

**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.**

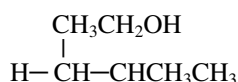
**Candidate may refer to the Periodic Table printed on page 16 when answering the questions.**

**Section A**

1. Which of the following has the highest content in a sample of liquefied gas of the atmosphere ?
  - A. nitrogen
  - B. oxygen
  - C. carbon dioxide
  - D. argon
  
2. The Z number of an element **K** is 14. Which of the following electronic arrangements is correct for the compound formed between **K** and oxygen in **K** ?
  - A. 2, 8
  - B. 2, 8, 2
  - C. 2, 8, 4
  - D. 2, 8, 8
  
3. Lithium and sodium are Group I elements in the Periodic Table. Which of the following statements concerning their properties is correct ?
  - A. They dissolve in water slowly.
  - B. The expected boiling point of lithium is greater than that of sodium.
  - C. They react with oxygen to form oxide with a formula of  $\text{LiO}_2$  and  $\text{NaO}_2$ .
  - D. Their hydroxide dissolves in water to give an alkaline solution.
  
4. Which of the following is NOT a property exhibited by dilute sulphuric acid ?
  - A. It reacts with zinc metal to give off hydrogen gas.
  - B. It reacts with ammonium chloride to give off ammonia.
  - C. It reacts with metal carbonates to give off carbon dioxide.
  - D. It turns a pink phenolphthalein indicator colourless.
  
5. Which of the following is an example of alkali ?
  - A. copper(II) oxide
  - B. sodium carbonate
  - C. potassium hydroxide
  - D. aluminium hydroxide

6. Which of the following settings would allow a piece of iron metal to corrode most rapidly ?
- A. outerspace
  - B. countryside
  - C. industrial area
  - D. dry sealed container
7. Given the same mass of reactants, which of the following processes releases the greatest number of electrons ?
- A.  $\text{O}_2(\text{g}) \rightarrow \text{OH}^-(\text{aq})$
  - B.  $\text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
  - C.  $\text{MnO}_4^-(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq})$
  - D.  $\text{MnO}_4^-(\text{aq}) \rightarrow \text{MnO}_2(\text{s})$
8. Which of the following requires the greatest number of moles of hydroxide ions to attain complete neutralization ?
- A.  $20 \text{ cm}^3$  of 1.5 M hydrochloric acid
  - B.  $40 \text{ cm}^3$  of 1 M ethanoic acid
  - C.  $10 \text{ cm}^3$  of 3 M nitric acid
  - D.  $25 \text{ cm}^3$  of 1 M sulphuric acid
9. The structure of a detergent molecule is characterized by the presence of
- A. a branched chain.
  - B. a metal cation.
  - C. a hydroscopic part.
  - D. an ester functional group.
10. Which of the following is NOT an application of sulphuric acid ?
- A. production of fertilizer
  - B. prevention of metal corrosion
  - C. manufacture of paint additives
  - D. preparation of soapless detergents

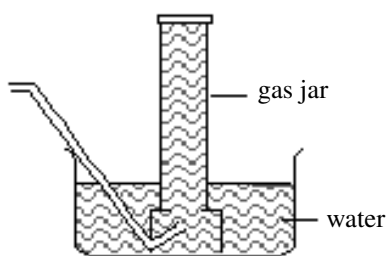
11. What is the systematic name for the following compound ?



- A. hexan-1-ol  
B. hexan-5-ol  
C. 1-methylpentan-4-ol  
D. 4-methylpentan-1-ol
12. Which of the following could explain the use of plastics over metals in making a helmet for a soldier ?
- (1) Plastics have a lower density.  
(2) Plastics do not corrode easily.  
(3) Plastics do not conduct electricity.
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)
13. Which of the following statements concerning the manufacture of ethanol by fermentation is INCORRECT ?
- A. Wheat can be used as a raw material.  
B. Yeast is required in the fermentation process.  
C. Carbon dioxide is liberation in the fermentation process.  
D. The ethanol produced can be completely extracted by simple distillation.
14. 46.4 g of an oxide of metal **H** contains 3.2 g of oxygen. What is the mole ratio of **H** to oxygen in the oxide ?
- (Relative atomic masses: O = 16.0, **H** = 108.0)
- A. 1 : 1  
B. 1 : 2  
C. 2 : 1  
D. 3 : 2
15. Which of the following pairs of substances CANNOT be distinguished by using dilute hydrochloric acid ?
- A. magnesium and silver  
B. magnesium carbonate and lead(II) carbonate  
C. magnesium carbonate and calcium carbonate  
D. potassium carbonate and sodium hydrogencarbonate

