සියලු ම හිමිකම් ඇවිරිණි /முழுப் பதிப்புரிமையுடையது/All Rights Reserved]

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව இலங்கைப் பரீட்சைத் திணைக்களம் Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2024
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2024
General Certificate of Education (Adv. Level) Examination, 2024

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 following chemical species is expected to have the **highest** boiling point?
(1) He (2) Ne (3) CH_4 (4) N_2 (5) CO

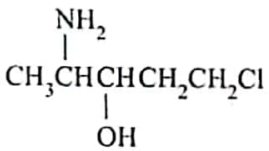
2. The orbital diagram in which both Aufbau principle and Hund's rule are violated is

	2*s*	2*p*
(1)	↑↓	↑↓ ↑ ○
(2)	↑	↑↓ ↑ ○
(3)	↑↓	↑ ↑ ↑
(4)	↑↓	↑↓ ↑ ↑
(5)	↑	↑↓ ↑ ↑

3. In an atom, how many orbitals can have the quantum numbers $n = 3$, $m_l = -1$ and $n = 4$, $m_l = -1$?
(1) 2 (2) 3 (3) 4 (4) 5 (5) 6

4. The de Broglie wavelengths of two particles **X** and **Y** are 1 nm and 3 nm respectively. If the mass of **X** is three times the mass of **Y**, the ratio of kinetic energies of **X** and **Y** (**X:Y**) would be
(1) 1 : 4 (2) 1 : 3 (3) 3 : 4 (4) 3 : 1 (5) 4 : 1

5. What is the IUPAC name of the following compound?



(1) 2-amino-5-chloro-3-pentanol
(2) 4-amino-1-chloro-3-pentanol
(3) 5-chloro-3-hydroxy-2-pentanamine
(4) 1-chloro-3-hydroxy-4-pentanamine
(5) 2-amino-5-chloro-3-hydroxypentane

6. At temperature 25 °C, the pH of a saturated solution of metal hydroxide $M(OH)_2$ is (K_{sp} of $M(OH)_2$ at 25 °C $= 4 \times 10^{-12}\ mol^3\ dm^{-9}$)
(1) 2 (2) 4 (3) 7 (4) 10 (5) 12

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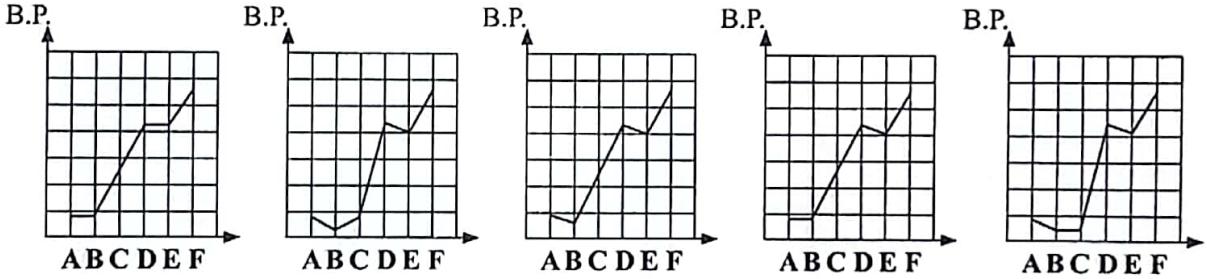
7. The shapes of IO_3^+, $NFCl_2$, F_3ClO_2 and F_4BrO^- are respectively
   (1) trigonal planar, trigonal pyramidal, square pyramidal and trigonal bipyramidal.
   (2) trigonal pyramidal, trigonal planar, square pyramidal and trigonal bipyramidal.
   (3) trigonal pyramidal, T-shape, trigonal bipyramidal and square pyramidal.
   (4) T-shape, trigonal planar, trigonal bipyramidal and square pyramidal.
   (5) trigonal planar, trigonal pyramidal, trigonal bipyramidal and square pyramidal.

