

KENDRIYA VIDYALAYA SANGATHAN

HALF YEARLY EXAMINATION 2019-20

SUBJECT: CHEMISTRY (043)

Class: XI

FIRST SHIFT

Maximum marks: 70

Duration: 3 Hours

General Instruction:

1. All Questions are compulsory. There are 37 questions in all.
2. This question paper has four sections: Section A, Section B, Section C and Section D.
3. Section A contains 20 questions of one mark, Section B contains 7 questions of two marks, Section C Contains 7 questions of three marks, Section D contains three questions of five marks.
4. There is no overall choice. However internal choice has been provided in some questions. You have to attempt only one of choices in all such questions.
5. Use of calculator is not permitted. You may ask for logarithmic table, if required.

Section A

Choose and write the correct option(s) in the following questions:

- | | | |
|---|---|---|
| 1 | Which of the following statements about a compound is incorrect?
a) A molecule of a compound has atoms of different elements.
b) A compound cannot be separated into its constituent elements by physical methods of separation.
c) A compound retains the physical properties of its constituent elements.
d) The ratio of atoms of different elements in a compound is fixed. | 1 |
| 2 | Which one of the following has the largest number of atoms?
a) 1 g Au(s)
b) 1 g Na(s)
c) 1 g Li(s)
d) 1 g of Cl ₂ (s) | 1 |
| 3 | Pairing of electrons in the orbitals belonging to the same subshell (p, d or f) does not take place until each orbital belonging to that subshell is singly occupied. This is called:
a) Hund's rule of maximum multiplicity.
b) Pauli's exclusion principle.
c) Aufbau principle
d) None of the above. | 1 |

4	Which important property did Mendeleev use to classify the elements in his periodic table? a) Atomic Weight b) Atomic Number c) Melting Point d) None of these	1
5	If the bond distance in chlorine molecule (Cl_2) is 198 pm, then the radius of chlorine is: a) 198 pm b) 99 pm c) 49.5 pm d) 24.75 pm	1
6	The shape of a molecule depends on a) Number of bonded valence electron pairs b) Number of non-bonded valence electron pairs c) All the electrons. d) 'a' and 'b' above	1
7	The type of attractive forces operating between the polar molecules having permanent dipole and the molecules lacking permanent dipole is: a) dipole-dipole b) London forces c) dipole-induced dipole d) H-bonding	1
8	Which of the following statements is correct? a) Evaporation occurs only at the surface. b) Evaporation takes place at all temperatures. c) Both 'a' and 'b' are correct. d) None of the above	1
9	Thermodynamics is not concerned about: a) Energy changes involved in a chemical reaction. b) The extent to which a chemical reaction proceeds. c) The rate at which a reaction proceeds. d) The feasibility of a chemical reaction.	1
10	Which of the following reactions is correct regarding homogeneous equilibria? a) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) = 2\text{NH}_3(\text{g})$ b) $\text{CH}_3\text{COOC}_2\text{H}_5(\text{aq}) + \text{H}_2\text{O}(\text{l}) = \text{CH}_3\text{COOH}(\text{aq}) + \text{C}_2\text{H}_5\text{OH}(\text{aq})$ c) $\text{Fe}^{3+}(\text{aq}) + \text{SCN}^-(\text{aq}) = [\text{Fe}(\text{SCN})]^{2+}(\text{aq})$ d) All of the above	1

In the following questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:

- (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- (b) Assertion and reason both are correct statements but reason is not correct explanations for assertion
- (c) Assertion is correct but reason is wrong statement.
- (d) Assertion is wrong statement but reason is correct statement.

11	Assertion: Heisenberg's uncertainty principle cannot be applied to a stationary electron. Reason: Position can be measured accurately if velocity is zero..	
12	Assertion: Elements in the same group have similar physical and chemical properties. Reason: Total number of electrons are same in the elements of same group.	
Fill in the blanks:		
13	C_2H_4 has _____ sigma bonds and _____ pi bonds.	
14	ΔG for a spontaneous process should have _____ value.	
15	When $Q_c = K_c$ the reaction is in _____	
Answer the following questions in one word or in one sentence		
16	Calculate the percentage of N in NH_3 molecule. OR Calculate the number of gram molecules of water in a beaker containing 576g of water.	
17	Which of the following are isoelectronic species: Na^+ , K^+ , Mg^{2+} , Ca^{2+} , S^{2-} , Ar OR How many electrons in an atom may have $n=3$ $l=0$?	1
18	Which hybrid orbitals are used by carbon atoms in CH_3CHO ? OR Is there any change in the hybridization of B and N atoms as a result of the following reaction? $BF_3 + NH_3 \rightarrow F_3B.NH_3$	1
19	The shape and hybridization of PCl_5 molecule is (a) octahedral, d^2sp^3 (b) Trigonal bipyramidal, sp^3d (c) Trigonal planar sp^3d , (d) square planar dsp^2	1
20	The molar enthalpy of vaporization of acetone is less than that of water. Why?	1
SECTION - B		
21	A solution is prepared by adding 6g of a substance A to 24g of water. Calculate the mass percent of the solute.	2
22	Define molarity and molality.	2
23	What is the number of photons of light with a wavelength of 4000pm that provide 1J of energy ($h=6.626 \times 10^{-34} Js$) OR The mass of an electron is $9.1 \times 10^{-31} kg$. If its K.E. is $3 \times 10^{-25} J$ then calculate its wavelength.	2
24	Explain why cations are smaller and anions are larger in radii than their parent atoms? OR Write the symbol and name according to the IUPAC system for the element with atomic number 120 and 142	2
25	Derive the relationship between P, V, n, R and T	2
26	(a) For the reaction $2Cl(g) \rightarrow Cl_2(g)$. What will be the sign of ΔH and ΔS ? (b) What happens to work when gas is compressed?	2