16. **P, Q, and R** are three metals. Heating with the presence of carbon will remove oxygen from the oxides of **P** and **Q** but not from the oxide of **R**. **Q** will remove oxygen from the oxide of **P**. On this evidence only, arrange these metals in the descending order of their reactivity.
- A. **P, Q, R**
  - B. **R, P, Q**
  - C. **P, R, Q**
  - D. **R, Q, P**
17. A sample of concentrated sulphuric acid has a density of  $1.80 \text{ g cm}^{-3}$  and contains 95.0 % of sulphuric acid by mass. What is the molarity of sulphuric acid in the sample ?
- A. 17.4 M
  - B. 18.4 M
  - C. 18.7 M
  - D. 19.3 M
18. Which of the following substances do(es) NOT react with acidified potassium permanganate solution ?
- (1) ethane
  - (2) chlorine
  - (3) sulphur dioxide
- A. (1) only
  - B. (2) only
  - C. (1) and (2) only
  - D. (2) and (3) only
19. Which of the following methods can be used to prepare limewater ?
- (1) dissolving calcium carbonate in excess water
  - (2) dissolving quicklime in excess water
  - (3) heating the limestone and the treat the solid formed with excess water
- A. (1) only
  - B. (2) only
  - C. (1) and (2) only
  - D. (2) and (3) only
20. Which of the following pair of substances would give the greatest amount of precipitate upon mixing ?
- A.  $8 \text{ cm}^3$  of 2 M  $\text{Na}_2\text{CO}_3(\text{aq})$  +  $15 \text{ cm}^3$  of 2 M  $\text{CaCl}_2(\text{aq})$
  - B.  $10 \text{ cm}^3$  of 2 M  $\text{Na}_2\text{CO}_3(\text{aq})$  +  $10 \text{ cm}^3$  of 2 M  $\text{CaCl}_2(\text{aq})$
  - C.  $15 \text{ cm}^3$  of 2 M  $\text{Na}_2\text{CO}_3(\text{aq})$  +  $8 \text{ cm}^3$  of 2 M  $\text{CaCl}_2(\text{aq})$
  - D.  $18 \text{ cm}^3$  of 2 M  $\text{Na}_2\text{CO}_3(\text{aq})$  +  $8 \text{ cm}^3$  of 2 M  $\text{CaCl}_2(\text{aq})$

21. Consider the following set-up:



In which of the following reactions the above set-up can be employed to collect the gaseous product formed ?

- (1) zinc and dilute hydrochloric acid  
(2) copper and sodium carbonate solution  
(3) sodium hypochlorite and hydrochloric acid
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only
22. Which of the following can be used to demonstrate the reducing power of a sulphite ion ?
- (1) reacting it with ammonia  
(2) addition of acidified potassium dichromate  
(3) a pH paper
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only
23. Which of the following conversions involve the use of a catalyst ?
- (1) from ethanol to ethyl ethanoate  
(2) from sulphur dioxide to sulphur trioxide  
(3) from large hydrocarbons to small hydrocarbons
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)

24. Which of the following is / are a thermoplastic as well as an addition polymer ?
- (1) perspex
  - (2) polyester
  - (3) urea methanal
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
25. Which of the following may have a molecular formula of  $C_4H_8O_2$  ?
- (1) alkanolic acid
  - (2) alkanol
  - (3) ester
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
26. Which of the following statements concerning ammonium chloride is correct ?
- (1) It is a covalent compound.
  - (2) It sublimes upon gentle heating.
  - (3) It produces a white fumes upon addition of sodium hydroxide solution.
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
27. **X** is a compound with 4 carbon atoms which yields negative results upon treatment with the following:
- (1) sodium hydrogencarbonate
  - (2) bromine in 1,1,1-trichloroethane
  - (3) hot acidified potassium dichromate solution
- The structural formula of **X** is most likely to be
- A.  $CH_3CH_2CH=CH_2$
  - B.  $CH_3CH_2CH_2CH_2OH$
  - C.  $CH_3CH_2CH_2CO_2H$
  - D.  $CH_3CO_2CH_2CH_3$

