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 processes is NOT involved in the erosion of limestone minerals ?

   A. thermal decomposition
   B. neutralization
   C. hydrolysis
   D. substitution

2. Which of the following quantities equals the isotopic mass of an element ?

   A. the mass number of the elements
   B. the mass of a particular isotope relative to carbon-12
   C. the sum of number of protons and electrons of its particular isotope
   D. the weighted average of the relative masses of its isotopes on ^{12}C scale

3. Suppose an incomplete transfer of electrons occurs in the formation of magnesium bromide. Which of the following statements concerning magnesium bromide is correct ?

   A. It has a melting point lower than expected.
   B. It adopts a giant lattice structure.
   C. It is a good conductor of electricity in aqueous solution.
   D. It does not conduct electricity in solid form.

4. When a piece of potassium metal is treated with sodium hydroxide solution,

   A. no observable change is detected.
   B. it sinks to the bottom of the trough.
   C. a gas which relights a glowing splint will evolve.
   D. a gas which burns with a ‘pop’ sound will evolve.

5. Which of the following is an endothermic process ?

   A. neutralization
   B. electrolysis of brine
   C. dilution of hydrochloric acid
   D. condensation of water vapour

6. Which of the following reagents can be used to prepare hydrogen gas from dilute sulphuric acid in the safest manner ?

A. zinc
B. copper
C. calcium
D. potassium

7. What is the concentration of aqueous sodium ions in a 500 cm^3 solution containing 0.585 g of pure sodium chloride ?

A. 0.01 mol dm^{-3}
B. 0.02 mol dm^{-3}
C. 0.03 mol dm^{-3}
D. 0.04 mol dm^{-3}

8. There is yet to be any simple chemical test for

A. water.
B. oxygen.
C. nitrogen.
D. carbon dioxide.

9. Which of the following could does NOT readily react with acidified potassium permanganate ?

A. ethane
B. ethene
C. ethanal
D. ethanol

10. Which of the following is NOT a constituent of town gas ?

A. methane
B. propane
C. hydrogen
D. carbon monoxide

11. Which of the following processes most likely involve a redox reaction ?

(1) formation of blackheads on skin
(2) formation of element in a chemical reaction
(3) dissolution of table salt in water

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 reagents should be stored in a brown bottle ?

(1) chlorine water
(2) silver nitrate solution
(3) concentrated hydrochloric acid

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

13. Which of the following ions has the same number of protons as the hydroxide ion, OH^- ?

A. O^{2-}
B. F^-
C. Na^+
D. Mg^{2+}

14. Which of the following substances can dissolve in a mercury liquid ?

A. carbon
B. sodium metal
C. silicon dioxide
D. sodium chloride

15. Which of the following methods can relieve the pollution problems brought by plastic wastes ?

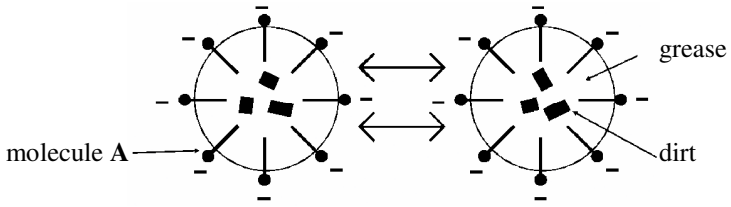
(1) recycling and reusing plastics
(2) making biodegradable plastics
(3) incinerating plastic in incinerators with high chimneys

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 statements concerning the Contact Process is INCORRECT ?

A. Vanadium(V) oxide is used as a catalyst in the process.
B. The conversion of sulphur dioxide to sulphur trioxide is reversible.
C. Sulphur dioxide is converted to sulphur trioxide at 200 atmospheric pressure.
D. Roasting iron pyrites can produce sulphur dioxide gas.

17. Consider the following simplified model of detergent molecules:



Which of the following statements concerning the above diagram is correct ?

A. Molecule **A** is overall neutral.
B. Attractions exist between greasy droplets.
C. Dirt is surrounded by molecule **A** since it is positively charged.
D. The diagram illustrates the emulsifying action of detergent molecules.

18. Which of the following are fossil fuels ?

(1) coal
(2) petroleum
(3) natural gas

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

19. There is an unknown compound **L** which is white solid. When **L** is warmed with sodium hydroxide solution, a gas is given off which turns moist red litmus paper blue. A brown solution is formed when chlorine is bubbled into an aqueous solution of **L**. **L** could probably be

A. sodium iodide.
B. potassium chloride.
C. potassium iodide.
D. ammonium chloride.

20. Which of the following solution would gradually turn brown upon bubbling chlorine gas into it ?

(1) calcium hydroxide
(2) sodium iodide
(3) iron(II) nitrate

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

21. Which of the following compounds will NOT be formed when ethene is treated with bromine in tetrachloromethane in the absence of light ?

(1) 1,2-dibromoethane
(2) 1-bromoethane
(3) hydrogen bromide

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

22 . Which of the following statements concerning thermoplastic articles is / are correct?

