Class	Full Name	Index Number

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PRELIMINARY EXAMINATION 2023

N

5105/5107/03

SCIENCE (CHEMISTRY)
Paper 3 Multiple Choice
Secondary 4 Normal Academic

Additional materials:
Multiple Choice Answer Sheet
28 July 2023

Papers 3 and 4: 1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on all the work you hand in.

There are **twenty** 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.

Answers to Paper 3 and Paper 4 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 3**.
You may proceed to answer Paper 4 as soon as you have completed Paper 3.
Any rough working should be done in the booklet.
A copy of Periodic Table is printed on page 9.
The use of an approved scientific calculator is expected, where appropriate.

DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

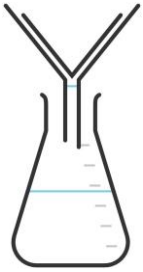
For Examiner's Use
20

This document consists of 9 printed pages, including the cover page and a copy of Periodic table

1. Substance X and substance Y are compounds found in a food sample. Both are liquids at room temperature with different boiling points.

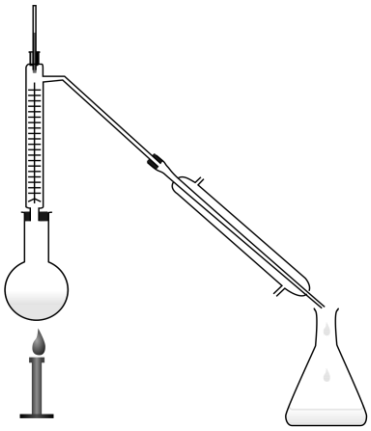
   Which of the following is the most suitable method to separate a mixture of X and Y to obtain each substance respectively?

A



C

B



D

2. Which statement shows that a sample of water is pure?

   A It has no effect on both red and blue litmus papers.

   B It is colourless and odourless.

   C It boils exactly at 100°C.

   D It has a density of 1g/dm^3.

3. The table below shows information about three different substances.

substance	decompose upon heating	solubility in water	solubility in alcohol
P	no	no	no
Q	no	no	yes
R	yes	yes	no

Which of the following shows the correct steps to take to separate and obtain a sample of substance R from a mixture of these three substances?

A dissolving the mixture in alcohol → filtration → evaporation to dryness

B dissolving the mixture in alcohol → filtration → crystallisation

C dissolving the mixture in water → filtration → evaporation to dryness

D dissolving the mixture in water → filtration → crystallisation

4. Which statement best explains why carbon dioxide gas does not have a fixed volume and can be compressed easily?

A The attractive forces between the particles are weak.

B The particles are able to move freely and randomly at high speeds.

C There are a lot of spaces between the particles.

D The particles are far apart and packed in an orderly manner.

5. The boiling points of a few elements are shown below.

element	boiling point/°C
P	-141
Q	50
R	134

A mixture of elements P, Q and R is heated gradually from -160°C to 99°C. Which substance(s) would remain as a liquid at 99°C?

A element P

B element R

C element Q and P

D element P and R

6. X is an atom with atomic number 13 and mass number 27. Which of the following correctly shows the number of protons, neutrons and electrons of a X^{3+} ion?

	number of protons	number of neutrons	number of electrons
A	13	14	10
B	13	27	10
C	14	13	13
D	14	14	16

7. The electronic configuration of elements X and Y are shown below.

X: 2.8.2

Y: 2.5

Which of the following correctly shows the type of bonding and chemical formula of the compound formed between X and Y?

	type of bonding	chemical formula
A	covalent	X_2Y_3
B	covalent	X_3Y_2
C	ionic	X_2Y_3
D	ionic	X_3Y_2

8. Which pair of substances will react to produce a gas that forms white precipitate in limewater?

	substance 1	substance 2
A	nitric acid	magnesium metal
B	hydrochloric acid	barium sulfate
C	sulfuric acid	sodium carbonate
D	nitric acid	calcium hydroxide

