

**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.**

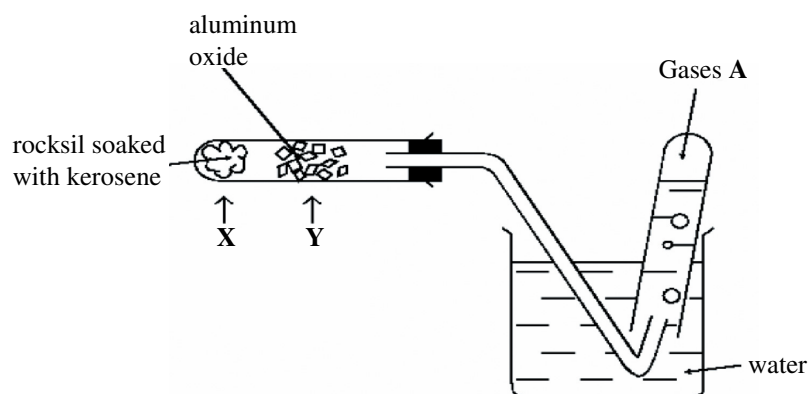
**Section A**

1. Which of the following can explain the 'pop' sound produced when a burning splint is treated with hydrogen gas ?
  - A. The flame expelled the hydrogen to the wall of test tube.
  - B. The explosion of hydrogen is initiated by burning flame.
  - C. Hydrogen reacts with oxygen in air to form a large volume of water vapour.
  - D. Immiscible oxygen and hydrogen exert a great pressure on the test tube wall.
  
2. Which of the following properties of sodium chloride CANNOT be explained by its giant lattice structure ?
  - A. It is odourless.
  - B. It has a high boiling point.
  - C. It has a high melting point.
  - D. It conducts electricity when dissolved in water.
  
3. Which of the following is NOT an ionic compound ?
  - A.  $K_2CO_3$
  - B.  $NH_4Cl$
  - C.  $CH_3COOH$
  - D.  $CH_3CH_2COONa$
  
4. Which of the following is a dominating factor that determines the chemical property of an element in atomic scale ?
  - A. atomic size
  - B. number of protons
  - C. electronic arrangement
  - D. number of fully-filled electron shell
  
5. Which of the following properties does NOT have a direct correlation with the reactivity of a metal ?
  - A. appearance of metal oxides
  - B. year of discovery of a metal
  - C. method of storage of a metal
  - D. thermal stability of metal oxides

6. Which of the following is an application of crystallization ?
- A. purification of a freshly prepared metal salts
  - B. separating sand from a sample of slug water
  - C. obtaining water from a solution of sodium carbonate
  - D. separating undissolved calcium sulphate from its saturated solution
7. Which of the following compounds has the lowest expected solubility in water ?
- A. calcium carbonate
  - B. copper(II) chloride
  - C. calcium hydroxide
  - D. ammonium sulphate
8. When a solution of acidified potassium dichromate is bubbled in a colourless gas, it turns from orange to green. The colourless gas is most likely to be
- A. sulphur dioxide.
  - B. carbon dioxide.
  - C. ammonia.
  - D. hydrogen chloride.
9. Which of the following statements concerning members of a homologous series are correct ?
- (1) They can be represented by a general formula.
  - (2) They show a gradual change in physical properties.
  - (3) Their chemical properties depend on their relative molecular masses.
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)
10. Some nitric acids are split in an accident happening in a factory. Which of the following substances, when added in excess, can neutralize the acid without leaving an alkaline solution ?
- (1) sodium chloride
  - (2) calcium carbonate
  - (3) ammonia solution
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only

11. Which of the following compounds exist as liquid state at room temperature and pressure ?
- (1) hexane
  - (2) methanal
  - (3) propene
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)
12. Which of the following circumstances may risk a 'striking back' in a Bunsen burner ?
- A. weak gas supply and closed air hole
  - B. strong gas supply and opened air hole
  - C. weak gas supply and open air hole
  - D. strong gas supply and closed air hole
13. Which of the following pairs of chemicals will produce a brown solution upon mixing ?
- A. ethanoic acid and sodium hydroxide solution.
  - B. copper turning and very dilute nitric acid.
  - C. ethanol and iodine in 1,1,1-trichloroethane.
  - D. sodium bromine solution and chlorine water.
14. Which of the following chemical species is absent from an aqueous solution of ammonia ?
- A. water
  - B. ammonia
  - C. hydroxide ion
  - D. ammonium hydroxide
15. Which of the following substances can be used to demonstrate the dehydrating property of concentrated sulphuric acid ?
- (1) copper(II) sulphate crystals
  - (2) calcium carbonate powder
  - (3) ethandioic acid ((COOH)<sub>2</sub>)
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)

