

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 5 June 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.

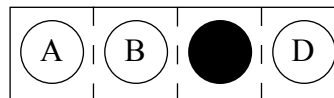
**Before the test begins:**

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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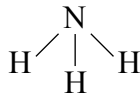


*Turn over*

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

### **Ammonia and its compounds**

The diagram shows a model of a molecule of ammonia.



1. Ammonia is

- A** a covalent compound
- B** an ionic compound
- C** a covalent element
- D** an ionic element

2. The formula of an ammonia molecule is

- A** N3H
- B** 3HN
- C** N<sub>3</sub>H
- D** NH<sub>3</sub>

3. Ammonia reacts with hydrogen chloride to form ammonium chloride.  
In an equation this product is shown as NH<sub>4</sub>Cl(s).

This shows that ammonium chloride is formed as a

- A** solution
- B** solid
- C** gas
- D** liquid

4. Which of these substances could be ammonia?

substance	melting point (°C)	boiling point (°C)
A	318	1390
B	0	100
C	-78	-33
D	1610	2230

5. When ammonium chloride is dissolved in water the temperature of the liquid decreases. This shows that the process is

- A neutralisation
- B reduction
- C homeopathic
- D endothermic

6. Ammonia is used to manufacture fertilisers. Which of these is the formula of a nitrogenous fertiliser?

- A CaO
- B N<sub>2</sub>
- C NH<sub>4</sub>NO<sub>3</sub>
- D Ni

7. Ammonia is made by reacting nitrogen with hydrogen. The reaction is exothermic. Exothermic means

- A a gas is given off
- B heat is given out
- C the reaction moves outwards
- D the reaction happens quickly

8. Fertilisers are used to

- A kill insects
- B kill weeds
- C help plants grow
- D reduce the amount of carbon dioxide produced by plants

## Carbon chemistry

Methane is found in natural gas.

Methane has the formula CH<sub>4</sub>.

9. What is the relative formula mass of methane?  
(Relative atomic masses H = 1; C = 12)
- A 13
  - B 16
  - C 49
  - D 52
10. Methane is
- A an alkene
  - B a carbohydrate
  - C a hydrocarbon
  - D a colourless liquid
11. What is the formula of ethene?
- A C<sub>2</sub>H<sub>4</sub>
  - B C<sub>2</sub>H<sub>6</sub>
  - C C<sub>3</sub>H<sub>6</sub>
  - D C<sub>3</sub>H<sub>8</sub>
12. Ethene is used to make poly(ethene).  
In this reaction ethene molecules are
- A monomers
  - B polymers
  - C cracked
  - D biodegraded
13. Poly(ethene) is used to make carrier bags.  
These bags can be an environmental problem because they
- A do not burn
  - B cannot be reused
  - C tear easily
  - D do not rot

14. A carbon atom contains 6 protons, 8 neutrons and 6 electrons.  
The mass number of this carbon atom is

- A 6
- B 8
- C 12
- D 14

15. Which row of the table correctly shows the position of the protons, neutrons and electrons in a carbon atom?

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

16. Which of these is a correct statement about the particles in atoms?

- A a proton has the same mass as an electron
- B a proton is heavier than a neutron
- C a neutron is lighter than an electron
- D a neutron has the same mass as a proton

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

### Magnesium chloride

Use the following information to answer questions 17 to 19.

Chlorine and magnesium atoms both form ions.

The table gives information about atoms of the elements and the ions they form.

	element	
	magnesium	chlorine
symbol of atom	Mg	Cl
number of electrons in atom	12	17
symbol of ion	Mg <sup>2+</sup>	Cl <sup>-</sup>

