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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2025
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2025
General Certificate of Education (Adv. Level) Examination, 2025

රසායන විද්‍යාව I இரசாயனவியல் I **Chemistry I**	**02 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

* *This paper consists of* **09** *pages.*
* *Periodic Table printed on page* **10** *can be detached if necessary.*
* *Answer* ***all*** *the questions.*
* ***Use of calculators is not allowed.***
* *Write your* ***Index Number*** *in the space provided in the answer sheet.*
* *Follow the instructions given on the back of the answer sheet carefully.*
* *In each of the questions* **1** *to* **50**, *pick one of the alternatives from* (1), (2), (3), (4), (5) *which is* ***correct*** *or* ***most appropriate*** *and* ***mark your response on the answer sheet with a cross*** (×) ***in accordance with the instructions given on the back of the answer sheet.***

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

1. Which of the discoveries given below is Henry Becqueral best known for?
(1) wave-particle dual nature of matter (2) radioactivity (3) X-rays
(4) structure of the nucleus (5) neutrons

2. The maximum number of electrons that can exist in an atom with quantum numbers $n = 4$ and $l = 2$ in the ground state is
(1) 3 (2) 4 (3) 6 (4) 10 (5) 18

3. The examples to best denote H-bonds, ion-induced dipole interactions, dipole-induced dipole interactions and dipole-dipole interactions are respectively given by
(1) ortho-nitrophenol, I_2 in KI(aq), HCl/Ar, ClF
(2) ortho-nitrophenol, HCl/Ar, I_2 in KI(aq), ClF
(3) para-nitrophenol, ortho-nitrophenol, ClF, I_2 in KI(aq)
(4) para-nitrophenol, I_2 in KI(aq), ClF, HCl/Ar
(5) ortho-nitrophenol, ClF, I_2 in KI(aq), HCl/Ar

4. The correct order of increasing electronegativities of C in the chemical species, CH_2Cl_2, CH_4, COF_2 and CH_2F_2 is
(1) $CH_4 < CH_2Cl_2 < CH_2F_2 < COF_2$
(2) $CH_2Cl_2 < CH_4 < CH_2F_2 < COF_2$
(3) $CH_2Cl_2 < CH_4 < COF_2 < CH_2F_2$
(4) $COF_2 < CH_2F_2 < CH_2Cl_2 < CH_4$
(5) $CH_4 < CH_2Cl_2 < COF_2 < CH_2F_2$

5. At a given temperature, $A_2(g)$ and $B_2(g)$ in a molar ratio of 1:3 were introduced into a closed-rigid container. Then the following reaction takes place.

$$A_2(g) + 3B_2(g) \rightleftharpoons 2AB_3(g)$$

At equilibrium, total pressure of the system, partial pressure of $AB_3(g)$ and the equilibrium constant are P_T, P_{AB_3} and K_p respectively. At this temperature, if $P_{AB_3} <<< P_T$, the value of P_{AB_3} is

(1) $\frac{3^{3/2}K_P^{1/2}P_T^2}{4}$ (2) $\frac{3^{3/2}K_P^{1/2}P_T^2}{16}$ (3) $\frac{K_P^{1/2}P_T^2}{16}$ (4) $\frac{K_P^{1/2}P_T^2}{4}$ (5) $\frac{3^3K_P^{1/2}P_T^2}{16}$

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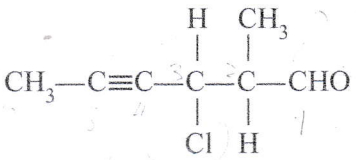
6. A description of the atoms **X** and **Y** is given below. **Y** is heavier than **X**.

Atom	X	Y
Number of protons	a	6
Number of neutrons	7	b
Number of electrons	6	c
Mass Number	d	e

Which of the following could be correct regarding **X** and **Y**?

