

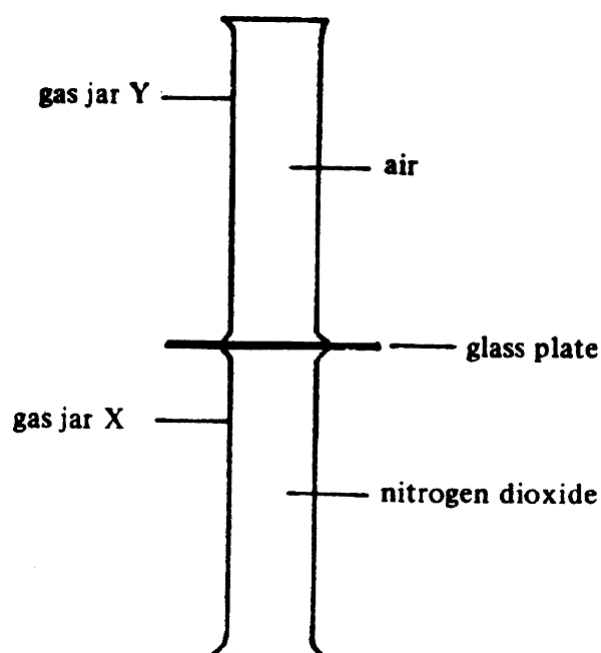
This paper consists of two sections. There are 30 questions in Section A and 20 questions in Section B.

Choose the best answer for each question.

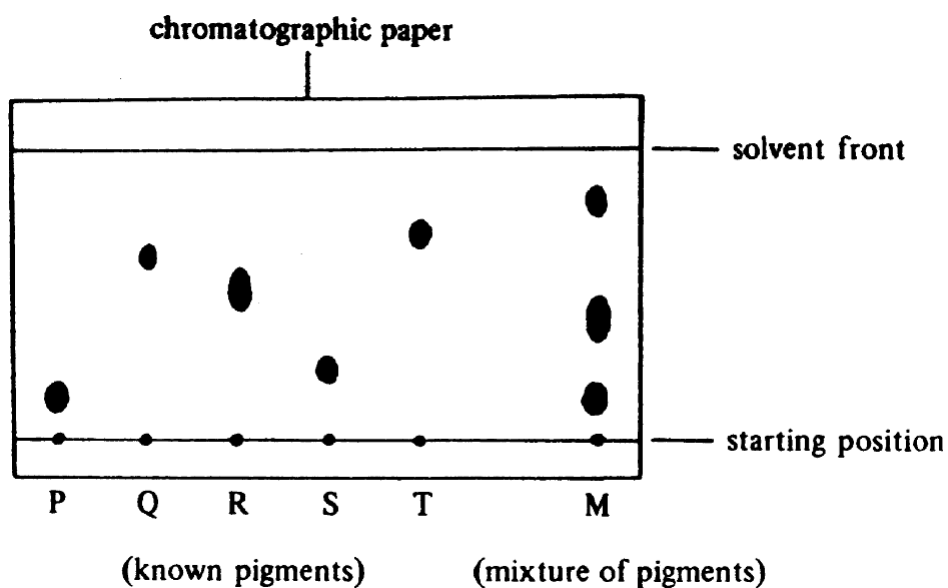
Candidates may refer to the Periodic Table when answering the questions.

Section A

1. Which of the following techniques can be used to obtain ammonium chloride from a solid mixture of ammonium chloride and sodium chloride?
- A. Chromatography
 - B. Ion exchange
 - C. Sublimation
 - D. Filtration



2. If the glass plate in the above diagram is removed, a brown coloration gradually appears in gas jar Y because
- A. Nitrogen dioxide is lighter than air.
 - B. Nitrogen dioxide reacts with air to form a brown compound.
 - C. Molecules of both gases are in continual random motion.
 - D. Weak intermolecular forces exist between air molecules and nitrogen dioxide molecules.



3. The above diagram represents the results of paper chromatography experiment. It can be concluded that the pigments present in mixture M are

- A. **P, R** and **T**.
- B. **P, Q** and **T**.
- C. **P, R** and another unknown pigment.
- D. **P** and two other unknown pigments.

4. Large crystals of a salt can be obtained by

- A. Adding ice to a hot, saturated solution of the salt.
- B. Allowing a hot, saturated solution of the stand overnight at room temperature.
- C. Heating a saturated solution of the salt to dryness.
- D. Cooling a hot, saturated solution of the salt under running tap water.