27 Arrange the following in increasing acid strength:

- (a) HI, HBr, HCl, HF
(b) HF, H₂O, NH₃, CH₄

OR

The equilibrium constant expression for a gas reaction is :

$$K_c = \frac{[NH_3]^4 [O_2]^5}{[NO]^4 [H_2O]^6}$$

Write the balanced chemical equation corresponding to this expression.

SECTION - C

28 Fill in the blanks in the following conversions

- (a) 1 km = _____ mm
(b) 1 mg = _____ kg
(c) 1 ml = _____ L

OR

Match the following prefixes with their multiples:

Prefixes	Multiples
(a) micro	10 ⁶
(a) nano	10 ⁻⁶
(a) mega	10 ⁻⁹

29 State:

- (a) Aufbau principle
(b) Pauli's exclusion principle
(c) Heisenberg's Uncertainty principle

30 Using s, p, d, f notations, describe the orbital with the following quantum numbers:

- (a) n=2 l=1 (d) n=3 l=1
(b) n=4 l=0 (e) n=5 l=3
(c) n=5 l=2 (f) n=6 l=0

OR

Write the electronic configuration of the following elements in s, p, d, f notation:

- (a) ₂₁Sc
(b) ₂₄Cr
(c) ₂₉Cu

31	<p>Assign the position of the elements having outer electronic configuration:</p> <p>(a) $ns^2 np^3$ for $n = 2$</p> <p>(b) $(n-1)d^3 ns^2$ for $n = 4$</p> <p>(c) $(n-2)f^7 (n-1)d^1 ns^2$ for $n = 6$</p> <p>In the periodic table.</p> <p style="text-align: center;">OR</p> <p>Explain the following:</p> <p>(a) The increasing order of reactivity among group I-elements is $Li < Na < K < Rb < Cs$</p> <p>(b) electron gain enthalpy of Cl is more than that of F</p> <p>(c) Decreasing order of ionic radii $F^- > Na^+ > Mg^{2+}$</p>	3
32	<p>Discuss the shape of the following molecules using VSEPR model:</p> <p>$BeCl_2, BCl_3, NH_3$</p>	3
33	<p>Give the corresponding conjugate acid and conjugate base of the following species:</p> <p>(a) H_2O</p> <p>(b) HCO_3^-</p> <p>(c) NH_3</p>	3
34	<p>$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$</p> <p>At equilibrium the concentration of $N_2 = 3.0 \times 10^{-3} M$, $O_2 = 4.2 \times 10^{-3} M$ and $NO = 2.8 \times 10^{-3} M$ in a sealed vessel at 800K. What will be K_c for the above reaction condition?</p>	3
Section D		
35	<p>Q35- (i) compare the relative stability of following species by calculating bond order and indicate their magnetic properties</p> <p>$O_2, O_2^{2-}, N_2, N_2^-$</p> <p>(ii) write any two point of difference between sigma and pi bond</p> <p style="text-align: center;">OR</p> <p>(i) Write the significance of a plus and a minus sign shown in representing the orbitals.</p> <p>(ii) Describe the hybridisation in case of PCl_5. Why are the axial bonds longer as compared to equatorial bonds?</p>	5

36

(a) State Boyle's Law. Write its mathematical expression.

(b) A vessel of 120ml capacity contains a certain amount of gas at 35°C and 1.2 bar pressure. The gas is transferred to another vessel of volume 180ml, at 35°C. What would be its pressure?

OR

(a) State Charles's Law. Write its mathematical expression.

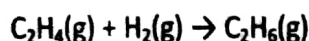
(b) On a ship sailing in Pacific Ocean where temperature is 20.4°C, a balloon is filled with 4L air. What will be the volume of the balloon when the ship reaches Indian ocean, where temperature is 27.1°C?

5

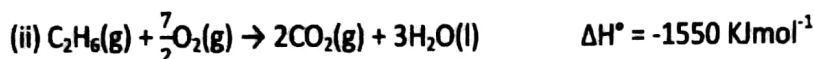
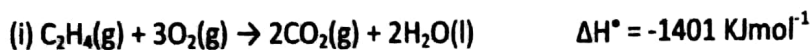
37

(a) State Hess's Law. Give an example.

(b) Calculate the enthalpy change for the reaction:

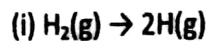


Using the following combustion data:



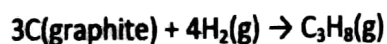
OR

(a) Predict in which of the following entropy increases/decreases



(ii) A liquid crystallizes into a solid

(b) Calculate the standard Gibbs energy change for the formation of propane at 298K

 $\Delta_f H^\circ$ for propane, $\text{C}_3\text{H}_8(\text{g})$ is $-103.8 \text{ KJmol}^{-1}$ Given $\Delta_f S^\circ = -269.7 \text{ JK}^{-1}\text{mol}^{-1}$

5
