Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **May/June 2019**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

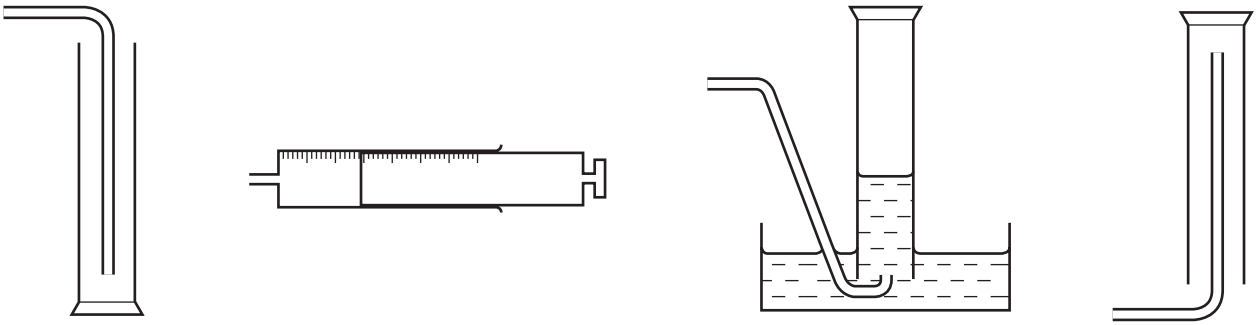
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

This document consists of **14** printed pages and **2** blank pages.

1 The diagrams show four different methods of collecting gases.



1 2 3 4

Which method is suitable for collecting a gas which has the properties described?

	method for collecting gas	properties of gas
A	1	less dense than air and soluble in water
B	2	denser than air and soluble in water
C	3	less dense than air and soluble in water
D	4	denser than air and insoluble in water

2 After acidification with dilute nitric acid, a colourless solution of **X** reacts with aqueous silver nitrate to give a white precipitate.

What could **X** be?

A calcium iodide

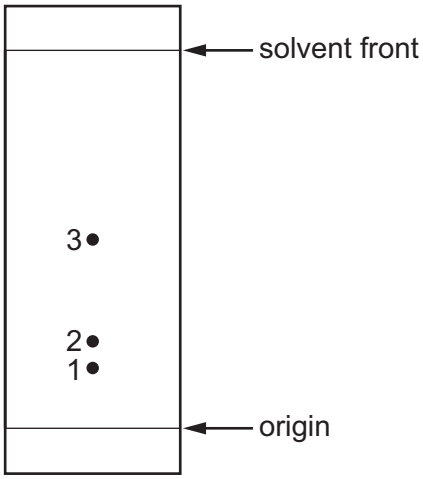
B copper(II) chloride

C lead(II) iodide

D sodium chloride

3 The diagram represents a chromatogram of the colourless acids present in a drink. The chromatogram has been treated with a locating agent.

A table of R_f values for the possible acids is given.



acid	R_f value
tartaric	0.14
citric	0.16
malic	0.23
lactic	0.45
succinic	0.50

Which acids are present in the drink?

A citric acid, malic acid and lactic acid

B citric acid, malic acid and succinic acid

C malic acid, lactic acid and succinic acid

D tartaric acid, citric acid and malic acid

4 Which gas will diffuse at the fastest rate at the same temperature and pressure?

A Ar **B** C_3H_8 **C** CO_2 **D** F_2

5 Two particles, K^+ and Ar, can be written as $^{39}_{19}K^+$ and $^{40}_{18}Ar$.

Which statement about these particles is correct?

A Ar has more neutrons than K^+.

B K has more nucleons than Ar.

C K^+ has 20 electrons.

D K^+ has a greater mass than Ar.

6 A mineral deposit is found to contain small grains made entirely of the element carbon.

Which property will **definitely** be true of the grains of carbon?

A They will be made of atoms arranged in layers.