5. Which of the following equations represents a dehydration reaction?

- A. $\text{Cu} + 2 \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2 + 2 \text{H}_2\text{O}$
- B. $(\text{NH}_4)_2\text{CO}_3 \rightarrow 2 \text{NH}_3 + \text{CO}_2 + \text{H}_2\text{O}$
- C. $\text{C}_2\text{H}_5\text{OH} \rightarrow \text{C}_2\text{H}_4 + \text{H}_2\text{O}$
- D. $\text{CuSO}_4 + 5 \text{H}_2\text{O} \rightarrow \text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$

6. A substance **X** melts at 1600°C. It does not conduct electricity in the solid or in the molten state. **X** probably has
- A. An ionic structure
 - B. A giant covalent structure
 - C. A simple molecular structure
 - D. A metallic structure
7. The table below shows the number of neutrons and electrons in the following five atoms / ions:

Atoms / Ions	Number of neutrons	Number of electrons
P	8	8
Q²⁺	12	10
R²⁻	10	10
S⁺	12	10
T	8	9

Which of the following atoms is an isotope of **P**?

- A. Q
 - B. R
 - C. S
 - D. T
8. Which of the following pairs of atomic numbers represents elements with similar chemical properties?
- A. 3 and 12
 - B. 9 and 16
 - C. 6 and 17
 - D. 12 and 20
9. Lead (II) chloride does not conduct electricity at room temperature because
- A. It is a covalent compound.
 - B. It is insoluble in water.
 - C. It does not contain ions.
 - D. Its ions are not mobile.

10. Which of the following molecules has only one lone pair of electrons?

- A. C_2H_4
- B. NH_3
- C. H_2O
- D. HBr

11. Which of the following carbonates would give the metal when heated with carbon?

- (1) $MgCO_3$
- (2) $PbCO_3$
- (3) K_2CO_3
- (4) $CuCO_3$

- A. (2) only
- B. (1) and (3) only
- C. (2) and (4) only
- D. (1), (2) and (4) only

12. A salt **X** dissolves readily in water to form a colourless solution which reacts with aqueous ammonia to form a white precipitate. The precipitate is soluble in excess ammonia. **X** could be

- A. $AgCl$
- B. $PbBr_2$
- C. $AlCl_3$
- D. $ZnBr_2$

13. Which of the following metals will NOT displace copper ions from aqueous copper(II) sulphate?

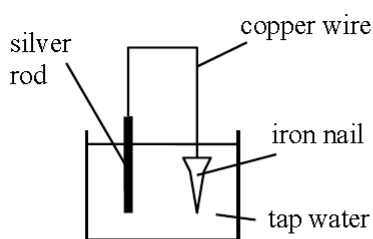
- A. Silver
- B. Iron
- C. Zinc
- D. Aluminium

14. A metal **X** displaces copper from copper(II) sulphate solution but does not displace zinc from zinc sulphate solution. Which of the following represents an increasing order for the reducing power of the three metals?

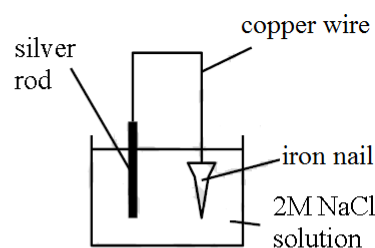
- A. $\text{Cu} < \text{X} < \text{Zn}$
- B. $\text{X} < \text{Cu} < \text{Zn}$
- C. $\text{Zn} < \text{X} < \text{Cu}$
- D. $\text{Zn} < \text{Cu} < \text{X}$

15. In which of the following cases would the rusting of the iron nail be most rapid?

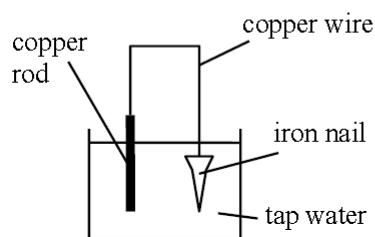
A.



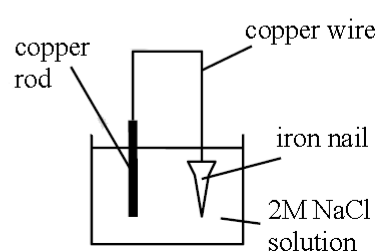
B.



C.



D.



16. Pure water has low electricity conductivity because

- A. It exists as molecule only.
- B. It takes a long time to establish the equilibrium $\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$
- C. It contains equal numbers of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$.
- D. It is only slightly ionized.

