



# G.C.E. A/L Examination June - 2018

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education, Northern Province.

Chemistry I

Grade :- 13 (2018)

Time :- Two hours

## Part - I

01. The scientist who is not related with either electrons or the arrangement of electrons in atoms is

01. Neil Bohr

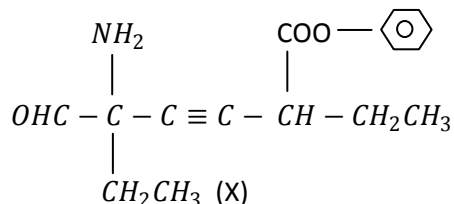
02. Hund

03. Thomson

04. Pauling

05. de Broglie

02. What is the IUPAC name of the compound X?



01. phenyl 5 -amino - 2 - ethyl - 5 - formyl - 3 - heptynoate

02. 5 - amino - 2 - ethyl - 5 - formyl - 3 - heptynoate

03. phenyl 2,5 - diethyl - 6 - oxo - 5 -amino - 3 - heptynoate

04. phenyl 5 amino - 2,5 diethyl - 6 - oxo - 3 - heptynoate

05. phenyl - 5 - amino -2,5 - diethyl - 6 - oxo - 3 - heptynoate

03. Which of the following statements regarding the properties of atoms is true?

01. The nuclear charge felt by the valence electron of Mg atom is 12

02. The first electron affinity of Li atom has a more negative value than that of Na atom

03. Electro negativity is a measure of the electron attracting ability of an isolated atom.

04. According to Pauling scale, electro negativity of S is greater than the electro negativity of Br.

05. The first ionization energy of an element with higher atomic radius is always less than that with lower atomic radius in the same period.

04. A,B and C are three elements belonging to the fourth period of the periodic table. Each of them has one unpaired electron. If the azimuthal quantum numbers of these unpaired electrons are all different from each other, the elements which are possible to be

A,B and C are

01. K, Sc, Cr

02. Cr, Cu, Ga

03. K, Sc, Br

04. Cr, Cu, Ge

05. Sc, Cr, Cu

05. The statement which is false in regard of alkali metals and alkaline earth metals is

01. All alkali metals react with water
02. None of the bicarbonates of alkali metals exists in solid state
03. Except Li, any other alkali metals do not react directly with  $N_2$  gas
04. Although the hydroxides of alkali metals are strong bases, only LiOH among them will undergo thermal decomposition
05. The melting point of alkali metals is less than the melting point of the corresponding alkali earth metal in the same period.

06. The element M forms the oxide  $M_2O_3$ . If the mass of dry sulphate formed when 1.60g of  $M_2O_3$  is dissolved in dilute  $H_2SO_4$  is 4.00g, the relative atomic mass of M is (S= 32, O= 16)

01. 27            02. 56            03. 112            04. 160            05. 168

07. A buffer solution may be prepared by mixing a weak acid HA ( $K_a = 4 \times 10^{-7} \text{ mol dm}^{-3}$ ) with a strong base. What is the volume ratio of the weak acid HA to the NaOH solution of the same concentration to be mixed to prepare a buffer solution of pH= 6?

01. 1:1            02. 1:2            03. 7:2            04. 5:2            05. 3:2

08. In which of the following reactions may  $Cl_2$  gas be produced as a product?

- a)  $OCl_{(aq)}^- + H^+_{(aq)} + Cl^-_{(aq)} \rightarrow$
- b)  $H_2O_{2(aq)} + Cl^-_{(aq)} + H^+_{(aq)} \rightarrow$
- c)  $MnO_{2(s)} + H^+_{(aq)} + Cl^-_{(aq)} \rightarrow$
- d)  $Cl^-_{(aq)} + \text{Conc. } H_2SO_4 \rightarrow$

01. Only b and d            02. Only b, c and d            03. Only c and d  
04. c only            05. Only a and c

09. A gas mixture of  $H_2$  and  $CH_4$  has a density of  $0.6 \text{ kg m}^{-3}$  at 300 K and under a pressure of  $3 \times 10^5 \text{ Nm}^{-2}$ . The mole fraction of  $CH_4$  gas in the mixture (assume that the gases behave ideally)