8. Select the **incorrect** statement.
   (1) Among the chemical species NCl_3, SO_3 and PCl_5 the only polar species is NCl_3.
   (2) Among the elements Mg, Al, Si and P, the lowest first ionization energy is shown by Al.
   (3) Among the elements B, C and O, the lowest negative value for electron gain energy is shown by C.
   (4) Among the chemical species NO_3^-, SO_3, SO_3^{2-} and ClF_3, only NO_3^- and SO_3 have the same shape.
   (5) Among the ions Li^+, Na^+, Be^{2+} and Mg^{2+}, the largest difference in size is between Na^+ and Be^{2+}.

9. Consider the following compounds, **A**, **B**, **C**, **D**, **E** and **F**.

	$CH_3CH_2CH_2CH_2CH_3$	$CH_3CH(CH_3)CH_2CH_3$	$CH_3CH(CH_3)CHO$
	A	**B**	**C**
Relative Molecular Mass	72	72	72
	$CH_3CH_2CH_2CH_2OH$	$CH_3CH(CH_3)CH_2OH$	$CH_3CH_2CH_2CH_2CH_2OH$
	D	**E**	**F**
Relative Molecular Mass	74	74	88

The variation of boiling points (B.P.) of these compounds is approximately shown best by



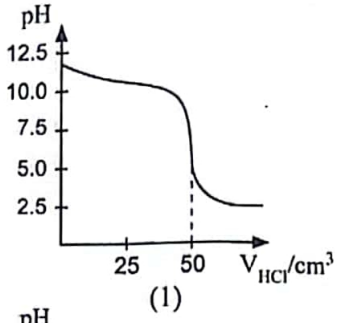
10. At a given temperature, a catalyst increases the rate of a reaction by
   (1) increasing the number of high energy collisions of reactant molecules.
   (2) increasing kinetic energy of reactant molecules.
   (3) increasing number of collisions among reactant molecules.
   (4) increasing the activation energy of the reaction.
   (5) providing a new pathway for the reaction.

11. $FeCl_3(s)$ reacts with $NH_3(g)$ and $H_2O(l)$ to produce $Fe(OH)_3$ and NH_4Cl.
   When 97.5 g of $FeCl_3(s)$, 34 g of $NH_3(g)$ and 27 g of $H_2O(l)$ are made to react, the maximum quantity of $Fe(OH)_3$ that can be obtained is
   (H = 1, N = 14, O = 16, Cl = 35.5, Fe = 56)
   (1) 21.3 g (2) 23.8 g (3) 53.5 g (4) 63.9 g (5) 71.3 g

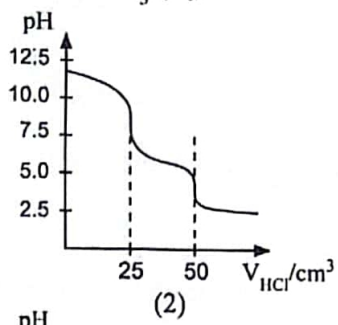
12. Bond energies of H—H, Cl—Cl and H—Cl are 436, 242 and 431 kJ mol^{-1} respectively. Enthalpy change (kJ mol^{-1}) of the reaction $\frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \longrightarrow HCl(g)$ is
   (1) −184 (2) −92 (3) 92 (4) 184 (5) 247

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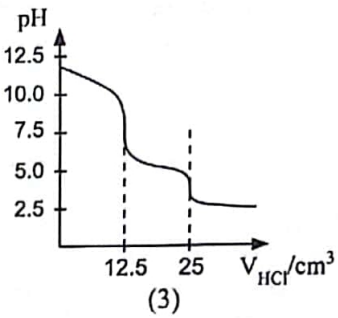
13. Which of the following figures correctly represents the titration curve when 0.100 mol dm^{-3} HCl(aq) is added to 25.00 cm^3 of 0.05 mol dm^{-3} CO_3^{2-}(aq) solution?



