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CHEMISTRY

PAPER 1

Thursday **10 JUNE 2021** 12:00 NOON–1:15 P.M.

Additional material:
Calculator

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions in this paper.

For each question, four possible answers, A, B, C and D are given.

Circle the letter by the response which you consider to be correct.

Attempt **ALL** the questions. Marks will **NOT** be deducted for wrong answers. Your total score on this test will be the number of correct answers given.

Relative atomic masses are given in the Periodic Table of Elements provided on page 2.

The volume of one mole of gas at room temperature and pressure (r.t.p.) is 24 000 cm³ and at standard temperature and pressure (s.t.p.) is 22 400 cm³



For Examiner's Use	
TOTAL MARKS	

This question paper consists of 14 printed pages and 2 blank pages.



The Periodic Table of the Elements

Group																		
I	II											III	IV	V	VI	VII	0	
1 H Hydrogen																		
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	4 He Helium 2
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18	
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54	
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86	
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																

58 140 Ce Cerium	59 141 Pr Praseodymium	60 144 Nd Neodymium	61 150 Pm Promethium	62 150 Sm Samarium	63 152 Eu Europium	64 157 Gd Gadolinium	65 159 Tb Terbium	66 162 Dy Dysprosium	67 165 Ho Holmium	68 167 Er Erbium	69 169 Tm Thulium	70 173 Yb Ytterbium	71 175 Lu Lutetium
90 232 Th Thorium	91 238 Pa Protactinium	92 238 U Uranium	93 238 Np Neptunium	94 238 Pu Plutonium	95 238 Am Americium	96 238 Cm Curium	97 238 Bk Berkelium	98 238 Cf Californium	99 238 Es Einsteinium	100 238 Fm Fermium	101 238 Md Mendelevium	102 238 No Nobelium	103 238 Lr Lawrencium

* 58-71 Lanthanoid series
† 90-103 Actinoid series

a

X

b

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

1. A forensic scientist wishes to separate the dyes in a sample of red ink found at a crime scene.

Which technique would she use?

- A. chromatography
- B. crystallisation
- C. fractional distillation
- D. simple distillation

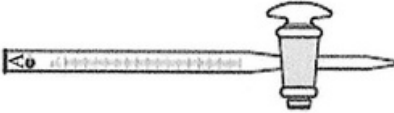
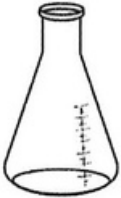
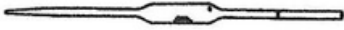
2. Water was tested and it was determined that the melting point is 273 K.

Which property is demonstrated by this test?

- A. it is odourless
- B. it is pure
- C. it is tasteless
- D. it is the universal solvent

3. In a titration the titrant has the unknown volume and the substance being identified has the known volume.

Which apparatus is used to measure the substance to be identified and which apparatus is used to measure the volume of the titrant?

	Apparatus to hold the substance being identified	Apparatus to measure the titrant
A.		
B.		
C.		
D.		

4. Which of the following **BEST** describes what happens to particles as a solid melts?

- A. They gain kinetic energy and become more ordered.
- B. They gain kinetic energy and become more spread out.
- C. They lose kinetic energy and lose freedom of movement.
- D. They lose kinetic energy and become more spread out.

5. Which row of the table describes an atom of two isotopes of the same element?

	same number	different number
A.	electrons	protons
B.	neutrons	electrons
C.	protons	electrons
D.	protons	neutrons

6. Molten aluminium oxide decomposes by electrolysis. In this process aluminium ions become aluminium atoms and oxygen ions form oxygen atoms.

How does an aluminium ion form an aluminium atom?

- A. aluminium gains three electrons
- B. aluminium gains two electrons
- C. aluminium loses three electrons
- D. aluminium loses two electrons

7. What is the correct formula for the compound formed between potassium and oxygen?

- A. KO
- B. K₂O
- C. PO
- D. P₂O



8. What is the number of moles of 38.70 g of copper (II) sulfate, CuSO_4 ?
- A. 0.24 mole
 - B. 1.60 mole
 - C. 4.61 mole
 - D. 38.70 mole
9. What is the molar mass of iron (III) sulfate, $\text{Fe}_2(\text{SO}_4)_3$?
- A. 152 g/mol
 - B. 208 g/mol
 - C. 344 g/mol
 - D. 400 g/mol
10. What is the basicity of ethanoic acid?
- A. 1
 - B. 2
 - C. 3
 - D. 4
11. Which gas is produced when magnesium metal reacts with dilute hydrochloric acid?
- A. carbon dioxide
 - B. chlorine
 - C. hydrogen
 - D. oxygen
12. What are the products formed when copper (II) oxide reacts with sulfuric acid?
- A. copper sulfate and hydrogen
 - B. copper sulfate and sulfur dioxide
 - C. copper sulfate and sulfur trioxide
 - D. copper sulfate and water
13. To which class of oxide does aluminium oxide and zinc oxide belong?
- A. acidic oxide
 - B. amphoteric oxide
 - C. basic oxide
 - D. neutral oxide