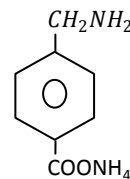
01.  $\frac{2}{16}$             02.  $\frac{3}{14}$             03.  $\frac{11}{14}$             04.  $\frac{2}{9}$             05.  $\frac{8}{9}$

10. The correct statement regarding the changes in enthalpy and entropy of a system and its surrounding when a chemical reaction takes place is

01. In an exothermic reaction both the enthalpy of the particles in the system decreases while the entropy of the particles in the surrounding increases
02. In an exothermic reaction both the enthalpy of the particles in a system and the entropy of the particles in the surrounding will decrease
03. When heat is liberated to the surrounding the entropy of the particles in the surrounding will increase
04. Entropy change occurring in the molecules of a system is equal to the entropy change in the molecules of the surrounding
05. All the above statements are correct.

11. Which one of the following does not give any chemical change with  $H_2O_2$ ?
01.  $MnO_2(s)$                       02.  $K_2Cr_2O_7/dilute\ H_2SO_4$                       03.  $Cr(OH)_3/NaOH$   
 04.  $KI/dilute\ H_2SO_4$                       05.  $Ag_2O$

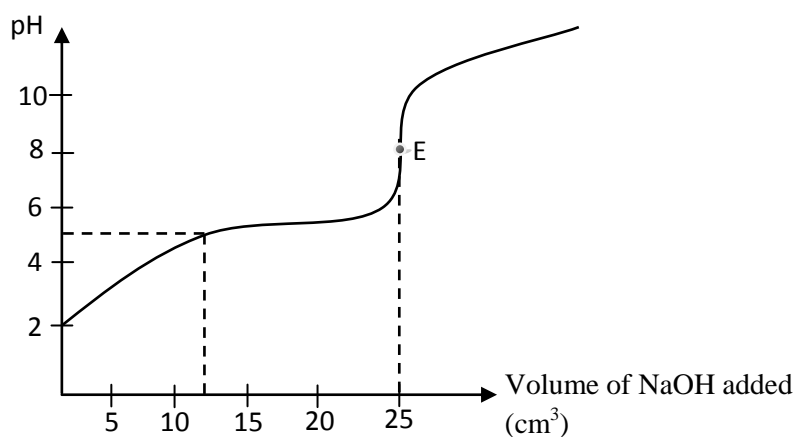
12. The statement which is incorrect regarding the compound



is

01. It dissolves in dilute HCl.  
 02. It gives  $NH_3$  gas with  $NaOH_{(aq)}$ .  
 03. It is soluble in water.  
 04. It produces diazonium salt with  $NaNO_2/dil\ HCl$ .  
 05. When the compound is heated, a compound with an amide group is obtained.
13. Assuming that only metallic cations are reduced in their relevant aqueous solutions, what is the mole ratio of Cu, Ag and Cr which are deposited when the same current is passed for the same duration of time through the aqueous solutions of  $CuSO_4$ ,  $AgNO_3$  and  $Cr_2(SO_4)_3$  of equal concentrations?
01. 2:3:3                      02. 3:6:2                      03. 3:2:6  
 04. 2:1:3                      05. 32:108:26

14. The following graph represents the pH change when  $0.1\ mol\ dm^{-3}\ NaOH_{(aq)}$  is added from a burette into a weak acid HA of concentration  $0.1\ mol\ dm^{-3}$  at  $25^\circ C$



The correct statement is,

01. The ionization constant of the weak acid HA at  $25^\circ C$  is  $K_a = 1 \times 10^{-5}\ mol\ dm^{-3}$ .  
 02. In the above titration, E denotes the equivalence point.  
 03. The indicator having a colour change pH range 8- 9.6 may be used for this titration.  
 04. The resulting solution at the equivalence point is neutral.  
 05. Statements 1,2 and 3 above are correct.
15. When  $100\ cm^3$  of a weak acid HA of concentration  $0.15\ mol\ dm^{-3}$  was shaken well with  $100\ cm^3$  of  $CCl_4$  and the layers were allowed to settle, the pH of the aqueous layer was found to be 3. The distribution co-efficient of HA between water and  $CCl_4$  at the temperature concerned is ( $K_a\ of\ HA = 1 \times 10^{-5}\ mol\ dm^{-3}$ )
01. 2                      02. 4                      03. 0.5                      04. 5                      05. 8

16. The statement which is not true regarding the metals in 3d - series and their compounds

01. Cu and Mn have relatively low melting point

02. The cations of metals with  $d^7, d^8, d^9$  and  $d^{10}$  electron configuration easily form ammine complexes with  $NH_3$ .