9. Which of the following oxides can react with both acids and alkalis?

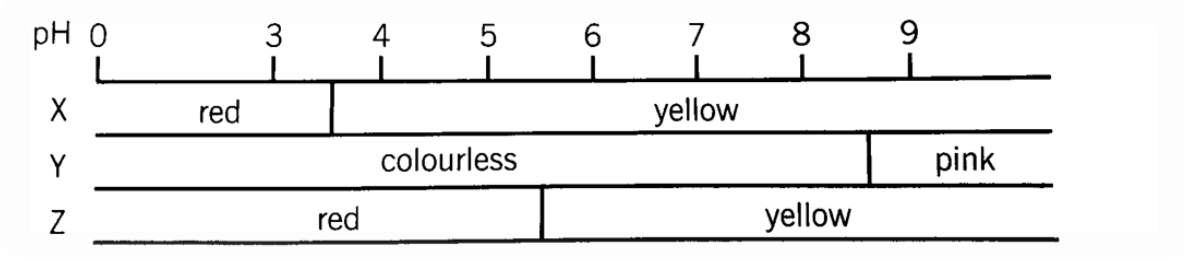
A zinc oxide

B sulfur dioxide

C carbon monoxide

D copper (II) oxide

10. The diagram below shows the pH ranges of three indicators, X, Y and Z.



The three indicators are mixed together in a beaker.

A few drops of this mixture was added into a solution, and the solution turned yellow.

What is the pH value of the solution?

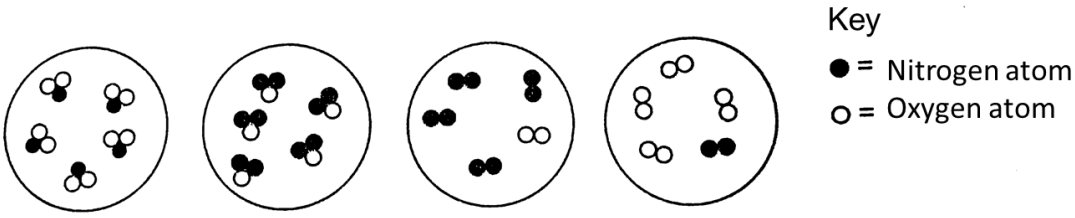
A pH 2

B pH 8

C pH 4

D pH 10

11. Which of the following best represents nitrogen and oxygen present in air?



A **B** **C** **D**

12. Which of the following solutions, when mixed, form an insoluble salt?

A barium nitrate and sodium chloride

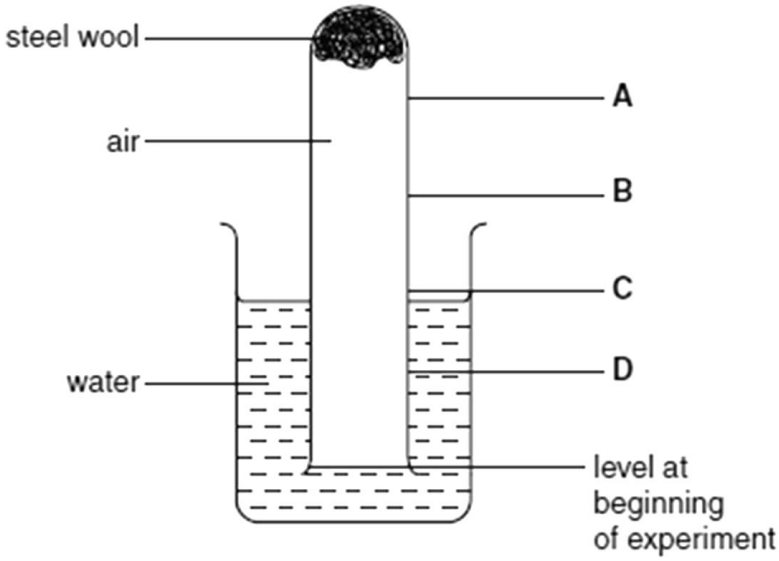
B calcium nitrate and hydrochloric acid

C lead (II) nitrate and sulfuric acid

D sodium nitrate and magnesium chloride

13. The diagram shows a piece of steel wool inside a test tube. The test tube is inverted in water, trapping air inside. Rusting begins to occur.