**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:

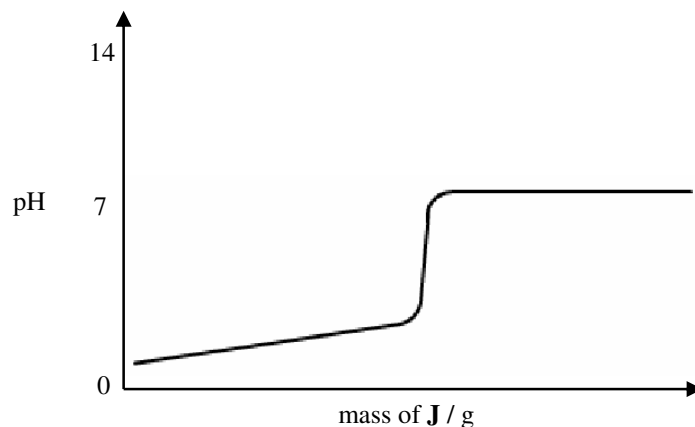
- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

	<b>1st statement</b>	<b>2nd statement</b>
28.	Ethanal can be converted to ethanoic acid by acidified potassium dichromate.	Ethanol can be converted to ethanoic acid by acidified potassium permanganate.
29.	Tin-plating can be applied in the preserving iron can from rusting.	The reactivity of tin is greater than that of iron.
30.	The number of moles of products in a reaction depends on the amount of limiting reagent present.	When a limiting reagent is fully consumed, a reaction proceeds to completion.

**END OF SECTION A**

## Section B

31. A solid **J** is dissolved in an aqueous solution of **K** of which variation of pH value is shown below:



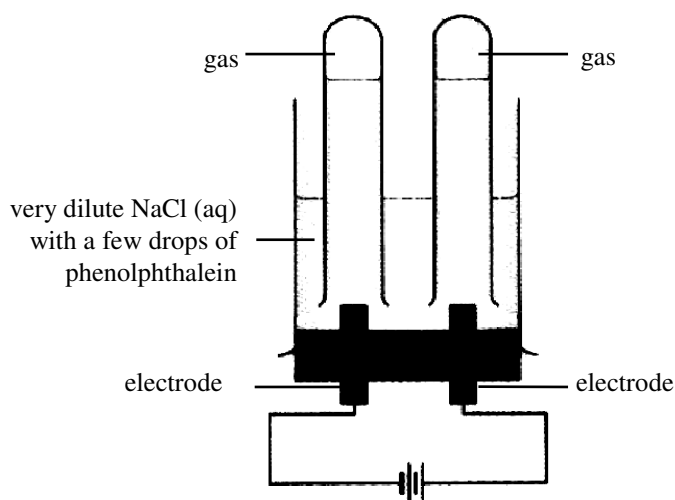
**J** and **K** could probably be respectively

- A. an insoluble metal oxide and hydrochloric acid.
  - B. a soluble metal oxide and hydrochloric acid.
  - C. an insoluble non-metal oxide and sodium hydroxide.
  - D. a soluble non-metal oxide and sodium hydroxide.
32. 0.670 g of hydrated sodium carbonate ( $\text{Na}_2\text{CO}_3 \cdot n\text{H}_2\text{O}$ ) required 25.0 cm<sup>3</sup> of 0.10 M sulphuric acid to attain complete neutralization. What is the value of  $n$  ?
- (Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Na = 23.0)
- A. 1
  - B. 3
  - C. 6
  - D. 9
33. Which of the following metals is used to make street lamps ?
- A. sodium
  - B. potassium
  - C. magnesium
  - D. aluminium
34. Which of the following pairs of substances would evolve a coloured gas upon mixing ?
- A. copper and concentrated nitric acid
  - B. zinc and concentrated sulphuric acid
  - C. calcium and concentrated hydrochloric acid
  - D. potassium chloride and sodium hydroxide