03. Of the oxides formed by V, Cr and Mn, lower oxidation states are basic whereas higher oxidation states show acidic nature.

04. Oxyanions of them in their highest oxidation states are reducing agents.

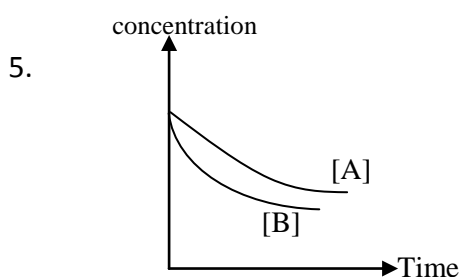
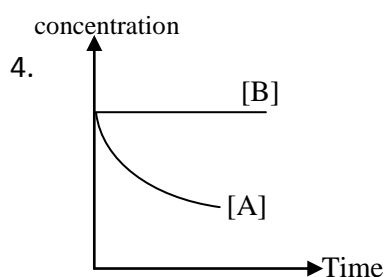
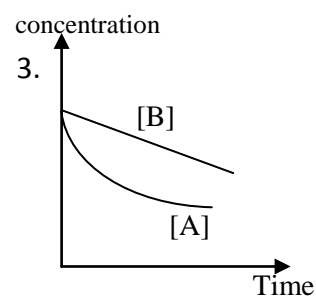
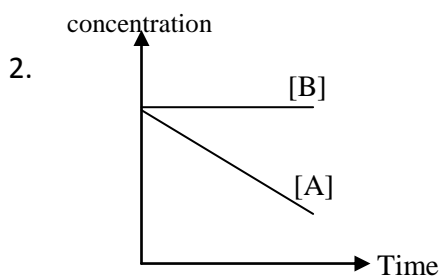
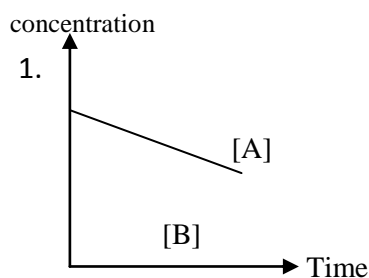
05. The highest oxidation state of the elements from Sc to Mn is the sum of the outermost electrons and the inner d electrons.

17.  $2A + B \rightarrow C + 4D$ .

Some information regarding the above reaction are given below.

- The concentration of B is not in the rate expression of the reaction.
- The time taken for the concentration of A to become half its initial value is independent of its initial concentration

If the above reaction is started with equal moles of A and B, which of the following graphs best represents the variation of concentration with time?



18. 0.04 moles of a sparingly soluble solid  $M(OH)_2$  is dissolved well in  $1 \text{ dm}^3$  of  $0.07 \text{ mol dm}^{-3}$  HCl solution. The solubility product ( $K_{SP}$ ) of  $M(OH)_2$  at the given temperature is  $3.5 \times 10^{-10} \text{ mol}^3 \text{ dm}^{-9}$  and the salt  $MCl_2$  dissolves completely in water. The  $OH^-$  concentration in the solution is,

01.  $1.0 \times 10^{-5} \text{ mol dm}^{-3}$

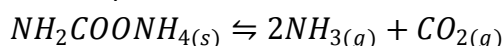
02.  $1.0 \times 10^{-4} \text{ mol dm}^{-3}$

03.  $1.0 \times 10^{-2} \text{ mol dm}^{-3}$

04.  $8.0 \times 10^{-2} \text{ mol dm}^{-3}$

05.  $2.0 \times 10^{-5} \text{ mol dm}^{-3}$

19. Consider the equilibrium reaction



If  $K_p = 3.2 \times 10^{10} N^2 m^{-4}$  for the above equilibrium reaction at  $27^\circ C$ , the total pressure of the system is,

