

Surface Chemistry

1. Which of the following statements is incorrect regarding physisorptions? [AIEEE-2009]

- (1) More easily liquefiable gases are adsorbed readily
- (2) Under high pressure it results into multi molecular layer on adsorbent surface
- (3) Enthalpy of adsorption ($\Delta H_{\text{adsorption}}$) is low and positive
- (4) It occurs because of van der Waal's forces

2. According to Freundlich adsorption isotherm, which of the following is correct? [AIEEE-2012]

- (1) $\frac{x}{m} \propto p^1$
- (2) $\frac{x}{m} \propto p^{1/n}$
- (3) $\frac{x}{m} \propto p^0$
- (4) All the above are correct for different ranges of pressure

3. 3 g of activated charcoal was added to 50 mL of acetic acid solution (0.06N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 N. The amount of acetic acid adsorbed (per gram of charcoal) is [JEE (Main)-2015]

- (1) 18 mg
- (2) 36 mg
- (3) 42 mg
- (4) 54 mg

4. For a linear plot of $\log\left(\frac{x}{m}\right)$ 'versus $\log p$ in a

Freundlich adsorption isotherm, which of the following statements is correct? (k and n are constants) [JEE (Main)-2016]

- (1) $\frac{1}{n}$ appears as the intercept

- (2) Only $\frac{1}{n}$ appears as the slope

- (3) $\log\left(\frac{1}{n}\right)$ appears as the intercept

- (4) Both k and $\frac{1}{n}$ appear in the slope term

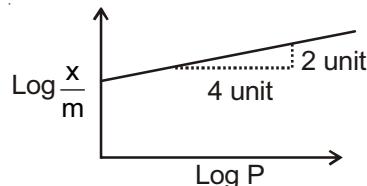
5. The Tyndall effect is observed only when following conditions are satisfied [JEE (Main)-2017]

- (a) The diameter of the dispersed particles is much smaller than the wavelength of the light used.
- (b) The diameter of the dispersed particle is not much smaller than the wavelength of the light used
- (c) The refractive indices of the dispersed phase and dispersion medium are almost similar in magnitude
- (d) The refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude

- (1) (a) and (c)
- (2) (b) and (c)
- (3) (a) and (d)
- (4) (b) and (d)

6. Adsorption of a gas follows Freundlich adsorption isotherm. In the given plot, x is the mass of the gas adsorbed on mass m of the adsorbent at pressure

p. $\frac{x}{m}$ is proportional to



[JEE (Main)-2019]

- (1) p^2
- (2) p
- (3) $p^{1/4}$
- (4) $p^{1/2}$

7. For coagulation of arsenious sulphide sol, which one of the following salt solution will be most effective?
[JEE (Main)-2019]

- (1) Na_3PO_4 (2) AlCl_3
 (3) NaCl (4) BaCl_2

8. Haemoglobin and gold sol are examples of
[JEE (Main)-2019]

- (1) Negatively charged sols
 (2) Positively charged sols
 (3) Positively and negatively charged
 (4) Negatively and positively charged sols, respectively

9. An example of solid sol is **[JEE (Main)-2019]**

- (1) Butter (2) Hair cream
 (3) Paint (4) Gem stones

10. Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispersed phase and dispersion medium, respectively is **[JEE (Main)-2019]**

- (1) C : solid in liquid; M : liquid in liquid; S : gas in solid
 (2) C : liquid in solid; M : liquid in solid; S : solid in gas
 (3) C : liquid in solid; M : liquid in liquid; S : solid in gas
 (4) C : solid in liquid; M : solid in liquid; S : solid in gas

11. Given

Gas	H_2	CH_4	CO_2	SO_2
Critical	33	190	304	630

Temperature/K

On the basis of data given above, predict which of the following gases shows least adsorption on a definite amount of charcoal? **[JEE (Main)-2019]**

- (1) SO_2 (2) CO_2
 (3) CH_4 (4) H_2

12. Among the following, the false statement is

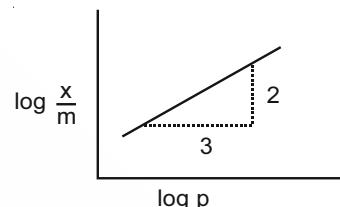
[JEE (Main)-2019]

- (1) Tyndall effect can be used to distinguish between a colloidal solution and a true solution.
 (2) Latex is a colloidal solution of rubber particles which are positively charged

- (3) Lyophilic sol can be coagulated by adding an electrolyte.

