

NEW STANDARD ACADEMY

Marks: 90

Date : 12-08-24

CLASS : 12TH JEE

Time: 3 HRS

PHYSICS

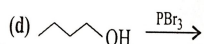
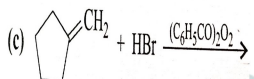
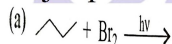
- The kinetic energy of electron and proton is 10^{-32} J. Then the relation between their de- Broglie wavelength is
 - $\lambda_p < \lambda_e$
 - $\lambda_p > \lambda_e$
 - $\lambda_p = \lambda_e$
 - $\lambda_p = 2\lambda_e$
- The de-Broglie wavelength of a neutron at 27°C is λ . What will be its wavelength at 927°C
 - $\lambda/2$
 - $\lambda/3$
 - $\lambda/4$
 - $\lambda/9$
- Assuming photoemission to take place, the factor by which the maximum velocity of the emitted photoelectrons changes when the wavelength of the incident radiation is increased four times, is
 - 4
 - $\frac{1}{4}$
 - 2
 - $\frac{1}{2}$
- Threshold wavelength for photoelectric effect on sodium is 5000 \AA . Its work function is
 - 15 J
 - $16 \times 10^{-14} \text{ J}$
 - $4 \times 10^{-19} \text{ J}$
 - $4 \times 10^{-81} \text{ J}$
- An X-ray machine has an accelerating potential difference of 25,000 volts. By calculation the shortest wavelength will be obtained as ($h = 6.62 \times 10^{-34} \text{ J -sec}$; $e = 1.6 \times 10^{-19} \text{ coulomb}$)
 - 0.25 \AA
 - 0.50 \AA
 - 1.00 \AA
 - 2.50 \AA
- A proton and an α -particle are accelerated through a potential difference of 100 V. The ratio of the wavelength associated with the proton to that associated with an α -particle is
 - $\sqrt{2}:1$
 - 2:1
 - $2\sqrt{2}:1$
 - $\frac{1}{2\sqrt{2}}:1$
- de-Broglie wavelength of a body of mass 1 kg moving with velocity of 2000 m/s is
 - $3.32 \times 10^{-27} \text{ m}$
 - $1.5 \times 10^7 \text{ m}$
 - $0.55 \times 10^{-22} \text{ m}$
 - None of these
- The energy that should be added to an electron to reduce its de-Broglie wavelength from one nm to 0.5 nm is
 - Four times the initial energy
 - Equal to the initial energy
 - Twice the initial energy
 - Thrice the initial energy
- The lowest frequency of light that will cause the emission of photoelectrons from the surface of a metal (for which work function is 1.65 eV) will be
 - $4 \times 10^{10} \text{ Hz}$
 - $4 \times 10^{11} \text{ Hz}$
 - $4 \times 10^{14} \text{ Hz}$
 - $4 \times 10^{10} \text{ Hz}$
- A radio transmitter radiates 1 kW power at a wavelength 198.6 metres. How many photons does it emit per second?
 - 10^{10}
 - 10^{20}
 - 10^{30}
 - 10^{40}
- Two identical metal plates show photoelectric effect by a light of wavelength λ_A falls on plate A and λ_B on plate B ($\lambda_A = 2\lambda_B$) The maximum kinetic energy is
 - $3K_A = K_B$
 - $K_A = K_B/2$
 - $K_A = K_B$
 - $K_A = K_B/4$
- Light of wavelength 1824 \AA incident on the surface of a metal, produces photoelectrons with maximum energy 5.3 eV. When light of wavelength 1216 \AA is used, the maximum energy of photoelectrons is 8.7 eV. The work function of the metal surface is
 - 3.5 eV
 - 13.6 eV
 - 6.8 eV
 - 1.5 eV
- The velocity of photon is proportional to (where ν is frequency)
 - $\frac{\nu^2}{2}$
 - $\frac{1}{\sqrt{\nu}}$
 - $\sqrt{\nu}$
 - ν
- The photoelectric effect can be understood on the basis of
 - The principle of superposition
 - The electromagnetic theory of light
 - The special theory of relativity

- d) Line spectrum of the atom
15. If the threshold wavelength for sodium is 5420 \AA , then the work function of sodium is
- a) 4.58 eV b) 2.28 eV
c) 1.14 eV d) 0.23 eV

CHEMISTRY

1. The reaction of SOCl_2 on alkanols to form alkyl chlorides gives good yields because
- (a) alkyl chlorides are immiscible with SOCl_2
(b) the other products of the reaction are gaseous and escape out
(c) alcohol and SOCl_2 are soluble in water
(d) the reaction does not occur via intermediate formation of an alkyl chlorosulphite

2. In which of the following reaction(s), the major product is a primary alkyl bromide?

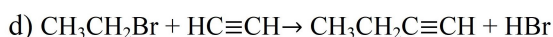


3. Choose the correct statement(s) from the following regarding free radical chlorination and bromination reaction of alkane.

