

**This paper consists of 2 sections. There are 30 questions in Section A and 20 questions in Section B.**

**Choose the best answer for each question.**

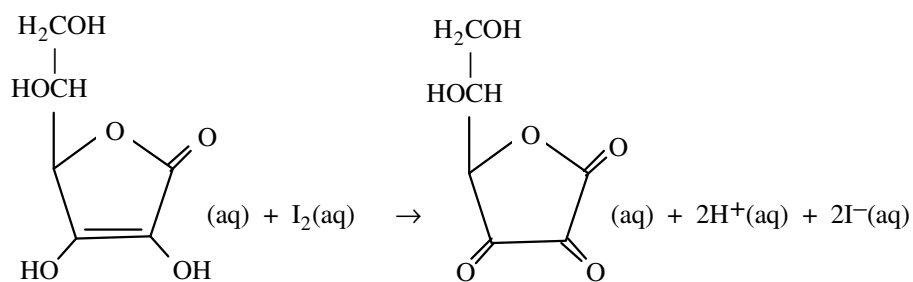
**Candidate may refer to the Periodic Table printed on page 16 when answering the questions.**

**Section A**

1. Which of the following substances can be classified as a compound ?
  - A. nitrogen gas
  - B. iron(II,III) oxide
  - C. hydrochloric acid
  - D. crystal of copper(II) sulphate
  
2. Which of the following is a common property of quartz and diamond ?
  - A. They are susceptible to hydrolysis.
  - B. They adopt a giant covalent network structure.
  - C. Each atom is bonded to one tetrahedra by layers in both cases.
  - D. There exists a substance with a same chemical formula but different spatial arrangement in both cases.
  
3. Iodine is soluble in heptane. Which of the following deductions is correct ?
  - A. Iodine is a diatomic molecule.
  - B. Iodine is a covalent compound.
  - C. Atoms in iodine attain a complete octet.
  - D. Atoms in iodine are held by weak van der Waals' forces.
  
4. Which of the following would NOT produce a gaseous product ?
  - A. heating silver oxide in air
  - B. reacting copper with dilute hydrochloric acid
  - C. reacting zinc carbonate with dilute hydrochloric acid
  - D. reacting a piece of iron metal with dilute sulphuric acid
  
5. In an industrial process to manufacture ammonia, the percentage yield of the reaction CANNOT achieve 100 % efficiency. Which of the following could best explain the phenomena ?
  - A. The reactant is inert.
  - B. The reaction is reversible.
  - C. The catalyst is poisoned gradually over time.
  - D. The temperature of the reaction chamber is not high enough.

6. Which of the following CANNOT be used to extract copper from its oxide ?
- A. carbon
  - B. hydrogen
  - C. aluminium
  - D. carbon monoxide
7. **X** and **Y** are the elements in the Periodic Table. **X** is a metal and it forms a chloride with a formula of  $\text{XCl}_3$  while there is 6 outermost shell electrons in the atoms of **Y**. The chemical formula of the compound formed between **X** and **Y** is
- A.  $\text{XY}_3$
  - B.  $\text{X}_2\text{Y}$
  - C.  $\text{X}_2\text{Y}_3$
  - D.  $\text{X}_3\text{Y}_2$
8. Large molecules of hydrocarbons are converted into small molecules in petroleum industry since the latter
- A. has a greater demand.
  - B. has a relatively low boiling point.
  - C. can be transported by easier means.
  - D. can be degraded by biological species.
9. Phenolphthalein turns from colourless to pink upon treatment with a solution of
- A. sodium hydroxide.
  - B. hydrogen chloride.
  - C. magnesium chloride.
  - D. potassium hydrogensulphate.
10. Which of the following can effectively reduce the emission level of sulphur dioxide ?
- (1) installation of catalytic converter in cars
  - (2) use of low sulphur content diesel
  - (3) promoting the height of the chimney
- A. (1) only
  - B. (2) only
  - C. (2) and (3) only
  - D. (1) and (3) only
11. Which of the following physical properties is employed in separation of two miscible liquids ?
- A. density
  - B. viscosity
  - C. boiling point
  - D. melting point

12. The following equation represents the reaction between ascorbic acid and iodine in which the structure of ascorbic acid is shown below (Each carbon atom is expressed as an intersection.)

