

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 11 November 2010 – Afternoon

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.

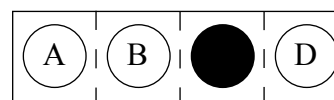
Before the test begins:

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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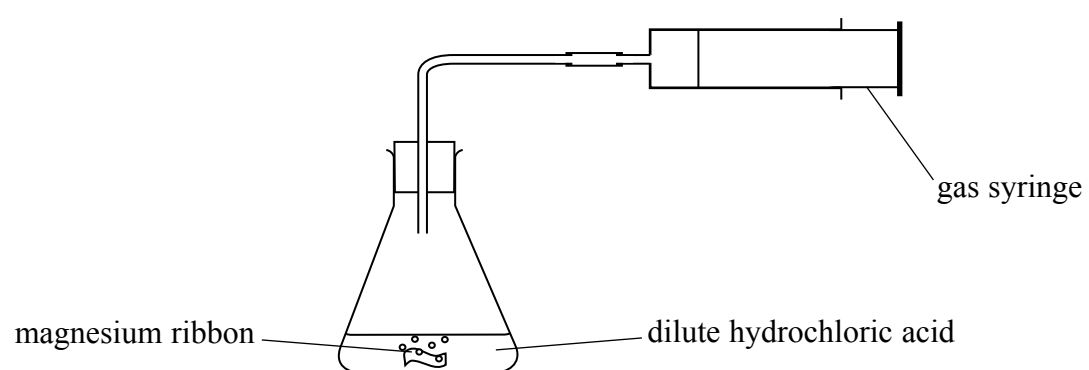
Turn over

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

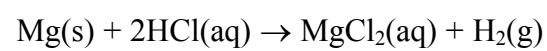
Magnesium and hydrochloric acid

This apparatus was used to investigate the reaction between magnesium and dilute hydrochloric acid. In this reaction hydrogen is produced.



1. The reaction can be slowed down by
 - A cooling the flask and contents
 - B using a bigger volume of the same acid
 - C shaking the flask
 - D using smaller pieces of magnesium
2. For the reaction to take place the reacting particles must
 - A dissolve
 - B boil
 - C collide
 - D evaporate
3. During the reaction the temperature increases. This shows that the reaction is an example of
 - A an endothermic process
 - B an exothermic process
 - C thermal decomposition
 - D combustion

4. The equation for the reaction is



The equation shows that, in this reaction, the magnesium is

- A a gas
 - B a solid
 - C a liquid
 - D an aqueous solution
5. The nucleus of a magnesium atom contains
- A protons and electrons
 - B neutrons and electrons
 - C protons and neutrons
 - D electrons only

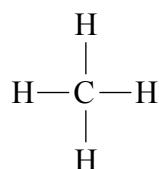
Use the following information to answer questions 6 to 8.

Magnesium chloride, MgCl_2 , is an ionic compound containing magnesium ions and chloride ions.

6. A magnesium atom, Mg, forms a magnesium ion, Mg^{2+} , by
- A gaining two electrons
 - B losing two electrons
 - C sharing two protons
 - D sharing two electrons
7. What is the formula of a chloride ion?
- A Cl^-
 - B Cl^{2-}
 - C Cl^+
 - D Cl^{2+}
8. Which of these is the most likely melting point for magnesium chloride?
- A $-78\text{ }^\circ\text{C}$
 - B $17\text{ }^\circ\text{C}$
 - C $80\text{ }^\circ\text{C}$
 - D $714\text{ }^\circ\text{C}$

Carbon compounds

The diagram shows the structure of a methane molecule.