17. If 1 g ^{12}C contains x atoms, the number of atoms in 8 g of ^{16}O is

- A. $6x$
- B. $8x$
- C. $12x$
- D. $16x$

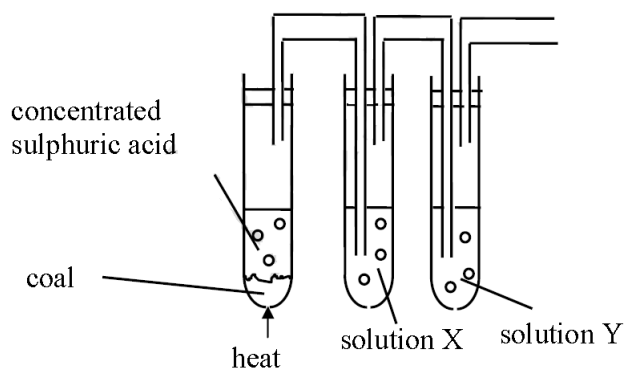
18. If 1 mole of XO_2 contains the same number of atoms as 60 g of XO_3 , the molar mass of XO_3 is

- A. 45 g
- B. 60 g
- C. 76 g
- D. 80 g

19. 1.5 moles of a metallic element **X** react with 12 g of oxygen to form an oxide. What is the simplest formula for the oxide?

(Relative atomic mass: O = 16)

- A. XO
- B. XO_2
- C. X_2O
- D. X_2O_3

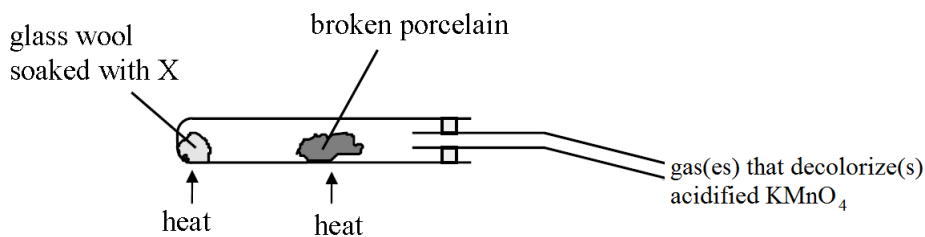


20. To show that sulphur dioxide and carbon dioxide are produced when charcoal reacts with hot concentrated sulphuric acid, solutions **X** and **Y** in the above set-up should be

- | <u>Solution X</u> | <u>Solution Y</u> |
|-----------------------------------|--------------------------------|
| A. acidified potassium dichromate | lime water |
| B. acidified potassium iodide | lime water |
| C. acidified potassium iodide | bromine water |
| D. sodium hydroxide | acidified potassium dichromate |

21. Which of the following hydrocarbons would most probably be present in petrol?

- A. C_2H_6
- B. C_4H_8
- C. C_4H_{10}
- D. C_6H_{14}



22. In the above experiment, X can be

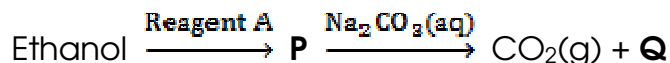
- (1) Crude oil
- (2) Propan-1-ol
- (3) Medicinal paraffin

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (1), (2) and (3) only

23. Liquefied petroleum gas (LPG) consists mainly of

- A. Butane
- B. Carbon monoxide
- C. Hydrogen
- D. Methane

24. The following is a series reactions starting from ethanol:



Which of the following correctly describes the nature of reagent **A** and product **Q**?

- | <u>Reagent A</u> | <u>Product Q</u> |
|----------------------|------------------|
| A. Dehydrating agent | Ethene |
| B. Dehydrating agent | Ethane |
| C. Oxidizing agent | Sodium ethanoate |
| D. Oxidizing agent | Ethanoic acid |

25. Which of the following molecular formulae can have isomeric structures?

- (1) C₂H₃Cl
- (2) C₃H₈O
- (3) C₄H₈

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

26. The element with an atomic number of 19 is likely to be

- A. An oxidizing agent
- B. A reducing agent
- C. A non-metal
- D. Chemically unreactive

27. In which of the following substances does nitrogen have the lowest oxidation number?

- A. NH₄Cl
- B. NO₂
- C. HNO₂
- D. N₂

Directions: Each question below (Question Nos. 28 to 30) consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a correct explanation of the first statement. Then select one option from A to D according to the following table:

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

1st statement	2nd statement
28. Both zinc and molten sodium chloride conduct electricity.	Both zinc and molten sodium chloride contains mobile ions.
29. Hydrogen chloride has a lower melting point than sodium chloride.	In each molecule of hydrogen chloride, a hydrogen atom and a chlorine atom are joined together by a covalent bond.
30. Both dry ice and quartz exist in the form of discrete molecules.	Carbon and silicon atoms have the same number of electrons in their outermost shells.