01.  $2 \times 10^3 N m^{-2}$

02.  $5.4 \times 10^5 N m^{-2}$

03.  $4 \times 10^3 N m^{-2}$

04.  $3 \times 10^3 N m^{-2}$

05.  $6 \times 10^3 N m^{-2}$

20. An electro chemical cell is constructed by connecting a redox electrode  $Pt_{(s)} / Fe_{(aq)}^{3+}, Fe_{(aq)}^{2+}$  and a metal - insoluble salt electrode  $Ag_{(s)}, AgCl_{(s)} / Cl_{(aq)}^-$  with a salt bridge

Standard electrode potentials of these electrodes are given below

$$E_{AgCl_{(s)}, Ag_{(s)} / Cl_{(aq)}^-}^\theta = 0.22V, E_{Pt_{(s)} / Fe_{(aq)}^{3+}, Fe_{(aq)}^{2+}}^\theta = 0.77v$$

Which of the following statement regarding the above cell is correct?

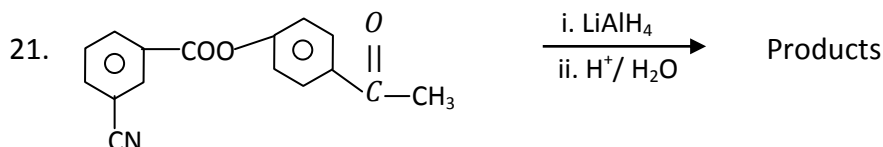
01. The emf of the cell is 0.99v.

02. Negative electrode of the cell is  $Pt_{(s)} / Fe_{(aq)}^{3+}, Fe_{(aq)}^{2+}$

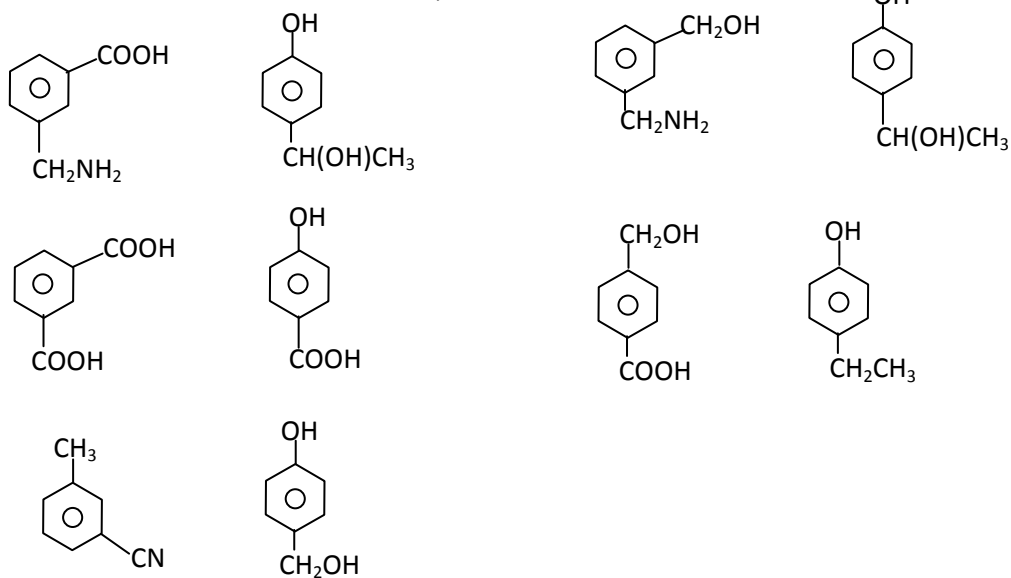
03. Reducing the concentration of  $Fe_{(aq)}^{2+}$  makes the electrode potential of  $Pt_{(s)} / Fe_{(aq)}^{3+}, Fe_{(aq)}^{2+}$  more positive

04. When the distance between the electrodes is reduced, the current that flows will not change.

05. When the cell operates, anions move towards cathodic compartment.



The products of the above reaction are,



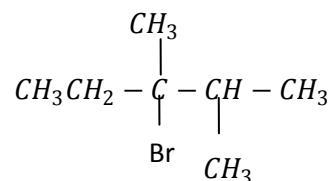
22. At a temperature  $T$ , the dissociation constant of monobasic weak acid is  $2 \times 10^{-6} \text{ mol dm}^{-3}$ . The pH value of a  $0.5 \text{ mol dm}^{-3}$  aqueous solution of it (At TK,  $K_w$  of water is  $1 \times 10^{-16} \text{ mol}^2 \text{ dm}^{-6}$ ).