9. Methane is
- A an element
 - B a saturated hydrocarbon
 - C an unsaturated hydrocarbon
 - D a carbohydrate
10. What is the relative formula mass of methane?
(Relative atomic masses: H = 1, C = 12)
- A 13
 - B 16
 - C 42
 - D 52
11. The formula of a molecule of propene is
- A C_2H_4
 - B C_2H_6
 - C C_3H_6
 - D C_3H_8
12. Propene molecules can be reacted together to form poly(propene).
In this reaction, the propene molecules
- A are cracked
 - B form double bonds
 - C are monomers
 - D are polymers
13. It is difficult to dispose of waste poly(propene) because it
- A does not burn
 - B does not rot
 - C is biodegradable
 - D releases toxic chlorine during decomposition

Structures

14. In solid metals the electric current is carried through the metal by the movement of
- A ions
 - B protons
 - C neutrons
 - D electrons

15. Methane and graphite are both covalent substances.
Methane is a gas at room temperature.
Graphite is a solid even at high temperatures.
Which row of the table shows the structures of methane and of graphite?

	methane	graphite
A	simple molecular	giant molecular
B	simple molecular	simple molecular
C	giant molecular	giant molecular
D	giant molecular	simple molecular

16. Methane molecules contain covalent bonds between carbon and hydrogen atoms.
A covalent bond in the methane molecule is formed by
- A the transfer of an electron from carbon to hydrogen
 - B the transfer of an electron from hydrogen to carbon
 - C the sharing of an electron
 - D the sharing of two electrons

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

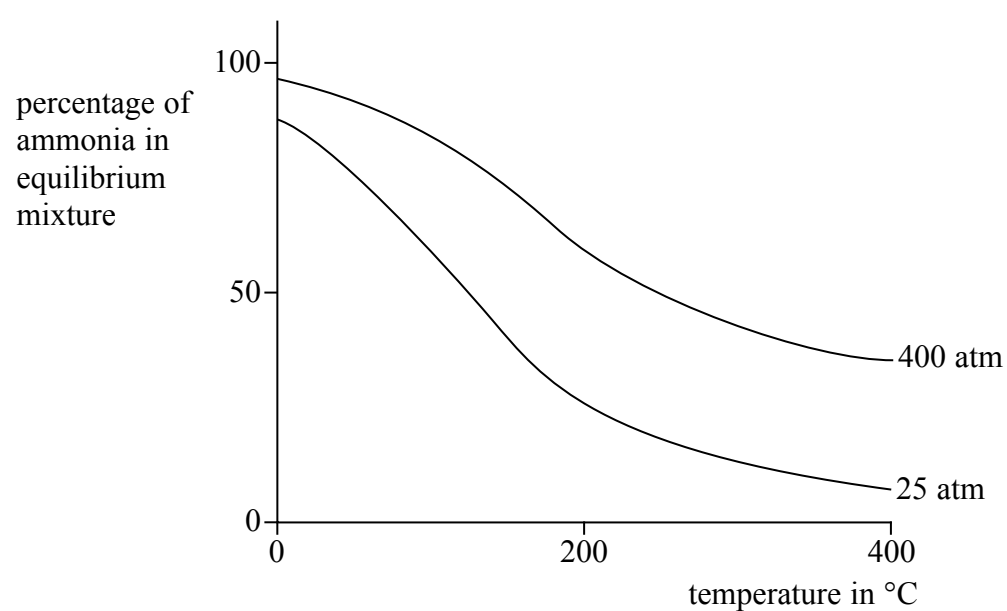
Ammonia

- 17.** Ammonia is a covalent compound with a low boiling point of $-34\text{ }^{\circ}\text{C}$.
The table shows the strength of the bonds between the atoms and strength of the forces between the molecules.
Which row of the table is correct for ammonia molecules?

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

- 18.** The reaction of nitrogen with hydrogen to produce ammonia can reach equilibrium.
When the reaction reaches equilibrium
- A** the reverse reaction starts
 - B** ammonia is no longer formed
 - C** all reactions stop
 - D** the composition of the mixture remains constant

19. The graph shows how the percentage of ammonia in the equilibrium mixtures changes with temperature at pressures of 25 atmospheres and 400 atmospheres.