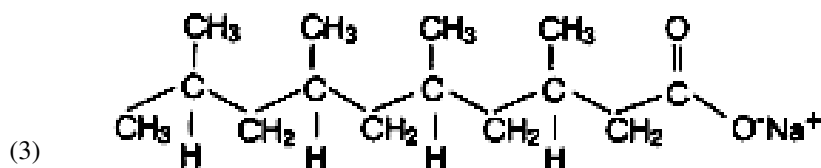
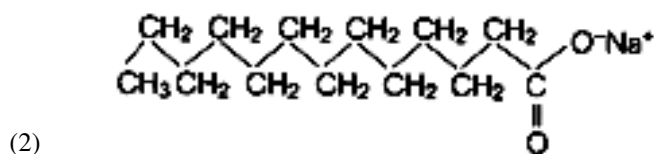
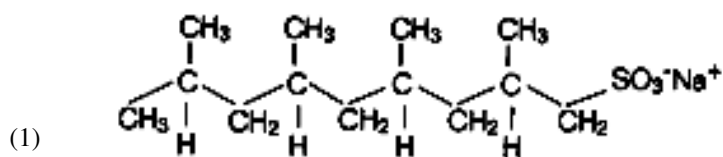
16. Which of the following fractions of hydrocarbons is used as a fuel in the aerial industry ?
- petrol
  - kerosene
  - heavy oil
  - fuel gas
17. Which of the following structural features of soap molecules could explain its miscibility with water ?
- ionic in nature
  - presence of hydroxyl functional groups
  - presence un-branched carbon chain
  - presence of hydrocarbon tails
18. Which of the following compounds will NOT be formed when ethene is treated with bromine in tetrachloromethane in the absence of light ?
- 1,2-dibromoethane
  - 1-bromoethane
  - hydrogen bromide
- (1) only
  - (2) only
  - (1) and (3) only
  - (2) and (3) only
19. The following shows the set-up of cracking of kerosene:



Which of the following is the statements concerning the above set-up is INCORRECT ?

- The Bunsen flame should be placed under **Y** instead of **X**.
- Gases **A** turn acidified potassium permanganate from purple to pale pink.
- Gases **A** burn with a 'pop' sound.
- The rocksil can be replaced by pumice stone.

20. Which of the following detergents is/are biodegradable ?



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

21. Which of the following can be a single-step conversion ?

- A. oil  $\rightarrow$  soap  
 B. alkane  $\rightarrow$  alkanol  
 C. sulphur dioxide  $\rightarrow$  oleum  
 D. calcium carbonate  $\rightarrow$  calcium hydroxide

22. Which of the following is an addition reaction ?

- A.  $C_4H_6(g) + H_2(g) \rightarrow C_4H_{10}(g)$   
 B.  $C_4H_9OH(l) \rightarrow C_4H_8(g) + H_2O(l)$   
 C.  $C_6H_{12}O_6(l) \rightarrow 2C_2H_5OH(l) + 2CO_2(g)$   
 D.  $CH_4(g) + Cl_2(g) \rightarrow CH_3Cl(g) + HCl(g)$

23. Which of the following solutions would produce a white precipitate upon addition of excess sodium hydroxide solution ?