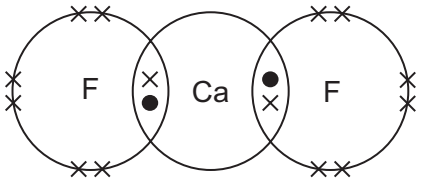
B They will be soft.

C They will burn to give carbon dioxide.

D They will conduct electricity.

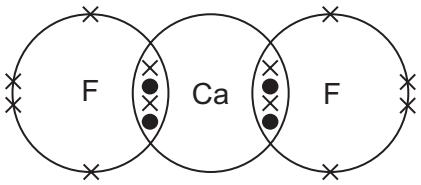
7 Which diagram shows the outer electron arrangement in calcium fluoride?

A

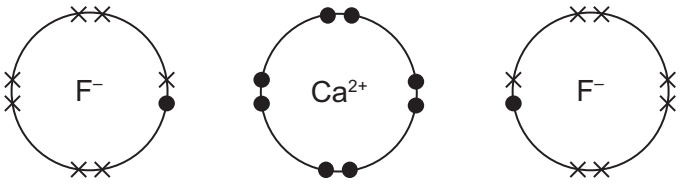


key
- ● an electron from calcium
- × an electron from fluorine

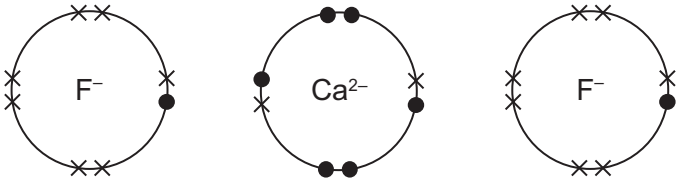
B



C



D



8 How many shared pairs of electrons are there in one carbon dioxide molecule?

A 2 **B** 4 **C** 8 **D** 12

9 Two statements about metals are given.

1 Metals contain a lattice of negative ions in a 'sea of electrons'.

2 The electrical conductivity of metals is related to the mobility of the electrons in the structure.

Which is correct?

A Both statements are correct and statement 1 explains statement 2.

B Both statements are correct but statement 1 does not explain statement 2.

C Statement 1 is correct and statement 2 is incorrect.

D Statement 2 is correct and statement 1 is incorrect.

10 Powdered calcium carbonate reacts with dilute hydrochloric acid to produce calcium chloride, water and carbon dioxide.

What is the correct ionic equation, including state symbols, for this reaction?

A $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

B $Ca^{2+}(aq) + CO_3^{2-}(aq) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

C $CO_3^{2-}(aq) + 2H^+(aq) \rightarrow H_2O(l) + CO_2(g)$

D $CaCO_3(s) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

11 Which mass of carbon contains the same number of atoms as 16.0 g of sulfur?

A 0.5 g **B** 6.0 g **C** 8.0 g **D** 12.0 g

12 3.0 dm^3 of sulfur dioxide is reacted with 2.0 dm^3 of oxygen.

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$$

Assuming the reaction goes to completion and that all gases are at room temperature and pressure, which volume of sulfur trioxide is formed?

A 2.0 dm^3 **B** 3.0 dm^3 **C** 4.0 dm^3 **D** 5.0 dm^3

13 A sample of magnesium hydroxide, $Mg(OH)_2$, is made by adding an excess of aqueous sodium hydroxide to an aqueous solution containing 1.20 g magnesium sulfate, $MgSO_4$.

The mass of magnesium hydroxide formed is 0.26 g.

What is the percentage yield of magnesium hydroxide?