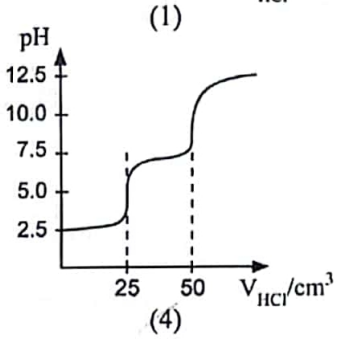
(1)



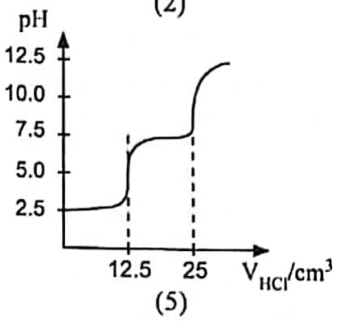
(2)



(3)

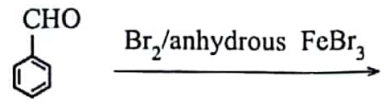


(4)

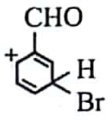


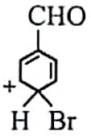
(5)

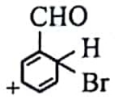
14. Consider the following reaction.

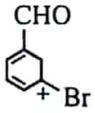


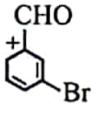
Which of the following is a resonance structure of the intermediate which gives the major product of the above reaction?

(1) 

(2) 

(3) 

(4) 

(5) 

15. Consider the reaction of $KMnO_4$(aq) with H_2O_2(l) in the presence of dilute H_2SO_4(aq). The correct co-efficients of the reactants when the chemical equation of the reaction is balanced with the smallest whole number co-efficients are

	MnO_4^-(aq)	H_2O_2(l)	H^+(aq)
(1)	2	3	10
(2)	2	4	6
(3)	2	5	6
(4)	2	5	8
(5)	2	5	16

16. A first-order gas phase reaction $A(g) \longrightarrow B(g) + C(g)$ occurs in a closed container at a given temperature. The half-life $\left(t_{1/2}\right)$ of the reaction is 20 s when the initial pressure is 100 kPa. The half-life of the reaction when the initial pressure is 200 kPa at the same temperature is

(1) 10 s (2) 20 s (3) 40 s (4) 400 s (5) 800 s

17. Consider the reactions shown below.

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g) \quad ; \quad \Delta H = -241.8 \text{ kJ mol}^{-1}$$

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l) \quad ; \quad \Delta H = -285.8 \text{ kJ mol}^{-1}$$

Enthalpy change of vaporization (kJ mol^{-1}) of water is

(1) −88 (2) −44 (3) 0 (4) 44 (5) 88

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18. When solutions of reactants **A** and **B** are mixed in a beaker, a spontaneous reaction takes place with the lowering of the temperature of the mixture. Which of the following is correct for the reaction between **A** and **B**?

	ΔH	ΔS
(1)	–	+
(2)	–	–
(3)	–	0
(4)	+	–
(5)	+	+

19. Select the correct statement with regard to the given reaction.

$CH_3NH_2(aq) + H_2O(l) \rightleftharpoons CH_3NH_3^+(aq) + OH^-(aq)$

(1) $CH_3NH_2(aq)$ behaves as a Lewis-acid in the forward reaction while $CH_3NH_3^+(aq)$ behaves as a Lewis-base in the reverse reaction.

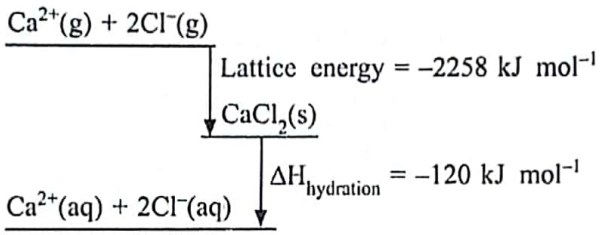
(2) $H_2O(l)$ behaves as a Lewis-base in the forward reaction while $OH^-(aq)$ behaves as a Lewis-base in the reverse reaction.

