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Total No. of Pages: 2

SHIVAJI UNIVERSITY, KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B.Sc. (Part- I) (Semester-II)(New) (CBCS)

Examination March/April, 2023

CHEMISTRY (Paper - III)

DSC– 3B: Physical Chemistry

Sub. Code: 72844

Day and Date: Monday, 05-06-2023

Total Marks: 50

Time: 10.30 a.m. to 12.30 p.m.

- Instructions:**
- 1) All questions are compulsory.**
 - 2) Figures to the right indicate full marks.**
 - 3) Draw neat labeled diagrams wherever necessary.**
 - 4) Use of Scientific calculator is allowed.**

Q. 1 A. Select the most correct alternative from the following. [10]

- The velocity constant K of first order is expressed in-----
 - a) mole lit⁻¹ sec⁻¹
 - b) dm³ mole⁻¹ sec⁻¹
 - c) sec⁻¹
 - d) all of these
- According to -----law, temperature remaining constant, the volume of a given mass of a gas varies inversely as its pressure.
 - a) Nernst
 - b) Charle's
 - b) Avogadro
 - d) Boyle's
- Photochemical union of H_2 and Cl_2 is an example of ----- reaction.
 - a) pseudo-unimolecular
 - b) zero order
 - c) first order
 - d) second order
- In adiabatic process-----
 - b) $q = 0$
 - b) $q = W$
 - c) $q = 1$
 - d) $q \neq 1$
- Which one of the following does not affect on the position of equilibrium.
 - a) temperaure
 - b) volume
 - c) pressure
 - d) catalyst and inert gas
- Efficiency of heat engine is always-----
 - a) Greater than one
 - b) less than one
 - b) c) equal to one
 - d) zero
- When work is done by the system on the surrounding, then sign convention of W is-----
 - a) positive
 - b) negative
 - c) both a) and b)
 - d) none of these

8 ----- is a sum of internal energy and product of pressure and volume of a system at constant temperature.

- a) Enthalpy
- b) entropy
- c) heat capacity
- d) resonance energy

9 Entropy of the universe tends towards -----.

- a) zero
- b) maximum
- c) minimum
- d) none of these

10 According to law of mass action, the rate of a chemical reaction is directly proportional to -----.

- a) equilibrium constant
- b) nature of products
- c) molar concentration of reactants
- d) volume of container

Q. 2 Attempt any TWO of the following. [20]

- a) State in different ways first law of thermodynamics and give mathematical expression for first law of thermodynamics.
- b) Give the postulates of kinetics theory of gases.
- c) Define rate of reaction and specific reaction rate? Explain the factors affecting rate of reaction.

Q. 3 Write short notes on any FOUR of the following. [20]

- a) What is thermochemistry? Explain endothermic and exothermic reactions with example .
 - b) Distinguish between spontaneous and non-spontaneous process
 - c) What are ideal and non-ideal gases? Distinguish between them.
 - d) What is mean by chemical equilibrium ? Give the characteristic of chemical equilibrium.
 - e) Distinguish between order and molecularity of a reaction?
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SHIVAJI UNIVERSITY, KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B.Sc. (Part- I) (Semester–II)(New) (CBCS)

Examination October, 2023

CHEMISTRY (Paper - III)

DSC– 3B: Physical Chemistry

Sub. Code: 72844

Day and Date: Sunday, 05-11-2023

Total Marks: 50

Time: 10.30 a.m. to 12.30 p.m.

- Instructions:**
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 - 4) Use of Scientific calculator is allowed.

Q. 1 A. Select the most correct alternative from the following. [10]

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4. In isochoric process-----
 - b) $\Delta P = 0$
 - b) $\Delta H = 0$
 - c) $\Delta V = 1$
 - d) $q \neq 1$
5. Which one of the following affect the position of equilibrium.
 - a) temperaure
 - b) volume
 - c) pressure
 - d) all of these
6. Efficiency of heat engine is always-----
 - a) Greater than one
 - b) less than one
 - b) c) equal to one
 - d) zero
7. When work is done by the system, then sign convention of W is-----
 - a) positive
 - b) negative
 - c) both a) and b)
 - d) none of these

8. Sink represents----- reservoir.

- a) hot
- b) cold
- c) sink
- d) all of these

9. According to Max Planck, the entropies of all perfectly crystalline substances are ----- at 0K(zero Kelvin).

- a) zero
- b) maximum
- c) minimum
- d) none of these

10. According to law of mass action, the rate of a chemical reaction is directly proportional to -----

- a) equilibrium constant
- b) nature of products
- c) molar concentration of reactants
- d) volume of container

Q. 2 Attempt any TWO of the following.

[20]

- a) Give the postulates of kinetics theory of gases.
- b) State in different ways first law of thermodynamics and give mathematical expression for first law of thermodynamics.
- c) What is first order reaction? Derive the equation for rate constant of first order reaction.