**Directions:** Question 35 and 36 refer to the following experiment.

A solution mixture of very dilute sodium chloride and a few drops of phenolphthalein was brought to an electrolytic cell as shown below to extract certain gaseous products:



35. Which of the following combinations about the formation of gaseous products is correct ?

	<u>cathode</u>	<u>anode</u>
A.	chlorine	hydrogen
B.	hydrogen	chlorine
C.	hydrogen	oxygen
D.	oxygen	hydrogen

36. Which of the statements concerning the above experiment is / are correct ?

- (1) Platinum electrodes are encouraged over carbon electrodes.
- (2) The concentration of  $\text{Na}^+(\text{aq})$  ions around the anode decreases over time.
- (3) The solution changes from pink to colorless.

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

37. Which of the following statements concerning esterification of ethanoic acid are INCORRECT ?

- (1) It is a substitution reaction.
- (2) It does not proceed to completion.
- (3) Sodium hydroxide can act a catalyst.

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

38. Which of the following would give a colourless solution upon adding excess sodium hydroxide solution ?

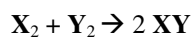
- (1) lead(II) hydroxide
  - (2) iron(II) hydroxide
  - (3) zinc hydroxide
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

39. How many atoms are present in 15 cm<sup>3</sup> of HCOOH ?

(Density of HCOOH = 1.22 g cm<sup>-3</sup>; Avogadro constant = 6.02 × 10<sup>23</sup>; Relative atomic mass: H = 1.0; C = 12.0, O = 16.0)

- A. 1.2 × 10<sup>23</sup>  
B. 2.4 × 10<sup>24</sup>  
C. 1.2 × 10<sup>23</sup>  
D. 2.4 × 10<sup>24</sup>

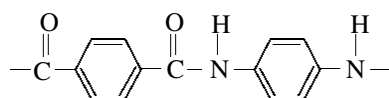
40. The following reaction between elements X and Y is an exothermic process:



Which of the following could best explain the exothermic nature of the reaction ?

- A. The number of bond formed is greater than that of bond broken.  
B. The number of bond broken is greater than that of bond formed.  
C. Energy involved in the bond breaking is greater than that of bond formation.  
D. Energy involved in the bond formation is greater than that of bond breaking.

41. A polymer has a repeating unit shown below:



Which of the following statements concerning the polymer are correct ?

- (1) It is a thermosetting plastics.
  - (2) It is a condensation polymer.
  - (3) Hydrogen chloride could be a side-product of its formation.
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)

42. Which of the following measures on vehicles can effectively reduce the formation of acid rain ?
- (1) use of unleaded petrol
  - (2) use of low sulphur content fuels
  - (3) installation of catalytic converter
- 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 statements concerning the advantages of experimental settings are INCORRECT ?
- (1) Microscale apparatus can give sensitive response.
  - (2) Traditional glassware can produce less chemical wastes.
  - (3) Quick-fit apparatus can be assembled for different purposes.
- 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 soapless detergent is / are INCORRECT ?
- (1) Soapless detergents are biodegradable.
  - (2) Soapless detergents contain phosphate additives.
  - (3) A soapless detergent molecule can be characterized by the presence of  $-\text{OSO}_3^-$  group.
- A. (1) only
  - B. (2) only
  - C. (1) and (3) only
  - D. (2) and (3) only
45. Which of the following processes has the slowest relative rate of reaction ?
- A. rusting of iron
  - B. fermentation of sucrose
  - C. weathering of marbles by acid rain
  - D. reaction between copper and silver nitrate solution

46. Which of the following would produce the greatest volume gaseous product at room temperature and pressure ?
- 0.5 g of sodium and excess water
  - 0.5 g of magnesium and excess water
  - 0.5 g of magnesium and excess 2.0 M nitric acid
  - 0.5 g of calcium and excess 2.0 M ethanoic acid
47. Xenon is an element in the Periodic Table. With reference to the Periodic Table on page 16, which of the following statements concerning the properties of xenon are correct ?
- Xenon is insoluble in water.
  - Xenon exists as a free element as its natural occurrence.
  - Xenon exists as colourless gas at room temperature and pressure.
- (1) and (2) only
  - (1) and (3) only
  - (2) and (3) only
  - (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:

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

	<b>1st statement</b>	<b>2nd statement</b>
48.	Ethanol turns red litmus paper blue.	Ethanol possesses a – OH functional group.
49.	Neutralization takes place when sodium carbonate is treated with dilute hydrochloric acid.	Sodium carbonate can function as a water softener.
50.	The pH value of 1 M hydrochloric acid is lower than that of 1 M ethanoic acid.	The acidity of hydrochloric acid is greater than that of ethanoic acid.