17. How many electrons are there in a magnesium ion?

- A 10
- B 12
- C 14
- D 24

18. What is the formula of magnesium chloride?

- A MgCl
- B Mg<sub>2</sub>Cl
- C MgCl<sub>2</sub>
- D MgCl<sup>2</sup>

19. What is the electronic configuration of a magnesium atom and of a chlorine atom?

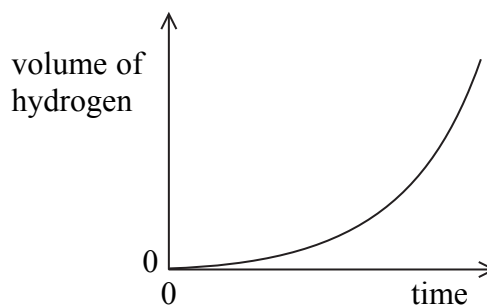
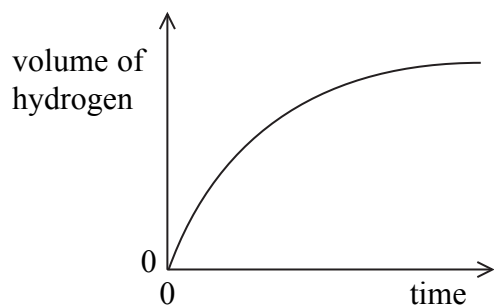
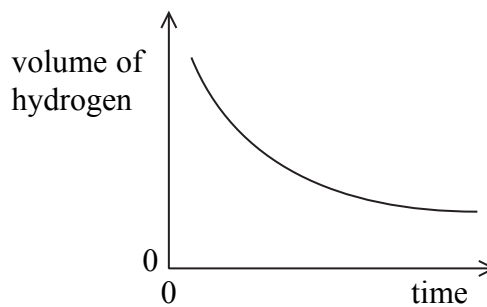
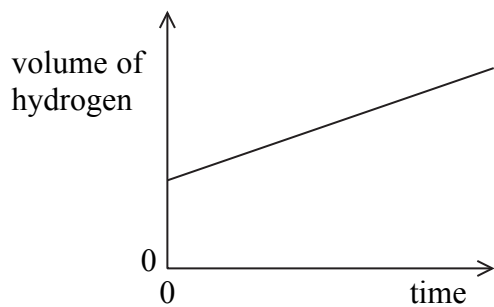
	magnesium	chlorine
A	2.8.2	7.8.2
B	2.8	2.8.8
C	2.8.2	2.8.7
D	2.8.7	2.8.2

Use the following information to answer questions 20 and 21.

Magnesium chloride is formed when magnesium reacts with dilute hydrochloric acid. Carla investigated the rate of this reaction by adding magnesium to excess dilute hydrochloric acid (25 cm<sup>3</sup>).

Every 30 seconds she recorded the total volume of hydrogen produced until the reaction was complete. She plotted a graph of her results.

20. Which is the correct graph?



21. She repeated the experiment using the same mass of magnesium but 50 cm<sup>3</sup> of the same acid. She found that

- A the final volume of hydrogen was larger
- B the rate of reaction was the same
- C it took longer to produce the same volume of hydrogen
- D the rate of reaction was greater

### A very important element

Carbon is a very important element and there are many different carbon compounds.

22. Graphite and diamond are two forms of carbon. The table refers to their melting points and their ability to conduct electricity. Which row of the table is correct for graphite and diamond?

	graphite	diamond
A	low melting point	high melting point
B	conducts electricity	high melting point
C	conducts electricity	conducts electricity
D	high melting point	conducts electricity

23. Methane is a carbon compound with a simple molecular structure. Which row of the table is correct for methane?

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

24. Which row of the table describes the bonding in most carbon compounds?

	type of bonding	number of electrons from each carbon atom used in bonding
A	covalent	8
B	ionic	8
C	ionic	4
D	covalent	4

**TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS**

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

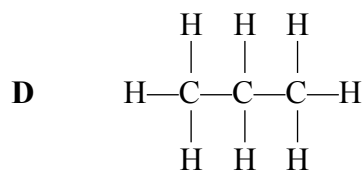
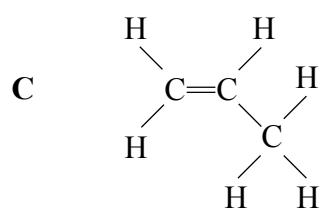
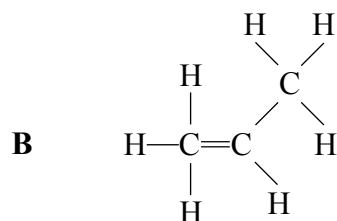
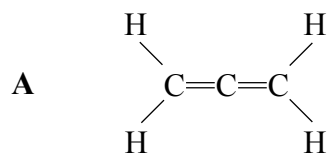
Questions 25 to 40 must be answered by Higher tier candidates only.  
Foundation tier candidates do not answer questions 25 to 40.