Which of the following temperatures and pressures would produce the highest percentage of ammonia in the equilibrium mixture?

- A 350 °C and 25 atm
 B 400 °C and 25 atm
 C 0 °C and 400 atm
 D 400 °C and 400 atm
20. In the reaction to convert nitrogen and hydrogen into ammonia, bonds are broken and new bonds are made.
 Which row of the table shows the heat change when bonds are broken and when bonds are made?

	heat change when	
	bonds broken	bonds made
A	endothermic	endothermic
B	exothermic	exothermic
C	endothermic	exothermic
D	exothermic	endothermic

Carbon

21. Diamond and Buckminsterfullerene

- A both conduct electricity
- B have both been known about for more than 100 years
- C are both compounds containing carbon
- D are both pure forms of carbon

22. Carbon has an atomic number of 6.

Carbon-12 is an isotope of carbon with a mass number of 12.

Carbon-14 is an isotope of carbon with a mass number of 14.

Which row of the table shows the number of protons and neutrons in an atom of each of these isotopes?

	carbon-12		carbon-14	
	number of protons	number of neutrons	number of protons	number of neutrons
A	12	12	14	14
B	6	6	6	8
C	6	6	8	6
D	6	12	6	14

23. The electronic configuration of a carbon atom is

- A 6
- B 4.2
- C 2.4
- D 2.2.2

24. Carbon forms a much larger number of compounds than any other element.
This is because an atom of carbon can

- A easily gain electrons
- B easily lose electrons
- C form four stable, covalent bonds
- D use all six of its electrons to form bonds

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

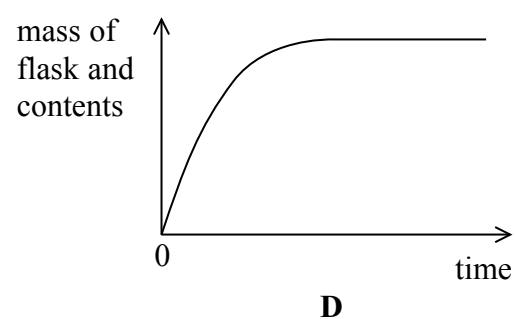
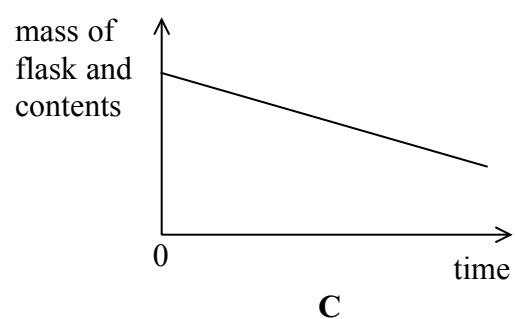
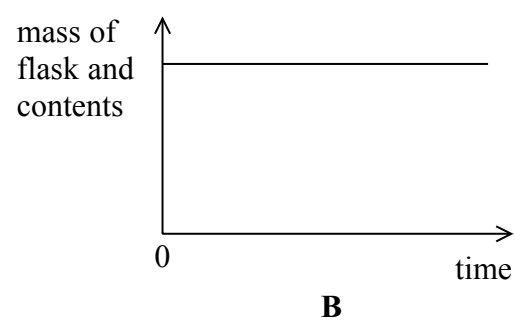
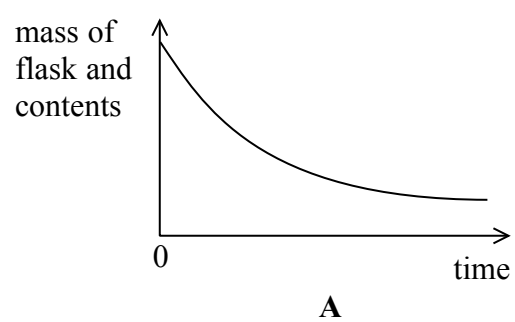
Foundation tier candidates do not answer any more questions after question 24.