01. 2.6      02. 3.0      03. 11.0      04. 11.3      05. 13

23. Which one of the following statements regarding  $\text{NH}_3$  is false?

01. When  $\text{NH}_3$  acts as an oxidizing agent,  $\text{H}_2$  will be a product.  
 02. Concentrated  $\text{H}_2\text{SO}_4$  cannot be used to dry  $\text{NH}_3(g)$ .  
 03.  $\text{NH}_3$  is formed in the reaction of  $\text{NH}_4\text{NO}_3$  and  $\text{NaNH}_2$ .  
 04.  $\text{NF}_3$  molecule has a dipole moment greater than that of  $\text{NH}_3$ .  
 05.  $\text{NCl}_3$  may form in the reaction of  $\text{NH}_3$  with excess  $\text{Cl}_2$ .

24. The correct statement about the reaction of the compound with  $\text{NaOH}_{(aq)}$  is



01. The reaction occurring is a single step reaction.  
 02. The major product in this reaction shows diastereoisomerism.  
 03. Mechanism of the reaction is nucleophilic addition.  
 04. The product formed does not give immediate turbidity with Lucas reagent.  
 05. The major products are optically active isomeric alcohols.

25. Which one of the following statements regarding  $\text{H}_2\text{O}_2$  is not true?

01. Boiling point of  $\text{H}_2\text{O}_2$  is greater than that of  $\text{H}_2\text{O}$ .  
 02. The resultant dipole moment of  $\text{H}_2\text{O}_2$  molecule is not zero.  
 03.  $\text{H}_2\text{O}_2$  reacts with HCl and liberates  $\text{Cl}_2$  gas.  
 04.  $\text{H}_2\text{O}_2$  may be prepared by the reaction of  $\text{BaO}_2$  with  $\text{H}_2\text{SO}_4$ .  
 05.  $\text{O}_2$  gas is evolved in the reaction of  $\text{Ag}_2\text{O}$  with  $\text{H}_2\text{O}_2$ .

26. When a mixture of FeO and  $\text{Fe}_3\text{O}_4$  is heated in air to constant mass, an increase of 5% in mass is observed. The mass percentage of FeO in the mixture is

01. 20%      02. 10%      03. 67.5%      04. 25%      05. 30%

27.  $\text{A}_{(g)} \xrightleftharpoons[K_2]{K_1} 2 \text{B}_{(g)} \Delta \quad \text{H} > 0$

Given above is a reversible, equilibrium reaction where  $K_1$  and  $K_2$  are rate constants of forward and reverse reactions respectively.

The correct statement about the above equilibrium system is

01. As the reaction is endothermic, with the increase in temperature rate of forward reaction will increase whereas the rate of reverse reaction will decrease  
 02. When a catalyst is introduced into the system, rate constants of both the forward and reverse reactions increase by the same extent.  
 03. When a catalyst is introduced into the system, the activation energies of both forward and reverse reactions decrease by the same percentage.  
 04. At a given temperature, the average speed to B molecules is greater than that of A molecules  
 05. When the system is in equilibrium, the percentage of reactant and product molecules having energy greater than a particular value is equal to each other.

28. A and B are two liquids which can form ideal solutions. At a given temperature, two ideal solutions comprising A and B were prepared and allowed to attain equilibrium with their vapours. When the mole fraction of A in these solutions are 0.6 and 0.2, the vapour pressures are  $P_1$  and  $P_2$  respectively ( $P_1 > P_2$ ) If at the given temperature vapour pressures of pure A and B are  $P_A^\circ$  and  $P_B^\circ$  respectively, which of the following relationships is correct?