(1) a = 7 b = 6 c = 6 d = 13 e = 14
(2) a = 6 b = 7 c = 6 d = 13 e = 14
(3) a = 6 b = 8 c = 6 d = 13 e = 14
(4) a = 7 b = 7 c = 6 d = 14 e = 13
(5) a = 6 b = 8 c = 7 d = 13 e = 14

7. What is the IUPAC name of the given compound?



(1) 4-chloro-5-methyl-2-hexynal
(2) 3-chloro-2-formyl-4-hexyne
(3) 4-chloro-5-formyl-2-hexyne
(4) 2-methyl-3-chloro-4-hexynal
(5) 3-chloro-2-methyl-4-hexynal

8. $CaCO_3$ and $Al_2(CO_3)_3$ undergo thermal decomposition as given below.

$$CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$$
$$Al_2(CO_3)_3(s) \longrightarrow Al_2O_3(s) + 3CO_2(g)$$

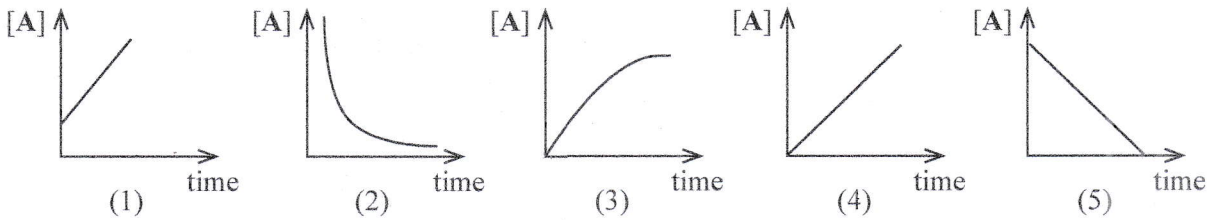
How much CO_2 is formed from $Al_2(CO_3)_3$ when 3.34 g of an equimolar mixture of $CaCO_3$ and $Al_2(CO_3)_3$ is thermally decomposed?
Relative molecular mass: $CO_2 = 44$, $CaCO_3 = 100$, $Al_2(CO_3)_3 = 234$

(1) 0.44 g (2) 1.32 g (3) 1.48 g (4) 1.76 g (5) 1.88 g

9. Which of the following species is **not** formed during the chlorination of methane in the presence of light?

(1) $\dot{C}H_3$ (2) $\dot{C}HCl_2$ (3) CH_3CH_3 (4) CH_2Cl_2 (5) $\dot{H}$

10. Consider the unimolecular zero order reaction **A** → **P** at temperature *T*.
Which of the following graphs represents the variation of concentration of **A** with time at temperature *T*?



11. Identify the species which has a different shape from that of NCO^- ion.

(1) NO_2^+ (2) N_3^- (3) XeF_2 (4) CNO^- (5) SF_2

12. A volume of 25.00 cm^3 of 0.02 mol dm^{-3} KIO_3 solution was added to a titration flask. The solution was acidified with dil. H_2SO_4 and 15 cm^3 of 0.5 mol dm^{-3} KI solution was added. The liberated I_2 was titrated with a $Na_2S_2O_3$ solution using starch as the indicator. The volume of $Na_2S_2O_3$ solution required for the titration was 20.00 cm^3. The concentration of the $Na_2S_2O_3$ solution in mol dm^{-3} is

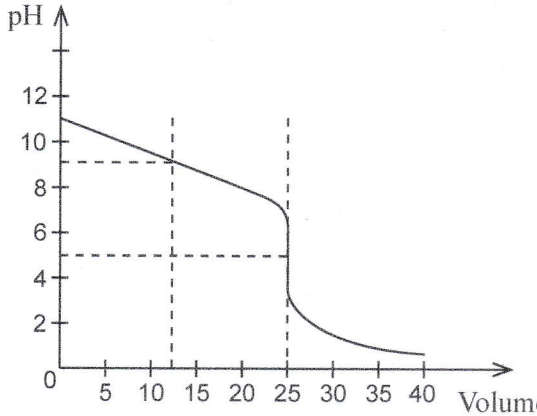
(1) 0.05 (2) 0.075 (3) 0.10 (4) 0.125 (5) 0.15