**END OF PAPER**

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## GROUP 族

## PERIODIC TABLE 週期表

atomic number 原子序

relative atomic mass 相對原子質量

																	0	
																	2	
																	<b>He</b>	
																	4.0	
I	II											III	IV	V	VI	VII		
3	4											5	6	7	8	9	10	
<b>Li</b>	<b>Be</b>											<b>B</b>	<b>C</b>	<b>N</b>	<b>O</b>	<b>F</b>	<b>Ne</b>	
6.9	9.0											10.8	12.0	14.0	16.0	19.0	20.2	
11	12											13	14	15	16	17	18	
<b>Na</b>	<b>Mg</b>											<b>Al</b>	<b>Si</b>	<b>P</b>	<b>S</b>	<b>Cl</b>	<b>Ar</b>	
23.0	24.3											27.0	28.1	31.0	32.1	35.5	40.0	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
<b>K</b>	<b>Ca</b>	<b>Sc</b>	<b>Ti</b>	<b>V</b>	<b>Cr</b>	<b>Mn</b>	<b>Fe</b>	<b>Co</b>	<b>Ni</b>	<b>Cu</b>	<b>Zn</b>	<b>Ga</b>	<b>Ge</b>	<b>As</b>	<b>Se</b>	<b>Br</b>	<b>Kr</b>	
39.1	40.1	45.0	47.9	50.9	52.0	54.9	55.8	58.9	58.7	63.5	65.4	69.7	72.6	74.9	79.0	79.9	83.8	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
<b>Rb</b>	<b>Sr</b>	<b>Y</b>	<b>Zr</b>	<b>Nb</b>	<b>Mo</b>	<b>Tc</b>	<b>Ru</b>	<b>Rh</b>	<b>Pd</b>	<b>Ag</b>	<b>Cd</b>	<b>In</b>	<b>Sn</b>	<b>Sb</b>	<b>Te</b>	<b>I</b>	<b>Xe</b>	
85.5	87.6	88.9	91.2	92.9	95.9	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3	
55	56	57 *	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
<b>Cs</b>	<b>Ba</b>	<b>La</b>	<b>Hf</b>	<b>Ta</b>	<b>W</b>	<b>Re</b>	<b>Os</b>	<b>Ir</b>	<b>Pt</b>	<b>Au</b>	<b>Hg</b>	<b>Tl</b>	<b>Pb</b>	<b>Bi</b>	<b>Po</b>	<b>At</b>	<b>Rn</b>	
132.9	137.3	138.9	178.5	180.9	183.9	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	(209)	(210)	(222)	
87	88	89 **	104	105														
<b>Fr</b>	<b>Ra</b>	<b>Ac</b>	<b>Rf</b>	<b>Db</b>														
(223)	(226)	(227)	(261)	(262)														
		*	58	59	60	61	62	63	64	65	66	67	68	69	70	71		
			<b>Ce</b>	<b>Pr</b>	<b>Nd</b>	<b>Pm</b>	<b>Sm</b>	<b>Eu</b>	<b>Gd</b>	<b>Tb</b>	<b>Dy</b>	<b>Ho</b>	<b>Er</b>	<b>Tm</b>	<b>Yb</b>	<b>Lu</b>		
			140.1	140.9	144.2	(145)	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0		
		**	90	91	92	93	94	95	96	97	98	99	100	101	102	103		
			<b>Th</b>	<b>Pa</b>	<b>U</b>	<b>Np</b>	<b>Pu</b>	<b>Am</b>	<b>Cm</b>	<b>Bk</b>	<b>Cf</b>	<b>Es</b>	<b>Fm</b>	<b>Md</b>	<b>No</b>	<b>Lr</b>		
			232.0	(231)	238.0	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(260)		