Centre Number UNIVERSITY OF LONDON , i j 7
SCHOOL EXAMINATIONS BOARD
%?939
Candidate Number
General Certificate of Education Examination
JANUARY 1989 ORDINARY LEVEL
Chemistry 2
One and a quarter hours
INSTRUCTIONS TO CANDIDATES
USE AN HB PENCIL THROUGHOUT THE TEST
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO
I Before the test begins:
1. Insert the information required in the spaces above.
2. Check that your answer sheet. which will be handed to you separately, is headed iOrdinary level-OSI Chemistry
Paper 2i. Take care that you do not crease or fold the answer sheet or make any marks on it other than those
asked for in these instructions.
. 3. Insert the information required in the spaces provided on the answer sheet. When you have written your Centre
Number and Candidate Number in the boxes provided draw neat horizontal lines with your HB pencil to join the
dots under the appropriate numbers in the grids below the boxes. (You can see how to do this in the right-hand
column headed "Fest Numberi.) Make sure you have marked the right numbers.
How to answer the test:
4. For each question there are live suggested answers, A, B, C, D and E. When you have selected your answer to
,. the question, find the row on the answer sheet with the number of that question and draw a horizontal line to
join the dots under the letter for the answer you have chosen.
i For example. the answer C would be marked as shown.
ABCDE
thh-HHi
5. Mark only one answer for each question. If you Change your mind about an answer. rub out the first mark
carefully, then mark your new answer.
6. There are 70 questions in this test and you are advised to answer all of them. You will score one mark for each
correct answer; no marks will be deducted for incorrect answers or omissions.
7. Do all rough work in this booklet.
8. You MAY use a calculator in answering any part of this test.
You must not take this booklet out of the examination room. All question booklets and answer sheets will be collected
at the end of the test.

Questions 1-25
Directions. Each group ofquestions below consists of fiv
For each numbered question select the one headin
once more than once, or not at all.
SECTION I
Questions 1-7 refer to the following chemical terms:
A Esteriheation
B Polymerization
C Isomerism
D Dynamic equilibrium
E Thermal cracking
Select. From A to E, the chemical term most Closely
related to the change or situation described.
in
The formation of a sweet smelling liquid from an
alcohol and an acid
The conversion ofmethyl methacrylute into perspex
Both ethanol and a difTerent substance called
methoxymethane have the same molecular formula
CzHGO
Solid leadHI) chloride in a saturated solution of
lead(ll) chloride
The conversion of parathn oil into a mixture of
gaseous hydrocarbons by strong heating
The production of petrol from other crude oil
fractions
The incomplete reaction between nitrogen and
hydrogen to produce ammonia
e lettered headings followed by a list of numbered questions,
g which is most closely related to it. Each heading may be used 7 "f;
Ix)
12.
(twenty-five questions)
Questions 8-12 eencern dilute aqueous solutions of
A copper(II) nitrate
B iron(III) sulphate
C potassium carbonate
D potassium hydroxide
E sodium chloride
Select, from A to E, the solution which will give
8. a blue precipitate with aqueous ammonia
solution
10. a white precipitate with silver nitrate solution
acidified with dilute nitric acid
11. an efTervescence with dilute hydrochloric acid
acidified with dilute hydrochloric acid
a red-brown precipitate with sodium hydroxide
a white precipitate with barium chloride solution
,

Questions 13-16 are concerned with various substances placed in sealed containers. The arrangement of the particles (atoms, molecules or ions) of which each substance is composed is shown in magnified form in the diagrams below.

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A 0000000
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Q.
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E

Select, from A to E. the diagram which hts most closely the description given.