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13. Enthalpy change, ΔH for the dissolution of NaOH(s) in water at temperature 23 °C is -42 kJ mol^{-1}. An amount of 20 g of NaOH(s) was dissolved in 230 g of water at 23 °C in an insulated container. The specific heat capacity of the resulting solution is 4.2 J g^{-1} K^{-1}. What is the final temperature of the solution? (Neglect the heat exchange taking place with the container). H = 1, O = 16, Na = 23

(1) 20 °C (2) 21.7 °C (3) 42 °C (4) 43 °C (5) 44.7 °C

14. The titration curve for a titration of 25.00 cm^3 mono-protic base with mono-basic acid obtained at a given temperature is shown below.



SA: Strong acid
SB: Strong base
WA: Weak acid
WB: Weak base
MO: Methyl orange
MR: Methyl red
Ph: Phenolphthalein

Which of the following descriptions is correct for the above titration curve?

	Titration	Volume of the titrant at the end point (cm^3)	pH at the end point	Suitable indicator
(1)	WA + SB	12.50	5	MR
(2)	SA + WB	25.00	5	Ph
(3)	WA + WB	12.50	9	Ph
(4)	SA + SB	25.00	7	MO
(5)	SA + WB	25.00	5	MR

15. Which of the following reaction schemes is **not** suitable to prepare 1,2-dibromopropane?

(1) $CH_3\underset{\displaystyle OH}{\underset{|}{C}}HCH_3 \xrightarrow[\Delta]{\text{conc. } H_2SO_4} \xrightarrow{Br_2}$

(2) $CH_3\underset{\displaystyle OH}{\underset{|}{C}}HCOOH \xrightarrow[(2)\ H^+/H_2O]{(1)\ LiAlH_4/\text{dry ether}} \xrightarrow{\text{excess } PBr_3}$

(3) $CH_3C{\equiv}CH \xrightarrow[\text{quinoline}]{H_2/\text{Pd-BaSO}_4} \xrightarrow{Br_2}$

(4) $CH_3C{\equiv}CH \xrightarrow{\text{excess } Br_2} \xrightarrow{H_2/Pt}$

(5) $CH_3CH_2CH_2Br \xrightarrow{\text{alcoholic KOH}} \xrightarrow{Br_2}$

16. The reaction $H_2(g) + I_2(g) \longrightarrow 2HI(g)$ proceeds through a fast equilibrium step followed by a slow elementary step. The rate law for the slow elementary step is, rate $= k'[H_2(g)][I(g)]^2$. The rate constant is k'. Which of the following gives the rate law of the overall reaction in terms of $[H_2(g)]$ and $[I_2(g)]$? k is the rate constant of the overall reaction.

(1) $k[H_2(g)][I_2(g)]$ (2) $k[H_2(g)][I_2(g)]^2$ (3) $k[H_2(g)]^2[I_2(g)]$
(4) $k[H_2(g)][I_2(g)]^3$ (5) $k[H_2(g)]^3[I_2(g)]$

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17. The colours of AgBr(s) and AgI(s) are pale yellow and yellow, respectively. A solution of NaI(aq) was added to a test tube containing AgBr(s). When the contents in the test tube were stirred, its colour turned yellow. The following ideas were proposed to explain this observation.

I. The reaction, $AgBr(s) + I^-(aq) \longrightarrow AgI(s) + Br^-(aq)$ occurs.
II. K_{sp} of AgBr(s) > K_{sp} of AgI(s)
III. K_{sp} of AgBr(s) < K_{sp} of AgI(s)
IV. Concentration of $I^-(aq)$ is decreased.
V. Concentration of $Br^-(aq)$ is decreased.

Which of the above are correct with regard to this observation?