A 10.5% **B** 21.7% **C** 44.8% **D** 61.9%

14 When concentrated aqueous sodium chloride is electrolysed using inert electrodes, which product is formed at the cathode and which product is formed at the anode?

	cathode product	anode product
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

15 Which negative ions are present in aqueous copper(II) sulfate?

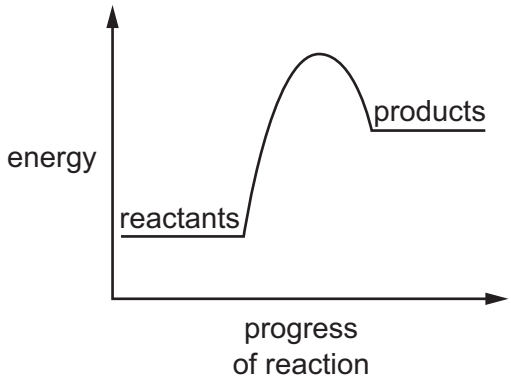
A copper(II) ions and hydrogen ions

B copper(II) ions only

C sulfate ions and hydroxide ions

D sulfate ions only

16 The diagram shows the energy profile of a chemical reaction.



Which row is correct?

	the reaction that is endothermic	the reaction with greater activation energy
A	backward reaction	backward reaction
B	backward reaction	forward reaction
C	forward reaction	backward reaction
D	forward reaction	forward reaction

17 The table shows the energy released by the complete combustion of some compounds.

compound	formula	M_r	ΔH in kJ / mol
benzene	C_6H_6	78	–3270
heptane	C_7H_{16}	100	–4800
octane	C_8H_{18}	114	–5510
propane	C_3H_8	44	–2200

Which compound releases the least energy when 1 g is completely burned?

A benzene

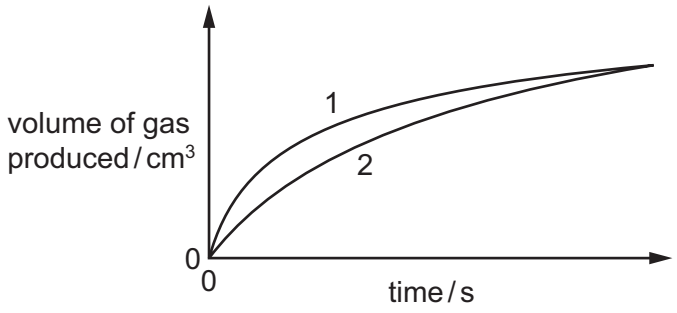
B heptane

C octane

D propane

18 An experiment is carried out to measure the rate of reaction between magnesium and dilute hydrochloric acid under two different conditions. The mass of magnesium and the number of moles of hydrochloric acid are the same in both experiments.

Graphs of the results are shown.



Which statements could explain the difference between graph 1 and graph 2?

1 Graph 1 results are obtained at a higher temperature.

2 Graph 1 results are obtained by using hydrochloric acid that is more concentrated.

3 Graph 1 results are obtained using smaller pieces of magnesium.

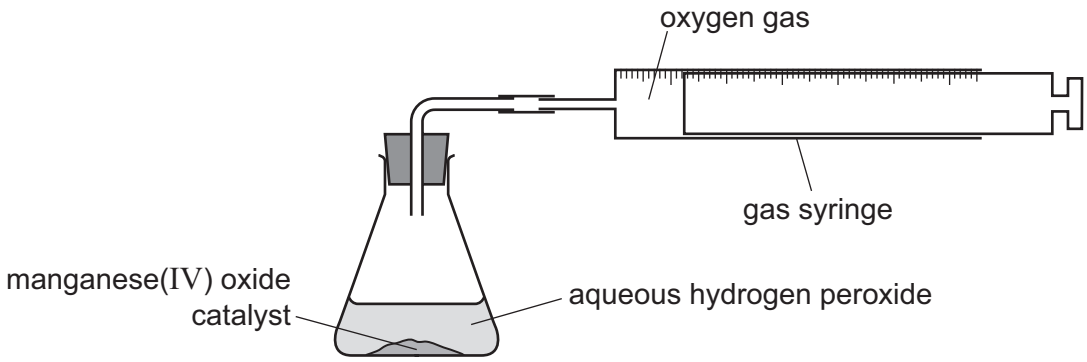
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

19 Hydrogen peroxide decomposes slowly at room temperature.

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

The reaction can be catalysed by adding manganese(IV) oxide.

The diagram shows the apparatus that can be used to monitor the rate of this reaction.



