NEW STANDARD ACADEMY

Marks: 90

Date : 20-08-24 **CLASS : 12TH JEE** **Time: 3 HRS**

PHYSICS

1. The time of revolution of an electron around a nucleus of charge Ze in n^{th} Bohr orbit is directly proportional to
   (a) n (b) $\frac{n^3}{Z^2}$
   (C) $\frac{n^2}{Z}$ (d) $\frac{n}{Z}$
2. In Bohr's model, if the atomic radius of the first orbit is r_0, then the radius of the fourth orbit is
   (a) r_0 (b) $4r_0$
   (c) $r_0/16$ (d) $16r_0$
3. In hydrogen atom, if the difference in the energy of the electron in n=2 and n = 3 orbits is E, the ionization energy of hydrogen atom is
   (a) 13.2 E (b) 72E
   (c) 5.6 E (d) 32E
4. If the energy of a hydrogen atom in n^{th} orbit is E_n then energy in the n^{th} orbit of a singly ionized helium atom will be
   (a) $4E_n$ (b) $E_n / 4$
   (c) $2E_n$ (d) $E_n / 2$
5. The energy required to knock out the electron in the third orbit of a hydrogen atom is equal to
   (a) 13.6 eV (b) 13.6/9eV
   (c) -13/3 eV (d) - 3/13.6 eV
6. The frequency of 1 line of Balmer series in H_2 atom is Vo. The frequency of line emitted by singly ionised He atom is
   (a) $2v_0$ (b) $4v_0$
   (c) $v_0 / 2$ (d) $v_0 / 4$
7. When the electron in the hydrogen atom jumps from 2nd orbit to 1^{st} orbit, the wavelength of radiation emitted is λ. When the electrons jump from 3rd orbit to 1^{st} orbit, the wavelength of emitted radiation would be
   (a) $\frac{27}{32}\lambda$ (b) $\frac{32}{27}\lambda$
   (c) $\frac{2}{3}\lambda$ (d) $\frac{3}{2}\lambda$
8. Which of the following transition will have highest emission wavelength
   (a) n=2 to n=1
   (b) n=1 to n=2
   (c) n=2 to n = 5
   (d) n = 5 to n = 2
9. The shortest wavelength in the Lyman series of hydrogen spectrum is 912 Å corresponding to a photon energy of 13.6 eV The shortest wavelength in the Balmer series is about
   (a) 3648 Å
   (b) 8208 Å
   (c) 1228 Å
   (d) 6566 Å
10. If R is the Rydberg's constant for hydrogen the wave number of the first line in the Lyman series will be
    (a) R/4
    (b) 3R/ 4
    (c) R/2
    (d) 2R
11. The shortest wavelength of X-rays emitted from an X-ray tube depends on
    (a) the current in the tube
    (b) the voltage applied to the tube
    (c) the nature of the gas in the tube
    (d) the atomic number of the target material
12. If elements with principal quantum number n > 4 were not allowed in nature, the number of possible elements would be
    (a) 60 (b) 32
    (c) 4 (d) 64
13. The X-ray beam coming from an X-ray tube will be
    (a) monochromatic
    (b) having all wavelengths smaller than a certain maximum wavelength
    (c) having all wavelengths larger than a certain minimum wavelength
    (d) having all wavelengths lying between a minimum and a maximum wavelength

14. The K_a X-ray emission line of tungsten occurs at lambda = 0.02 nm. The energy difference between K and L levels in this atom is about
(a) 0.51 MeV (b) 1.2 MeV
(c) 59 MeV (d) 13.6 MeV

15. As per the Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Lα atom (Z = 3) is
(a) 1.51 (b) 13.6
(c) 40.8 (d) 122.4

CHEMISTRY

1. On heating diethyl ether with conc. HI,2 moles of which of the following is formed
(a) Ethanol
(b) lodoform
(c) Ethyl iodide
(d) Methyl iodide