Q. 3 Write short notes on any FOUR of the following.

[20]

- a) Distinguish between order and molecularity of a reaction?
 - b) What is Thermodynamics? Define any four basic concepts of thermodynamics.
 - c) Distinguish between spontaneous and non-spontaneous process
 - d) What are ideal and non-ideal gases? Distinguish between them.
 - e) Show that in every first order reaction, the time required for 75% reaction is double the time required for 50% reaction.
 - f) Distinguish between order and molecularity of a reaction?
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SHIVAJI UNIVERSITY, KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B.Sc. (Part- I) (Semester–II)(New) (CBCS)

Examination October, 2023

CHEMISTRY (Paper - III)

DSC– 3B: Physical Chemistry

Sub. Code: 72844

Day and Date: Sunday, 05-11-2023

Total Marks: 50

Time: 10.30 a.m. to 12.30 p.m.

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 - a) pseudo-unimolecular
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 - c) first order
 - d) second order
4. In isochoric process-----
 - b) $\Delta P = 0$
 - b) $\Delta H = 0$
 - c) $\Delta V = 1$
 - d) $q \neq 1$
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 - b) negative
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 - d) none of these

8. Sink represents----- reservoir.

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9. According to Max Planck, the entropies of all perfectly crystalline substances are ----- at 0K(zero Kelvin).

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- c) molar concentration of reactants
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SHIVAJI UNIVERSITY, KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B.Sc. (Part- I) (Semester-II)(New) (CBCS)

Examination October, 2023

CHEMISTRY (Paper - III)

DSC– 3B: Physical Chemistry

Sub. Code: 72844

Day and Date: Tuesday, 07-11-2023

Total Marks: 50

Time: 10.30 a.m. to 12.30 p.m.

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
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 - 4) Use of Scientific calculator is allowed.

Q. 1 A. Select the most correct alternative from the following. [10]

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 - c) first order
 - d) second order
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 - b) $\Delta P = 0$
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 - c) $\Delta V = 1$
 - d) $q \neq 1$
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 - c) pressure
 - d) all of these
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 - b) less than one
 - b) c) equal to one
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 - b) negative
 - c) both a) and b)
 - d) none of these

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- d) volume of container

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[20]

- a) Give the postulates of kinetics theory of gases.
- b) State in different ways first law of thermodynamics and give mathematical expression for first law of thermodynamics.
- c) What is first order reaction? Derive the equation for rate constant of first order reaction.

Q. 3 Write short notes on any FOUR of the following.

[20]

- a) Distinguish between order and molecularity of a reaction?
 - b) What is Thermodynamics? Define any four basic concepts of thermodynamics.
 - c) Distinguish between spontaneous and non-spontaneous process
 - d) What are ideal and non-ideal gases? Distinguish between them.
 - e) Show that in every first order reaction, the time required for 75% reaction is double the time required for 50% reaction.
 - f) Distinguish between order and molecularity of a reaction?
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SHIVAJI UNIVERSITY, KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B.Sc. (Part – I) (Semester – II) (CBCS)

Examination February, 2023

CHEMISTRY (Paper - III)

DSC – 3B: Physical Chemistry

Sub. Code: 72844

Day and Date: Thursday, 20-02-2023

Total Marks: 50

Time: 10.30 a.m. to 12.30 p.m.

- Instructions:*
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Draw neat labeled diagrams wherever necessary.
 - 4) Use of Scientific calculator is allowed.

Q.1) A. Select the most correct alternative from the following. [10]

1. The process that does not occurs of its own accord is called.....process.
 - a) Non spontaneous
 - b) Spontaneous
 - c) Isothermal
 - d) adiabatic
2. All reversible heat engine operating between the same temperature have.....efficiency
 - a) different
 - b) same
 - c) zero
 - d) none of these
3. The standard state of a substance is the most stable state of the substance atpressure and at a specified temp.
 - a) 1 atm, 298 K
 - b) 0.1 atm, 0 K
 - c) 0.5 atm, 273 K
 - d) 10 atm, 1 K
4. The equations representing the variation of heat change of reaction with temperature are known asequation.
 - a) Exothermic
 - b) Graphic
 - c) Kirchhoff's
 - d) Boltzmann
5. The relation between free energy and equilibrium constant, k of a reaction is
 - a) $\Delta G = RT \ln k$
 - b) $\Delta G^0 = - RT \ln k$
 - c) $\Delta G^0 = RT \ln k$
 - d) $\Delta G = - RT \ln k$
6. Which one of the following does not affect the position of equilibrium?
 - a) Temperature
 - b) Pressure
 - c) Catalyst & inert gas
 - d) Volume

7. The quantity of a given substance which undergoes change in unit time is known as
- a) rate of the reaction b) velocity of the reaction
c) both a & b d) none of these
8. $(P + a/v^2) (v - b) = RT$ is known asequation.
a) ideal gas b) Vander waals
c) Kinetic gas d) gas
9. Velocity constant 'k' of second order reaction is expressed in
- a) $\text{mol lit}^{-1} \text{ s}^{-1}$ b) $\text{dm}^3 \text{ mole}^{-1} \text{ s}^{-1}$
c) $\text{lit}^{-1} \text{ mole}^{-1} \text{ s}^{-1}$ d) All of these
10. The reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI is an example ofreaction.
a) termolecular b) unimolecular
c) Pseudo d) bimolecular

Q.2) Attempt any TWO of the following. [20]

- a) Derive the equation for rate constant of a first order reaction. Mention the units of rate constant of a first order reaction.
- b) State and derive mathematical expression for first law of thermodynamics. Give statements of second law of thermodynamics in different ways.
- c) Give the postulates of Kinetic theory of gases.

