PART 1 - CHEMISTRY

Topic : Surface chemistry

SECTION–1 : (Maximum Marks : 12)

- This section contains **THREE** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, −0.33, −.30, 30.27, −127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;
Zero Marks : 0 In all other cases.

1. At a given temperature, 0.45 g of acetic acid in 50 mL of water is shaken with 1.0 g of charcoal and the pH of the resulting solution is 3.0. Assume, the adsorption of acetic acid from the aqueous solution by charcoal follows Freundlich isotherm,

$$\frac{x}{m} = kC^{1/n}$$

If the plot of $\log_{10}(x/m)$ against $\log_{10} C$ gives a straight line with slope 1, the value of k in L mol^{-1} is ____.

Given: The molar mass of acetic acid is 60 g mol^{-1}.

The acid dissociation constant of acetic acid is 1.0×10^{-5} at the given temperature.

x is the mass (in grams) of acetic acid adsorbed.

m is the mass (in grams) of charcoal.

C is the equilibrium concentration of acetic acid in the solution after the adsorption is complete.

k and n are constants for acetic acid–charcoal system at the given temperature. [JEE Advanced 2026 Paper 2]

Scan or tap for the full solution

2. Adsorption of phenol from its aqueous solution on to fly ash obeys Freundlich isotherm. At a given temperature, from 10 mg g^{-1} and 16 mg g^{-1} aqueous phenol solutions, the concentrations of adsorbed phenol are measured to be 4 mg g^{-1} and 10 mg g^{-1}, respectively. At this temperature, the concentration (in mg g^{-1}) of adsorbed phenol from 20 mg g^{-1} aqueous solution of phenol will be _____.

Use: $\log_{10} 2 = 0.3$ [JEE Advanced 2025 Paper 2]

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3. To form a complete monolayer of acetic acid on 1g of charcoal, 100 mL of 0.5 M acetic acid was used. Some of the acetic acid remained unadsorbed. To neutralize the unadsorbed acetic acid, 40 mL of 1 M NaOH solution was required. If each molecule of acetic acid occupies $P \times 10^{-23}$ m^2 surface area on charcoal, the value of P is _____.

[Use given data: Surface area of charcoal = 1.5×10^2 m^2 g^{-1}; Avogadro's number (N_A) = 6.0×10^{23} mol^{-1}] [JEE Advanced 2024 Paper 2]

Space for Rough Work

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Space for Rough Work

JEE ADVANCED SURFACE CHEMISTRY — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1												
Ques.	1	2	3									
Ans.	**1.45 to 1.52**	**15.5 to 16.5**	**2500**									