බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
மேல் மாகாணக் கல்வித் திணைக்களம்
Department of Education - Western Province

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය **2026** උපකාරක ප්‍රශ්න පත්‍රය
General Certificate of Education (Adv. Level) Exam

රසායන විද්‍යාව I Chemistry I	**2** **E** **I**	**13** ශ්‍රේණිය **Grade 13**	*පැය දෙකයි* ***Two hour***

Universal gas constant	$R = 8.314\ J\ K^{-1}\ mol^{-1}$	Planck's constant	$h = 6.626 \times 10^{-34}\ J\ s$
Avogadro constant	$N_A = 6.022 \times 10^{23}\ mol^{-1}$	Speed of light	$c = 3 \times 10^{8}\ m\ s^{-1}$

Instructions:

* This question paper has **10** pages.
* A periodic table is provided
* Answer all questions.
* **Use of calculators is not allowed.**
* Write your exam number in the given space on the answer sheet.
* Read the other instructions given at the back of the answer sheet carefully.
* For each question from 1 to 50, select the correct or most appropriate answer from the answers (1), (2), (3), (4), (5) and mark it with a cross (x) as per the instructions on the back of the answer sheet.

1. According to the history of the atom, the scientists who made the following discoveries are respectively?

   a) determination of e / m (charge / mass) ratio of the electron

   b) discovery of the neutron

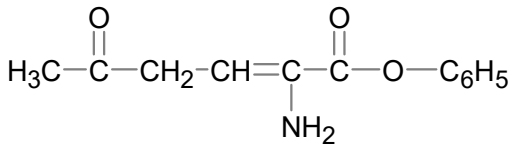
   c) discovery of the mass number

   1)Millikan, Chadwick, Aston
   2)Thomson , Chadwick, Aston
   3)Millikan, Bohr, Mosely
   4)Thomson, Chadwick, Mosely
   5)Thomson, Millikan, Rutherford

2. Which of the following is not a suitable set of quantum numbers for an electron belonging to the Cr^{3+} ion ? (in the order of { n, l, m_l, m_s})

   1) {3, 2, 0, +1/2}
   2) {3, 2, -1, +1/2}
   3) {3, 2, -2, +1/2}
   4) {4, 0, 0, +1/2}
   5) {3, 1, -1, +1/2}

3. What is the correct IUPAC name of the following molecule ?



   1) 2-amino-5-oxophenoate
   2) 2-amino-5-oxo-2-hexenphenoate
   3) hexyl 2-amino-5-oxo-2-hexenphenoate
   4) phenyl 2-amino-5-oxo-2-hexenoate
   5) phenyl 2-amino-5-oxo-2-hexanoate

4. The correct order of increasing radii of Cl^-, O^{2-}, Al^{3+}, Na^+ is?

   1) $Al^{3+} < O^{2-} < Cl^- < Na^+$
   2) $Na^+ < Al^{3+} < O^{2-} < Cl^-$
   3) $Al^{3+} < Na^+ < Cl^- < O^{2-}$
   4) $Al^{3+} < Na^+ < O^{2-} < Cl^-$
   5) $Na^+ < Al^{3+} < Cl^- < O^{2-}$

5. The correct order of increasing boiling points of the following series of compounds is?

$H_3CCH_2CH_2Cl$, $H_3CCH_2CH_2OH$, H_3CCH_2COOH, $H_3C-\overset{O}{\overset{\|}{C}}H$

1) $H_3C-\overset{O}{\overset{\|}{C}}H < H_3CCH_2CH_2OH < H_3CCH_2COOH < H_3CCH_2CH_2Cl$

2) $H_3CCH_2CH_2OH < H_3C-\overset{O}{\overset{\|}{C}}H < H_3CCH_2COOH < H_3CCH_2CH_2Cl$

3) $H_3CCH_2CH_2Cl < H_3C-\overset{O}{\overset{\|}{C}}H < H_3CCH_2CH_2OH < H_3CCH_2COOH$

4) $H_3C-\overset{O}{\overset{\|}{C}}H < H_3CCH_2CH_2OH < H_3CCH_2CH_2Cl < H_3CCH_2COOH$