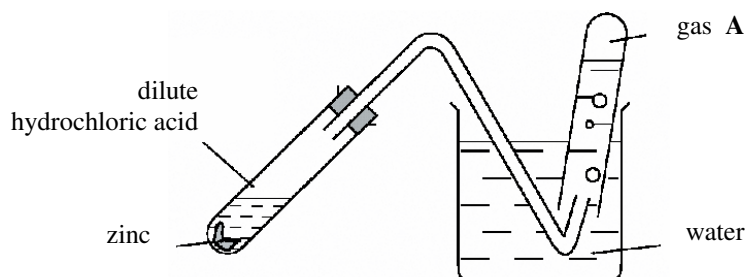


Which of the following statements is / are correct ?

- (1) The basicity of ascorbic acid is 3.  
 (2) Ascorbic acid possesses two C–C unsaturations.  
 (3) The oxidation number of iodine decreases from 0 to -1.
- A. (1) only  
 B. (2) only  
 C. (1) and (3) only  
 D. (2) and (3) only
13. When propene is bubbled through acidified potassium permanganate, which of the following substances will be formed ?
- A. propan-1-ol  
 B. propan-2,2-diol  
 C. propan-1,2-diol  
 D. propan-1,3-diol
14. Which of the following is the oxidation number of hydrogen in potassium hydride ?
- A. +1  
 B. -1  
 C. +2  
 D. -2
15. Which of the following has the highest carbon content ?
- A. 1 mole of carbon dioxide gas  
 B. 1 mole of methane gas  
 C. 1 mole of calcium carbide (CaC<sub>2</sub>)  
 D. 1 mole of carbon monoxide gas

16. Which of the following is a possible and the most appropriate way to prepare hydrogen in laboratory ?
- A. reacting zinc with ethanoic acid
  - B. reacting copper with dilute hydrochloric acid
  - C. reacting calcium with dilute sulphuric acid
  - D. reacting calcium with dilute hydrochloric acid
17. Which of the following compounds can be used to construct a salt-bridge for a simple chemical cell ?
- (1) ammonium nitrate
  - (2) sodium sulphite
  - (3) potassium sulphate
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
18. A colourless solution of an organic compound was treated with bromine in tetrachloromethane and the bromine was decolorized. Which of the following deductions is correct ?
- A. The compound does not react with chlorine.
  - B. The compound is a saturated hydrocarbon.
  - C. The compound could possibly be an alkene.
  - D. The compound contains at least one multiple bond.
19. In which of the following pairs of chemicals there exists a difference in the bonding type between them ?
- A. iron and chromium
  - B. polystyrene and styrene
  - C. beryllium oxide and sulphur dioxide
  - D. magnesium nitride and ammonium chloride
20. The pH value of a solution of hydrochloric acid will change upon adding
- (1) water.
  - (2) soda ash.
  - (3) magnesium metal.
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)

21. Consider the following experimental set-up:



Which of the following statements concerning the above experiment are INCORRECT ?

- (1) Heat is evolved.  
(2) The pH value of the water is below 7.  
(3) Gas A turns limewater milky.
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)
22. Which of the following is / are NOT thermosetting plastic ?
- (1) nylon  
(2) polyethene  
(3) polystyrene
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only
23. Which of the following can be used to prepare propan-1-ol in a one-step conversion ?
- (1) propane  
(2) propyl ethanoate  
(3) glucose
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