(1) They deform upon heating.
(2) They are commonly produced by compression moulding.
(3) They must be addition polymers.

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

23. Which of the following are the possible uses of alkanol ?

(1) fuel
(2) solvent
(3) food flavouring

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 used to acidify silver nitrate in the test for chloride ion ?

(1) dilute nitric acid
(2) dilute sulphuric acid
(3) dilute hydrochloric acid

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

25. Which of the following statements concerning a salt is / are correct ?

(1) Dilution of the salt solution decreases its electrical conductivity.
(2) It does not contain a covalent bond.
(3) It dissolves in water to give an expected pH value of 7.

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

26. **l** cm^3 of 0.4 M tribasic acid $H_3X(aq)$ is completely neutralized by **k** cm^3 of 0.6 M NaOH(aq). Which of the following expressions is correct ?

A. $3\,\mathbf{l} = 5\,\mathbf{k}$
B. $\mathbf{l} = 2\,\mathbf{k}$
C. $2\,\mathbf{l} = \mathbf{k}$
D. $5\,\mathbf{l} = 3\,\mathbf{k}$

27. Which of the following pairs of substances can be separated from its mixture by using a separating funnel ?

(1) hexane and propanal
(2) sodium chloride and heptane
(3) sodium chloride and sodium sulphate solution

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.

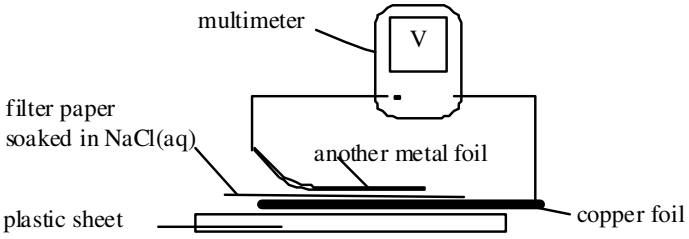
	1st statement	2nd statement
28.	Gold metal does not tarnish in air.	Gold is weak reducing agent.
29.	Vinegar can function as an electrolyte.	Ethanol turns sour upon standing in air.
30.	Concentrated sulphuric acid is more vicious relative to concentrated hydrochloric acid.	The basicity of sulphuric acid is higher than that of hydrochloric acid.

END OF SECTION A

Section B

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

The electrochemical property of four metals of unknown identities **A**, **B**, **C** and **D** was studied:



31. Which of the following compounds can be used to replace sodium chloride in the experiement ?

A. sodium sulphite
B. calcium sulphate
C. ammonium nitrate
D. potassium sulphate

32. The following shows the voltages recorded when metals **A**, **B**, **C** and **D** are connected to a copper metal:

Metal	Direction of electron flow in the external circuit	Voltage / V
A	**A** to Cu	+0.79
B	Cu to **B**	–0.22
C	**C** to Cu	+1.41
D	**D** to Cu	+0.20

Which of the following represents the decreasing order of reducing power of the above metals ?

A. **B > C > D > A**
B. **A > B > D > C**
C. **C > A > D > B**
D. **D > A > B > C**

33. 47.1 g of a tribasic acid $H_3\mathbf{X}$ is dissolved in deionized water and then diluted to 1000 cm^3. 25 cm^3 of the solution requires 20 cm^3 of 1.80 M sodium hydroxide solution to attain complete neutralization. What is the relative molecular mass of $H_3\mathbf{X}$?

A. 10.9
B. 32.7
C. 52.3
D. 98.1

34. Which of the following statements concerning household bleach is INCORRECT ?

A. The active ingredient of household bleach is sodium hypochlorite.
B. Household bleach can be used as a germicide.
C. Household bleach is produced by dissolving chlorine into water.
D. The raw material for manufacturing household bleach is sodium chloride.

35. 3 g of a metal **M** was added into 100 cm^3 $\mathbf{M}(NO_3)_2$ solution. Upon addition of 50 cm^3 of 1.5 M nitric acid, the resultant molarity of $\mathbf{M}^{2+}$ would be

(Formula mass of $\mathbf{M}(NO_3)_2$ = 148.0)

A. 0.25 M.
B. 0.75 M.
C. 1.58 M.
D. 2.38 M.

36. Which of the following products CANNOT be obtained from electrolysis of brine solution ?

(1) sodium chloride
(2) hydrogen chloride
(3) sodium hydroxide

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

37. Which of the following statements concerning cracking are correct ?

(1) Aluminium oxide can function as a catalyst.
(2) Cracking can proceed at high temperature and low pressure without a catalyst.
(3) Cracking with a catalyst has a better quality control of products than without.

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 gases can be collected over upward delivery ?

(1) nitrogen
(2) ammonia
(3) sulphur dioxide

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

39. Germanium is a Group IV element in the Periodic Table. Its chloride reacts with iron(II) chloride according to the following reaction:

$$GeCl_2 + 3\ FeCl_3 \rightarrow 2\ FeCl_2 + GeCl_4$$

Which of the following statements concerning the germanium and the reaction are correct ?

