | yellow-green gas | -101 | -34 |
| bromine | dark red liquid | -7 | 59 |
| iodine | shiny, grey solid | 114 | 184 |

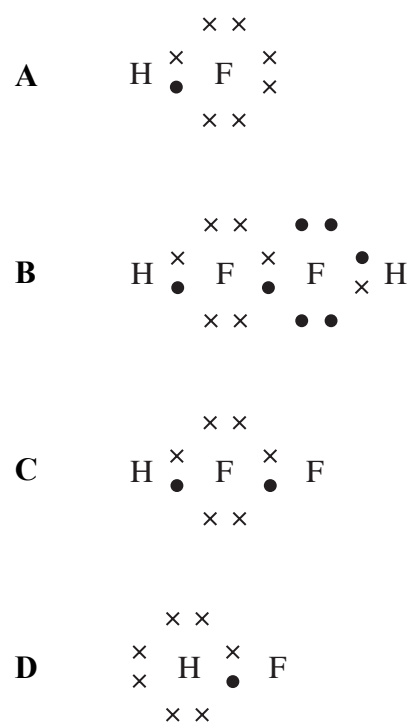
29. For the halogens, which row of the table shows the type of molecule, the bonding and how the bonds are formed?

| | type of molecule | type of bonding | in forming the bond electrons are |
|----------|------------------|-----------------|-----------------------------------|
| A | giant | ionic | transferred |
| B | simple | covalent | shared |
| C | simple | ionic | shared |
| D | giant | covalent | transferred |

30. As the atomic number of the halogens decreases, the intermolecular forces of attraction

- A** increase
- B** stay the same
- C** decrease
- D** increase and then decrease

31. Fluorine (atomic number 9) reacts with hydrogen (atomic number 1) to form hydrogen fluoride.
Which of the dot and cross diagrams correctly represents the outer shell electrons in a molecule of hydrogen fluoride?

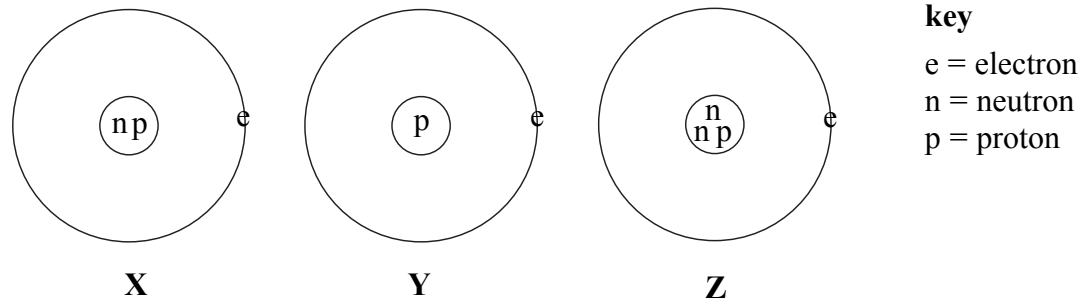


32. Chlorine and carbon form a compound with the formula CCl_x .
If 7.7 g of the compound contain 0.6 g of carbon the value of x is
(Relative atomic masses: C = 12, Cl = 35.5)

- A** 1
B 2
C 4
D 8

Isotopes and atoms

There are three isotopes of hydrogen. The atoms of these three isotopes, **X**, **Y** and **Z**, are shown below.



33. Which of these statements is **not** correct?
Atoms of different isotopes of an element have
- A the same atomic number
 - B different mass numbers
 - C the same number of neutrons
 - D the same number of electrons
34. An atom of the element W can be shown as $\overset{\text{mass number}}{\text{atomic number}} \text{W}$
The hydrogen atom **Z** is
- A ${}^1_0\text{H}$
 - B ${}^1_1\text{H}$
 - C ${}^2_1\text{H}$
 - D ${}^3_1\text{H}$
35. There are two isotopes of neon, neon-20 and neon-22.
In a sample of neon there is 91% of neon-20 and 9% of neon-22.
The relative atomic mass of neon is
- A 20.18
 - B 20.81
 - C 21.00
 - D 21.82

36. The electronic structures of three atoms are

| | |
|---|-----|
| 1 | 2 |
| 2 | 2.2 |
| 3 | 2.8 |

Which are the electronic structures of atoms which will not react with any other atom?

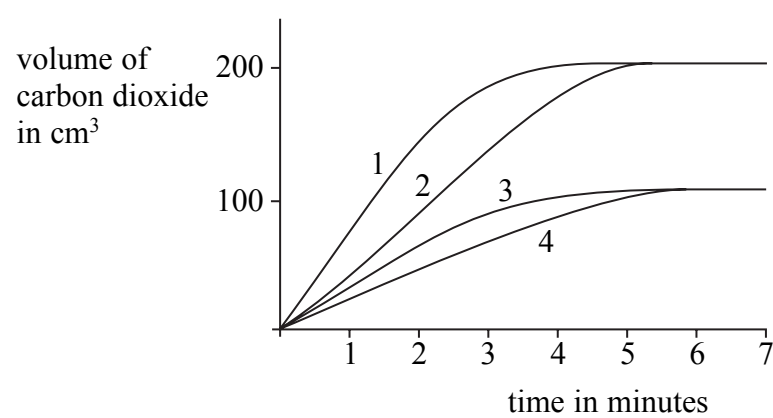
- A 1 only
- B 3 only
- C 1 and 2 only
- D 1 and 3 only

Speeds of reactions

In four separate experiments, 1, 2, 3 and 4, nitric acid was added to excess marble chips and the volume of carbon dioxide formed was measured.

In all the experiments the same volume of acid was used each time but its concentration and/or temperature were changed.

The results of the experiments are shown on the graph.



37. Which of these statements is correct?

- A The temperature of the acid was the same in experiments 1 and 2.
- B The acid used in experiment 2 was at a higher temperature than in experiment 1.
- C Experiment 4 was faster than experiment 3.
- D A lower concentration of acid was used in experiment 3 than in experiment 1.

38. The reaction can be speeded up by increasing the surface area of the marble chips. If the surface area of the marble chips is increased and all other conditions remain the same, the particle collisions are

- A more frequent and of the same energy
- B more frequent and of higher energy
- C of the same frequency and of the same energy
- D of the same frequency and of higher energy

39. The equation for the reaction of nitric acid with marble chips is



Calculate the maximum mass of carbon dioxide formed by the reaction of 20 g of marble chips with excess nitric acid.

(Relative atomic masses: C = 12, O = 16, Ca = 40)

- A 2.2 g
- B 4.4 g
- C 8.8 g
- D 17.6 g

40. Catalysts are added to some reactions. Here are three statements about catalysts and their effects.

- 1 A catalyst remains chemically unchanged at the end of a reaction.
- 2 The mass of a catalyst remains unchanged at the end of a reaction.
- 3 Addition of a catalyst causes different products to be formed.

Which statements are correct?

- A 1 only
- B 3 only
- C 1 and 2 only
- D 1, 2 and 3

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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