- (4) It is possible to cause artificial rain by throwing electrified sand carrying charge opposite to the one on clouds from an aeroplane.

13. Adsorption of a gas follows Freundlich adsorption isotherm. x is the mass of the gas adsorbed on mass m of the adsorbent. The plot of $\log \frac{x}{m}$ versus $\log p$ is shown in the given graph. $\frac{x}{m}$ is proportional to



[JEE (Main)-2019]

- (1) $p^{3/2}$ (2) p^3
 (3) $p^{2/3}$ (4) p^2

14. The aerosol is a kind of colloid in which

[JEE (Main)-2019]

- (1) Solid is dispersed in gas
 (2) Gas is dispersed in solid
 (3) Liquid is dispersed in water
 (4) Gas is dispersed in liquid

15. 10 mL of 1 mM surfactant solution forms a monolayer covering 0.24 cm^2 on a polar substrate. If the polar head is approximated as a cube, what is its edge length? **[JEE (Main)-2019]**

- (1) 2.0 pm
 (2) 2.0 nm
 (3) 0.1 nm
 (4) 1.0 pm

16. The principle of column chromatography is

[JEE (Main)-2019]

- (1) Differential adsorption of the substances on the solid phase.
 (2) Gravitational force.
 (3) Differential absorption of the substances on the solid phase.
 (4) Capillary action.

17. A gas undergoes physical adsorption on a surface and follows the given Freundlich adsorption isotherm equation

$$\frac{x}{m} = kp^{0.5}$$

Adsorption of the gas increases with

[JEE (Main)-2019]

- (1) Increase in p and decrease in T
 - (2) Decrease in p and decrease in T
 - (3) Increase in p and increase in T
 - (4) Decrease in p and increase in T
18. The correct option among the following is :

[JEE (Main)-2019]

- (1) Colloidal medicines are more effective because they have small surface area.
- (2) Colloidal particles in lyophobic sols can be precipitated by electrophoresis.
- (3) Brownian motion in colloidal solution is faster if the viscosity of the solution is very high.
- (4) Addition of alum to water makes it unfit for drinking.

19. Peptization is a :

[JEE (Main)-2019]

- (1) Process of converting a colloidal solution into precipitate
- (2) Process of converting precipitate into colloidal solution
- (3) Process of converting soluble particles to form colloidal solution
- (4) Process of bringing colloidal molecule into solution

20. Among the following, the INCORRECT statement about colloids is

[JEE (Main)-2019]

- (1) They can scatter light.
- (2) The range of diameters of colloidal particles is between 1 and 1000 nm.
- (3) The osmotic pressure of a colloidal solution is of higher order than the true solution at the same concentration.
- (4) They are larger than small molecules and have high molar mass.

21. A chromatography column, packed with silica gel as stationary phase, was used to separate a mixture of compounds consisting of (A) benzaldehyde (B) aniline and (C) acetophenone. When the column is eluted with a mixture of solvents,

hexane : ethyl acetate (20 : 80), the sequence of obtained compounds is

[JEE (Main)-2020]

- (1) (A), (B) and (C)
- (2) (C), (A) and (B)
- (3) (B), (C) and (A)
- (4) (B), (A) and (C)

22. As per Hardy-Schulze formulation, the flocculation values of the following for ferric hydroxide sol are in the order

[JEE (Main)-2020]