### Plastics

25. Which row of the table describes a thermosetting polymer?

	softened by heating	cross links between chains
<b>A</b>	yes	no
<b>B</b>	no	yes
<b>C</b>	yes	yes
<b>D</b>	no	no

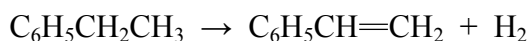
26. Propene is used to make poly(propene).  
Which of these shows the correct structure of propene?



27. Paul added bromine water to a sample of ethene in a test tube. When he shook the tube, the bromine water turned from

- A colourless to white
- B colourless to orange
- C orange to clear
- D orange to colourless

28. Phenylethene is used to make poly(phenylethene) which is commonly known as polystyrene. Phenylethene is manufactured from ethylbenzene as shown in this equation



What is the theoretical atom economy for the manufacture of phenylethene?  
(Relative masses: H = 1,  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_3$  = 106,  $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$  = 104)

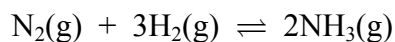
- A 49.6 %
- B 98.0 %
- C 98.1 %
- D 102 %

## Ammonia

Use the following information to answer questions 29 and 30.

Ammonia is manufactured by the Haber process.

The equation for the reaction is



The forward reaction is exothermic.

29. Here are two statements about the Haber process.

- 1 Increasing the temperature increases the percentage yield of ammonia at equilibrium.
- 2 Increasing the pressure increases the percentage yield of ammonia at equilibrium.

Which of these statements are correct?

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

30. If 3 tonnes of hydrogen reacted completely with excess nitrogen, what mass of ammonia, in tonnes, would be produced?

(Relative atomic masses: H = 1.0; N = 14)

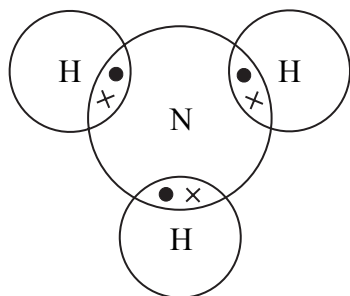
- A** 8.5  
**B** 17  
**C** 31  
**D** 34

31. A catalyst is used in the Haber process.

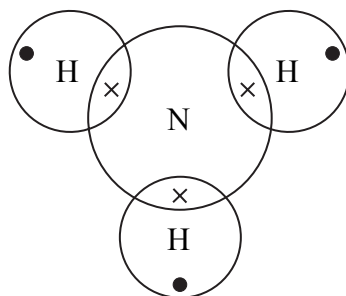
Which row of the table describes the effect of the catalyst on the rate of the forward reaction and the percentage yield of ammonia at equilibrium?

	rate of forward reaction increases	percentage yield of ammonia at equilibrium increases
<b>A</b>	yes	no
<b>B</b>	no	no
<b>C</b>	yes	yes
<b>D</b>	no	yes

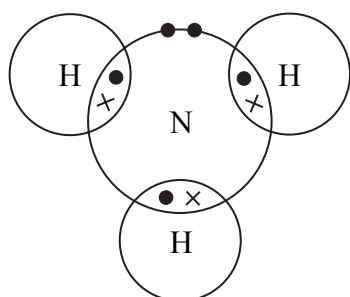
32. Which of these dot and cross diagrams correctly shows the outer shell electrons of the atoms in an ammonia molecule?  
(Atomic numbers: hydrogen = 1, nitrogen = 7)



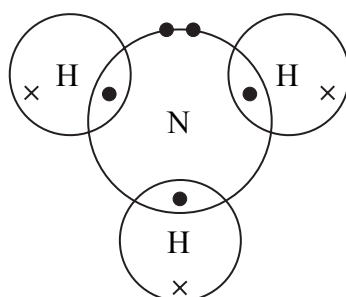
**A**



**B**



**C**



**D**

33. The reaction to make ammonia from nitrogen and hydrogen is exothermic.

Two possible reasons for this are

- 1 during the reaction the energy required to break the bonds is greater than the energy released when the new bonds are formed.
- 2 when atoms form bonds the process is endothermic.