24. Which of the following products CANNOT be obtained from the fractional distillation of crude oil ?
- (1) butane
  - (2) ethanol
  - (3) 2-methylbutane
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
25. Which of the following is / are NOT the applications of alkenes ?
- (1) as a fuel
  - (2) production of plastics
  - (3) as a food flavouring
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
26. Which of the following structural properties of metals could explain its electrical conductivity?
- (1) presence of cations
  - (2) presence of delocalized electrons
  - (3) spherical shape of atoms
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
27. Gasohol is a mixture of petrol and alcohol. It is commonly used as a fuel because alcohol
- A. combusts to give more gaseous products.
  - B. is miscible with petrol.
  - C. possesses a hydroxyl functional group.
  - D. has lower carbon content.
28. How many possible structures of alkanolic acids does a molecular formula of  $C_3H_7COOH$  possess ?
- A. 1
  - B. 2
  - C. 3
  - D. 4

**Directions :** Each question below (Questions Nos. 28-30) 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.

	<b>1st statement</b>	<b>2nd statement</b>
28.	Concentrated sulphuric acid is a dehydrating agent.	Ammonia gas can be dried over concentrated sulphuric acid.
29.	The bleaching action of sulphite lasts longer than hypochloride.	Sulphite is a stronger reducing agent compared to hypochlorite.
30.	Nuclear energy is a source of renewable energy.	The reaction employed in a nuclear plant is an exothermic process.

**END OF SECTION A**

## Section B

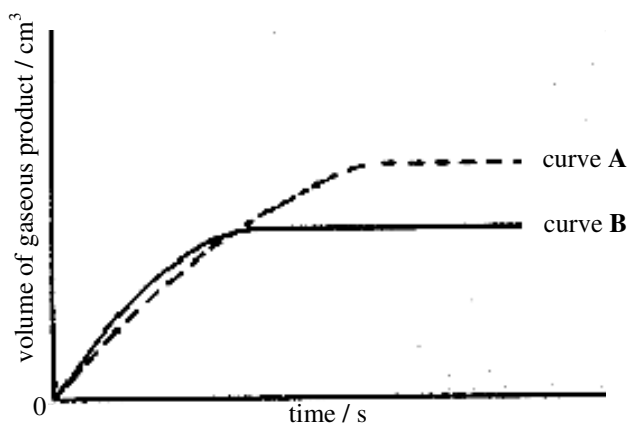
31. Which of the following statements concerning the anodization of aluminium metal is INCORRECT ?

- A. Dilute sulphuric acid can act as an electrolyte in the process.
- B. An aluminum utensil can be recoloured to red in the process.
- C. The aluminium is to be connected to the positive pole of the cell.
- D. The process can protect a piece of aluminium metal from corrosion.

32. Which of the following is / are NOT used to prepare a standard solution of a soluble salt ?

- (1) pipette
  - (2) measuring cylinder
  - (3) volumetric flask
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only

33. Consider the following variation:



Curve A was obtained by the reaction between  $100 \text{ cm}^3$  of  $1.5 \text{ M HCl}$  and  $10.0 \text{ g}$  limestone at room temperature. Which of the following changes would produce curve B ?

- A. increasing the temperature by  $20^\circ\text{C}$
- B. using  $200 \text{ cm}^3$  of  $1.0 \text{ M HCl}$  instead
- C. using  $100 \text{ cm}^3$  of  $2.0 \text{ M HCl}$  instead
- D. using  $15.0 \text{ g}$  of limestone instead of  $10.0 \text{ g}$



34. Deuterium (**D**) is an isotope of hydrogen. Based on your knowledge in the property of hydrogen, which of the following substances is / are NOT likely to exist ?

- (1) **CD<sub>4</sub>**
- (2) **CaOD**
- (3) **C<sub>2</sub>D<sub>2</sub>OD**

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

35. Which of the following is NOT a problem related to the use of soapless detergent ?

- A. algal bloom
- B. skin irritation
- C. affecting aquatic ecosystem
- D. increase in minerals content of sea water

36. Which of the following statements concerning the properties of polystyrene are INCORRECT ?

- (1) It is a covalent compound.
- (2) It is synthetic in nature.
- (3) It melts at high temperature.