01.  $2P_1 - P_2 = P_A^\circ$                       02.  $P_B^\circ = \frac{1}{2}(3P_2 - P_1)$                       03.  $P_A^\circ > P_B^\circ$   
 04.  $P_A^\circ = P_B^\circ$                               05. in the vapour phase always  $Y_A > Y_B$

29. To determine the amount of sulphur in a sample of coal, the following procedure was followed. 1g sample of coal was burnt in excess  $O_2$  and the  $SO_2$  gas formed was passed into chlorine water which was sufficient for its complete reaction. When the resultant solution was titrated against a  $0.1 \text{ mol dm}^{-3} NaOH_{(aq)}$  the end point was found to be  $40 \text{ cm}^3$ . The mass percentage of sulphur in the coal sample (S= 32).

01. 3.2              02. 6.4              03. 1.6                              04. 0.8                              05. 8

30. When forming compounds with the following, with which does nitrogen exhibit its highest oxidation state?

01. F              02. O              03. Cl                              04. Mg                              05. B

❖ For each of the question 31 to 40 one or more response out of four responses (a), (b), (c) and (d) given is / are correct. Select the correct responses / responses. In accordance with the instruction given on your answer sheet mark.

1	2	3	4	5
only (a) and (b) are correct	only (b) and (c) are correct	only (c) and (d) are correct	only (a) and (d) are correct	any other number or combination is correct

31. The correct statement / statements pertaining to reaction kinetics is/are

- a) It is the slowest step which determines the unit of the rate of a reaction.  
 b) Depending on the molecularity of the overall reaction, the unit of the rate constant is decided.  
 c) The overall rate of a reaction depends on the slowest step in a multi - step reaction.  
 d) If one of the reactants is not involved in the rate law of a reaction, the reaction cannot be a single step reaction.

32. The correct statement/ statements which is/ are true regarding the molecule of 4 - pentenal.

- a) It does not exhibit stereoisomerism.  
 b) The compound produced when it reacts with HBr is not found in enantiomeric forms  
 c) When it is reacted with  $CH_3MgBr$  followed by hydrolysis, a primary alcohol is obtained.  
 d) When it is treated with  $LiAlH_4$  and then water is added, a primary alcohol is obtained

33. Of the following statements about extraction of sodium by Down cell, the correct statement/ statements is are

- a) High current is used in this process.
- b) Titanium anode and nickel cathode are used.
- c)  $CaCl_2$  solid is added to  $NaCl$  solid and melted.
- d) A porous steel gauze diaphragm is used to protect the contact of Na with  $Cl_2$ .

34. The solution/solutions that can be a buffer is/are

- a)  $NaHSO_4(aq)$
- b)  $NaHPO_3(aq)$
- c)  $NaHCO_3(aq)$
- d)  $NaHC_2O_4$

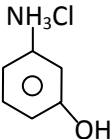
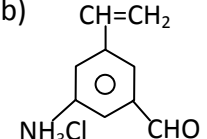
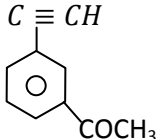
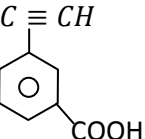
35. In which of the following electrolysis processes, the deposition of a metal at the cathode and the liberation of a gas at the anode would take place?

- a) Electrolysis of an aqueous  $AgNO_3$  solution using Ag anode.
- b) Electrolysis of dilute  $H_2SO_4$  solution using inert electrodes.
- c) Electrolysis of a mixture of molten  $NaCl$  and  $MgCl_2$  using inert electrodes.
- d) Electrolysis of an aqueous solution of  $CuSO_4$  using Pt electrodes.

36. Some tests carried out with the organic compound X and the observations are given below.

- When  $NaHCO_3(aq)$  is added, a colourless, odourless gas was evolved.
- When  $Br_2/H_2O$  is added, its orange colour was decolorized.
- Gave a white precipitate when Toller's reagent is added
- No observation with 2, 4 – DNPH.

