

CHEMISTRY

Paper 1 Multiple Choice

5070/12 October/November 2019 1 hour

Additional Materials: Mult

Multiple Choice Answer Sheet Soft clean eraser Soft pencil (type B or HB 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 15 printed pages and 1 blank page.

1 The concentration of aqueous sodium carbonate can be found by reaction with hydrochloric acid of known concentration. The indicator methyl orange is used.

Which items of equipment are needed?

- A burette, measuring cylinder, gas syringe
- **B** burette, measuring cylinder, thermometer
- **C** burette, pipette, conical flask
- **D** burette, pipette, stopwatch
- 2 The diagrams show three stages, 1, 2 and 3, used in the preparation of a salt.



Which row correctly shows the solubilities both of the reactants and of the salt formed in this preparation?

	solubility of reactants	solubility of salt formed
Α	both soluble	insoluble
в	both soluble	soluble
С	one soluble, one insoluble	insoluble
D	one soluble, one insoluble	soluble

Atoms that have different nucleon numbers but the same proton number are called2......

Which words correctly complete gaps 1 and 2?

	1	2
Α	electrons	isomers
в	electrons	isotopes
С	neutrons	isomers
D	neutrons	isotopes

- **4** Which three elements exist as diatomic molecules at room temperature?
 - A hydrogen, oxygen, helium
 - B nitrogen, chlorine, neon
 - **C** nitrogen, oxygen, fluorine
 - **D** oxygen, chlorine, helium
- **5** Which is a pure compound?
 - A dry air
 - B ethanol
 - C steel
 - **D** petrol (gasoline)

6 Which diagram best represents the structure of a solid metal?





7 Hydrogen sulfide burns in an excess of oxygen according to the equation shown.

 $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(g) + 2SO_2(g)$

48 dm³ of hydrogen sulfide is burned.

Which volume of sulfur dioxide will be formed at room temperature and pressure?

[All volumes are measured at the same temperature and pressure.]

A 24 dm^3 **B** 36 dm^3 **C** 48 dm^3 **D** 96 dm^3

- 8 Which statement about electrical conductivity is correct?
 - A Covalent compounds, such as glucose, conduct when molten or dissolved in water.
 - **B** Dilute acids, such as sulfuric acid, conduct because all the ions are free to move.
 - **C** lonic compounds, such as sodium chloride, conduct due to movement of electrons.
 - **D** Metals, such as copper, conduct due to movement of positive ions.
- **9** Ammonia is manufactured from nitrogen and hydrogen by the Haber process.

 $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

What is the percentage yield when 60 kg of ammonia is produced from 60 kg of hydrogen?

A 5.9% **B** 17.6% **C** 35.3% **D** 50.0%

- **10** What is the ratio of the number of molecules in 71g of gaseous chlorine to the number of molecules in 2g of gaseous hydrogen?
 - **A** 1:1 **B** 1:2 **C** 2:1 **D** 71:2
- **11** The diagram shows the apparatus for an electrolysis experiment.



Using the apparatus shown, which electrolyte would give colourless gases at both electrodes?

- **A** aqueous copper(II) sulfate
- B concentrated aqueous sodium chloride
- C dilute sulfuric acid
- D molten lead bromide
- 12 Which metal is most likely to be extracted from its molten chloride by the use of electrolysis?
 - A calcium
 - B copper
 - **C** iron
 - D silver

13 Two energy profile diagrams are shown. The scale on the *y*-axis is the same for both diagrams.



Which statement is correct?

- **A** Both reactions are exothermic.
- **B** Only one reaction is endothermic.
- **C** The activation energy of reaction 1 is smaller than the activation energy of reaction 2.
- **D** The enthalpy change of reaction 2 is larger than the enthalpy change of reaction 1.
- 14 Ammonium nitrate dissolves in water.

$$H_2O$$

NH₄NO₃(s) \longrightarrow NH₄NO₃(aq) $\Delta H = +25 \text{ kJ/mol}$

Which statements are correct?

- 1 The reaction is endothermic.
- 2 The water gets colder during the reaction.
- 3 Heat energy is absorbed by the ammonium nitrate from the water.
- **A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3
- 15 Which statement about photosynthesis is correct?
 - A Chlorophyll is a reactant.
 - **B** Oxygen is a product.
 - **C** Sunlight is a reactant.
 - D Water is a product.

- 16 In which reaction is the underlined substance reduced?
 - $\textbf{A} \quad \underline{C}(s) \ + \ CO_2(g) \ \rightarrow \ 2CO(g)$
 - $\textbf{B} \quad \underline{Cl_2}(g) \ + \ 2I^{-}(aq) \ \rightarrow \ I_2(aq) \ + \ 2Cl^{-}(aq)$

 - **D** $\underline{Zn}(s) + 2H^{+}(aq) \rightarrow Zn^{2+}(aq) + H_{2}(g)$
- **17** Catalysts alter the rate of chemical reactions.