14. A chemist measures 23.26 g of calcium hydroxide, $\text{Ca}(\text{OH})_2$. What is the concentration of this substance in mol/dm^3 ?
- A. 0.24 mol/dm^3
 B. 0.31 mol/dm^3
 C. 3.2 mol/dm^3
 D. 74 mol/dm^3
15. Which salt is prepared by precipitation?
- A. aluminium nitrate
 B. barium sulfate
 C. magnesium nitrate
 D. potassium nitrate
16. Which acid has a pH range of 0–1?
- A. acetic acid
 B. carbonic acid
 C. citric acid
 D. sulfuric acid
17. Which ion is found in all acids?
- A. Cl^-
 B. H^+
 C. O^{2-}
 D. OH^-
18. Sodium hydrogencarbonate, NaHCO_3 is used to make bread rise in a hot oven.

Which row of the table gives the name of the gas produced and the reagent used to test for this gas?

	Gas	Reagent
A.	ammonia	red litmus paper
B.	carbon dioxide	limewater
C.	hydrogen	lighted splint
D.	oxygen	glowing splint



19. Dennis was given an aqueous compound **X**. He added aqueous sodium hydroxide and a white precipitate formed which was dissolved in excess aqueous sodium hydroxide.

Which cation was present?

- A. Ca^{2+}
- B. Cu^{2+}
- C. Fe^{2+}
- D. Zn^{2+}

20. Acidified aqueous silver nitrate, AgNO_3 is added to a solution and a white precipitate is produced.

Which ion is present in this solution?

- A. barium
- B. chloride
- C. magnesium
- D. sulfate

21. In some older-style food packaging the following reaction takes place.



Which type of chemical reaction is occurring in the above equation?

- A. displacement
- B. electrolysis
- C. exothermic
- D. galvanising

22. Which theory best explains why chemical reactions occur at different rates?

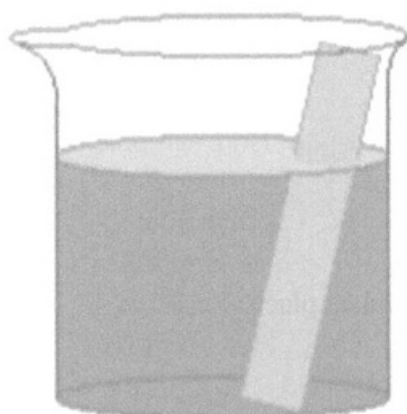
- A. Atomic theory
- B. Avogadro's theory
- C. Collision theory
- D. Kinetic theory

23. Use the equation and state which statement is **TRUE**.

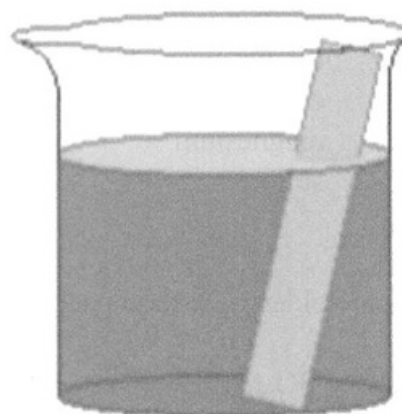


- A. Carbon monoxide is neither oxidised or reduced.
- B. Carbon monoxide is reduced to carbon dioxide.
- C. Nitrogen dioxide is oxidised to nitrogen monoxide.
- D. Nitrogen dioxide is reduced to nitrogen monoxide.

24. Strips of copper and zinc metals were placed in separate beakers each containing 0.50 mol/dm^3 of silver nitrate solution. The mass of the metal strips and volume of silver nitrate solution were kept constant.



copper metal strip



zinc metal strip

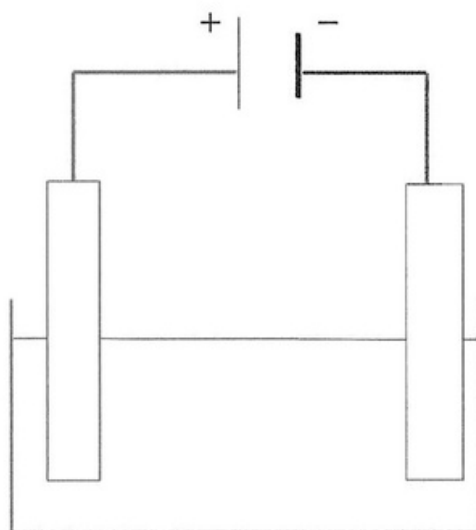
After 10 minutes it was observed that more silver metal was deposited on the zinc metal strip compared with the copper metal strip.

Which statement correctly explains the observation?

- A. Copper and zinc are equally reactive.
- B. Copper is less reactive than zinc.
- C. Copper is more reactive than zinc.
- D. Silver nitrate solution is more reactive with zinc metal.



The diagram shows a cell used in the electrolysis of brine. Use the diagram to answer questions 25–27.