5) $H_3CCH_2COOH < H_3CCH_2CH_2OH < H_3C-\overset{O}{\overset{\|}{C}}H < H_3CCH_2CH_2Cl$

6. Samples of AgCl(s) and $PbCl_2$(s) were dissolved by stirring in a solution of x mol dm^{-3} $MgCl_2$ (aq) until become saturated. The ratio $[Ag^+ (aq)] : [Pb^{2+} (aq)]$ of this solution is?

$$AgCl_{(s)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)} : K_{sp_1}$$
$$PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)} : K_{sp_1}$$

1) $K_{sp1} : K_{sp2}$ 2) $K_{sp1} : K_{sp2} / 2$ 3) $2K_{sp1} : K_{sp2}$
4) $K_{sp1} : 4K_{sp2}$ 5) $4K_{sp1} : K_{sp2}$

7. The order of increasing electronegativity of N in the compounds NO_2, NO_2^- , NO_3^- and NH_4^+ is?

1) $NH_4^+ < NO_2^- < NO_2 < NO_3^-$
2) $NO_3^- < NO_2 < NO_2^- < NH_4^+$
3) $NO_2 < NH_4^+ < NO_2^- < NO_3^-$
4) $NO_3^- < NO_2^- < NH_4^+ < NO_2$
5) $NH_4^+ < NO_2 < NO_2^- < NO_3^-$

8. what is the volume required from 0.5 mol dm^{-3} XO_3^- (aq) solution in order to completely react with 20 cm^3 of 0.2 mol dm^{-3} FeC_2O_4 solution in acidic medium? (XO_3^- reduces to X^{2+} during the reaction)

1) 12 cm^3 2) 5.3 cm^3 3) 8 cm^3 4) 16 cm^3 5) 5.24 cm^3

9. which of the following group of species shows the octahedral geometry?

1) SO_3^{2-} , XeF_2, PO_4^{3-} 2) XeF_2^{2-}, ICl_5, SF_6 3) SO_4^{2-} , PO_4^{3-} , SF_6
4) XeF_2, SO_4^{2-}, PO_4^{3-} 5) PO_4^{3-} , SF_6, $BrCl_5$

10. what is the order of increasing pH of the following solutions?

A : - solution prepared by mixing 25 cm^3 of 0.2 mol dm^{-3} CH_3NH_2 and 25 cm^3 of distilled water

B : - solution prepared by mixing 25 cm^3 of 0.2 mol dm^{-3} CH_3NH_2 and 25 cm^3 of 0.2 mol dm^{-3} NH_4OH

C : - solution prepared by mixing 25 cm^3 of 0.2 mol dm^{-3} CH_3NH_2 and 25 cm^3 of 0.2 mol dm^{-3} NH_4Cl

D : - solution prepared by mixing 25 cm^3 of 0.2 mol dm^{-3} CH_3NH_2 and 25 cm^3 of 0.2 mol dm^{-3} HCl

1) A < B < C < D 2) B < A < C < D 3) D < C < B < A
4) D < C < A < B 5) A < D < C < B

11. When two liquids A and B are mixed in a mole ratio 3 : 1 to form an ideal binary solution and allowed the liquid - vapor phases to reach equilibrium in a closed vessel, which of the following statement is **true** ? ($P^0_A > P^0_B$)

X_A, X_B : mole fractions of A and B in liquid phase respectively.

Y_A, Y_B : mole fractions of A and B in gas phase respectively.

1) $X_A = 3/8$ and $X_B = 5/8$ ක්.
2) $X_B < Y_A$ and $X_A < Y_B$
3) $X_A < Y_A$ and $Y_B < X_B$
4) $X_A = Y_A$ and $X_B = Y_B$
5) $Y_A < X_A$ and $Y_B < X_B$

12. The K_D for compound X between two immiscible liquids P and Q is 25 at 25 °C . If 50 cm^3 of solution P containing 0.5 moles of X is placed to reach equilibrium with 50 cm^3 of Q, what is the percentage of X that entered into Q?

1) 0.4 %
2) 4 %
3) 40 %
4) 6 %
5) 60 %

13. A pair of cations, P and Q, show the following observations:

I.Gives a yellow solution with concentrated HCl. .