Which statements correctly describe the effect of adding a catalyst to a reaction?

- 1 All reactant particles have more energy and move faster.
- 2 The activation energy is lowered.
- 3 More reactant particles collide with enough energy to react.
- A 1, 2 and 3 B 1 and 3 only C 2 and 3 only D 3 only
- **18** Solution T has the following properties.
 - 1 It reacts with magnesium forming a gas.
 - 2 It reacts with calcium carbonate forming a gas.

Which statement about solution T is correct?

- **A** It contains more OH^- ions than H^+ ions.
- B It has pH 9.
- **C** Its reaction with calcium carbonate produces hydrogen.
- **D** It reacts with aqueous ammonia.
- **19** Which substance is soluble in water?
 - **A** copper(II) carbonate
 - B copper(II) oxide
 - **C** copper(II) hydroxide
 - D copper(II) nitrate
- 20 Which statement about ammonia is correct?
 - A It is a colourless, odourless gas.
 - **B** It is a gas that turns damp blue litmus paper red.
 - **C** It is formed when potassium nitrate is heated with aqueous sodium hydroxide and aluminium.
 - D It is manufactured using vanadium(V) oxide as a catalyst.

21 Part of the Periodic Table is shown with four elements, W, X, Y and Z. These are **not** the elements' actual symbols.



Some pairs of these elements may react to form compounds.

Which formulae are correct?

- A WX and YZ
- **B** WY₂ and WZ
- C WZ and XZ
- \mathbf{D} X₂Z₃ and YZ
- 22 The elements in Group I have similar chemical properties.

Which statement explains why this is true?

- **A** They all have metallic bonding.
- **B** They all have the same number of complete electron shells.
- **C** They all have the same number of electrons in their outer shell.
- **D** They are all stored under oil to prevent reactions with the air.
- **23** Helium and xenon are both noble gases.

What is true of both elements?

	they are chemically inert	the atoms have eight electrons in their outer shell
Α	\checkmark	1
в	\checkmark	X
С	x	\checkmark
D	×	X

24 The ions of metal X react with aqueous potassium iodide.

 $\begin{array}{rl} 2X^{2^{+}}(aq) \ + \ 4I^{-}\!(aq) \ \rightarrow \ 2XI(s) \ + \ I_{2}(aq) \\ coloured \end{array}$

From this information, it can be deduced that X is most likely a1..... metal and the $X^{2+}(aq)$ ions are2.....

Which words correctly complete gaps 1 and 2?

	1	2
Α	Group II	oxidised
в	Group II	reduced
С	transition	oxidised
D	transition	reduced

25 Which substance is a metal?

	melting point	conducts electricity when solid	conducts electricity when molten
Α	high	x	1
в	high	x	X
С	high	\checkmark	✓
D	low	x	X

26 Which metal can be obtained from its oxide by using either carbon or hydrogen?

A Cu **B** Fe **C** Mg **D** Zn

27 Metal carbonates decompose when heated.

Which carbonate is most stable to heat?

- A calcium carbonate
- **B** copper(II) carbonate
- **C** lead(II) carbonate
- D zinc carbonate

28 Iron is extracted from its ore in a blast furnace. Coke and limestone are also added to the blast furnace.

What is the purpose of the limestone?

- A to decompose to release oxygen to burn the coke
- **B** to decompose to release oxygen to oxidise the iron
- **C** to decompose to neutralise the acidic impurities
- D to react with coke to heat the blast furnace
- **29** Aluminium is extracted from aluminium oxide by electrolysis.



Which statement about this electrolysis is correct?

- A Aluminium ions gain electrons to form aluminium.
- **B** Cryolite increases the melting point of the electrolyte.
- **C** Cryolite reacts with impurities to form slag.
- **D** The carbon cathode has to be replaced regularly as it reacts with oxygen.
- **30** Steel is produced by blowing oxygen into impure molten iron.

A student suggests two reasons why this process is carried out.

- 1 The oxygen removes some of the carbon from the impure iron.
- 2 The oxygen oxidises iron(II) ions to iron(III) ions.

Which reasons are correct?

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

31 Z is a pollutant gas that is formed in internal combustion engines.

An aqueous solution of Z is acidic.

Z is removed from the exhaust gases in a catalytic converter by reduction.

What is Z?

32 A student investigates the properties of a colourless organic liquid.

Which observation shows that the liquid is unsaturated?

- **A** It decolourises aqueous bromine.
- **B** It has a sweet smell.
- **C** It is a good solvent for organic compounds.
- **D** It produces carbon dioxide when burned.

33 Alkanes are saturated compounds containing carbon and hydrogen only.

Structures 1, 2, 3 and 4 are saturated hydrocarbons.