(1) I, III and V (2) I, IV and V (3) I, II and IV
(4) I, II and V (5) I, III and IV

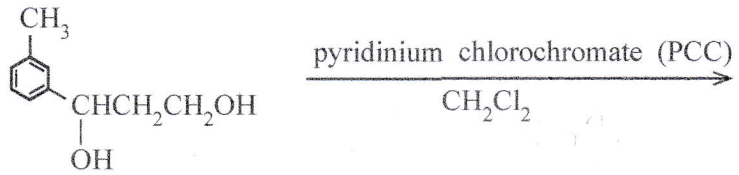
18. A small sample of water placed in a beaker at room temperature was found to have evaporated completely after 6 hours. Which of the following descriptions of this process is correct with respect to the water sample?

	ΔH	ΔS	ΔG
(1)	> 0	> 0	> 0
(2)	> 0	< 0	> 0
(3)	< 0	< 0	< 0
(4)	> 0	> 0	< 0
(5)	> 0	< 0	< 0

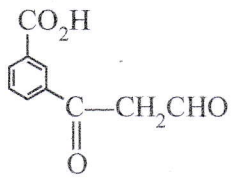
19. Which of the following statements is **incorrect** regarding *d*-block elements?

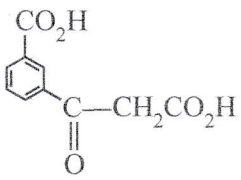
(1) VO is a basic oxide while V_2O_5 is an acidic oxide.
(2) In Mn_3O_4, manganese is present as a mixture of Mn(II) and Mn(III).
(3) When NH_4Cl/NH_4OH are added to an aqueous solution containing Fe^{3+} and Co^{2+}, only Fe^{3+} precipitates.
(4) The white precipitate formed on addition of dil. NaOH to $ZnCl_2(aq)$ is insoluble in dil. HCl.
(5) The first five elements of the 3*d* transition series achieve their maximum oxidation states by losing all 4*s* and 3*d* electrons.

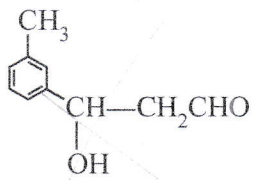
20. Consider the following reaction.

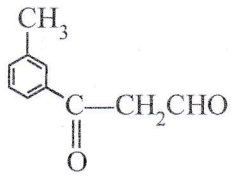


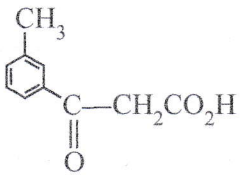
Which is the major product of this reaction?

(1) 

(2) 

(3) 

(4) 

(5) 

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21. Given that $Hg(s) \longrightarrow Hg(l)$, $\Delta H = 2.4$ kJ mol^{-1} and normal freezing point of Hg(l) = –38 °C, what is the entropy change (J K^{-1}) when 47 g of Hg(l) freezes at the normal freezing point? (Hg = 200)

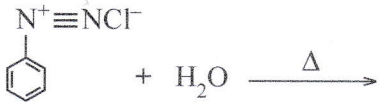
(1) 14.84 (2) 2.40 (3) –0.49 (4) –2.40 (5) –14.84

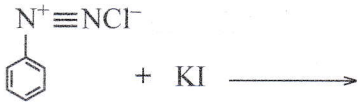
22. Which of the following statements regarding E°_{cell} and the flow of electrons is correct for the galvanic cell of Ni(s) | Ni^{2+}(aq, 1.0 mol dm^{-3}) || Cu^{2+}(aq, 1.0 mol dm^{-3}) | Cu(s), at 25 °C immediately after the electrodes are connected?