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

Metals and their salts

Zinc reacts with dilute hydrochloric acid to produce zinc chloride and hydrogen.

- 25.** A flask containing zinc and excess dilute hydrochloric acid was placed on a very accurate balance.
The mass of flask and contents was recorded every 30 seconds until after the reaction was complete.
Which graph shows the results of this experiment?



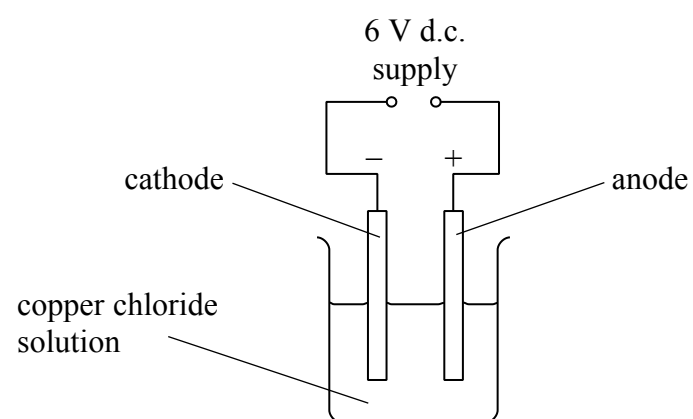
26. The equation for the reaction of zinc with dilute hydrochloric acid is

- A** $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl} + \text{H}$
B $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + 2\text{H}$
C $2\text{Zn} + 2\text{HCl} + 2\text{H}_2\text{O} \rightarrow \text{ZnCl}_2 + \text{Zn}(\text{OH})_2 + 2\text{H}_2$
D $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$

27. A zinc atom contains protons, neutrons and electrons.
 Which row of the table shows the relative masses of a proton, a neutron and an electron?

	proton	neutron	electron
A	1	1	1
B	1	1	$\frac{1}{1837}$
C	1	$\frac{1}{1837}$	1
D	$\frac{1}{1837}$	1	$\frac{1}{1837}$

28. Chlorine can be obtained from copper chloride solution by electrolysis.



During this process

- A** chlorine atoms move to the cathode and gain electrons
B chloride ions move to the cathode and lose electrons
C chloride ions move to the anode and lose electrons
D chlorine atoms move to the anode and gain electrons

29. Aluminium is in group 3 of the periodic table.
This means an atom of aluminium will
- A have three shells containing electrons
 - B have three protons in its nucleus
 - C have three electrons in its outer shell
 - D need to gain three electrons to complete its outer shell

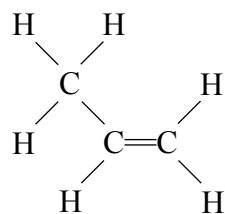
30. Calcium fluoride has a giant ionic structure.
It has a melting point of 1418 °C.
Which of these statements about calcium fluoride are correct?

- 1 in solid calcium fluoride there are strong forces of attraction between calcium atoms and fluorine atoms
- 2 molten calcium fluoride conducts electricity

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

Carbon compounds

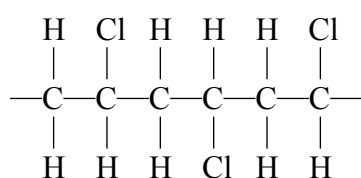
31. Which of the following compounds has a molecule with this structure?



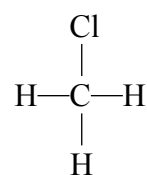
- A butane
 - B butene
 - C propane
 - D propene
32. What colour change is seen when ethane is shaken with bromine water?
- A no colour change
 - B colourless to orange
 - C orange to colourless
 - D orange to clear

33. Which of these is the best description of cracking?
- A** the formation of large molecules from small monomer molecules
B the separation of hydrocarbon mixtures
C hydrocarbons burning
D the formation of smaller hydrocarbon molecules from larger ones

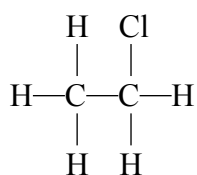
34. The diagram shows part of the structure of an addition polymer.



