16505

BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – Dip.CSE-2024/Dip.EE-2024/Dip.ME-2024/Dip.RA-2024/Dip.CSE-2025/Dip.EE-2025/Dip.ME-2025

Course Name – Applied Chemistry

Course Code - DBS00003

(Semester I)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) The summation of mole fractions of all the components of a solution is always:

a) 0 b) 1
c) <1 d) >1

(ii) In the alpha-scattering experiment, few alpha particles were rebounded because:

a) Most of the space in the atom is occupied
b) Alpha-particles are negatively charged
c) The mass of the atom is concentrated at the centre
d) Atom is positively charged

(iii) Which of the following options is incorrect?

a) 6.022×10^{23} ions of sodium = 23 g of sodium
b) 6.022×10^{23} molecules of oxygen = 32 g of oxygen
c) 6.022×10^{23}atoms of C = 6 g of carbon
d) 6.022×10^{23} atoms of H = 1 g of hydrogen atoms

(iv) Which one of the following has the correct order of bond angle?

a) $CH_4 < H_2O < NH_3$ b) $H_2O < CH_4 < NH_3$
c) $H_2O < NH_3 < CH_4$ d) $NH_3 < CH_4 < H_2O$

(v) The number of *p*-orbitals possible for the second shell is:

a) 1 b) 2
c) 3 d) 4

(vi) What type of titration is done to remove of hardness of water?

a) Complexometric titration b) Precipitation titration
c) Conductometric titration d) Iodometric titration

(vii) A 1000 ml of aqueous solution of $CaCO_3$ contains 10 g of $CaCO_3$. What is the hardness of the solution?

a) 10 ppm
b) 100 ppm
c) 1000 ppm
d) 10000 ppm

(viii) Coagulants help in the settling of:

a) Suspended impurities only
b) Finely-divided metallic impurities only
c) Colloidal impurities only
d) Both the suspended and colloidal impurities

(ix) Which kind of monomers are used in an addition-polymerization?

a) Unsaturated compounds
b) Saturated compounds
c) Bifunctional saturated compounds
d) Trifunctional saturated compounds

(x) What is the initial setting time of cement?

a) 1 hour
b) 30 minutes
c) 15 minutes
d) 30 hours

(xi) Predict the octane number of a fuel containing 95% of n-heptane and 5% of 2, 2, 4-trimethylpentane.

a) 5
b) 95
c) 90
d) 100

(xii) Choose the correct mixture for carbureted water gas from the following mixtures.

a) Water gas and semi water gas
b) Water gas and coal gas
c) Water gas and producer gas
d) Producer gas and coal gas

(xiii) The tendency of knocking in an internal combustion engine is highest in:

a) Aromatics
b) Cycloparaffins
c) Straight chain hydrocarbons
d) Olefins

(xiv) Which of the following is a common type of solid lubricant?

a) Graphite
b) Coal tar
c) Gas carbon
d) Coal

(xv) The calorific values of fuel gases follow the order:

a) Water gas > producer gas > coal gas
b) Coal gas > water gas > producer gas
c) Producer gas > water gas > coal gas
d) Coal gas > producer gas > water gas

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define the total acid number of oils. (3)

3. Write down the electronic configuration of Cr, S^{2-} and Fe^{3+}. (3)

4. Apply the concept of polymerization to show the preparation of Nylon-6,6 with proper reactions. (3)

5. Demonstrate the process by which the hardness of water can be removed through boiling. (3)

6. Select whether the following reactions belong to the category of redox reactions or not: (3)

a) $AgNO_3 + KCl \rightarrow AgCl + KNO_3$

b) $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$

OR

Assess the differences between chemical corrosion and electrochemical corrosion. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Write a short note on the octane and cetane numbers of liquid fuels. (5)

8. Analyze two of Faraday's laws of electrolysis and evaluate their significance with examples. (5)

9. Develop a detailed list of chemical reactions occurring in the blast furnace during iron extraction. (5)

10. Summarize the working principle of ion exchange used in water softening. (5)

11. a) List the possible values of l, m_l and m_s for the following orbitals: (5)
    i) 3d
    ii) 5p

    b) How many d orbitals are possible?

    c) Show that a d orbital can accommodate 10 electrons.

12. Evaluate the factors affecting corrosion rate and prioritize them based on their significance. (5)

OR

Estimate the amount of silver deposited on a metallic vessel of 800 cm² surface area when a current of 0.2 A is passed for 3 hours, and evaluate the result using the given atomic mass and density of silver. (5)

Given: The atomic mass of Ag is 107.92 amu, and the density of Ag is 10.5 g/ cm^3.

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