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

37. The following list some procedures to determine the concentration of citric acid in a sample of lemon juice by titrimetric analysis with NaOH(aq):

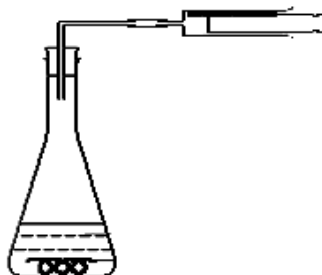
- (1) filling a burette with the standard NaOH(aq)
- (2) using methyl orange as the indicator
- (3) repeating the titration several times

Which of the above procedures are inappropriate practices ?

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

38. 0.607 g of an impure sample of anhydrous potassium carbonate was dissolved in water. The resulting solution required 34.9 cm<sup>3</sup> of 0.200 M hydrochloric acid for complete neutralization. What is the percentage purity of the anhydrous potassium carbonate sample ?
- A. 78 %  
 B. 79 %  
 C. 80 %  
 D. 81 %

39. Consider the set-up shown below:



- Which of the following pairs of substances CANNOT be monitored by the above of its rate of reaction ?
- A. calcium and water  
 B. zinc and dilute sulphuric acid  
 C. dilute sodium hydroxide and dilute hydrochloric acid  
 D. magnesium carbonate and dilute hydrochloric acid
40. Which of the following statements concerning water in a process of electrolysis is / are correct ?
- (1) It provides a medium for the reaction to take place.  
 (2) It is chemically unchanged in the process.  
 (3) It slightly ionizes to give hydrogen ions and hydroxide ions.
- A. (1) and (2) only  
 B. (2) and (3) only  
 C. (1) and (3) only  
 D. (1), (2) and (3)
41. The following lists the solubility of some lead salts:

	lead(II) chloride	lead(II) chloride	lead(II) chloride	lead(II) chloride
solubility in water	slightly when cold soluble when hot	insoluble	insoluble	soluble

- Which of the following methods is the best approach in preparation of a sample of lead(II) chloride ?
- A. adding dilute hydrochloric acid to aqueous lead(II) nitrate and filtering it.  
 B. heating lead(II) sulphate with dilute hydrochloric acid, cooling and filtering it.  
 C. heating powdered lead with aqueous sodium chloride, cooling and filtering it.  
 D. shaking lead(II) carbonate with cold dilute hydrochloric acid

42. Which of the following would pose potential harm to the planet earth ?
- (1) use of plastics
  - (2) use of detergents
  - (3) use of fossil fuels
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)
43. A mixture of oil and sodium hydroxide solution was heated for some time and then treated with saturated sodium chloride solution. A white solid was formed. Which of the following statements concerning the process is / are correct ?
- (1) The mixture undergoes saponification.
  - (2) The white solid is an ester.
  - (3) The white solid is fatty acids.
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
44. When 10 g of rubidium carbonate was treated with excess nitric acid,  $1.04 \text{ dm}^3$  of carbon dioxide evolved under normal conditions. When 10 g of rubidium carbonate contaminated with *one* metal carbonate,  $0.98 \text{ dm}^3$  of carbon dioxide evolved. The contaminates could possibly be
- (Formula masses:  $\text{Rb}_2\text{CO}_3 = 231 \text{ g}$ ;  $\text{Li}_2\text{CO}_3 = 73.8 \text{ g}$ ;  $\text{Na}_2\text{CO}_3 = 106 \text{ g}$ ;  $\text{K}_2\text{CO}_3 = 138.2 \text{ g}$ ;  $\text{Cs}_2\text{CO}_3 = 325.8 \text{ g}$ )
- A.  $\text{Li}_2\text{CO}_3$
  - B.  $\text{Na}_2\text{CO}_3$
  - C.  $\text{K}_2\text{CO}_3$
  - D.  $\text{Cs}_2\text{CO}_3$
45.  $80 \text{ cm}^3$  of 5 M aqueous barium chloride reacts with  $40 \text{ cm}^3$  5 M aqueous sodium sulphate. What is the mass of barium sulphate produced ?
- A. 23.4 g
  - B. 46.7 g
  - C. 93.4 g
  - D. 186.8 g