- (a) The first propagation step is exothermic in bromination reaction and endothermic in chlorination reaction
(b) The first propagation step is endothermic in bromination reaction and exothermic in chlorination reaction
(c) Chlorination reaction is more reactive but very less selective, reverse is true for bromination
(d) Chlorination is more selective but less reactive process and its reverse is true for bromination

4. Which of the S_N^2 reaction is fastest?

- (a) $\text{CH}_3\text{Br} + \text{HC}\equiv\text{C}^- \rightarrow \text{CH}_3\text{C}\equiv\text{CH} + \text{Br}^-$
(b) $\text{CH}_3\text{Br} + \text{HC}\equiv\text{CH} \rightarrow \text{CH}_3\text{C}\equiv\text{CH} + \text{Br}^-$
(c) $\text{CH}_3\text{CH}_2\text{Br} + \text{HC}\equiv\text{C}^- \rightarrow \text{CH}_3\text{CH}_2\text{C}\equiv\text{CH} + \text{Br}^-$



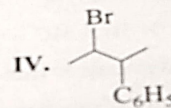
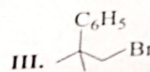
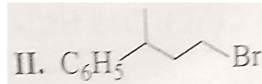
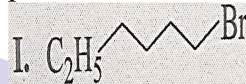
5. What is the correct increasing order of reactivity of the following in the $\text{S}_\text{N}2$ reaction?

- I. $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$
II. $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$
III. $\text{C}_6\text{H}_5\text{Cl}$

IV. $\text{P-O}_2\text{N-C}_6\text{H}_4\text{-CH}_2\text{Cl}$

- (a) $\text{I} < \text{II} < \text{III} < \text{IV}$
(b) $\text{III} < \text{II} < \text{I} < \text{IV}$
(c) $\text{II} < \text{III} < \text{IV} < \text{I}$
(d) $\text{III} < \text{I} < \text{II} < \text{IV}$

6. Pick out the strongest substrate(s) which promote a $\text{S}_\text{N}1$ reaction.



- a) Only I b) Only II
c) Only III d) Only IV

7. Pick out the following factor(s) which promote a $\text{S}_\text{N}1$ reaction:

- I. Temperature
II. Concentration of nucleophile
III. Concentration of alkyl halide
IV. Aprotic solvents

- (a) Both I and II
(b) Both II and III
(c) Both III and IV
(d) Both I and III

8. What is the main product of the reaction between 2-methyl propene with HBr

- a) 1-bromo butane
b) 1-bromo-2 methyl propane
c) 2-bromo butane
d) 2-bromo-2 methyl propane

9. Halogenation of alkanes is

- a) A reductive process
b) An oxidative process
c) An isothermal process
d) An endothermal process

10. Diazonium salts + $\text{Cu}_2\text{Cl}_2 + \text{HCl} \rightarrow$ the reaction is known as ,

- a) Chlorination
b) Sandmeyer's reaction
c) Perkin reaction
d) Substitution reaction

11. Chlorobenzene is prepared commercially by

- a) Raschig process
b) Wurtz Fitting reaction
c) Friedel-Craft's reaction
d) Grignard reaction

12. $\text{R-OH} + \text{HX} \rightarrow \text{R-X} + \text{H}_2\text{O}$

In the above reaction, the reactivity of different alcohols

- a) Tertiary > Secondary > Primary

- b) Tertiary > Secondary < Primary
 c) Tertiary > Secondary > Primary
 d) Secondary < Primary < Tertiary

13. $C_6H_6 + Cl_2 \xrightarrow{UV\ Light}$ product.. In above reaction product is