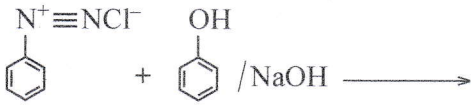
At 25 °C, $E^\circ_{Cu^{2+}/Cu} = 0.34$ V and $E^\circ_{Ni^{2+}/Ni} = -0.24$ V

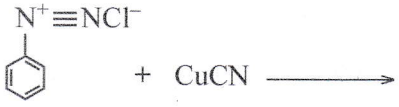
(1) Electrons flow from Ni-electrode to Cu-electrode and $E^\circ_{cell} = 0.58$ V
(2) Electrons flow from Ni-electrode to Cu-electrode and $E^\circ_{cell} = -0.58$ V
(3) Electrons flow from Ni-electrode to Cu-electrode and $E^\circ_{cell} = 0.10$ V
(4) Electrons flow from Cu-electrode to Ni-electrode and $E^\circ_{cell} = 0.58$ V
(5) Electrons flow from Cu-electrode to Ni-electrode and $E^\circ_{cell} = 0.10$ V

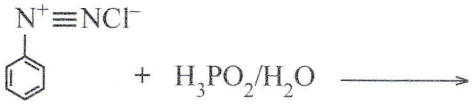
23. Identify the reaction in which the diazonium ion acts as an electrophile.

(1) 

(2) 

(3) 

(4) 

(5) 

24. At the temperature at which a pure liquid will boil when it is heated in an open container, the
(1) average kinetic energy of the liquid is equal to the average kinetic energy of its vapour.
(2) average kinetic energy of the liquid is equal to the molar-entropy of its vapour.
(3) entropy of the liquid is equal to the entropy of its vapour.
(4) entropy of the vapour above the liquid is equal to the entropy of the atmosphere.
(5) vapour pressure of the liquid is equal to the atmospheric pressure above the liquid surface.

25. Consider the following information for an electrochemical cell at 25 °C.

Half-reaction	**E°/V**
$Br_2(l) + 2e \rightleftharpoons 2Br^-(aq)$	1.065
$BrO_3^-(aq) + 6H^+(aq) + 5e \rightleftharpoons \frac{1}{2}Br_2(l) + 3H_2O(l)$	1.520

Which of the following correctly shows the overall cell reaction, the corresponding E°_{cell} and the number of electrons transferred?

Overall cell reaction	**E°/V**	**Number of electrons transferred in the overall reaction**
(1) $3Br_2(l) + 3H_2O(l) \rightleftharpoons 5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq)$	–0.460	5
(2) $6Br_2(l) + 6H_2O(l) \rightleftharpoons 10Br^-(aq) + 2BrO_3^-(aq) + 12H^+(aq)$	0.920	10
(3) $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightleftharpoons 3Br_2(l) + 3H_2O(l)$	0.460	10
(4) $3Br_2(l) + 3H_2O(l) \rightleftharpoons 5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq)$	–0.920	10
(5) $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightleftharpoons 3Br_2(l) + 3H_2O(l)$	0.460	5

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26. The following redox couples are given in the decreasing order of their reduction potentials.

$O_2(g)/H_2O(l)$, $Br_2(l)/Br^-(aq)$, $I_2(s)/I^-(aq)$, $H^+(aq)/H_2(g)$, $Cd^{2+}(aq)/Cd(s)$, $Fe^{2+}(aq)/Fe(s)$, $Zn^{2+}(aq)/Zn(s)$, $Al^{3+}(aq)/Al(s)$

Which of the following reactions will **not** take place spontaneously in an electrochemical cell?

(1) $Zn(s) + Cd^{2+}(aq) \longrightarrow Cd(s) + Zn^{2+}(aq)$

(2) $2Al(s) + 3Br_2(l) \longrightarrow 2Al^{3+}(aq) + 6Br^-(aq)$

(3) $2H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$

(4) $H_2(g) + I_2(g) \longrightarrow 2H^+(aq) + 2I^-(aq)$

(5) $2Al^{3+}(aq) + 3Fe(s) \longrightarrow 2Al(s) + 3Fe^{2+}(aq)$

27. **X** and **Y** are two compounds having the molecular formula $C_4H_8O_2$. The observations, when **X** and **Y** are reacted with three reagents are given in the following table.

Reagent	Observation	
	X	**Y**
Na metal	a gas evolved	a gas evolved
2, 4-dinitrophenylhydrazine	no precipitate	coloured precipitate
Br_2/H_2O	decolourised	no reaction

Which of the following pairs of structures could be **X** and **Y** respectively?