END OF SECTION A

Section B

31. If a mixture of 0.80 g of oxygen and 0.20 g of hydrogen is exploded, what will be the volume of the remaining gas at room temperature and pressure?

(Relative atomic masses: H = 1.0, O = 16;

Molar volume of a gas at room temperature and pressure = 24 dm³)

- A. 0.60 dm³
- B. 0.90 dm³
- C. 1.2 dm³
- D. 2.4 dm³

32. When 4.6 g of ethanol are completely burnt in air, what is the volume of carbon dioxide produced at room temperature and pressure?

(Relative atomic masses: H = 1.0, C = 12; O = 16;

Molar volume of a gas at room temperature and pressure = 24 dm³)

- A. 1.2 dm³
- B. 2.4 dm³
- C. 3.6 dm³
- D. 4.8 dm³

33. In the manufacture of sulphuric acid by the Contact Process, which of the following steps require the use of a catalyst?

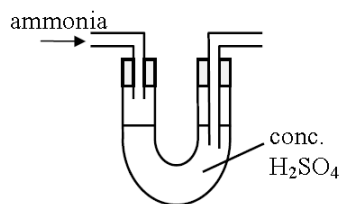
- (1) The burning of sulphur to form sulphur dioxide
- (2) The oxidation of sulphur dioxide to sulphur trioxide
- (3) The conversion of sulphur trioxide to sulphuric acid

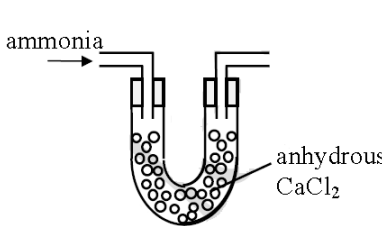
- A. (2) only
- B. (3) only
- C. (1) and (2) only
- D. (2) and (3) only

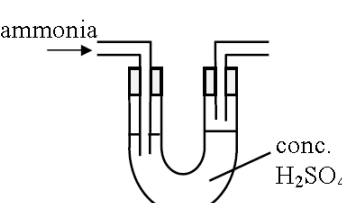
34. When ammonium chloride is warmed with concentrated sulphuric acid in a test-tube, a gas is evolved which will

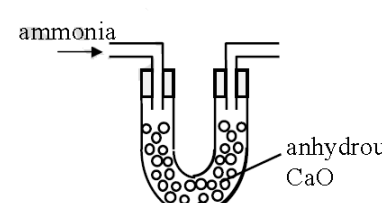
- A. bleach moist litmus paper.
- B. condense to form a white solid at the mouth of the test-tube.
- C. turn acidified potassium dichromate(VI) solution green.
- D. form white fumes with ammonia.

35. Which of the following set-ups should be used to dry ammonia gas?

A. 

B. 

C. 

D. 

36. The table below gives some information about certain components in a sample of liquefied air.

Component	Boiling point / °C
Argon	- 186
Nitrogen	- 196
Oxygen	- 183

In what order are these components distilled out when the sample undergoes fractional distillation?

- A. nitrogen, oxygen, argon
- B. nitrogen, argon, oxygen
- C. oxygen, argon, nitrogen
- D. oxygen, nitrogen, argon

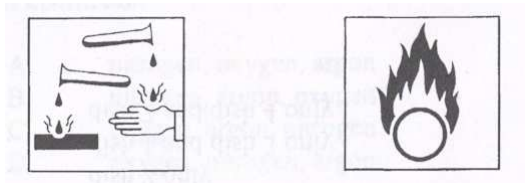
37. When a flame test is performed on copper(II) chloride, what is the colour of the flame observed?

- A. Golden yellow
- B. Pale purple
- C. Brick-red
- D. Bluish-green

38. Which of the following reactions is endothermic?

- A. $\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu(s)}$
- B. $\text{CaCO}_3(\text{s}) + 2 \text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O(l)} + \text{CO}_2(\text{g})$
- C. $2 \text{C}_4\text{H}_{10}(\text{g}) + 13 \text{O}_2(\text{g}) \rightarrow 8 \text{CO}_2(\text{g}) + 10 \text{H}_2\text{O(l)}$
- D. $\text{C}_9\text{H}_{20}(\text{l}) \rightarrow \text{C}_2\text{H}_6(\text{g}) + \text{C}_3\text{H}_6(\text{g}) + \text{C}_4\text{H}_8(\text{g})$