- (1) $\text{AlCl}_3 > \text{K}_3[\text{Fe}(\text{CN})_6] > \text{K}_2\text{CrO}_4 > \text{KBr} = \text{KNO}_3$
- (2) $\text{K}_3[\text{Fe}(\text{CN})_6] < \text{K}_2\text{CrO}_4 < \text{KBr} = \text{KNO}_3 = \text{AlCl}_3$
- (3) $\text{K}_3[\text{Fe}(\text{CN})_6] > \text{AlCl}_3 > \text{K}_2\text{CrO}_4 > \text{KBr} > \text{KNO}_3$
- (4) $\text{K}_3[\text{Fe}(\text{CN})_6] < \text{K}_2\text{CrO}_4 < \text{AlCl}_3 < \text{KBr} < \text{KNO}_3$

23. For the following Assertion and Reason, the correct option is

Assertion : For hydrogenation reactions, the catalytic activity increases from Group 5 to Group 11 metals with maximum activity shown by Group 7-9 elements.

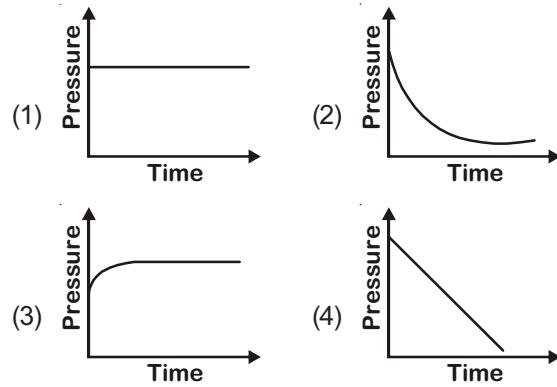
Reason : The reactants are most strongly adsorbed on group 7-9 elements.

[JEE (Main)-2020]

- (1) Both assertion and reason are true and the reason is the correct explanation for the assertion.
- (2) Both assertion and reason are false.
- (3) The assertion is true, but the reason is false.
- (4) Both assertion and reason are true but the reason is not the correct explanation for the assertion.

24. A mixture of gases O_2 , H_2 and CO are taken in a closed vessel containing charcoal. The graph that represents the correct behaviour of pressure with time is

[JEE (Main)-2020]



25. Which of the following is used for the preparation of colloids?

[JEE (Main)-2020]

- (1) Van Arkel Method
- (2) Bredig's Arc Method
- (3) Mond Process
- (4) Ostwald Process

26. Amongst the following statements regarding adsorption, those that are valid are
- ΔH becomes less negative as adsorption proceeds
 - On a given adsorbent, ammonia is adsorbed more than nitrogen gas
 - On adsorption, the residual force acting along the surface of the adsorbent increases
 - With increase in temperature, the equilibrium concentration of adsorbate increases

[JEE (Main)-2020]

- (c) and (d)
- (a) and (b)
- (d) and (a)
- (b) and (c)

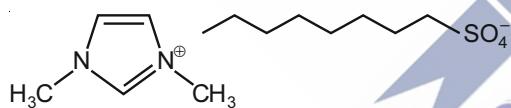
27. Tyndall effect is observed when [JEE (Main)-2020]

- The diameter of dispersed particles is much larger than the wavelength of light used
- The diameter of dispersed particles is similar to the wavelength of light used
- The diameter of dispersed particles is much smaller than the wavelength of light used
- The refractive index of dispersed phase is greater than that of the dispersion medium

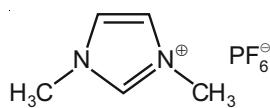
28. An ionic micelle is formed on the addition of

[JEE (Main)-2020]

- Excess water to liquid



- Excess water to liquid



- Sodium stearate to pure toluene

- Liquid diethyl ether to aqueous NaCl solution

29. Match the following

[JEE (Main)-2020]