II.Gives a deep blue solution with concentrated NH_3.

P and Q could be, respectively:

1) Co^{2+} and Cu^{2+}
2) Co^{2+} and Ni^{2+}
3) Cr^{3+} and Cu^{2+}
4) Cr^{3+} and Ni^{2+}
5) Cu^{2+} and Ni^{2+}

14. 500 cm^3 of 0.5 mol dm^{-3} HA (aq) is mixed with 100 cm^3 of CCl_4 solution. When the system reaches equilibrium, a 25 cm^3 portion taken from the aqueous phase required 25 cm^3 of 0.1 mol dm^{-3} NaOH for titration. What is the distribution coefficient of HA between aqueous and CCl_4 phases?

1) 0.2
2) 2.0
3) 20
4) 40
5) 200

15. Which of the following reactions of the compound CH_3CH_2CHO yields a product with an asymmetric carbon atom?

1) $LiAlH_4$ / Dry ether
2) Reaction with $AgNO_3$ / NH_3
3) Reaction with $CH_3CH_2NH_2$
4) 1. CH_3CH_2MgBr / ether
   2. H_3O^+
5) Reaction with HCN

16. The mechanism for the reaction $2NO_{(g)} + 2H_{2(g)} \rightleftharpoons N_{2(g)} + 2H_2O_{(g)}$ is given below:

$2NO(g) \rightleftharpoons N_2O_2(g)$: $fast$

$N_2O_2(g) + H_2(g) \longrightarrow N_2O\,(g) + H_2O(g)$: $slow$

$N_2O\,(g) + H_2(g) \longrightarrow N_2(g) + H_2O\,(g)$: $fast$

The rate law for the above reaction is ?

1) $R = k[NO(g)]\,[H_2(g)]$
2) $R = k[NO(g)]^2$
3) $R = k[NO(g)]^2\,[H_2(g)]$
4) $R = k\,[H_2(g)]^2$
5) $R = k[NO(g)]^2\,[H_2(g)]^2$

17. When 10 ml of 0.1 mol dm^{-3} NaOH is added to a 100 ml volume of a 0.11 mol dm^{-3} solution of an indicator HIn, the final pH of the final solution was 5. What could be the pH range of the indicator?

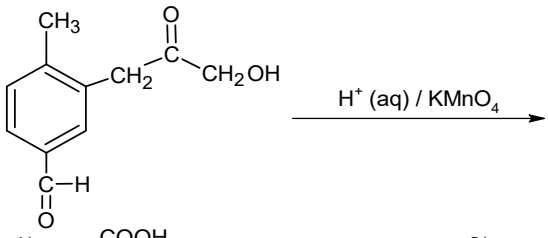
1) 4 - 6
2) 5 - 7
3) 3 - 5
4) 3 - 6
5) 4 - 7

18. For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ ΔH^0 = -92 kJ mol^{-1} and ΔS^0 = -200 J mol^{-1} K^{-1}. Which statement regarding this reaction is **true**?

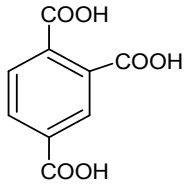
1) Entropy increases during the forward reaction.
2) It is not spontaneous at 27 ℃
3) It is not spontaneous at 527 ℃ .
4) Spontaneity increases at high temperatures.
5) Spontaneity is determined by the activation energy.

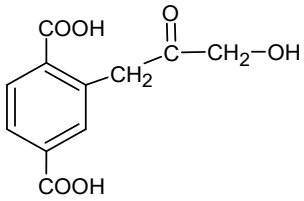
19. Which of the following statements regarding d-block is **incorrect**?

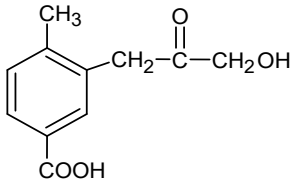
1) MnO_3 is an acidic oxide, while MnO_2 is a basic oxide.
2) Cr is the element with highest unpaired electrons in the 3d-block.
3) When NH_4OH is added to an aqueous solution containing Fe^{3+} and Fe^{2+} , both precipitate.
4) When either dilute NH_3 or dilute NaOH is added to $ZnCl_2$ (aq), a white precipitate is obtained.
5) Among 3d transition elements, V element has the highest melting point.