- a) CCl_3CHO b) $C_6H_6Cl_6$
 c) $C_6H_{12}Cl_6$ d) $C_6H_9Cl_2$

14. The order of reactivities of methyl halides in the formation of Grignard reagent is

- (a) $CH_3I > CH_3Br > CH_3Cl$
 (b) $CH_3Cl > CH_3Br > CH_3I$

- (c) $CH_3Br > CH_3Cl > CH_3I$
 (d) $CH_3Br > CH_3I > CH_3Cl$

15. Carbon-halogen bond is strongest among the following

- (a) CH_3Cl (b) CH_3Br
 (c) CH_3F (d) CH_3I

MATHS

1. $\int \frac{dx}{\sin^2 x \cos^2 x}$ is equal to
 a) $\tan x + \cot x + c$ b) $(\tan x + \cot x)^2 + c$
 c) $\tan x - \cot x + c$ d) $(\tan x - \cot x)^2 + c$

2. $\int \frac{dx}{\sqrt{x} + \sqrt{x-2}}$ =
 a) $\frac{1}{3} [x^{3/2} - (x-2)^{3/2}] + c$
 b) $\frac{2}{3} [x^{3/2} - (x-2)^{3/2}] + c$
 c) $\frac{1}{3} [(x-2)^{3/2} - x^{3/2}] + c$
 d) $\frac{2}{3} [(x-2)^{3/2} - x^{3/2}] + c$

3. $\int a^{bx} \cdot b^{ax} dx$; a, b, $\in R^+$ is equal to

- a) $\frac{(a^b \cdot b^a)^x}{\log(a^b \cdot b^a)} + C$
 b) $\frac{a^{bx} b^{ax}}{\log a \cdot \log b}$
 c) $\frac{1}{\ln a^b \cdot \ln b^a} + C$
 d) None of these

4. $\int \frac{\cot x \tan x}{\sec^2 x - 1} dx =$

- a) $\cot x - x + c$ b) $-\cot x + x + c$
 c) $\cot x + x + c$ d) $-\cot x - x + c$

5. $\int x^{51} (\tan^{-1} x + \cot^{-1} x) dx =$

- a) $\frac{x^{52}}{52} (\tan^{-1} x + \cot^{-1} x) + c$
 b) $\frac{x^{52}}{52} (\tan^{-1} x - \cot^{-1} x) + c$
 c) $\frac{\pi x^{52}}{104} + \frac{\pi}{2} + c$
 d) $\frac{\pi x^{52}}{52} + \frac{\pi}{2} + c$

6. $\int \frac{dx}{x + x \log x} =$

- a) $\log(1 + \log x) + c$

b) $\log(1 + \log x) + c$

c) $\log x + \log(\log x) + c$

d) None of these

7. $\int (1 - \cos x) \operatorname{cosec}^2 x dx$ equal to

- a) $\tan \frac{x}{2} + c$ b) $\cot \left(\frac{x}{2}\right) + c$
 c) $\frac{1}{2} \tan \frac{x}{2} + c$ d) $2 \tan \frac{x}{2} + c$

8. $\int \frac{dx}{\sin x + \sqrt{3} \cos x} =$

- a) $\log \tan \left(\frac{x}{2} + \frac{\pi}{2}\right) + c$
 b) $\frac{1}{2} \log \tan \left(\frac{x}{2} + \frac{\pi}{6}\right) + c$
 c) $\log \cot \left(\frac{x}{2} + \frac{\pi}{6}\right) + c$
 d) $\frac{1}{2} \log \cot \left(\frac{x}{2} + \frac{\pi}{6}\right) + c$

9. $\int \frac{(x+1)^2 dx}{x(x^2+1)}$ is equal to

- a) $\log_e x + c$
 b) $\log_e x + 2 \tan^{-1} x + c$
 c) $\log_e \frac{1}{x^2+1} + c$
 d) $\log_e \{x(x^2+1)\} + c$

10. To find the value of $\int \frac{dx}{x\sqrt{2ax-x^2}}$, the suitable substitution is

- a) $x = a \cos t$ b) $x = 2a \cos t$
 c) $x = 2at$ d) $x = 2a \sin^2 t$

11. Evaluate $\int \frac{x^2 + \cos^2 x}{1+x^2} \cdot \operatorname{Cosec}^2 x dx$

12. find the integral $\int (1-x) \sqrt{x} dx$.

13. Evaluate

$$\int \sqrt{1+x} \sqrt{1+(x+1)} \sqrt{1+(2+x)(x+4)} dx$$

14. Find the integral of the function $\sin^2(2x+5)$.

15. Evaluate $\int \frac{\cos x - \sin x}{\cos x + \sin x} (2 + 2 \sin 2x) dx$.