2. Among the following, the molecule with the highest dipole moment is
(a) CH_3Cl (b) CH_2Cl_2
(c) $CHCl_3$ (d) CCl_4

3. When $CHCl_3$ is boiled with NaOH, It gives
(a) Formic acid
(b) Trihydroxy methane
(c) Acetylene
(d) Sodium formate

4. Consider the following reaction,
$C_2H_3CI + AgCN \xrightarrow{C_2H_3OH/H_2O} X$ (major)
Which one of the following statements is true for?
I. It gives propionic acid on hydrolysis
II. It has an ester functional group
III. It has a nitrogen linked to ethyl carbon
IV. It has a cyanide group
(a) IV (b) III
(c) II (d) 1

5. Ethyl orthoformate is formed by heating with sodium ethoxide
(a) $CHCl_3$
(b) C_2H_5OH
(c) HCOOH
(d) CH_3CHO

6. An alkyl halide may be converted into an alcohol by
(a) Addition (b) Substitution
(c) Dehydrohalogenation
(d) Elimination

7. The C-Cl bond in chlorobenzene as compared with C - C bond in methyl chloride is
(a) Longer and weaker
(b) Shorter and weaker
(c) Shorter and stronger
(d) Longer and stronger

8. The following reaction belongs to
$(CH_3)_3$ C-Br $\xrightarrow{H_2O}$ $(CH_3)_3$ - C - OH
(a) Elimination reaction
(b) Substitution reaction
(c) Free radical reaction
(d) Displacement reaction

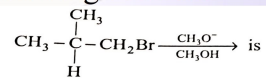
9. The correct order of C - X bond polarity is
(a) $CH_3Br > CH_3Cl > CH_3I$
(b) $CH_3I > CH_3Br > CH_3Cl$
(c) $CH_3Cl > CH_3Br > CH_3I$
(d) $CH_3Cl > CH_3l > CH_3Br$

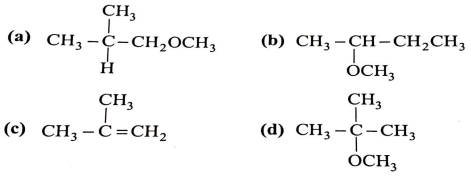
10. Which of these do not undergo Wurtz reaction
(a) C_2H_5F
(b) C_2H_5Br
(c) C_2H_5Cl
(d) C_2H_5I

11. C_2H_5I and Ag_2O reacts to produce
(a) C_2H_6
(b) $C_2H_5 - C_2H_5$
(c) $C_2H_5 - O - C_2H_5$
(d) $C_2H_5 - CH_3$

12. The reactivity order of halides for dehydrohalogenation is
(a) R - F > R - CI > R - Br > R - I
(b) R - I > R - Br > R - Cl > R - F
(c) R - 1 > R - Cl > R - Br > R - F
(d) R - F > R - I > R - Br > R – Cl

13. The major product formed in the following reaction





14. The catalyst used in the preparation of an alkyl chloride by the action of dry HCl on an alcohol is
(a) Anhydrous $AlCl_3$
(b) $FeCl_3$
(c) Anhydrous $ZnCl_2$

(d) Cu

15. Among the choices of alkyl bromide, the least reactive bromide in a S_N1 reaction is
(a) 1-bromopentane
(b) 1-bromo-2-methylbutane
(c) 1-bromo-3-methylbutane
(d) 2-bromo-2-methylbutane

MATHS

1. Evaluate $\int \frac{\sin\left(1-\frac{3}{2}\cos\right)dx}{e^{\sin^2 x+\cos^3 x}}$
a) $-e^{-(\sin^2 x+\cos^3 x)}+c$
b) $e^{-(\sin^2 x+c\ ^3 x)}+c$
c) $e^{-(\sin^2 x+\cos^3 x)}-c$
d) $e^{-(\sin^2 x-\cos^3 x)}+c$

2. $\int \frac{\left(\sqrt{x}+1\right)(x^2-\sqrt{x})}{x\sqrt{x}+\sqrt{x}+n}\,dx =$
a) $\frac{x^2}{2}+x+c$
b) $x-\frac{x^2}{2}+c$
c) $\frac{x^2}{2}-x+c$
d) $\frac{x^2}{2}-x^2+c$

3. $\int \frac{e^{-x}}{1+e^{x}}\,dx =$
a) $\log(1+e^x)-x-e^x+c$
b) $\log(1+e^x)+x-e^x+c$
c) $\log(1+e^x)-x+e^x+c$
d) $\log(1+e^x)+x+e^x+c$