(1) $CH_3\underset{\displaystyle COOH}{\underset{|}{C}}HCH_3$ and $CH_3\underset{\displaystyle OH}{\underset{|}{C}}HCH_2CHO$

(2) $CH_2{=}CHCH(OH)CH_2OH$ and $CH_3C(=O)CH_2CH_2OH$

(3) $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}}HCOOH$ and $CH_3C(=O)CH(OH)CH_3$

(4) $HOCH_2CH_2CH_2CHO$ and $HOCH_2\underset{\displaystyle CH_2OH}{\underset{|}{C}}{=}CH_2$

(5) $HOCH_2CH{=}CHCH_2OH$ and $CH_3CH_2CH_2COOH$

28. Manganese(III) fluoride can be prepared according to the following reaction.

$$2MnI_2(s) + 13F_2(g) \longrightarrow 2MnF_3(s) + 4IF_5(l)$$

If the percentage yield is 80%, what is the mass of MnF_3 obtained when 0.10 moles of MnI_2 are reacted with excess F_2?

(F = 19, Mn = 55, I = 127)

$$\% \text{ yield} = \frac{\text{obtained mass}}{\text{theoretical mass}} \times 100\%$$

(1) 4.48 g (2) 7.44 g (3) 8.96 g (4) 9.20 g (5) 11.20 g

29. Consider the equilibrium reaction below taking place in a closed-rigid container at 300 K.

$$\mathbf{AB}(g) + \mathbf{CD_2}(s) \rightleftharpoons \mathbf{AD}(g) + \mathbf{BD}(g) + \mathbf{C}(s)$$

In an experiment carried out at 300 K it was found that 5% of **AB**(g) converted to **AD**(g) and the total pressure of the system at equilibrium was 10 atm. The equilibrium constant K_p of the system at 300 K is

(1) $\frac{(19\times10)}{21}$ (2) $\frac{10}{(19\times21)}$ (3) $\frac{0.10}{(19\times21)}$ (4) $\frac{19\times19\times10}{39}$ (5) $\frac{19\times19\times0.10}{39}$

[See page seven

30. The diagram-I below depicts the variation of rates with time of forward and backward reactions of an equilibrium reaction P ⇌ Q at a given temperature. At time *t*, when an additional amount of P is added to the system the change in rate of the forward reaction is also shown in diagram-I. Which line (*A*, *B*, *C*, *D* or *E*) in diagram-II shows the change in the rate of the backward reaction?

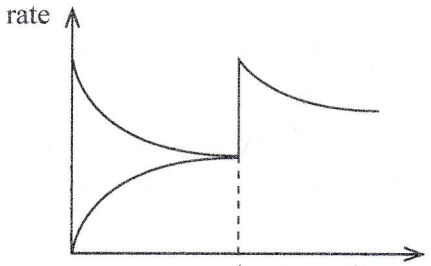


diagram-I

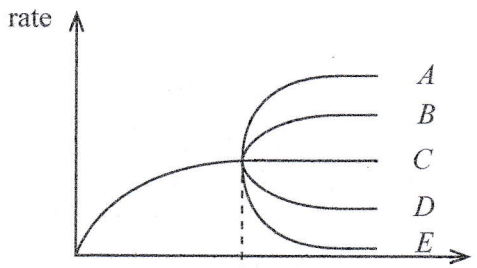


diagram-II

(1) *A* (2) *B* (3) *C* (4) *D* (5) *E*

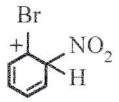
● For each of the questions **31** to **40**, one or more responses out of the four responses (*a*), (*b*), (*c*) and (*d*) given is/are correct. Select the correct response/responses. In accordance with the instructions given on your answer sheet, mark

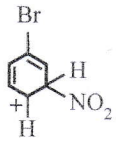
(1) if only (*a*) and (*b*) are correct.
(2) if only (*b*) and (*c*) are correct.
(3) if only (*c*) and (*d*) are correct.
(4) if only (*d*) and (*a*) are correct.
(5) if **any other** number or combination of responses is correct.