13. An ionic solid 0f the same type as sodium chloride
14. A metallic crystal
15. A gas like hydrogen chloride

16. A noble gas such as helium
DSE 88/0708
DJ
Questions 17-21 concern the following gases:
Ammonia
Carbon dioxide
Hydrogen chloride
UOWh
Methane
E Sulphur dioxide
Select, from A to E. the gas which
17. may be used as a fuel
18. is used in some fire extinguishers
19. is acidic in aqueous solution. and is oxidized during the large scale production 011m important acid
20. dissolves in water to give a solution with a pH value greater than 7
21. has diatomic molecules
Questions 22-25 concern the following table which shows some properties of five elements A to E:

	Melting Point C ,AOC	Boiling Point	Electrical Conductivity	pH value of oxide dissolved in water
A	- 39	357	Good	oxide insoluble
B	730	4830	Good	5
C	650	i l 10	Good	9
D	98	890	Good	14
E	44	280	Poor	3

Select. from A to E. the set of properties which most closely fit those of the element indicated.
22. Graphite
23. Phosphorus (while)
24. The clement which remains liquid over the shortest range of tcm pcraturc
An clement which is 21 liquid metal at room temperature and atmospheric pressure
Turn over

SECTION II
the responses is (are) correct. Then Choose:
A if 1, 2 and 3 are correct
B if I and 2 only are correct
C if 2 and 3 only are correct
D if 1 only is correct
E if 3 only is correct
26. The particles that move through 21 metal when it conducts electricity include
1 electrons
2 protons
3 ions
27. Which of the following are made up of molecules containing atoms of three dilTerent elements?
1 Carbohydrates
2 Hydrocarbons
3 Proteins
28. When :1 mixture oli solid sodium chloride and ammonium Chloride is stroneg heated in a test-tube
1 sodium chloride is left at the bottom
2 ammonia and hydrogen Chloride are formed in the heated section ol the test-tube
3 ammonium Chloride is reformed in the cooler section 01 the test-tubc
29. Gases which have a relative molecular mass of 28 include
(Relative atomic masses: H : l. C : 12. N 2 14. O : l6)
1 carbon monoxide
2 nitrogen
3 ethcne
(seventeen questions)
30.
31.
32.
l, 2, 3
correct
A
In the equation:
2502(g) T 02(8) :1 2803(g)
the ’7: sign means i
l the reaction is used in industry
2 the reaction may reach equilibrium
3 the reaction is reversible
In an atom of an element. which of the following are the same as the atomic number? l
l The number of electrons
2 The number of protons
3 The number of neutrons
(Relative atomic mass: He : 4)
One mole of helium atoms 51
l occupies the same volume as one mole of 1! oxygen molecules at the same temperature and pressure
- $1
. . . ’fe
2 contains L atoms of helium. where L IS the g-Avogzidro constant 5i
till
3 has a mass of 4 g w
l
A. dilute aqueous acid would be expected to react l
With 5
1 magnesium oxide V
2 magnesium carbonate
3 magnesium sulphate -

34.
35.
36.
37.
38.
Ethene is used to manufacture
l polythene
2 ethanol
3 hydrogen
The pH of a solution of an acid increases when
l u more concentrated solution of acid is added
2 alkali is added
3 water is added
The element radium occurs in the same group
of the Periodic Table as culcmm. Radium would
therefore be expected 10 form
I an insoluble carbonate
2 a soluble nitrate
3 a basic oxide
Substances run off from the blast furnace include
I pure iron
2 steel
3 pig iron (cast iron)
ALL members 01’ each homologous series
I undergo addition reactions
2 have isomers
3 have the same general formula ,
DSF. 880708
39. Ammonia can be oxidized ul about 800 "(V according
40.
41.
42.
lo the equation
4NH;(2) 4r 503(g) _, 4N()(g) i (iHjmg)
-.
This reaction
I is faster in the presence oli a catalyst
2 produccs an increase in volume if the pressurc
and temperature are kept conslunl
1:)
forms the husis of :1 method for producing
nitric ucnd industrially
lron(lll) chloride can he prcpurcd by
l dissolving iron wirc in dilute hydrochloric acid
2 healing iron wire in a stream nhlry hydrogen
chloride
W
hculing iron wirc in u slrcum 0T dry chlorine
gas
In the mumlillclurc uli aluminium from aluminium
oxulc
i
l the uxidc is dissolved in mollcn cryolilc
2 reduction lukcs plucc ill lhc mlhmlc
3 lhc clcclrodcs :er mudc uli graphite (carbon)
Asluliнc is the clement hclnw iodine in the hulngcn
group. The mills 0f lhc clcmcnl urc culled :lSlillidCS.
It would he cxpcclcd (hut chlormc Will displace
l bromine from aqueous sodium hmmidc :
2 iodine I’mm uqucous wdium iodide
3 uslzllinc from aqueous wdium uxmlidc
’l’urn over