(3) $CH_3NH_2(aq)$ behaves as a Lewis-base in the forward reaction while $OH^-(aq)$ behaves as a Lewis-acid in the reverse reaction.

(4) $H_2O(l)$ behaves as a Lewis-acid in the forward reaction while $CH_3NH_3^+(aq)$ behaves as a Lewis-base in the reverse reaction.

(5) $CH_3NH_2(aq)$ behaves as a Lewis-base in the forward reaction while $OH^-(aq)$ behaves as a Lewis-base in the reverse reaction.

20. Consider the enthalpy diagram shown below.



The enthalpy change of hydration of $Ca^{2+}(g)$ is –1650 kJ mol^{-1}. The hydration enthalpy change of $Cl^-(g)$ (kJ mol^{-1}) is

(1) –728 (2) –364 (3) 364 (4) 728 (5) 2378

21. Consider the following reaction scheme.

$$CH_3C{\equiv}CH \xrightarrow[\text{Quinoline}]{H_2/Pd\text{-}BaSO_4} \mathbf{A} \xrightarrow[\text{(Peroxides)}]{HBr} \mathbf{B}$$

A and **B** respectively could be:

(1) $CH_3CH_2CH_3$ and $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_3$

(2) $CH_3CH{=}CH_2$ and $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_3$

(3) $CH_3CH_2CH_3$ and $CH_3CH_2CH_2Br$

(4) $CH_3CH{=}CH_2$ and $CH_3CH_2CH_2Br$

(5) $CH_3CH{=}CH_2$ and $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_2Br$

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22. At a given temperature, the reaction $3ClO^-(aq) \longrightarrow ClO_3^-(aq) + 2Cl^-(aq)$ occurs through the following mechanism.

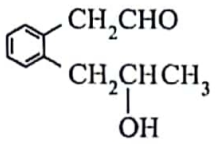
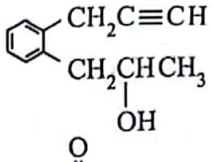
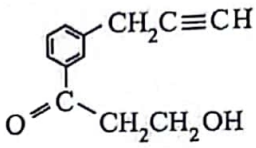
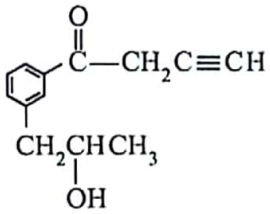
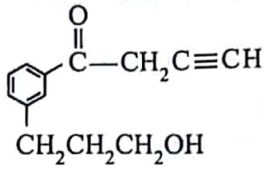
$ClO^-(aq) + ClO^-(aq) \longrightarrow ClO_2^-(aq) + Cl^-(aq)$ (slow)

$ClO_2^-(aq) + ClO^-(aq) \longrightarrow ClO_3^-(aq) + Cl^-(aq)$ (fast)

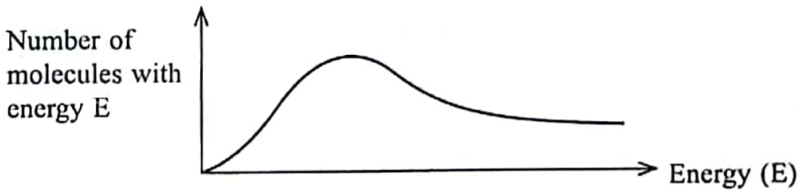
The rate law of this reaction is, (k = rate constant)

(1) rate = $k[ClO^-(aq)]$
(2) rate = $k[ClO^-(aq)]^3$
(3) rate = $k[ClO^-(aq)]^2$
(4) rate = $k[ClO_2^-(aq)]\,[ClO^-(aq)]$
(5) rate = $k[Cl^-(aq)]\,[ClO^-(aq)]$

23. Compound **A** forms a coloured precipitate with 2,4-dinitrophenylhydrazine (2,4-DNP). Compound **A** also forms a precipitate with ammoniacal $AgNO_3$.
Compound **A** reacts with acidified $K_2Cr_2O_7$ to give product **B** and a green colour solution.
Compound **B** does not dissolve in aqueous Na_2CO_3.
Compound **A** could be:

(1) 
(2) 
(3) 
(4) 
(5) 

24. At a given temperature the distribution of kinetic energies of molecules of a gas within a sealed container is shown in the following graph.