The compound/ compounds that comply with the above observations is/are

- a)  b)  c)  d) 

37. The correct statement/ statements regarding nitric acid is/are

- a) Pure nitric acid is a pale yellow liquid.
- b) The N -O bond lengths in  $HNO_3$  are not all equal.
- c) In its reaction with conc.  $H_2SO_4$ , conc.  $HNO_3$  acts as a base.
- d) Nitric acid can act as a reducing agent.

38. The incorrect statement/ statements related to polymers is/are

- a) Terelene is a thermoplastic condensation polymer.
- b) Bakelite, urea formaldehyde and Teflon are thermosetting polymers.
- c) Polythene, PVC and polystyrene are thermoplastic linear polymers.
- d) Although Teflon is a thermosetting polymer, it can withstand high temperature due to the presence of halogen.



39. Among the statements about gases which is/are true?

- a) At room temperature and atmospheric pressure, the compressibility factor ( $z$ ) of  $H_2$  gas is greater than unity.
- b) At Boyle's Temperature, real gases conform to ideal gas behaviour for a greater range of pressure
- c) Van - der - waal's equation cannot be used for ideal gases
- d) When  $Z > 1$ , the gas can be compressed more easily than an ideal gas.

40. Which of the following statement/statements regarding some chemical industrial processes carried out in Sri Lanka is/ are true?

- a) In the manufacture of bleaching powder,  $Cl_2$  gas is allowed to react with solid quick lime
- b) In the extraction of sodium by Down cell method, the cathode and anodic compartments are separated so as to avoid the reaction of Na with  $Cl_2$
- c) In the production of urea the starting materials are  $NH_3$  and  $CO_2$
- d)  $K_2CO_3$  may be produced by Solvay process.

❖ Instructions for questions 41 to 50

Response	First statement	Second statement
(1)	True	True and correctly explains the first statement.
(2)	True	True, but does not explain the first statement correctly
(3)	True	False
(4)	False	True
(5)	False	False

Statement I	Statement II
41. When a non - volatile solute is dissolved in a volatile solvent, vapour pressure of the solvent decreases.	The molar mass of the non - volatile solute cannot be determined using the depression in vapour pressure.
42. A Grignard's reagent can be produced by the reaction of $\begin{array}{c} \text{CH}_2 - \text{CH}_2 - \text{CHO} \\   \\ \text{Cl} \end{array}$ with Mg in dry ether.	If an acidic hydrogen is present in the compound, it will react with Grignard's reagent.
43. Addition of $\text{He}_{(g)}$ into the equilibrium system $\text{A}_{2(g)} + 3\text{B}_{2(g)} \rightleftharpoons 2\text{AB}_{3(g)}$ will drive the equilibrium position to the right.	When $\text{He}_{(g)}$ is inserted in to the equilibrium system, partial pressures of $\text{A}_{2(g)}$ and $\text{B}_{2(g)}$ increases in a constant volume
44. When an aqueous solution containing $\text{Cu}^{2+}$ and $\text{Ni}^{2+}$ ions is treated with $\text{OH}^-/\text{H}_2\text{S}$ , only NiS will get precipitated	As $\text{S}^{2-}$ ion concentration in $\text{OH}^-/\text{H}_2\text{S}$ is high, $\text{CuS}$ will not be precipitated.
45. Unlike alkyl halides, vinyl chloride and chlorobenzene do not easily undergo nucleophilic substitution reactions.	Due to resonance, the bond between carbon and chlorine in these compounds shows a partial double bond character.
46. Spontaneous reactions occurring in an isolated system always take place with an increase in entropy.	The overall effect of $\Delta H$ and $\Delta S$ is given by the Gibb's free energy change $\Delta G$ .
47. The temperature of $\text{He}$ gas molecules having the same mean speed as that of $\text{O}_2$ gas molecules must be smaller.	The distribution of mean speed of gas molecules depends on their molar mass and the temperature.
48. In contact process for the manufacture of sulphuric acid, high pressure is employed to get higher yield.	The reaction $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$ occurs with a decrease in the number of moles
49. 2 - methylbut - 2 - ene does not exhibit diastereoisomerism.	All three dimensional structures which are not the mirror images of each others are called diastereoisomers.
50. The boiling point of an ideal solution shows a uniform linear variation with its composition.	In an ideal solution, the attractive forces between different species is equal to that between the species of individual components.