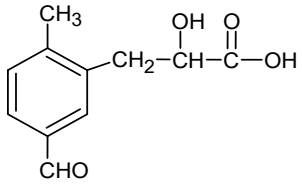
20. 

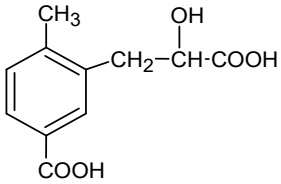
The major product of this reaction is?

1) 

2) 

3) 

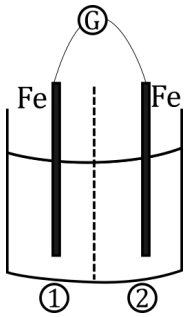
4) 

5) 

21. If $Hg(l) \longrightarrow Hg(s)$ ΔH = -2.4 kJ mol^{-1} , the change in enthalpy in kJ when 80 g of Hg (s) melts is? (Hg = 200)

1) -4.8 2) -9.6 3) 9.6 4) -0.96 5) 0.96

22. The following diagram shows two iron rods immersed in a $FeSO_4$ solution separated by an ion-permeable membrane, connected at the top through a galvanometer by a wire. The section containing the first electrode was diluted with water in a 1:5 ratio. Which of the following statements regarding this cell is **true**?

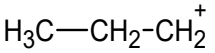
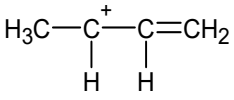
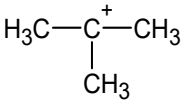
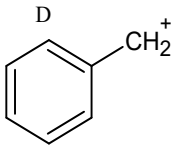
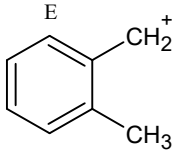


Fe^{2+} (aq) / Fe(s) = - 0.76 V

O_2 (g) / OH^- (aq) | Fe (s) = +0.26 V

1) Here, electrode (1) is the anode.
2) The electromotive force of this cell is 1.02 V.
3) The concentration of Fe^{2+} at electrode (2) increases.
4) The cell reaction for this cell is $2Fe^{2+}(aq) + 4OH^-(aq) \longrightarrow 2Fe(s) + O_2(g) + 2H_2O(l)$
5) The cathode reaction of this cell is $2H_2O(l) \longrightarrow O_2(g) + 4H^+(aq) + 4e$

23. The order of increasing stability of following carbocations is?

A  B  C  D  E 

1)A < B < C < D < E
2)B < A < C < D < E
3)E < D < A < B < C
4)A < C < B < D < E
5)D < E < C < A < B

24. The saturated vapor pressures of A (l) and B(l) are respectively 4×10^4 Pa and 6×10^4 Pa . When an equimolar mixture of these two liquids is subjected to fractional distillation, what is the mole percentage of A in the resulting distillate?

1) 40 % 2) 50 % 3) 60 % 4) 70 % 5) 80 %

25. 0.15 mol of N_2O_4 gas was placed in a 1 dm^3 closed rigid vessel and allowed to reach the equilibrium $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ At equilibrium, the total pressure was found to be 9 x 10^5 Nm^{-2}. Which of the following statements regarding the equilibrium system is **incorrect**?

1) At equilibrium, the partial pressure of NO_2 gas is 8×10^5 Nm^{-2} ගේ.
2) For the equilibrium system, $K_P = 6.4 \times 10^6$ Nm^{-2} ගේ.
3) For the equilibrium system, $K_C = 1.9$ mol dm^{-3} ගේ.
4) The equilibrium system has shifted towards the right side.
5) The percentage of N_2O_4 that reacted is 20 % .

26. Which of the following is **false** about sulfuric acid industry?

1) The first step is the combustion of deposited S or S^{2-} in air.
2) Both the formation of SO_2(g) via $S(s) + O_2(g) \longrightarrow SO_2(g)$ and the formation of SO_3 (g) via $SO_2(g) + O_2(g) \longrightarrow SO_3(g)$ is exothermic.
3) To obtain SO_3(g) via $SO_2(g) + O_2(g) \longrightarrow SO_3(g)$, SO_2(g) is passed through a metal chamber consisting of four compartments.
4) This reaction is accelerated by the catalyst V_2O_5 .
5) Dissolving the formed SO_3(g) in oleum is more efficient. .