39. The following hazard warning labels are displayed on the reagent bottle of an acid.



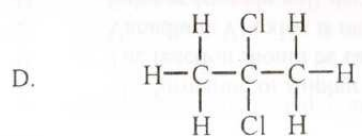
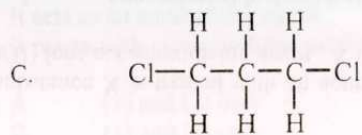
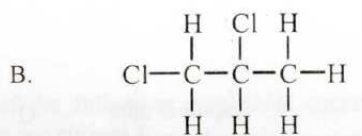
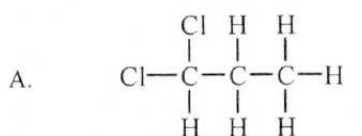
What information about this acid can be obtained from the labels?

- A. It is very concentrated and flammable.
- B. It is very concentrated and oxidizing.
- C. It is flammable and corrosive.
- D. It is corrosive and oxidizing.

40. Which of the following correctly describes the sequence of procedures to separate sand, salt and water from a mixture of sand and salt solution?

- A. filtration, evaporation
- B. filtration, distillation
- C. crystallization, filtration
- D. crystallization, filtration, distillation

41. Which of the following compounds is formed from the reaction of propene with chlorine?



42. Which of the following statements concerning the cleansing action of a detergent are correct?

- (1) It reduces the surface tension of water.
- (2) It acts as an emulsifying agent.
- (3) It reacts with grease to form soluble products.

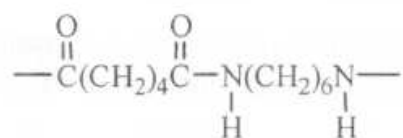
- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

43. Which of the following materials is/are used in the production of soap?

- (1) Petroleum fractions
- (2) Sodium hydroxide
- (3) Sulphuric acid

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

44. The repeating unit of polymer **X** is shown below:



Which of the following statements about **X** is/are correct?

- (1) **X** is an addition polymer.
- (2) **X** is formed from two different monomers.
- (3) **X** is a thermosetting plastic.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

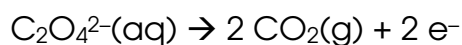
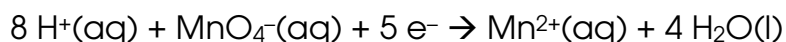
45. When potassium carbonate solution and calcium chloride solution are mixed, calcium carbonate is precipitated. Which of the following mixtures would produce the greatest amount of precipitate?

- A. 5 cm³ of 1 M K₂CO₃(aq) + 15 cm³ of 1 M CaCl₂(aq)
- B. 10 cm³ of 1 M K₂CO₃(aq) + 10 cm³ of 1 M CaCl₂(aq)
- C. 15 cm³ of 1 M K₂CO₃(aq) + 8 cm³ of 1 M CaCl₂(aq)
- D. 18 cm³ of 1 M K₂CO₃(aq) + 5 cm³ of 1 M CaCl₂(aq)

46. Which of the following pairs of solutions, when mixed, would produce a precipitate?

- A. Lead(II) nitrate and sodium hydroxide
- B. Copper(II) sulphate and sodium nitrate
- C. Zinc chloride and potassium nitrate
- D. Iron(II) sulphate and acidified potassium permanganate

47. Consider the half equations of a redox reaction:



How many moles of MnO₄⁻(aq) ions will react completely with one mole of C₂O₄²⁻(aq) ions?

- A. 0.4
- B. 1.0
- C. 2.5
- D. 5.0

Directions: Each question below (Question Nos. 48 to 50) consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a correct explanation of the first statement. Then select one option from A to D according to the following table:

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

1st statement	2nd statement
48. 2 M hydrochloric acid reacts faster with 1 g of zinc granules than with 1 g of zinc powder.	The surface area of 1 g of zinc powder is larger than that of 1 g of zinc granules.
49. Nitrogen does not react readily with other elements or compounds.	The outermost electron shell of the nitrogen atom is completely filled.
50. Graphite is a rather soft substance.	All the bonds between the carbon atoms in graphite are weak.

END OF PAPER

Answers

1 C	2 C	3 D	4 B	5 C	6 B	7 B	8 D	9 D	10 B
11 C	12 D	13 A	14 A	15 B	16 D	17 A	18 D	19 C	20 A
21 D	22 D	23 A	24 C	25 C	26 B	27 A	28 C	29 B	30 C
31 C	32 D	33 A	34 D	35 D	36 B	37 D	38 D	39 D	40 B
41 B	42 A	43 B	44 B	45 B	46 A	47 A	48 C	49 C	50 C