Some of the gas is removed and the container resealed; then the gas is cooled. Which of the following correctly describes the change in the graph?

	Area under the curve	**Position of the maximum point**
(1)	decrease	shift to the left
(2)	increase	shift to the left
(3)	no change	shift to the left
(4)	decrease	shift to the right
(5)	no change	no change

25. Consider the electrochemical cell operating at temperature 298 K given below.

$Zn(s) \mid Zn^{2+}(aq,\ 1.0\ mol\ dm^{-3}) \parallel Fe^{2+}(aq,\ 1.0\ mol\ dm^{-3}),\ Fe^{3+}(aq,\ 1.0\ mol\ dm^{-3}) \mid Pt(s)$

Which of the following gives the correct overall cell reaction and E^o_{cell}?

$E^o_{Zn^{2+}(aq)/Zn(s)} = -0.76$ V $\quad E^o_{Fe^{3+}(aq)/Fe^{2+}(aq)} = +0.77$ V

	Cell reaction	E^o_{cell} /(V)
(1)	$Zn(s) + 2Fe^{3+}(aq) \longrightarrow 2Fe^{2+}(aq) + Zn^{2+}(aq)$	1.53
(2)	$Zn(s) + 2Fe^{3+}(aq) \longrightarrow 2Fe^{2+}(aq) + Zn^{2+}(aq)$	−1.53
(3)	$Zn(s) + 2Fe^{3+}(aq) \longrightarrow 2Fe^{2+}(aq) + Zn^{2+}(aq)$	0.01
(4)	$Zn^{2+}(aq) + 2Fe^{2+}(aq) \longrightarrow 2Fe^{3+}(aq) + Zn(s)$	−1.53
(5)	$Zn^{2+}(aq) + 2Fe^{2+}(aq) \longrightarrow 2Fe^{3+}(aq) + Zn(s)$	−0.01

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26. Consider the reaction below taking place in a closed-rigid container at a given temperature.

$4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(g)$; $\Delta H = -900$ kJ mol^{-1}

Which of the following statements is true for this reaction?

(1) High pressure and high temperature give the highest equilibrium amount of NO(g).
(2) Low pressure and high temperature give the highest equilibrium amount of NO(g).
(3) High pressure and low temperature give the highest equilibrium amount of NO(g).
(4) Low pressure and low temperature give the highest equilibrium amount of NO(g).
(5) Changes in pressure and temperature have no effect on the equilibrium amount of NO(g).

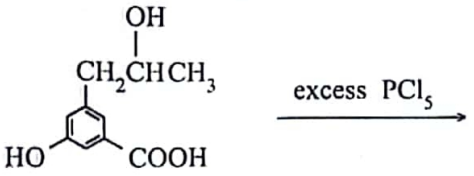
27. The following information is displayed on the label of a bottle which contains concentrated NH_3 solution.

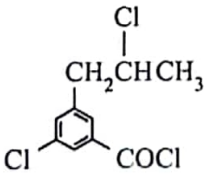
NH_3 content – 30.0% (by mass)
density – 0.850 g cm^{-3}

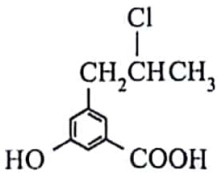
When 400.0 cm^3 of this NH_3 solution was reacted completely with H_2SO_4, the amount of ammonium sulfate that can be formed is
(H = 1, N = 14, O = 16, S = 32)

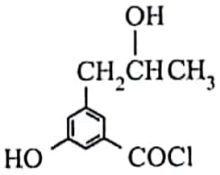
(1) 132 g (2) 396 g (3) 528 g (4) 792 g (5) 1584 g

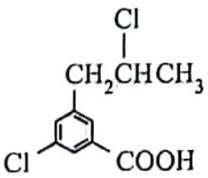
28. What is the major product of the following reaction?