Which statement is correct when a catalyst is added to the aqueous hydrogen peroxide?

A The catalyst increases the activation energy for the reaction.

B The catalyst is used up during the reaction.

C The gas syringe fills up more quickly when the catalyst is added.

D The total amount of oxygen produced increases when the catalyst is added.

20 Reduction can be defined in terms of the gain or loss of oxygen or of hydrogen or of electrons.

Which row correctly describes all three definitions of reduction?

	oxygen	hydrogen	electrons
A	gain	loss	loss
B	gain	loss	gain
C	loss	loss	loss
D	loss	gain	gain

21 Why is ethanoic acid described as a weak acid?

A It is an organic acid.

B It is a poor conductor of electricity.

C It is only slightly dissociated in water.

D It reacts only with very reactive metals.

22 What is the best method to prepare a sample of silver chloride?

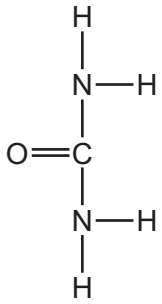
A Add silver nitrate to chlorine.

B Add silver to hydrochloric acid.

C Burn silver in chlorine.

D Mix aqueous solutions of silver nitrate and sodium chloride.

23 The nitrogenous fertiliser urea has the structure shown.



Which percentage, by mass, of nitrogen does it contain?

A 23.3 **B** 25.0 **C** 43.8 **D** 46.7

24 Ammonia is manufactured by the Haber process.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \qquad \Delta H = -92\,kJ/mol$$

For this reaction, which rows give a true statement together with a correct reason?

	statement	reason
1	Nitrogen and hydrogen are mixed in the ratio 1 : 3 by volume.	The formula of ammonia is NH_3.
2	The pressure used is approximately 200 atmospheres.	A high pressure is needed to produce a good yield of ammonia at equilibrium.
3	The temperature used is approximately 450 °C.	A high temperature is needed to produce a good yield of ammonia at equilibrium.
4	Vanadium(V) oxide is used as a catalyst.	A catalyst speeds up the rate of the reaction.

A 1 and 2 only **B** 2 and 3 only **C** 3 and 4 only **D** 1, 2 and 3 only

25 Which uses for sulfuric acid are correct?

1 as a bleach in the manufacture of wood pulp for paper

2 as a food preservative in tinned foods

3 as a raw material in the manufacture of detergents

4 as a fertiliser

A 1 and 3 **B** 2 and 4 **C** 2 only **D** 3 only

26 The atomic number of element X is 12.

What is the formula of the chloride of X?

A X_2Cl **B** XCl **C** XCl_2 **D** XCl_4

27 Which property is common to ^{40}Ca, ^{39}K and ^{23}Na?

A Their atoms all have more neutrons than protons.

B Their ions all have eight electrons in their outer shell.

C They all sink when added to water.

D They are all deposited at the positive electrode when their molten chloride is electrolysed.

28 Which statement about transition elements is correct?

A Their soluble salts usually form coloured aqueous solutions.

B They are all in the same group of the Periodic Table.

C They are non-metals with high melting points.

D They can be mixed together to form compounds.

29 Three different elements react by losing electrons. The ions formed all have the electronic configuration 2,8.

Which statement about these elements is correct?

A They are in the same group.

B They are in the same period.

C They are noble gases.

D They are transition elements.

30 Metal M is displaced from aqueous M nitrate by copper.

Which statement about metal M and its compounds is correct?

A M carbonate is stable when heated.

B M oxide is reduced to M by heating with carbon.

C M reacts with dilute hydrochloric acid to give hydrogen.

D M reduces zinc oxide to zinc on heating.

31 Which statement about some of the gases present in air is correct?

A Dry air contains about 78% of oxygen.

B Methane is produced by the incomplete combustion of fossil fuels.

C Sulfur dioxide is released by volcanoes.

D The noble gases make up about 5% of dry air.

32 Which treatment process is used to disinfect water?

A adding carbon

B chlorination

C desalination

D filtration

33 A molecule of compound Q has three C–C single bonds and ten C–H bonds only. It has no other bonds.

Which statement about compound Q is correct?