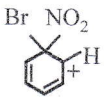
Summary of above Instructions

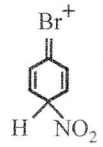
(1)	(2)	(3)	(4)	(5)
Only (*a*) and (*b*) are correct	Only (*b*) and (*c*) are correct	Only (*c*) and (*d*) are correct	Only (*d*) and (*a*) are correct	**Any other** number or combination of responses is correct

31. Consider the mechanism of the nitration of bromobenzene with conc. HNO_3/conc. H_2SO_4. Which of the following structure/structures represent/s the ion/ions formed during this reaction?

(*a*) 

(*b*) 

(*c*) 

(*d*) 

32. At a given temperature the following equilibrium exists in a closed-rigid container.

$$CO(g) + 2O_2(g) \rightleftharpoons 2CO_2(g) : \Delta H < 0$$

Which of the following statements is/are correct for this system?

(*a*) Adding more $CO_2(g)$ at the same temperature increases the amount of CO(g) with a change in the value of the equilibrium constant.
(*b*) Increasing the temperature of the system increases the amount of CO(g) with a decrease in the value of the equilibrium constant.
(*c*) Adding more CO(g) at the same temperature increases the amount of $CO_2(g)$ without a change in the value of the equilibrium constant.
(*d*) Adding more $CO_2(g)$ at the same temperature increases the amount of $O_2(g)$ with an increase in the value of the equilibrium constant.

33. The following statements refer to industrial processes. Which of them is/are correct?

(*a*) A catalyst is not required in the manufacture of NH_3 by the Haber-Bosch process.
(*b*) Citric acid is used in the purification of soap.
(*c*) In the extraction of Mg by the Dow process, CO_2 is added to the atmosphere only by the thermal decomposition of limestone or dolamite.
(*d*) HCl is the main by-product in the manufacture of NaOH using the membrane cell method.

[*See page eight*

39. Which of the following statements is/are correct regarding hydrogen halides?
(*a*) Hydrogen halides are acidic in water.
(*b*) The bond dissociation energies of hydrogen halides decrease when going down the group.
(*c*) The acidic strength of hydrogen halides decreases when going down the group.
(*d*) The bond length of hydrogen halides decreases when going down the group.

40. Which of the following statements is/are true regarding the production of H_2SO_4 by the contact process?
(*a*) The reaction $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is endothermic.
(*b*) Fe is the commonly used catalyst for this process.
(*c*) SO_2 is converted to SO_3 in four catalytic chambers.
(*d*) In this process pressures greater than 1 atm are not utilized.

● 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.	Among the elements of the second period of the Periodic Table, the electron gain energy of N and Be have a positive value.	Half filled shells and completely filled shells have a higher stability than other electron configurations.
42.	Ketones cannot be prepared from the reaction between esters and Grignard reagents.	Ketones react much faster than esters with Grignard reagents.
43.	In an evacuated closed-rigid container water boils at a temperature below 100 °C.	When the external pressure is low it is easy for water molecules to be released from the liquid phase to the vapour phase.
44.	The bond angles of H_2O, H_2S and H_2Se decrease in the order $H_2O > H_2S > H_2Se$.	The electronegativity of the central atom of H_2O, H_2S and H_2Se decreases in the order O > S > Se.
45.	Atmospheric water vapour contributes to global warming.	Water vapour is a greenhouse gas.
46.	For water, enthalpy of fusion ΔH_{fus} is less than the enthalpy of vaporization ΔH_{vap}.	Water molecules move further apart during fusion compared to vaporization.
47.	CH_3COCl reacts with excess aqueous NaOH to form $CH_3COO^-Na^+$.	During the reaction of an acid chloride with aqueous NaOH a tetrahedral intermediate is formed.
48.	Solubility of $Cu(OH)_2(s)$ at pH = 5 is higher than that at pH = 10.	In acidic solutions OH^- gets neutralized.
49.	In the production of Na_2CO_3 industrially, ammonification precedes carbonation.	When CO_2 is passed into an ammoniated (ammonified) brine solution, $(NH_4)_2CO_3$ is produced in high concentration.
50.	In acidic media, H_2O_2 can act as an oxidizing agent or a reducing agent, depending on the species it reacts with.	Out of the oxidation states oxygen exhibits, 0 is the most stable and abundant.