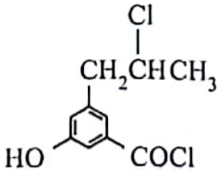


(1) 

(2) 

(3) 

(4) 

(5) 

29. A wood ash sample **X** contains $CaCO_3$, K_2CO_3, and an inert material. In **X** the molar ratio of $CaCO_3$:K_2CO_3 is 2:1. A 1.0 g sample of dry powdered **X** was reacted with excess HCl. The concentration and volume of HCl used was 0.30 mol dm^{-3} and 25.0 cm^3 respectively. After the reaction was completed, the remaining HCl was quantitatively collected and titrated with 0.10 mol dm^{-3} NaOH. The burette reading at the end-point was 15.0 cm^3. The percentage of $CaCO_3$ in the wood ash sample **X** is

(1) 10% (2) 16% (3) 20% (4) 24% (5) 40%

30. Consider the equilibrium reaction given below.

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ ($K_C = 50$ at temperature 600 °C)

Equal molar amounts of $H_2(g)$, $I_2(g)$ and HI(g) were inserted into a 2.0 dm^3 previously evacuated closed-rigid container at room temperature and the temperature was increased to 600 °C.
Which of the following will occur as the system reaches equilibrium?

(1) More $H_2(g)$ and $I_2(g)$ will be produced because $Q_C > K_C$ (Q_C = reaction quotient)
(2) Less $H_2(g)$ and $I_2(g)$ will be produced because $Q_C > K_C$
(3) More $H_2(g)$ and $I_2(g)$ will be produced because $Q_C < K_C$
(4) Less HI(g) will be produced because $Q_C < K_C$
(5) More HI(g) will be produced because $Q_C < K_C$

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- 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. Which of the following statements is/are correct regarding the experiment for determination of the order of the reaction between $Fe^{3+}(aq)$ and $I^-(aq)$ (iodine-clock experiment)?

(*a*) The time taken to react a constant amount of $S_2O_3^{2-}(aq)$ is measured.
(*b*) The concentration of $S_2O_3^{2-}(aq)$ must be much higher than the concentration of $I^-(aq)$.
(*c*) $S_2O_3^{2-}(aq)$ cannot be used in the experiment determining the rate constant of the reaction between $Fe^{3+}(aq)$ and $I^-(aq)$.
(*d*) The concentration of $S_2O_3^{2-}(aq)$ must be much smaller than the concentration of $I^-(aq)$.

32. Which of the following statements is/are true regarding the reaction of 2-bromo-2-methylpropane with aqueous NaOH?

(*a*) It is an electrophilic substitution reaction.
(*b*) A carbocation is formed as an intermediate during the reaction.
(*c*) The major product formed is $(CH_3)_3COH$.
(*d*) $(CH_3)_2C{=}CH_2$ can be formed as a byproduct.

33. Which of the following reactions is/are correct?

(*a*) $CH_3\overset{O}{\overset{\|}{C}}OH \xrightarrow[(2)\ H^+/H_2O]{(1)\ CH_3MgBr} CH_3\overset{O}{\overset{\|}{C}}CH_3 + Mg(OH)Br$

(*b*) $CH_3CH_2\overset{CHO}{\overset{|}{C}}HCH_2OH \xrightarrow{CH_3MgBr} CH_3CH_2\overset{CH_3CHOMgBr}{\overset{|}{C}}HCH_2OH$