27. For the reaction $2A(g) \rightleftharpoons B(g) + C(g)$ occurring at 27 °C , the forward rate constant is 1×10^{-2} s^{-1} and the backward rate constant is 2×10^{-2} mol^{-1} dm^3 s^{-1} . When the initial concentrations of A, B, and C are 5 mol dm^{-3} each, which of the following is **true** regarding the reaction?

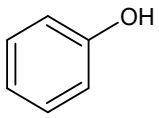
1) It is a single step reaction.
2) The order of the reaction with respect to A is 2
3) The initial rate of the forward reaction is 0.25 mol dm^{-3} s^{-1} .
4) The order of the reaction with respect to A could be 2.
5) The order of the reaction with respect to C is zero.

28. Which of the following statements regarding acid rain is **true**?

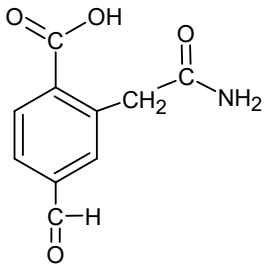
1) The dissolution of atmospheric CO_2, makes every rain an acid rain.
2) SO_2 and SO_3 gases contribute to acid rains as SO_x gases.
3) Only NO_2 is considered as NO_x .
4) NO is also a factor for acid rains to occur.
5) the CO_3^{2-} formed by the dissolution of CO_2 in rain water, makes the water basic.

29. The tests and observations performed for organic compound X are shown in the table below. What could X be?

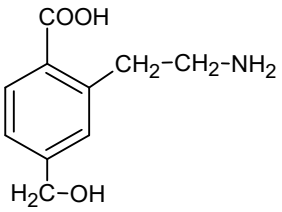
Reagent	**Observations**
1. Liquid Br_2	Brown color vanishes.
2. Metallic Na	A gas liberates
3. Adding NaOH (s)	System becomes hot.

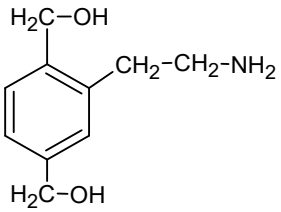
1) $H_3C-CH_2-C\equiv CH$
2) $H_3C-CH_2-CH_2-CHO$
3) H_3C-CH_2COOH
4) 

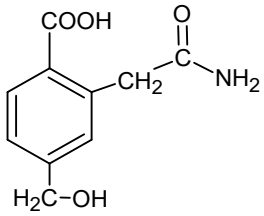
5) $H_3C-CH_2-CH_2-OH$

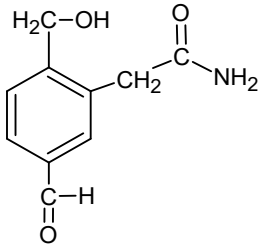
30. 

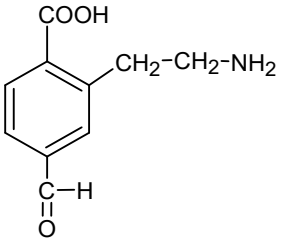
$\xrightarrow[\text{Butanol}]{\text{(i)}NaBH_4}$ The major product of this reaction is ?

1) 

2) 

3) 

4) 

5) 

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

(1) if only *(a)* and *(b)* are correct.

(2) if only *(b)* and *(c)* are correct.

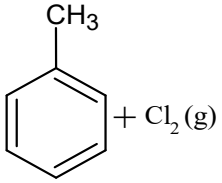
(3) if only *(c)* and *(d)* are correct.

(4) if only *(d)* and *(a)* are correct.

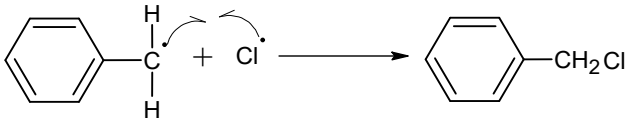
(5) if **any other** number or combination of responses is correct.