46. Which of the following factors would affect the rate of reaction in an electrolysis process ?

- (1) size of electrodes
- (2) magnitude of the current flow
- (3) concentration of electrolyte

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

47. Which of the following are NOT the uses of chlorine ?

- (1) as a disinfectant
- (2) bleaching newspaper
- (3) manufacture of plastics

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

**Directions :** Each question below (Questions Nos. 48-50) 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.

	<b>1st statement</b>	<b>2nd statement</b>
48.	Concentrated nitric acid and dilute nitric acid yield different products in the reaction with copper metal.	Concentrated nitric acid does not exhibit acid property.
49.	Calcium phosphate can act as a water softener.	Soapy detergent does not function well in hard water.
50.	Hydrogen bromide dissolves in water to give an acidic solution.	Hydrogen chloride exhibits similar chemical property with hydrogen bromide.

**END OF PAPER**

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## GROUP 族

## PERIODIC TABLE 週期表

I		II												III	IV	V	VI	VII	0
3 <b>Li</b> 6.9	4 <b>Be</b> 9.0											5 <b>B</b> 10.8	6 <b>C</b> 12.0	7 <b>N</b> 14.0	8 <b>O</b> 16.0	9 <b>F</b> 19.0	10 <b>Ne</b> 20.2		
11 <b>Na</b> 23.0	12 <b>Mg</b> 24.3											13 <b>Al</b> 27.0	14 <b>Si</b> 28.1	15 <b>P</b> 31.0	16 <b>S</b> 32.1	17 <b>Cl</b> 35.5	18 <b>Ar</b> 40.0		
19 <b>K</b> 39.1	20 <b>Ca</b> 40.1	21 <b>Sc</b> 45.0	22 <b>Ti</b> 47.9	23 <b>V</b> 50.9	24 <b>Cr</b> 52.0	25 <b>Mn</b> 54.9	26 <b>Fe</b> 55.8	27 <b>Co</b> 58.9	28 <b>Ni</b> 58.7	29 <b>Cu</b> 63.5	30 <b>Zn</b> 65.4	31 <b>Ga</b> 69.7	32 <b>Ge</b> 72.6	33 <b>As</b> 74.9	34 <b>Se</b> 79.0	35 <b>Br</b> 79.9	36 <b>Kr</b> 83.8		
37 <b>Rb</b> 85.5	38 <b>Sr</b> 87.6	39 <b>Y</b> 88.9	40 <b>Zr</b> 91.2	41 <b>Nb</b> 92.9	42 <b>Mo</b> 95.9	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.9	46 <b>Pd</b> 106.4	47 <b>Ag</b> 107.9	48 <b>Cd</b> 112.4	49 <b>In</b> 114.8	50 <b>Sn</b> 118.7	51 <b>Sb</b> 121.8	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.3		
55 <b>Cs</b> 132.9	56 <b>Ba</b> 137.3	57 * <b>La</b> 138.9	72 <b>Hf</b> 178.5	73 <b>Ta</b> 180.9	74 <b>W</b> 183.9	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.1	79 <b>Au</b> 197.0	80 <b>Hg</b> 200.6	81 <b>Tl</b> 204.4	82 <b>Pb</b> 207.2	83 <b>Bi</b> 209.0	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)		
87 <b>Fr</b> (223)	88 <b>Ra</b> (226)	89 ** <b>Ac</b> (227)	104 <b>Rf</b> (261)	105 <b>Db</b> (262)															
		* 58 <b>Ce</b> 140.1	59 <b>Pr</b> 140.9	60 <b>Nd</b> 144.2	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 152.0	64 <b>Gd</b> 157.3	65 <b>Tb</b> 158.9	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.9	68 <b>Er</b> 167.3	69 <b>Tm</b> 168.9	70 <b>Yb</b> 173.0	71 <b>Lu</b> 175.0				
		** 90 <b>Th</b> 232.0	91 <b>Pa</b> (231)	92 <b>U</b> 238.0	93 <b>Np</b> (237)	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (260)				

atomic number 原子序

relative atomic mass 相對原子質量