(*c*) $CH_3C{\equiv}CH \xrightarrow{CH_3MgBr} CH_3C{\equiv}CMgBr + CH_4$

(*d*) $CH_3CH_2CH_2OH \xrightarrow{CH_3MgBr} CH_3CH_2CH_2OMgBr + CH_4$

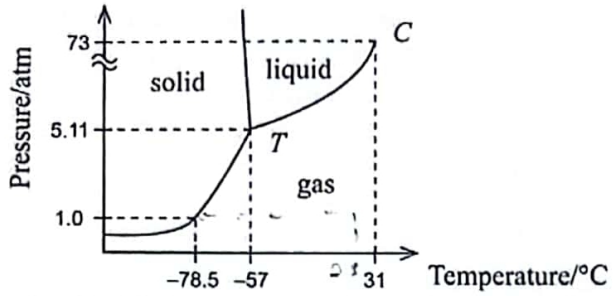
34. Which of the following statements is/are true with regard to *s* and *p* block elements and their compounds?

(*a*) Be reacts with hydrogen gas to produce an ionic metal hydride.
(*b*) Mg has the highest electronegativity among *s*-block elements.
(*c*) NH_3, SO_2 and H_2S can act as oxidizing agents as well as reducing agents.
(*d*) Na and Ba react with excess oxygen gas when heated to give Na_2O_2 and BaO_2 respectively.

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35. The phase-diagram of carbon dioxide (CO_2) is shown below.



It is observed that liquid CO_2 does not form when a sample of solid CO_2 (dry-ice) is placed in a beaker at 25 °C and 1 atm pressure. According to the above diagram which of the following statement/s explain/s this observation?

(*a*) The temperature at the triple-point is less than the critical temperature.
(*b*) The temperature at the critical point is higher than 25 °C.
(*c*) The pressure of the triple-point is higher than 1 atm.
(*d*) At 1 atm pressure solid CO_2 is in equilibrium only with the gas phase.

36. Which of the following statements is/are true?

(*a*) Following a systematic method of waste disposal contributes to minimize global warming.
(*b*) Minimizing deforestation contributes to increase global warming.
(*c*) NO gas emitted from transportation contributes to increase global warming.
(*d*) Coolant gases used in refrigerators and air-conditioners contribute to increase global warming.

37. Which of the following statements is/are true with regard to the function of the ozone layer in the stratosphere?

(*a*) NO_2 is required for the formation of ozone.
(*b*) Atomic oxygen produced in the troposphere produces ozone after reaching the stratosphere.
(*c*) Ozone level in the stratosphere fluctuates throughout the year.
(*d*) Infrared radiation is essential for the formation of ozone.

38. Consider the following cells.

A : $Zn(s) \mid Zn^{2+}(aq,\ 1.0\ mol\ dm^{-3}) \,\vdots\, Cu^{2+}(aq,\ 1.00\ mol\ dm^{-3}) \mid Cu(s)$

B : $Zn(s) \mid Zn^{2+}(aq,\ 1.0\ mol\ dm^{-3}) \parallel Cu^{2+}(aq,\ 1.00\ mol\ dm^{-3}) \mid Cu(s)$

(*a*) Ion migration occurs at both A and B.
(*b*) Mixing of electrolytes is prevented in both A and B.
(*c*) Ion migration occurs only in B.
(*d*) Mixing of electrolytes is prevented only in B.

39. Which of the following statements is/are correct regarding 3*d*-block elements and their compounds?

(*a*) The correct IUPAC name of $[Cr(NH_3)_6]Br_3$ is hexaamminechromium(III) tribromide.
(*b*) Based on the electronic configurations of the 3*d*-block metals, Zn is expected to have the lowest melting point.
(*c*) Cu shows the lowest stable oxidation state among 3*d*-block elements.
(*d*) CrO_3 dissolves in aqueous NaOH and gives $Cr_2O_7^{2-}$ ion.