SECTION III
I
Questions 43-70 (twenty-eight questions)
Directions. Each of the questions or incomplete statements in this section is followed by five suggested answers. $6
the best answer in each case.
43. The most important use of ammonia in industry is
in the manufacture of molecules would
A have a low melting point
A bleaches
B contain a metallic element
B detergents
C conduct electricity
C drugs
_ D have a high boiling point
D explosives
E 01 merize
E fertilizers p y
s s _ , . 48. A colourless liquid burns in air, reacts with sodium
44. Which ofthe lollowmg IS NOT a naturally occurrmg to form hydrogen and is neutral to l itmus solution.
raw material? The liquid could be
A Calcium carbonate A CthanOlC ac1d
8 Sodium chloride B ethanol .1-
C Sodium hydroxide C paramn 3
i
D Sulphur D petrol V
E Water E water a
. . . . 49. TI’ ’ ’ ’ ’ ’
45. 3.2 g of sulphur reacts With bromine 10 form 1 1.2 g I dnium ’8 made by the followmg reaction
. _ - . :. .’_ "
of sulphur bromide. TiCh 4_ 4Na _, Ti i 4NaCi ,7 K), r, , :71?
The simplest formula of sulphur bromide is The minimurh riumbgi of tonnes of sodium nbeti zid
(Relative atomic masses: Br I 80. S 2 32) to produce 96 tonnes of titanium is
A . E ’ (Relative atomic masses: Na : 23. Cl 2 35.5,
A SBr , ’. ; 3 T1 - 48)
_ . . .7 A 12.5
B 5813 .1, J’ .
. 7
C SZBU B -3
D SzBrS j C 46
7
E SzBr7 D 9-
E 184
46. All of the following, would be decomposed by strong
heating in u bunscn Hume EX(EPT 50. A compound could be described as ttunsaturated’i if it
cnlcmm carbonate A burns in air to give carbon dioxide and water L
hydrated c0ppcr(ll) sulphate is an alkane ,
Icud(ll) nitrate
m’i mcsium oxide . . .
i E rapidly decolorizes bromine water
MUOUUA
B
C is a hydrocarbon
D
sugar E
forms compounds by substitution
6

52.
53.
54.
. All of the following are properties of ammonia EXCEPT that
A it is a gas at room temperature and atmospheric pressure
it is very soluble in water
it readily burns in air -
it reacts with dilute acids
MDOW
it is alkaline
If the atomic number of an element is 35 and the relative mass of its atom is 80, one atom of the element will contain
35 protons, 35 electrons, 35 neutrons
45 protons, 35 electrons, 35 neutrons
35 protons. 45 electrons, 35 neutrons
35 protons, 35 electrons, 45 neutrons _
HCOWh
45 protons, 45 electrons. 45 neutrons
The diagram shows the outer electrons of both of the atoms in a molecule.
s)
The molecule could be ’ 1’
A chlorine ’
B oxygen
C nitrogen
D hydrogen chloride
E
carbon monoxide
Which of the following solutions would exactly neutralize 1000 cm3 of 1.0 mol dm-3 sodium hydroxide, NaOH, solution?
A 1000cm30fl.0moldm 3sulphuricacid.H3504
B 1000cm30f2.0moldm 3sulphuricacid.H3804
C 250 cm3 of 1.0 mol dm"1 ethanoic acid.
CHgCOZH
D 1000 cm1 of 1.0 mol dm R hydrochloric acid.
HCl
E 500 cml of 0.5 mol dm 7.1 hydrochloric acid.
HCl
DSE 88/0708
55.
56.
57.
58.
Crucibles containing known masses of each of the followmg were strongly heated in air. In which cruelble would there be an. increase in mass?
Calcium
Calcium oxide
Calcium carbonate
Carbon
HUOWJe
Calcium chloride
A colourless gas dissolves in water and the resulting solution gives a white precipitate with aqueous silver nitrate. The gas is probably
A chlorine, C13
B hydrogen chloride, HCI
C hydrogen iodidet Hl
D tetrachloromethane, CC14
E
sodium chloride, NaCl
Air is a mixture. Which of the following statements about air is therefore NOT true?
A The components can be easily separated by physical methods.
B Air can be made by mixing the components together in the correct proportions.