- A. lead(II) nitrate  
 B. copper(II) nitrate  
 C. potassium nitrate  
 D. magnesium nitrate

24. Which of the following do(es) NOT react with potassium oxide ?
- (1) butane
  - (2) propanoic acid
  - (3) ammonium bromide
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
25. Which of the following statements concerning a hypochlorite ion is / are correct ?
- (1) It forms a covalent bond with a hydrogen ion.
  - (2) It contains 6 lone-pair electrons.
  - (3) It does not contain a multiple bond.
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
26. Which of the following statements concerning the resultant solution between potassium hydroxide and sulphur dioxide are INCORRECT ?
- (1) It has an electrical conductivity poorer than vinegar.
  - (2) It turns potassium bromide solution from colourless to brown.
  - (3) It turns acidified potassium dichromate solution from orange to green.
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)
27. Which of the following statements concerning one mole of sulphur dioxide gas is / are correct ?
- (1) The number of molecules it contains is  $6.02 \times 10^{23}$ .
  - (2) It has the same number of atoms with one mole of ammonia.
  - (3) It has the same number of molecules with two moles of oxygen gas.
- (Avogadro constant =  $6.02 \times 10^{23} \text{ mol}^{-1}$ )
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only

**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.

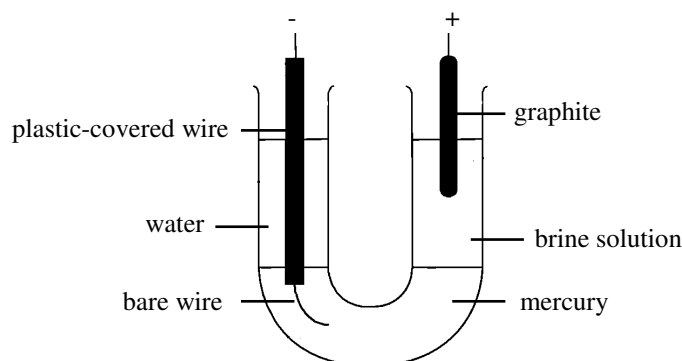
	<b>1st statement</b>	<b>2nd statement</b>
28.	Hexane burns with greater sootiness than propane.	Hexane has a higher carbon content than propane.
29.	Calcium is stronger reducing agent than sodium.	The reactivity of sodium is greater than that of calcium.
30.	Concentrated sulphuric acid act as a catalyst in the esterification of ethanol and propanoic acid.	Esterification between ethanol and propanoic acid is a substitution reaction.

**END OF SECTION A**

## Section B

**Directions:** Question 31 and 32 refer to the following experiment.

The electrolysis of brine solution has been carried out:



31. Which of the following is NOT a result of the above experiment ?
- A. Sodium is formed and dissolves in the mercury.
  - B. Concentration of sodium chloride solution decreases over time.
  - C. Hydrogen gas is given off at the negative bare wire.
  - D. Gas bubbles with a pungent smell evolved at the anode.
32. Which of the following is the dominating factor for the preferential discharge in the cathodic reaction ?
- A. mobility of ions
  - B. nature of electrode
  - C. concentration of ions
  - D. electrochemical series
33. Which of the following substances CANNOT be used to distinguish concentrated nitric acid and concentrated sulphuric acid ?
- (1) soda ash
  - (2) copper turnings
  - (3) hydrated copper(II) sulphate
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
34. Which of the following solutions has the greatest initial rate upon addition of 1.2 g of Zn granules ?
- A. 20 cm<sup>3</sup> of 1 M HCl
  - B. 20 cm<sup>3</sup> of 2 M H<sub>2</sub>SO<sub>4</sub>
  - C. 40 cm<sup>3</sup> of 1 M H<sub>2</sub>SO<sub>4</sub>
  - D. 40 cm<sup>3</sup> of 3 M CH<sub>3</sub>COOH



35. The cleaning power of a soapy detergent would be significantly reduced upon adding
- A. sodium phosphate solution.
  - B. potassium carbonate solution.
  - C. sodium hydroxide solution and hydrochloric solution.
  - D. magnesium chloride and calcium chloride solution.
36. Which of the following factors are taken into consideration in choosing a location for setting up a chemical plant ?
- (1) availability of resources
  - (2) potential environmental impact
  - (3) means of transport of raw materials
- A. (1) and (2) only
  - B. (1) and (3) only
  - C. (2) and (3) only
  - D. (1), (2) and (3)

37. A town gas has the following volume composition of combustible gases:

49.0 % H<sub>2</sub>;      28.5 % CH<sub>4</sub>;      3.0 % CO

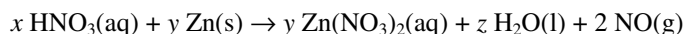
What is the volume of oxygen required for complete combustion of 100 dm<sup>3</sup> of town gas ?