2







Which pair of structures are isomers?

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

34 When butene reacts with bromine, which compound could be made?









- 35 Which statement about propene is correct?
 - A It can be formed by cracking butane.
 - **B** It has the formula C_3H_8 .
 - **C** It is a saturated hydrocarbon.
 - **D** It reacts with hydrogen to form ethane.
- 36 Which term describes the structure of Terylene?
 - A polyalkene
 - B polyamide
 - C polyester
 - D protein
- 37 Which process is involved in the formation of ethanol from ethene?
 - A addition
 - B combustion
 - C polymerisation
 - **D** substitution

38 Which compound is an alcohol?







- **39** Which two compounds react together to form CH₃CH₂COOCH₃?
 - A ethanoic acid and ethanol
 - **B** methanoic acid and ethanol
 - **C** methanoic acid and propanol
 - **D** propanoic acid and methanol
- 40 Which compound might be suitable to flavour a soft drink?
 - A CH₃CH₂CH₂COOCH₃
 - **B** CH₃CH₂CH₂CH₂CH₂OH
 - $\textbf{C} \quad CH_3CH_2CH_2CH_2COOH$
 - D CH₃CHCHCH₂CH₃

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The Periodic Table of Elements

	VIII	2	He	helium 4	10	Ne	neon 20	18	Ar	argon 40	36	Кr	krypton 8.4	5 5	5 >	2 <	xenon 131	86	Rn	radon	1			
	٨I				თ	L	fluorine 19	17	C1	chlorine 35.5	35	Ъ	bromine	20 27	3 -	-	iodine 127	85	At	astatine	1			
	N				ø	0	oxygen 16	16	ა	sulfur 32	34	Se	selenium 70	F.0	¦ F	<u>ש</u>	tellurium 128	84	Ъо	polonium	116	2	livermorium	I
	>				7	z	nitrogen 14	15	٩	phosphorus 31	33	As	arsenic 75	о - т	5 0	ŝ	antimony 122	83	Ē	bismuth	607			
	2				9	U	carbon 12	14	Si	silicon 28	32	Ge	germanium 72	2.02	s c	5	tin 119	82	РЬ	lead	114	Fl	flerovium	I
	≡				5	Ш	boron 11	13	Al	aluminium 27	31	Ga	gallium 70	40	2 2		indium 115	81	11	thallium	×04			
											30	Zn	Zinc	48	ר ד ר	· د	cadmium 112	80	Hg	mercury	112	C	copernicium	I
											29	Cu	copper 6.4	47		D K	silver 108	79	Au	gold	111	Rg	roentgenium	I
Group											28	ïZ	nickel	46	ה ה		palladium 106	78	Ţ	platinum	110	Ds	darmstadtium	I
Gro											27	ပိ	cobalt 50	45	2	Ē	rhodium 103	77	Ir	iridium 400	192	Mt	meitnerium	I
		1	т	hydrogen 1							26	Бе	iron 56	84			nuthenium 101	76	SO	osmium	108	Hs	hassium	I
											25	Mn	manganese 55	43	۲ ۲	<u>َ</u>	technetium -	75	Re	rhenium 1 oc	107	Bh	bohrium	I
						bol	ass				24	ŗ	chromium 5.2	70			molybdenum 96	74	8	tungsten	106	Sg	seaborgium	I
				Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	17	- 41		niobium 93	73	Та	tantalum	105	Db	dubnium	I
						atc	rel				22	F	titanium 48	07	۲ ا	J .	zirconium 91	72	Ŧ	hafnium 470	104	Ŗ	rutherfordium	I
												လိ	scandium A 5	30	3 >	-	yttrium 89	57-71	lanthanoids		89-103	actinoids		
	=				4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium	ç ğ	ڻ 8	ดิ	strontium 88	56	Ba	barium	88	Ra	radium	I
	_				e	:=	lithium 7	11	Na	sodium 23	19	¥	potassium 20	37	2		rubidium 85	55	Cs	caesium	87	Ъ	francium	I

71 Lu Iutetium 175 103 Lr Iawrencium 70 Yb 173 173 172 102 No mendelevium 69 101 Md 68 Er 167 100 100 fm fm 67 HO 165 99 ES 66 Dy dysprosium 163 98 Cf 65 Tb 159 97 97 berkelium 64 Gd 157 157 96 96 Cm -63 Eu ^{europium} 152 95 95 americium 62 Sm 150 94 Pu plutonium oromethium ieptunium Pm ⁶¹ ⁹³ Np eodymium 144 92 **U** °8 Nd uranium 238 praseodymium 141 91 Pa protactinium 231 Pr 59 58 Cerium 140 90 90 90 232 232 57 La lanthanum 139 89 AC actinium lanthanoids actinoids

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

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