25. Which particles conduct electricity in the wire and the electrolyte?

	Wire	Electrolyte
A.	electrons	ions
B.	ions	electrons
C.	neutrons	electrons
D.	protons	ions

26. Hydrogen gas is released as a product of electrolysis.

Which test shows the presence of hydrogen?

- A. bleaches litmus paper
- B. explodes with a squeaky pop
- C. relights a glowing splint
- D. turns limewater milky

27. Which of the following substances will **NOT** conduct electricity if placed in the cell?

- A. aqueous sulfuric acid
- B. ethanoic acid
- C. molten potassium iodide
- D. pure water

Use the following list of salts to answer questions 28–30.

- A. ammonium nitrate
- B. lead (II) chloride
- C. potassium hydrogencarbonate
- D. lithium iodide

28. Which salt is insoluble in water? A. B. C. D.

29. Which salt is used as a fertiliser? A. B. C. D.

30. Which salt gives a lilac flame test? A. B. C. D.

31. Which of the following is a **CORRECT** property of salts?

- A. covalent bonding
- B. do not conduct electricity when molten or aqueous
- C. low melting and boiling points
- D. mostly soluble in water

32. A piece of calcium is added to distilled water in a container.

What is the expected pH of the suspension formed?

- A. 3
- B. 5
- C. 7
- D. 10



33. Bauxite is an ore found in the earth.

Which element is extracted from this ore?

- A. aluminium
- B. boron
- C. calcium
- D. sulfur.

34. Which of the following is **NOT** a raw material used in the extraction of iron?

- A. air
- B. carbon monoxide
- C. haematite
- D. limestone

Use the lettered choices to answer questions **35–37**. A lettered choice may be used once, more than once or not at all.

- A. alkaline earth metal
- B. halogen
- C. noble gas
- D. transition element

Which of the lettered choices describes each of the following elements?

35. argon A. B. C. D.

36. iodine A. B. C. D..

37. beryllium A. B. C. D.

38. Which element is the most reactive non-metal?

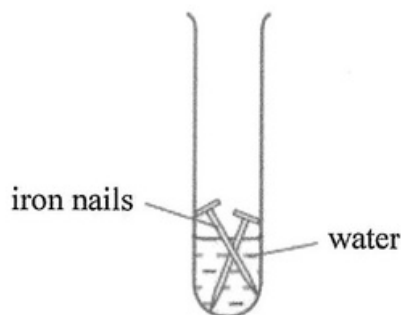
- A. chlorine
- B. fluorine
- C. neon
- D. oxygen



39. Which statement describes why manufacturing large quantities of sulfuric acid is economically beneficial?
- A. All the steps in the manufacturing process produce energy rather than requiring energy.
 - B. Large quantities of sulfur are easily extracted from underground deposits.
 - C. Oxygen and water required for the manufacturing process are naturally available.
 - D. Sulfuric acid has a large number of industrial uses.
40. Which one of the following represents the molecular formula of ethanol?
- A. CH_3Cl
 - B. CH_3OH
 - C. $\text{C}_2\text{H}_5\text{COOH}$
 - D. $\text{C}_2\text{H}_5\text{OH}$
41. Which one of the following shows a homologous series?
- A. C_2H_4 , C_2H_6 , $\text{C}_2\text{H}_5\text{OH}$
 - B. C_2H_4 , C_3H_6 , C_4H_8
 - C. F_2 , Cl_2 , Br_2
 - D. Li , Na , K
42. Which catalyst is used in the Contact process?
- A. Fe
 - B. MnO_2
 - C. Ni
 - D. V_2O_5



43. The experiment shown was set up to investigate the rusting of iron.



The presence of which substances in this experiment allows rusting to occur?

- A. hydrogen and oxygen
B. nitrogen and oxygen
C. nitrogen and water
D. oxygen and water
44. A compound with the formula XF_2 has a relative molecular mass of 78.
What is element X?
- A. argon
B. calcium
C. platinum
D. zirconium
45. Which of the following present in water can cause profuse growth of algae?
- A. carbon dioxide
B. carbonates
C. hydrogen sulfide
D. nitrates
46. Which of the following is a substitution reaction?
- A. $\text{C}_2\text{H}_2 + 2\text{H}_2 \longrightarrow \text{C}_2\text{H}_6$
B. $\text{C}_2\text{H}_4 + \text{H}_2\text{O} \longrightarrow \text{C}_2\text{H}_5\text{OH}$
C. $\text{C}_2\text{H}_6 + \text{Cl}_2 \longrightarrow \text{C}_2\text{H}_4\text{Cl} + \text{HCl}$
D. $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \longrightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

Questions 47–49 refer to the following organic compounds. Each letter may be used once, more than once or not at all.

- A. ethane
- B. ethanoic acid
- C. ethanol
- D. ethene

47. Which compound is a saturated compound? A. B. C. D.
48. Which compound is found in beverages? A. B. C. D.
49. Which compound is used as a starting material for plastics? A. B. C. D.
50. Ammonia was manufactured during World War II to make explosives.

Which of these substances can ammonia also be used to manufacture?

- A. antacids
- B. fertilisers
- C. food preservatives
- D. detergents



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