C The composition of air varies slightly From place to place.
D The properties ofair are the average properties of the components.
E All the components ofair have the same density
A hydrocarbon is composed of 85.7% carbon and 14.3% hydrogen by mass. Its molecular formula is (Relative atomic masses: C 2 12, H 2 1)
A CZHG
C CRHx
D CJHH)
E CoHn
Turn over

59. Anhydrous iron(III) chloride is a solid substance 62. Which of the following is a pai
r of isotopes? V
which will sublime. You could show that iron(III)
chloride does sublime by _
A Graphite and dlamond
A freezing the solid B Ethane and ethene
B passing an electric current through an aqueous C H H H H
solution of the solid l I C l l
H_C-C_C_C-H
C adding water to the solid l l I I
H H H H
heating the solid
and
E filtering an aqueous solution of the solid H
l
H_C_H
60. Which of the following industrial processes gives H H
more than one useful product? I I
H_C_C_C_H
l l l
A The Haber Process H H H
B The Contact process - 3.?
D ?%CI and ’30 f;
C The polymerization of ethene ’
E F6203 and F6304 .
D The electrolysis of aqueous sodium chloride
E The catalytic oxidation of ammonia
63. In industry. liquid air is separated into oxygen and
nitrogen by
61. The major component of natural gas IS gas Chromatography
fractional distillation
A methane
B carbon monoxide
ditTusion through a porous tube
A
B
C fractionalcrystallisation
C hydrogen D
E
D nitrogen passage through white-hot coke
E oxygen

64. At 20 oC and LO atmosphere pressure, l.0g of oxygen occupies 750 cm3. The same mass of oxygen will have a volume of 1500 cm3 at
20 DC and 2.0 atmospheres
40 oC and 1.0 atmosphere
20 0C and 0.5 atmosphere
40 oC and 0.5 atmosphere
PJUOWJ0
80 aC and 2.0 atmospheres
65. Ethanol can be converted into elhzmoic acid by the process of
A combustion
B ’cracking
C esterification
. D fermentation
E oxidation
66. Starch is an example of a natural
A cslcr
B polymer
C hyd rocarbon
D protein
E isotope

Questions 67-70 concern an experiment in which a constant current was passed through aque
ous copper(Il) sulphate,
using copper electrodes. in the apparatus shown below.
Copper anode COPPCF cathode
Aqueous copper(II)
sulphate
67. The mass of the copper CLllhOdC was measured at certain time 1mm vale The graph of ma
ss of cathode against
time would be .-
A B
Mass of Mass of Mass of .
cathodc cathode cathode
0 0 0O
0 Time 0 Time Time
D E
Mass of Mass of
cathode cathode
0 00
0 Time Time
10
l!

68.
69.
70.
During electrolysis. at the anode
A hydrogen gas would be evolved
B oxygen gas would be evolved
C sulphur dioxide would be evolved
D sulphuric acid would be produced
E
the copper of the anode would dissolve
During electrolysis. the colour of the solution in the
beaker
A becomes paler blue
B becomes darker blue
C remains the same
D becomes paler round the anode and darker
round the cathode
E becomes darker round the anode and paler
round the cathode
The experiment was repeated. using platinum
electrodes Instead ol copper electrodes.
Observation of the electrodes would show
Anode Cathode
A platinum dissolved platinum deposited
B platinum deposited platinum dissolved
C platinum dissolved copper deposited
D oxygen evolved copper deposited
E oxygen evolved hydrogen evolved
STOP
Now go back and check your work.
I l

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