(1) Germanium can form a saturated compound with hydrogen.
(2) The oxidation number of germanium increases from +2 to +4.
(3) The resultant solution gives a green precipitate upon addition of sodium hydroxide.

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

40. Which of the following processes is exothermic in nature ?

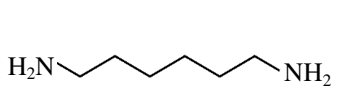
A. combustion of petrol.
B. cracking of hydrocarbons
C. fractional distillation of air
D. melting bitumen for reshaping

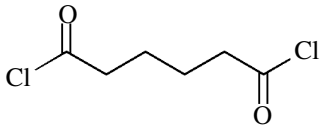
41. Which of the following air pollutants of which atmospheric concentration can be effectively reduced by use of high chimney ?

(1) nitrogen oxides
(2) sulphur dioxide
(3) carbon monoxide

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

42. Consider the following organic compounds, in which each intersection represents a carbon atom:





Which of the following statements concerning the above compounds are correct ?

(1) They polymerize to form a thermosetting plastic.
(2) Their polymerization yields water as a side-product.
(3) The polymer formed between them are not susceptible to alkaline medium.

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 substances can be used to distinguish potassium nitrate and ammonium sulphate ?

A. sodium iodide
B. sodium hydroxide
C. potassium permanganate
D. concentrated sulphuric acid

44. Which of the following reactions involves a transfer of hydrogen ion ?

A. $2Li + 2NH_3 \rightarrow 2LiNH_2 + H_2$
B. $NaOH + HCl \rightarrow NaCl + H_2O$
C. $K_2S_2O_8 + 2\ KI \rightarrow 2\ K_2SO_4 + I_2$
D. $NH_4Br + KNH_2 \rightarrow KBr + 2\ NH_3$

45. Which of the following statements concerning an organic compound with a molecular formula of C_4H_8 is correct ?

(1) It has an empirical formula of CH_2.
(2) It belongs to the homologous series of alkenes.
(3) It gives carbon dioxide and oxygen only upon complete combustion.

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

46. Which of the following apparatus should be washed with the solution to be placed in a titration ?

(1) burette
(2) pipette
(3) conical flask

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 would pose harm to the planet earth if NOT properly discharged ?

(1) soapy detergent
(2) used materials from contact process
(3) used materials from electroplating process

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.

	1st statement	2nd statement
48.	Neutralization takes place between methanoic acid and methanol.	Methanol can be oxidized to methanoic acid by acidified potassium dichromate.
49.	Redox reaction takes place when ethane is treated with dilute nitric acid.	Dilute nitric acid is an oxidizing agent.
50.	Delocalized electrons are present in a potato.	Potato can be used as a source of electrolyte in constructing a simple chemical cell.

END OF PAPER

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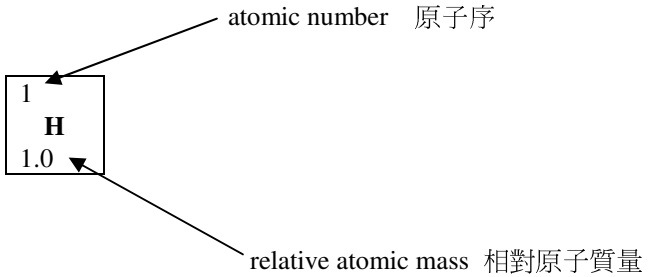
GROUP 族 **PERIODIC TABLE 週期表**



I	II											III	IV	V	VI	VII	0
																	2 **He** 4.0
3 **Li** 6.9	4 **Be** 9.0											5 **B** 10.8	6 **C** 12.0	7 **N** 14.0	8 **O** 16.0	9 **F** 19.0	10 **Ne** 20.2
11 **Na** 23.0	12 **Mg** 24.3											13 **Al** 27.0	14 **Si** 28.1	15 **P** 31.0	16 **S** 32.1	17 **Cl** 35.5	18 **Ar** 40.0
19 **K** 39.1	20 **Ca** 40.1	21 **Sc** 45.0	22 **Ti** 47.9	23 **V** 50.9	24 **Cr** 52.0	25 **Mn** 54.9	26 **Fe** 55.8	27 **Co** 58.9	28 **Ni** 58.7	29 **Cu** 63.5	30 **Zn** 65.4	31 **Ga** 69.7	32 **Ge** 72.6	33 **As** 74.9	34 **Se** 79.0	35 **Br** 79.9	36 **Kr** 83.8
37 **Rb** 85.5	38 **Sr** 87.6	39 **Y** 88.9	40 **Zr** 91.2	41 **Nb** 92.9	42 **Mo** 95.9	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 * **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 ** **Ac** (227)	104 **Rf** (261)	105 **Db** (262)													

*	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
**	90 **Th** 232.0	91 **Pa** (231)	92 **U** 238.0	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)