Summary of above Instructions

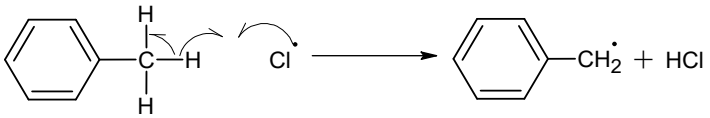
(1)	(2)	(3)	(4)	(5)
Only *(a)* and *(b)* are correct	Only *(b)* and *(c)* are correct	Only *(c)* and *(d)* are correct	Only *(d)* and *(a)* are correct	**Any other** number or combination of responses is correct

31. 

What is the correct statement(s) regarding the mechanism of the reaction that proceeds with reactants in 1 : 1 molar ratio.

a) 

forms

b) 

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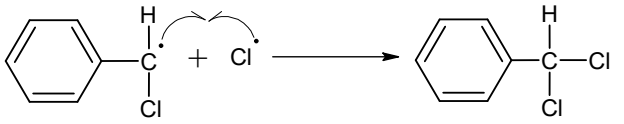
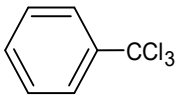
c) 

forms

d) 

Forms as the final product.

32. The true statement(s) regarding the s block is/are:

a) Electrolysis of molten salts is the most suitable method for the extraction of s-block metals.

b) $MgSO_4.\ 7H_2O$ is known as Epsom salt, a naturally occurring form of Mg.

c) A metal oxide is obtained as the product by the thermal decomposition of any oxide in s block.

d) The precipitation of the second group carbonates (CO_3^{2-}) as well as sulfates (SO_4^{2-}) increases down the group.

33. Which of the following statements is/are **correct** regarding equilibrium given below?

$$2H_2O(l) \rightleftharpoons H_3O^+(aq) + OH^-(aq)$$

a) It exists in any weakly basic solution.

b) Its entropy is zero

c) For any aqueous solution, [H_3O^+ (aq)] = [OH^- (aq)]

d) At temperatures higher than 25 °C, [H_3O^+ (aq)] [OH^- (aq)] $> 1 \times 10^{-14}$ mol^2 dm^{-6}

34. Which statement(s) is / are **true** about catalysts and their function?

a) When a catalyst is added, the average speed of the reactant molecules in the system increases.

b) When a catalyst is added, the equilibrium constants K_P and K_C of a reversible reaction increase.

c) When a catalyst is added, the rate constants of the reaction change.

d) A catalyst allows the reaction to proceed via an alternative pathway with a lower activation energy

35. Below equilibrium is reached at 100 °C

$$A(g) + B(g) \rightleftharpoons C(g) + D(s)\ ; \Delta H < 0$$

Which of the following is/are **correct** if the temperature of the equilibrium system is increased to 200°C ?

a) Initially, the rate of the forward reaction becomes greater than the rate of the backward reaction.

b) Initially, the rate of the backward reaction becomes greater than the rate of the forward reaction.

c) When a small amount of D is removed, the reaction rate remains unchanged.

d) When a small amount of D is removed, the forward reaction rate increases.

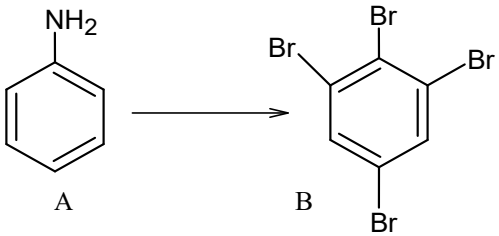
36. When the decomposition reaction $A(g) \longrightarrow B(g) + C(g)$ occurs in a closed system,

a) The temperature of the system increases.

b) The temperature of the surrounding decreases.

c) The entropy of the system increases.

d) The entropy of the surrounding decreases.

37. 