The correct reasons for the reaction being exothermic are

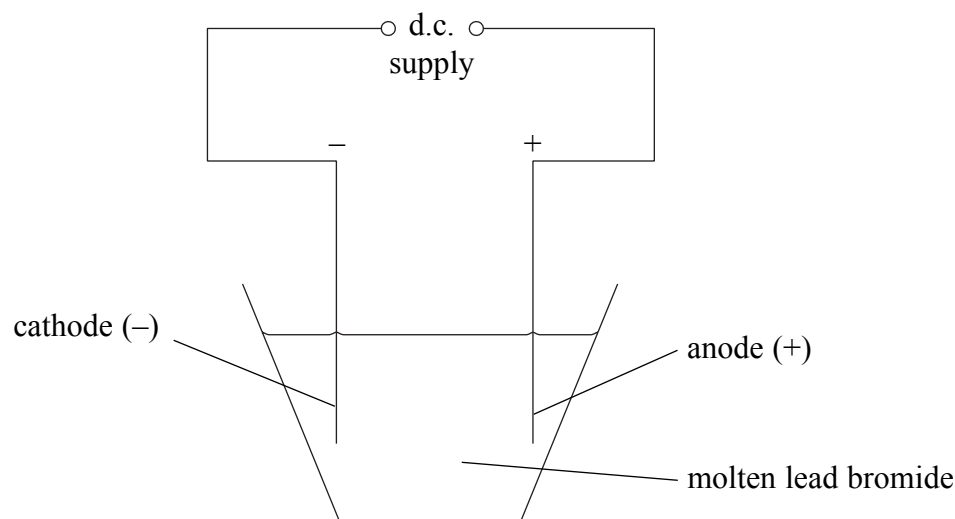
- A** 1 only  
**B** 2 only  
**C** both 1 and 2  
**D** neither 1 nor 2

## Electricity

34. Here are two statements about electrical conduction.
- 1 Solid sodium conducts electricity because electrons in it are free to move through the structure.
  - 2 Solid sodium chloride does not conduct electricity but, when it is dissolved in water, the solution conducts because electrons become free to move through the solution.

Which of these statements are correct?

- A** 1 only  
**B** 2 only  
**C** both 1 and 2  
**D** neither 1 nor 2
35. When electricity passes through molten lead bromide, lead and bromine are produced.

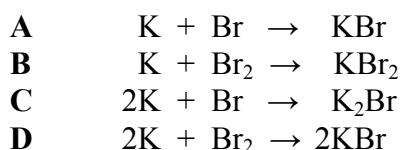


During this process

- A** lead ions move to the anode and gain electrons  
**B** lead atoms move to the cathode and gain electrons  
**C** bromine atoms move to the cathode and lose electrons  
**D** bromide ions move to the anode and lose electrons
36. If a direct electric current is passed through sodium chloride solution, hydrogen is produced. Which of these is the balanced half equation for the production of hydrogen gas at the cathode?
- A**  $\text{H}^+(\text{aq}) + \text{e} \rightarrow \text{H}(\text{g})$   
**B**  $2\text{H}^+(\text{aq}) \rightarrow \text{H}_2(\text{g}) + 2\text{e}$   
**C**  $2\text{H}^+(\text{aq}) + 2\text{e} \rightarrow \text{H}_2(\text{g})$   
**D**  $\text{H}^-(\text{aq}) \rightarrow \text{H}(\text{g}) + \text{e}$

## The halogens

37. Bromine reacts with potassium to form potassium bromide.  
The balanced equation for the reaction is



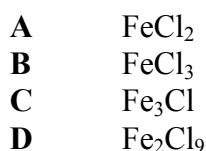
38. Which row of the table correctly compares the reactivities and electronic arrangements of fluorine and iodine?

	reactivity of fluorine	number of shells containing electrons in a fluorine atom	number of outer electrons in a fluorine atom
<b>A</b>	greater than iodine	less than in an iodine atom	same as in an iodine atom
<b>B</b>	greater than iodine	greater than in an iodine atom	less than in an iodine atom
<b>C</b>	same as iodine	less than in an iodine atom	same as in an iodine atom
<b>D</b>	less than iodine	same as in an iodine atom	same as in an iodine atom

39. At room temperature chlorine is a gas and iodine is a solid.  
This is because

- A**      iodine atoms are larger than chlorine atoms with bigger forces of attraction between the atoms  
**B**      iodine molecules are more stable than chlorine molecules  
**C**      iodine molecules contain more atoms than chlorine molecules  
**D**      iodine molecules are larger than chlorine molecules with bigger forces of attraction between the molecules

40. 1.12 g of iron reacted with chlorine to form 3.25 g of a compound.  
What is the empirical formula of the compound?  
(Relative atomic masses: Cl = 35.5; Fe = 56)



**TOTAL FOR HIGHER TIER PAPER: 24 MARKS**

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