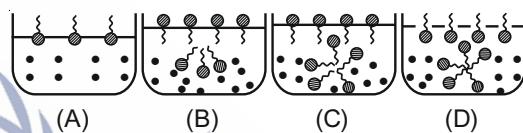
- | | |
|---------------|----------------|
| (i) Foam | (a) smoke |
| (ii) Gel | (b) cell fluid |
| (iii) Aerosol | (c) jellies |
| (iv) Emulsion | (d) rubber |
| | (e) froth |
| | (f) Milk |

- (i)-(b), (ii)-(c), (iii)-(e), (iv)-(d)
- (i)-(d), (ii)-(b), (iii)-(e), (iv)-(f)
- (i)-(d), (ii)-(b), (iii)-(a), (iv)-(e)
- (i)-(e), (ii)-(c), (iii)-(a), (iv)-(f)

30. A sample of red ink (a colloidal suspension) is prepared by mixing eosin dye, egg white, HCHO and water. The component which ensures stability of the ink sample is [JEE (Main)-2020]

- HCHO
- Water
- Eosin dye
- Egg white

31. Identify the correct molecular picture showing what happens at the critical micellar concentration (CMC) of an aqueous solution of a surfactant (● polar head; ~ non-polar tail; • water).

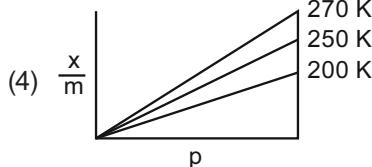
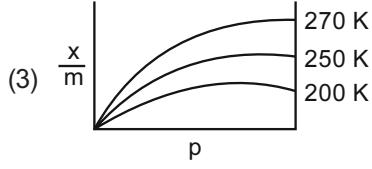
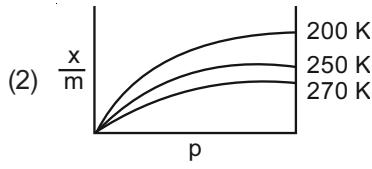
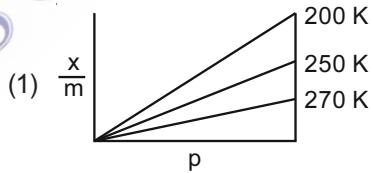


[JEE (Main)-2020]

- (C)
- (A)
- (D)
- (B)

32. Adsorption of a gas follows Freundlich adsorption isotherm. If x is the mass of the gas adsorbed on

mass m of the adsorbent, the correct plot of $\frac{x}{m}$ versus p is [JEE (Main)-2020]



33. Kraft temperature is the temperature

[JEE (Main)-2020]

- (1) below which the aqueous solution of detergents starts freezing.
- (2) above which the formation of micelles takes place.
- (3) below which the formation of micelles takes place.
- (4) above which the aqueous solution of detergents starts boiling.

34. The flocculation value of HCl for arsenic sulphide sol. is 30 m mol L^{-1} . If H_2SO_4 is used for the flocculation of arsenic sulphide, the amount, in grams, of H_2SO_4 in 250 ml required for the above purpose is _____.

(molecular mass of $\text{H}_2\text{SO}_4 = 98 \text{ g/mol}$)

[JEE (Main)-2020]

35. The mass of gas adsorbed, x , per unit mass of adsorbate, m , was measured at various pressures,

p . A graph between $\log \frac{x}{m}$ and $\log p$ gives a straight line with slope equal to 2 and the intercept equal to 0.4771. The value of $\frac{x}{m}$ at a pressure of 4 atm is:

(Given $\log 3 = 0.4771$) [JEE (Main)-2020]

36. For Freundlich adsorption isotherm, a plot of $\log (x/m)$ (y-axis) and $\log p$ (x-axis) gives a straight line. The intercept and slope for the line is 0.4771 and 2, respectively. The mass of gas, adsorbed per gram of adsorbent if the initial pressure is 0.04 atm, is _____ $\times 10^{-4}$ g. ($\log 3 = 0.4771$)

[JEE (Main)-2020]