Which of the following expression(s) is/are **correct** regarding the required reagents and the process for the given synthesis?

a) $A \xrightarrow{NaNO_2/HCl} I_1 \xrightarrow{Br_2(l)} I_2 \xrightarrow{PBr_3} B$

b) $A \xrightarrow[(0-5)^0C]{NaNO_2/HCl} I_1 \xrightarrow{Br_2(l)} I_2 \xrightarrow{PBr_3} B$

c) $A \xrightarrow{Br_2(l)} I_1 \xrightarrow[(0-5)^0C]{NaNO_2/HCl} I_2 \xrightarrow{CuBr} B$

d) A white precipitate occurs during the synthesis.

38. Which of the following is\are **true**?

a) Under standard conditions, the heat released during the neutralization between 1 mol of HCl (aq) and NaOH (aq) is -57.3 kJ mol^{-1}

b) Under standard conditions, the heat released during the neutralization between 1 mol of H_2SO_4 (aq) and NaOH (aq) is -114.6 kJ mol^{-1}

c) the heat released during the neutralization between $Ca(OH)_2$ and 1 mol of H_2SO_4 is greater than -114.6 kJ mol^{-1}.

d) the heat released during the neutralization between $Ba(OH)_2$ and 1 mol of H_2SO_4 is greater than -114.6 kJ mol^{-1}

39. Which statement(s) is/are **true** regarding Teflon?

a) It contains double bonds.

b) It is formed by the addition polymerization of CHF = CHF .

c) It is a thermosetting polymer.

d) It is a network polymer

40. Which of the following can be used as a definition for a mole?

a) The number of electrons contained in one Faraday of charge is 1 mole.

b) The number of $^{12}{}_6C$ atoms in 12.00 g of the isotope $^{12}{}_6C$ is 1 mole.

c) The number of gas molecules in a volume of 22.4 dm^3 at 0 °C and under 1 atm is 1 mole.

d) The number of C atoms in 180 g of $C_6H_{12}O_6$ is 1 mole.

- In question Nos. **41** to **50**, two statements are given in respect of each question. From the Table given below, select the response, out of the responses (1), (2), (3), (4) and (5), that best fits the two statements and mark appropriately on your answer sheet.

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

	First statement	Second statement
41.	When the temperature of the equilibrium system $NO_2(g)$, $N_2O_4(g)$ at a certain temperature is increased, the red brown color of the system increases.	As the reaction $NO_2(g) \rightleftharpoons N_2O_4(g)$ is exothermic, the backward reaction speeds up at a higher temperature and increases the concentration of the $NO_2(g)$.
42.	C_2H_5OH can be obtained from $CH_3COOC_2H_5$ in a single step.	C_2H_5OH can be obtained by reacting the compound $CH_3COOC_2H_5$ with C_2H_5MgCl followed by hydrolysis.
43.	The ozone layer is protected by using HCFC s.	The compound HCFC is not harmful to the ozone layer.
44.	The bond angle of H_2O is higher than that of H_2S	The electronegativity of the central atom decreases down the group 16.

	First statement	Second statement
45.	The presence of NO_3^- can be assumed by the liberation of brown color gas when conc: H_2SO_4 is added to a solid ionic compound.	Only NO_3^- releases a brown color gas with H_2SO_4 (aq).
46.	When 0.5 mol of He is added to a system that contains $N_2(g)$ and $O_2(g)$ 0.5 moles each, the partial pressures of $N_2(g)$ and O_2 (g) decreases.	The mole fractions of N_2 and O_2 decreases when He is added to the system.
47.	The boiling point of propanoic acid is higher than the boiling point of propanal.	There are no hydrogen bonds in propanal.
48.	The pH of 0.1 mol dm^{-3} NH_4Cl solution at 25 °C is about 5.	NH_3 is a weak base and HCl is a strong acid.
49.	Bakelite is formed by the addition of phenol and formaldehyde in the presence of concentrated H_2SO_4	Bakelite is a network (cross-linked) polymer.
50.	When storing H_2O_2 in the laboratory, the solution is made slightly acidic.	The disproportionation of H_2O_2 is inhibited by acids and catalyzed by bases.

The periodic table

	1																2
1	H																He
	3	4											5	6	7	8	9	10
2	Li	Be											B	C	N	O	F	Ne
	11	12											13	14	15	16	17	18
3	Na	Mg											Al	Si	P	S	Cl	Ar
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	55	56	La-	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
6	Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	87	88	Ac-	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
7	Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

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