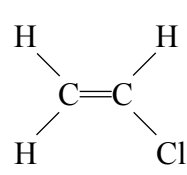
Which of these monomers is used to make this polymer?



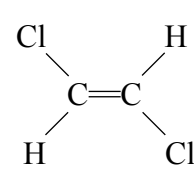
A



B

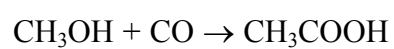


C



D

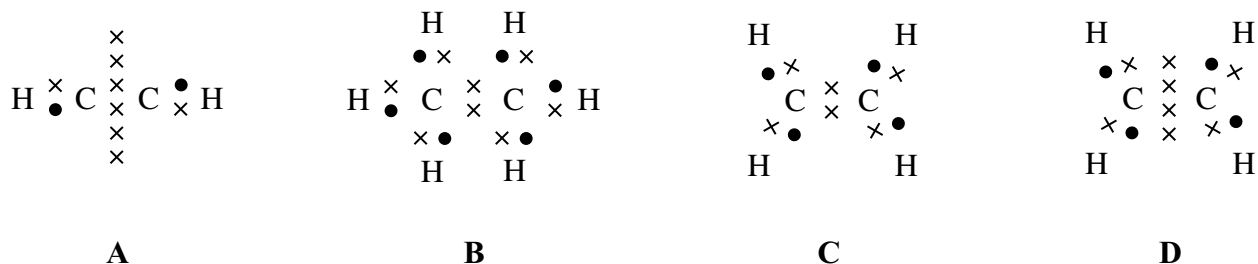
35. Ethanoic acid, CH_3COOH , can be manufactured by reacting methanol with carbon monoxide. The equation for the reaction is



Which of these statements are correct?

- 1 ethanoic acid is a hydrocarbon
 2 the atom economy for this reaction is 100%
- A** 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

36. Which of these dot and cross diagrams shows the positions of the outer shell electrons of the atoms in a molecule of ethene?



Halogens

The table gives information about two halogens.

halogen	atomic number	melting point (°C)
chlorine	17	-101
iodine	53	114

37. Which row of the table below describes the structure of a chlorine molecule?

	type of molecule	type of bond	bond formed by
A	giant	ionic	transfer of electrons
B	giant	covalent	sharing of electrons
C	simple	ionic	transfer of electrons
D	simple	covalent	sharing of electrons

38. Which of these statements about the halogens are correct?

- 1 the intermolecular forces of attraction between iodine molecules are weaker than those between chlorine molecules
- 2 iodine and chlorine are in group 7 of the periodic table because every atom of both elements contains only seven electrons

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

Ammonia

39. In the Haber process, hydrogen reacts with nitrogen to produce ammonia.
The forward reaction is exothermic.
The reaction can reach a dynamic equilibrium.

Which of these statements about the conditions used in the Haber process are correct?

- 1 a catalyst is used to increase the rate of reactions
2 a catalyst is used to increase the equilibrium yield

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

40. Ammonium nitrate can be made by reacting ammonia with nitric acid.
The equation for the reaction is

- A** $\text{NH}_4 + \text{HNO}_3 \rightarrow \text{NH}_5\text{NO}_3$
B $\text{NH}_4 + 2\text{HNO}_3 \rightarrow \text{NH}_4(\text{NO}_3)_2 + \text{H}_2$
C $2\text{NH}_3 + \text{H}_2\text{NO}_3 \rightarrow (\text{NH}_4)_2\text{NO}_3$
D $\text{NH}_3 + \text{HNO}_3 \rightarrow \text{NH}_4\text{NO}_3$

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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