Q.3) Attempt any FOUR of the following. [20]

- a) Explain law of chemical equilibrium (Law of mass action).
- b) What are pseudo-unimolecular reactions? Explain with suitable examples.
- c) Distinguish between spontaneous and non-spontaneous reaction.
- d) Explain in brief exothermic and endothermic reaction with suitable examples.
- e) What are causes of deviation from gas laws?
- f) Show that half life time or time taken to complete any fraction of a second order reaction ($a=b$) is inversely proportional to the initial concentrations of reaction.
-

expression for first law of thermodynamics.

c) What is first order reaction? Derive the equation for velocity constant of first order reaction .

Q. 3 Write short notes on any FOUR of the following.

[16]

- a) Factors affecting rate of reaction.
 - b) What is thermochemistry? Define endothermic and exothermic reactions.
 - c) Distinguish between spontaneous and non-spontaneous process
 - d) Explain causes of deviation from gas laws.
 - e) What is mean by chemical equilibrium ? Give the characteristic of chemical equilibrium.
 - f) Distinguish between order and molecularity of a reaction?
-

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[16]

- a) Factors affecting rate of reaction.
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SHIVAJI UNIVERSITY KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B. Sc. (Part – I) Sem – II Examination March/April 2022

Title of Subject :- Chemistry

Paper No. II

Title of Paper :- Physical Chemistry

Subject Code :- 72844

Day & Date :-

Total Marks:- 50

Time :-

Instructions

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams and give equations wherever necessary.

Q.1: Choose the correct alternative for each of the following and rewrite the sentence: [10]

- a) In adiabatic process,.....
 - i) $q = W$
 - ii) $q \neq 1$
 - iii) $q = 0$
 - iv) $q = 1$
- b) When work is done by the system on the surrounding, then sign convention of W is.....
 - i) positive
 - ii) negative
 - iii) both i) and ii)
 - iv) none of these
- c) The equation representing the variation of heat change of reaction (enthalpy) with temperature is known asequation.
 - i) Exothermic
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 - iii) Kirchoff's
 - iv) Boltzmann
- d) The relation between free energy and equilibrium constant, k of a reaction is
 - i) $\Delta G = RT \ln k$
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 - iii) $\Delta G^0 = RT \ln k$
 - iv) $\Delta G = - RT \ln k$
- e) Which one of the following does not affect on the position of equilibrium.
 - i) Temperature
 - ii) Pressure
 - iii) Catalyst & inert gas
 - iv) Volume

- f) Which of the following equation is not correct ?
- | | |
|--------------------------------------|---------------------------------------|
| i) $\Delta H = \Delta E + P\Delta V$ | ii) $H = E + PV$ |
| iii) $\Delta H = H_1 - H_2$ | iv) $\Delta H = \Delta E - P\Delta V$ |
- g) What are the conditions for gas like carbon monoxide to obey the ideal gas laws ?
- | | |
|--|--|
| i) Low temperature and low pressure | ii) Low temperature and high pressure |
| iii) High temperature and low pressure | iv) High temperature and high pressure |
- h) According to Charles's law, at constant pressure, the temperature of a gas increases, its.....
- | | |
|-----------------------|---------------------------------|
| i) volume increases | ii) mass increases |
| iii) volume decreases | iv) particles move more slowly. |
- i) The unit of first order rate constant is
- | | |
|---|---|
| i) $\text{dm}^3 \text{mole}^{-1} \text{sec}^{-1}$ | ii) $\text{dm}^{-3} \text{mole}^{-1} \text{sec}^{-1}$ |
| iii) sec^{-1} | iv) sec^{+1} |
- j) The velocity of the reaction when the conc. of all the reactants are unity is known as.....
- | | |
|-----------------------------|--------------------------|
| i) Velocity constant | ii) Velocity coefficient |
| iii) Specific reaction rate | iv) All of these |

Q.2: Solve Any Two of the following:

[20]

- Give the postulates of kinetics theory of gases.
- State in different ways and give mathematical expression for first law of thermodynamics. Also give statement of second law of thermodynamics in different ways
- What is energy of activation? Explain activated complex theory of reaction rate.

Q.3: Solve Any Four of the following:

[20]

- What is thermodynamics? Explain the terms, energy and work.
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SHIVAJI UNIVERSITY KOLHAPUR

DATTAJIRAO KADAM ARTS, SCIENCE AND COMMERCE COLLEGE, ICHALKARANJI

B. Sc. (Part – I) Sem – II Examination March/April 2022

Title of Subject :- Chemistry

Paper No. II

Title of Paper :- Physical Chemistry

Subject Code :- 72844

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Total Marks:- 50

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- e) Which one of the following does not affect on the position of equilibrium.
 - i) Temperature
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- f) Which of the following equation is not correct ?
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