A It can be polymerised.

B It decolourises bromine water.

C It has three isomers.

D It reacts with chlorine by substitution.

34 Which organic compound requires the least number of moles of oxygen for the complete combustion of one mole of the compound?

A C_3H_7OH **B** C_3H_7COOH **C** C_3H_8 **D** C_4H_8

35 Which reaction is an addition reaction?

A making ethane and ethene from butane

B making ethene and hydrogen from butane

C the manufacture of margarine from a vegetable oil

D the reaction between ethene and oxygen, giving carbon dioxide and water

36 Two equations involving ethanol are shown.

1 ethanol + oxygen $\xrightarrow{\text{oxidation}}$ carboxylic acid

2 glucose $\xrightarrow{\text{fermentation}}$ ethanol + carbon dioxide

Which row is correct?

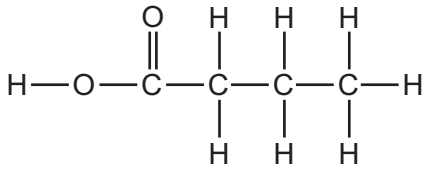
	molecular formula of carboxylic acid in 1	a catalyst is needed
A	CH_3CO_2H	1 only
B	$C_2H_5CO_2H$	1 only
C	CH_3CO_2H	2 only
D	$C_2H_5CO_2H$	2 only

37 What is the empirical formula of ethanoic acid?

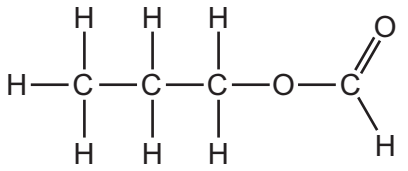
A CH_2O **B** CH_4O **C** C_2H_3O **D** $C_2H_4O_2$

38 Which structure represents propyl methanoate?

A



B



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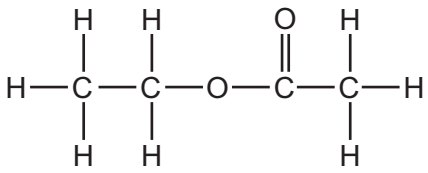

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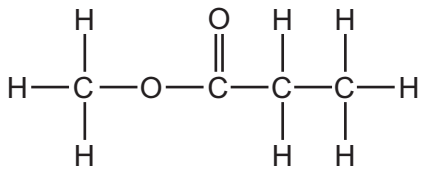
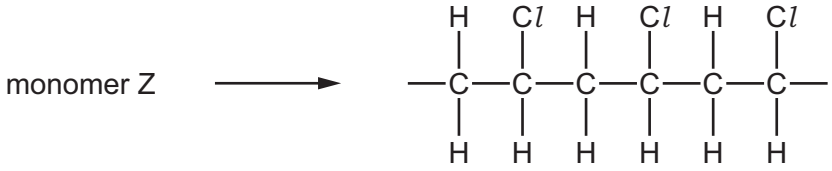


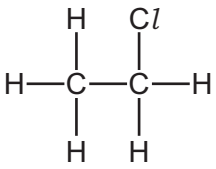
39 Monomer Z is used to make poly(chloroethene).



partial structure of poly(chloroethene)

What is monomer Z?

A



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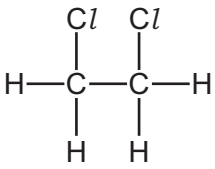

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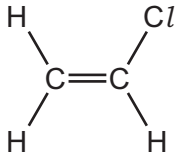

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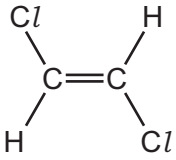

40 *Terylene*, a man-made fibre, is used to make clothing.

Which row correctly describes how *Terylene* is manufactured?

	starting materials	type of polymerisation
A	an acid and an alcohol	addition
B	an acid and an alcohol	condensation
C	an alkene	addition
D	an alkene	condensation

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).