(Molar volume of gas at room temperature and pressure = 24 dm<sup>3</sup>; Relative atomic mass of H = 1.0, C = 12.0, O = 16.0)

- A. 80 dm<sup>3</sup>
  - B. 81 dm<sup>3</sup>
  - C. 82 dm<sup>3</sup>
  - D. 83 dm<sup>3</sup>
38. 80 cm<sup>3</sup> of 5 M aqueous metal chloride **MCl<sub>2</sub>** reacts with 40 cm<sup>3</sup> 5 M aqueous sodium sulphate to give a precipitate. What is the mass of the precipitate ?
- (Formula mass of **MCl<sub>2</sub>** = 127.0)
- A. 23.4 g
  - B. 46.7 g
  - C. 93.4 g
  - D. 186.8 g

39. Salting out is the last stage of laboratory preparation of soapy detergents. The process aims at
- lowering the solubility of salts in water.
  - decreasing the surface tension of water.
  - reducing the solubility of soapy detergent in water.
  - transforming the oil molecules into soap molecules.

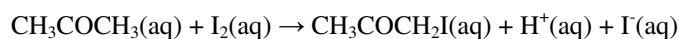
40. Consider the following reaction:



Which of the following combinations is correct ?

- |    | $x$ | $y$ | $z$ |
|----|-----|-----|-----|
| A. | 3   | 4   | 1   |
| B. | 3   | 8   | 2   |
| C. | 4   | 3   | 2.  |
| D. | 8   | 3   | 4.  |
41. Which of the following processes are reversible reactions ?
- saponification of oil
  - dissolution of nitrogen dioxide in water
  - dissolution of sulphur dioxide in water
- (1) and (2) only
  - (1) and (3) only
  - (2) and (3) only
  - (1), (2) and (3)
42. Which of the following statements concerning a substitution of alkane and addition of alkene with / to bromine are correct ?
- The latter yields a single product only.
  - The latter proceeds at greater relative rate.
  - The latter is initiated by diffuse sunlight.
- (1) and (2) only
  - (1) and (3) only
  - (2) and (3) only
  - (1), (2) and (3)

43. Consider the following reaction of propanone with iodine:



Which of the following statements concerning the reaction is correct ?

- (1) Iodine disproportionate in the reaction.
  - (2) The pH value of the mixture decreases over time until completion.
  - (3) The rate of reaction can be monitored by measuring light intensity of the mixture.
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)
44. Which of the following statements concerning a titration of ethanoic acid against sodium hydroxide are correct ?
- (1) Methyl orange can be a choice of indicator.
  - (2) Ethanoic acid CANNOT be completely neutralized.
  - (3) The mole ratio of ethanoic acid to sodium hydroxide consumed is 1:1 when the end-point is attained.
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)
45. Which of the following air pollutants and their impacts can be relieved by combustion at higher temperature and sufficient amount of oxygen ?
- (1) nitrogen oxides
  - (2) hydrocarbons
  - (3) carbon monoxide
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

46. The following shows some information of a compound **K**:

melting point:  $-20\text{ }^{\circ}\text{C}$   
appearance: colourless gas

**K** most probably adopts

- A. a giant covalent structure.
- B. a giant ionic structure.
- C. a giant metallic structure.
- D. a simple molecular structure.

47. Which of the following compound(s) can undergo addition polymerization ?

- (1)  $\text{CH}_3\text{CH}_2\text{OH}$
- (2)  $\text{CH}_3\text{CH}=\text{CH}_2$
- (3)  $\text{HOOC}-(\text{CH}_2)_4-\text{COOH}$

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

**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.	Carbon dissolves in both concentrated nitric acid and concentrated sulphuric acid.	Both concentrated nitric acid and concentrated sulphuric acid are corrosive.
49.	Ethyl ethanoate and butanoic acid are miscible with water.	Ethyl ethanoate and butanoic acid possess the same relative molecular mass but different molecular formula.
50.	Iron is a better conductor of electricity than copper.	Iron is a stronger reducing agent than copper.

**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