40. Which of the following statements is/are true regarding some industrial processes?

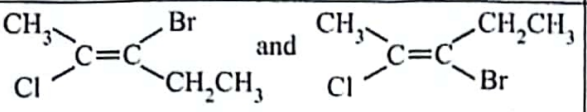
(*a*) The entropy change for the reaction of $N_2(g)$ with $H_2(g)$ to produce $NH_3(g)$ in the Haber-Bosch process is positive ($\Delta S > 0$).
(*b*) The reaction of $N_2(g)$ with $H_2(g)$ to produce $NH_3(g)$ in the Haber-Bosch process is an exothermic reaction.
(*c*) The industrial process for the production of high purity TiO_2 from rutile by chlorination followed by oxidation, results in the release of CO_2 to the environment.
(*d*) The reaction of $SO_2(g)$ with $O_2(g)$ to give $SO_3(g)$ in the contact process for producing sulphuric acid is an endothermic reaction.

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- 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.	Metallic bonding in Group 1 elements (Li–Cs) is weaker than metallic bonding in Group 2 elements (Be–Ba).	Metallic bonding involves only one valence electron in Group 1 elements whereas two electrons are involved in Group 2 elements.
42.	 and are diastereoisomers of each other.	Stereoisomers which are not mirror images of each other are diastereoisomers.
43.	When a few drops of dilute mineral acid are added to a 100 cm^3 solution of $CH_3NH_2(aq)$/ $CH_3NH_3Cl(aq)$, the pH of the solution does not change significantly.	A solution containing $CH_3NH_2(aq)$ and $CH_3NH_3Cl(aq)$ acts as a buffer solution.
44.	Aqueous solutions of Ni^{2+}, Cu^{2+} and Zn^{2+} when individually treated with excess $NH_4OH(aq)$ do not give permanent precipitates.	All three ions $Ni^{2+}(aq)$, $Cu^{2+}(aq)$ and $Zn^{2+}(aq)$ give ammine complexes when individually treated with excess $NH_4OH(aq)$.
45.	Benzene reacts with electrophilic reagents to give substitution products and not addition products.	The carbocation intermediate formed by the reaction between benzene and the electrophile is stabilized by the delocalization of its positive charge.
46.	In an electrochemical cell constructed by $Ag^+(aq)$/ $Ag(s)$ and $Cu^{2+}(aq)/Cu(s)$ electrodes, electrons flow from Cu to Ag. $E^\circ_{Cu^{2+}(aq)/Cu(s)} = 0.34$ V, $E^\circ_{Ag^+(aq)/Ag(s)} = 0.80$ V	In the electrochemical cell $Cu(s)\|Cu^{2+}(aq, 1\ M)\|Ag^+(aq, 1\ M)\|Ag(s)$, the $Cu^{2+}(aq)\|Cu(s)$ electrode is the cathode. $E^\circ_{Cu^{2+}(aq)/Cu(s)} = 0.34$ V, $E^\circ_{Ag^+(aq)/Ag(s)} = 0.80$ V
47.	$N_2(g)$ cannot behave as an oxidizing agent.	When heated $N_2(g)$ reacts with Li to give an ionic product which reacts with water liberating $NH_3(g)$.
48.	Addition of dilute $HNO_3(aq)$ to a saturated solution of PbC_2O_4 increases the solubility of $PbC_2O_4(s)$.	In the equilibrium $PbC_2O_4(s) \rightleftharpoons Pb^{2+}(aq) + C_2O_4^{2-}(aq)$, $C_2O_4^{2-}(aq)$, can be considered as the conjugate-base of $H_2C_2O_4(aq)$ acid.
49.	The amount of CO(g) produced by the reaction of coke and $O_2(g)$ in a blast furnace increases with increasing temperature.	The reaction between coke and $O_2(g)$ which produces CO(g) has a positive entropy change.
50.	Thermoset polymers cannot be softened by heating.	Thermoset polymers have a molecular structure arranged as a three dimensional network.

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