* * *

34. Which of the following statements is/are correct regarding *s*-block elements?

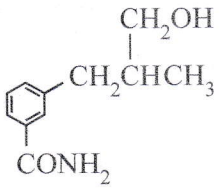
(*a*) The metallic radii of Group II elements are less than the metallic radii of the corresponding Group I elements.

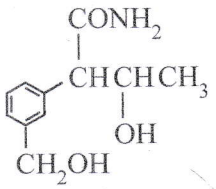
(*b*) The first ionization energies of Group II elements are greater than the first ionization energies of the corresponding Group I elements.

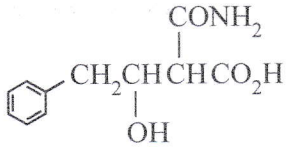
(*c*) The densities of Group II elements are lower than the densities of Group I elements.

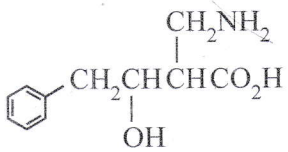
(*d*) Group II elements have weaker metallic bonds than Group I elements.

35. An organic compound **A** when heated with aqueous NaOH, liberates ammonia. The compound formed when **A** is heated with acidified $K_2Cr_2O_7$, gives a coloured precipitate with 2, 4-dinitrophenylhydrazine. Which of the following could be **A**?

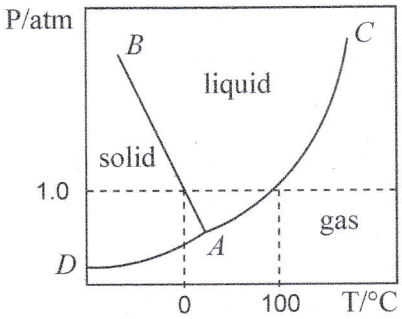
(*a*) 

(*b*) 

(*c*) 

(*d*) 

36. The phase-diagram of a pure substance **X** is shown below.



Which of the following statements is/are correct?

(*a*) The temperature needed to solidify the liquid decreases as the pressure increases.

(*b*) The freezing point of the liquid is higher than its normal freezing point at pressures above 1.0 atm.

(*c*) *A* is the triple point of **X**.

(*d*) At a temperature greater than 100 °C, a pressure above 1.0 atm is needed to liquefy the gas.

37. Which of the following statements is/are true about atmospheric ozone?

(*a*) The highest ozone concentration is at the ground level.

(*b*) Stratospheric ozone protects human life.

(*c*) Motor vehicle emissions contribute to the formation of ground level ozone.

(*d*) In the ozone layer, ozone is formed and destroyed in the presence of UV radiation.

38. The enthalpy change, ΔH, for the reaction given below at 25 °C is –126 kJ.

$$2Na_2O_2(g) + 2H_2O(l) \longrightarrow 2NaOH(aq) + O_2(g)$$

Which of the following statements about the enthalpy change is/are correct when a given amount of $Na_2O_2(s)$ is added to an excess of water at 25 °C?

(H = 1, O = 16, Na = 23)

(*a*) 63.0 kJ of energy is released when one mole of $Na_2O_2(s)$ is added.

(*b*) 31.5 kJ of energy is absorbed when 39 g of $Na_2O_2(s)$ is added.

(*c*) 63.0 kJ of energy is absorbed when one mole of $Na_2O_2(s)$ is added.

(*d*) 31.5 kJ of energy is released when 39 g of $Na_2O_2(s)$ is added.

[*See page nine*

The Periodic Table

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

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