What could the water level be after several days?



14. The table shows the results of halogen displacement experiments.

halogen added	halide X^-	halide Y^-	halide Z^-
X_2	--	no reaction	no reaction
Y_2	displacement takes place	--	displacement takes place
Z_2	displacement takes place	no reaction	--

Which of the following halogens could represent X, Y and Z respectively?

	X	Y	Z
A	chlorine	bromine	iodine
B	iodine	chlorine	bromine
C	chlorine	iodine	bromine
D	iodine	bromine	chlorine

15. Which statement best explains why potassium and francium are placed in the same group of the Periodic Table?

A Both elements contain one electron at the outermost shell.

B Both elements form ionic compounds with group VII elements.

C Both elements have high melting and boiling points.

D Both elements have low density and are able to float on water.

16. Which of the following elements is used in filling of tubes for glowing advertising lamps?

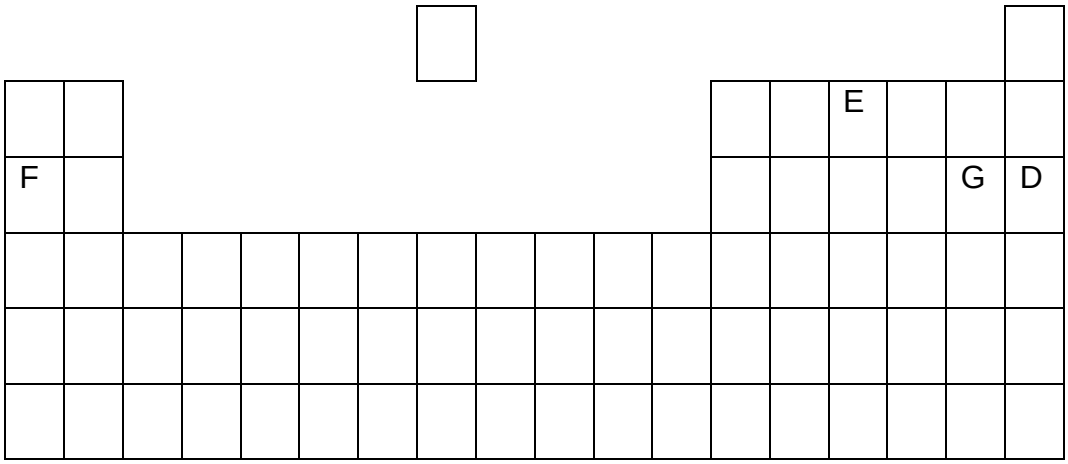
A hydrogen

B neon

C helium

D nitrogen

17. The diagram shows an outline of the Periodic table.



Which of the following shows a correct statement regarding elements D, E, F and G?

A F has the same number of electron shells as G and D.

B F has 7 valence electrons while G has 1 valence electron.

C D is more reactive than G.

D G and D are more metallic in nature compared to F and E.

18. Octane is an alkane present in petrol.

What are the products obtained when octane is completely burnt in air?

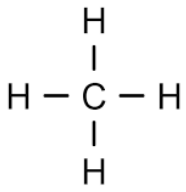
A carbon monoxide and water

B carbon and carbon monoxide

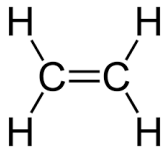
C carbon dioxide and water

D carbon dioxide and hydrogen

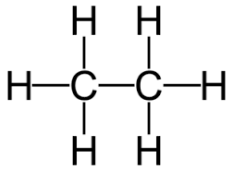
19. The diagrams show the structures of three hydrocarbons.



P



Q



R

Which hydrocarbons belong to the same homologous series?

A P and Q

B P and R

C Q and R

D P, Q and R

20. Which fraction, from the distillation of petroleum, is used as feedstock for the petrochemical industry?

A Bitumen

B Lubricating oil

C Kerosene

D Naphtha

- End of paper -

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		Key proton (atomic) number atomic symbol name relative atomic mass									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 –		

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.).