4. $\int (x+1)(x+2)^7(x+3)\,dx =$
a) $\frac{(x+1)^{10}}{10}-\frac{(x+2)^8}{8}+c$
b) $\frac{(x+2)^{10}}{2}-\frac{(x+2)^8}{8}-\frac{(x+3)^2}{2}+c$
c) $\frac{(x+1)^2}{2}-\frac{(x+2)^8}{8}-\frac{(x+3)^2}{2}+c$
d) $\frac{(x+2)^9}{9}-\frac{(x+2)^{10}}{10}++c$

5. $\int 4\sin x.\cos\frac{x}{2}.\cos\frac{3x}{2}\,dx$ is equal to
a) $\cos x+\frac{1}{2}\cos 2x-\frac{1}{3}\cos 3x+c$
b) $\cos x-\frac{1}{2}\cos 2x-\frac{1}{3}\cos 3x+c$
c) $\cos x+\frac{1}{2}\cos 2x+\frac{1}{3}\cos 3x+c$
d) $\cos x-\frac{1}{2}\cos 2x+\frac{1}{3}\cos 3x+c$

6. If $\int \frac{\cos x-\sin x+1-}{e^x+\sin x+x}\,dx = \log_e(f(x))+g(x)+c$ where c is the constant of integration and f(x) is positive , then f(x)+ g(x) has the value equal to
a) $e^x+\sin x+2x$
b) $e^x+\sin x$
c) $e^x-\sin x$
d) $e^x+\sin x+x$

7. $\int \frac{\sin\left(\frac{\pi}{4}-x\right)dx}{2+\sin 2x} = A\tan^{-1}(f(x))+B$, where A,B are constants. Then the range of A f(x) is
a) [-1, 1] b)$[-\sqrt{2},\sqrt{2}]$
c) [0,1] d) [-1,0]

8. If $\int \frac{\sin x}{\sin(x-\alpha)}\,dx = Ax+B\log\sin(x-\alpha)+c$, then the value of (A,B) is
a) $(\sin\alpha,\cos\alpha)$ b) $(\cos\alpha,\sin\alpha)$
c) $(-\sin\alpha,\cos\alpha)$ d) $(-\cos\alpha,\sin\alpha)$

9. $\int \frac{dx}{\cos x-\sin x}$ is equal to
a) $\frac{1}{\sqrt{2}}\log\left|\tan\left(\frac{x}{2}-\frac{\pi}{8}\right)\right|-c$
b) $\frac{1}{\sqrt{2}}\log\left|\cot\left(\frac{x}{2}\right)\right|+c$
c) $\frac{1}{\sqrt{2}}\log\left|\tan\left(\frac{x}{2}-\frac{3\pi}{8}\right)\right|+c$
d) $\frac{1}{\sqrt{2}}\log\left|\tan\left(\frac{x}{2}+\frac{3\pi}{8}\right)\right|+c$

10. The integral $\int\left(\frac{dx}{x^2(x^4+1)^{3/4}}\right)$
a) $\left(\frac{x^4+1}{x^4}\right)^{1/4}+c$ b) $(x^4+1)^{1/4}+c$
c) $-(x^4+1)^{1/4}+c$ d) $-\left(\frac{x^4+1}{x^4}\right)^{1/4}+c$

11. If $\int \frac{\cos 4x+1}{\cot x-\tan x}\,dx = A\cos 4x+B$, then the value of |8A| is_____

12. If $\int \frac{x^2-4}{x^4+9x^2+16}\,dx = A\tan^{-1}(f(x))+B$, then the value of f(4) is ____

13. integrate $\tan^9 x\,dx = f(x)+\log|\cos x|$ where $f(x)$ is apolynomial of degree n in tan x then the value of n is_____

14. let $f(x)=\int x^{\sin x}(1+x\cos x.Inx+\sin x)\,dx$ and $f\left(\frac{\pi}{2}\right)=\frac{\pi^2}{4}$. Then thye value of $(f(\pi))/\pi is$ _____

15. *If* $\int\left[\left(\frac{x}{e}\right)^x+\left(\frac{e}{x}\right)^x\right] inx\,dx = A\left(\frac{x}{e}\right)^x+\left(\frac{e}{x}\right)^x+C$ *then then value of A+B is*_____