MET 2023 Memory Based Question Paper PDF

Physics

1. Two stones having different masses m_1 and m_2 are projected at angles θ and $(90^\circ - \theta)$ with same velocity from the same point. The ratio of their maximum heights is

A. 1:1

B. 1 : tan θ

C. tanθ : 1

D. $\tan^2 \theta : 1$

2. A force $F = (2 + x)$ acts on a particle in xx-direction, where F is in newton and x in metre. The work done by this force during'a displacement from $x = 1.0$ m to $x = 2.0$ m is

A. 2J

B. 3.5J

C. 4.5J

D. None of these

3. A disc of mass 5 kg and radius 50 cm rolls on the ground at the rate of 10 ms^{-1}. Find the kinetic energy of the disc in J .

Numerical

4. The acceleration due to gravity becomes g/2 (g = acceleration due to gravity on the surface of the earth) at a height equals to

A. R/4

B.R/2

C. R/3

D. R/5

5. Two steel wires having same length are suspended from a ceiling under the same load. If the ratio of their energy stored per unit volume is 1 : 4, then the ratio of their diameters is found to be $\sqrt{k} : 1$. Find the value of k.

Numerical

6. The lower end of a capillary tube is dipped into water and it is seen that water rises through 7.5 cm in the capillary. Given, surface tension of water is 7.5×10^{-2} Nm^{-1} and angle of contact between water and glass capillary tube is zero.

What will be the diameter (in mm) of the capillary tube? (given, $g = 10\ ms^{-2}$)

Numerical

7. A function of time is represented as follows $\sin \omega t + \cos 2\omega t + \sin 4\omega t$. The motion represented by it is

A. non-periodic

B. periodic

C. both non-periodic and periodic

D. data insufficient

8. A charged capacitor when filled with a dielectric $K = 3$ has charge Q_0, voltage V_0 and field E_0. If the dielectric is replaced with another one having $K = 9$, the new values of charge voltage and field will be respectively

A. $3Q_0, 3V_0, 3E_0$

B. $Q_0, 3V_0, 3E_0$

C. $Q_0, \frac{V_0}{3}, 3E_0$

D. $Q_0, \frac{V_0}{3}, \frac{E_0}{3}$

9. The resistance of a wire at 20^oC is 20Ω and at 500^oC is 60Ω. At which temperature its resistance will be 25Ω ?

A. 50^oC

B. 60^oC

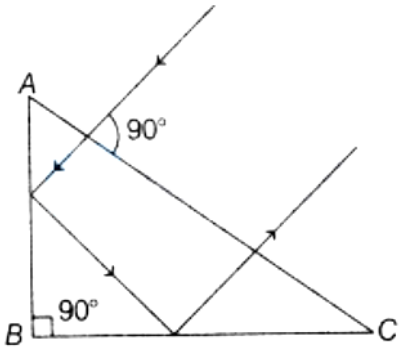
C. 70^oC

D. 80^oC

10. A vertical disc of diameter 10 cm makes 20 revolutions per second about a horizontal axis passing through its centre. A uniform magnetic field 10^{-1} T acts perpendicular to the plane of the disc. If the potential difference between its centre and rim is found to be $\pi/x \times 10^{-p}$ Volt, then find the ratio of x/p.

Numerical

11. A ray falls on a prism ABC(AB = BC) and travels as shown in figure. The minimum refractive index of the prism material should be



A. $4/3$

B. $\sqrt{2}$

C. 1.5

D. $\sqrt{3}$

12. In Young's double slit experiment, if the source of light changes from orange to blue, then

A. the central bright fringe will become a dark fringe

B. the distance between consecutive fringes will decrease

C. the distance between consecutive fringes will increase.

D. the intensity of the minima will increase.

13. A proton accelerated through a potential difference of 100 V , has de-Broglie wavelength λ_0. The de-Broglie wavelength of an α-particle, accelerated through 800 V is

A. $\lambda_0/\sqrt{2}$

B. $\lambda_0/2$

C. $\lambda_0/4$

D. $\lambda_0/8$

14. Light of wavelength 2475Å is incident on barium. Photoelectrons emitted describe a circle of radius 100 cm by a magnetic field of flux density $1/\sqrt{17} \times$

10^{-5} tesla. The value of work function of the barium is ..... eV. . given, $e/m = 1.7 \times 10^{11}$)

Numerical

15. Ionisation potential of hydrogen atom is 13.6 V . Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy 12.1 eV . The spectral lines emitted by hydrogen atoms according to Bohr's theory will be

A. one

B. two

C. three

D. four

Chemistry

1. The number of Cl^- ions in 100 mL of 0.001 M NaCl solution is

A. 6.022×10^{23}

B. 6.022×10^{20}

C. 6.022×10^{19}

D. 6.022×10^{21}

2. Which of the following conclusion is correct regarding photoelectric effect?

A. Energy of a photon depends upon frequency of light absorbed.

B. Energy of a photon depends upon intensity of light.

C. Kinetic energy of electrons increases due to increase in intensity of light.

D. All the energy of photon is absorbed by metal súrface.

3. Which of the following given below species have same bond order?

I. H_2

II. B_2

III. O_2^{2-}

IV. Be_2

V. N_2

Correct option is

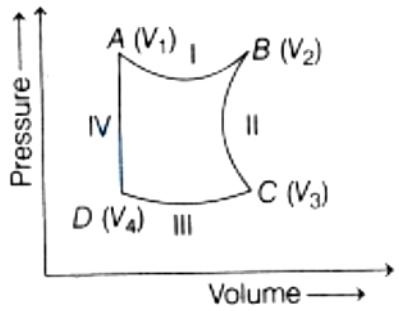
A. I and II

B. I, II and III

C. I, II and IV

D. I, IV and V

4. Consider the graph for cyclic process.



The isothermal compression process among them is

A. I

B. II

C. III

D. IV

5. The pK_a of acetic acid is 4.74. The concentration of CH_3COOH is 0.01 M . The pH of CH_3COOH is____

Numerical

6. The hydroxide of alkaline earth metal not soluble in water is

A. magnesium hydroxide

B. calcium hydroxide

C. beryllium hydroxide

D. barium hydroxide

7. Total number of $2c-2e^-$ and $3c-3e^-$ bonds are present in diborane is___

Numerical

8. Which of the following reagents are used to convert propene to propyne?

A. $SOCl_2$/Py, alc. KOH,H^+/H_2O

B. Br_2/CCl_4/ alc. KOH/Δ

C. alc. KCN,$SOCl_2$

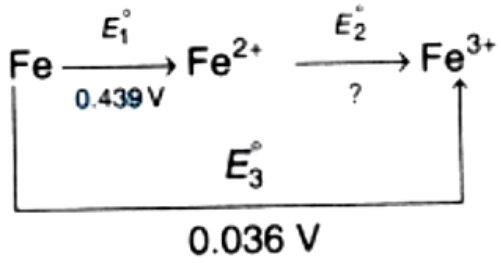
D. alc. KOH,B_2H_6/H_2O_2

9. A 5% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60 g mol^{-1}) in the same solvent. If the densities of both the solutions are assumed to be equal to 1gcm^{-3} molar mass of the substance will be____

Numerical

10.

Value of E_2^0 is in the given diagram (ignore -ve sign)



Numerical

11. Among Cu^{2+}, Fe^{3+}, Ti^{3+} and Zn^{2+} ions.

The number of ions that impart colour is____.

Numerical

12. Match the complex given in column-I with their hybridisation given in column-II.

	Column-I		Column-II
A.	$[Ni(CO)_4]$	1.	dsp^2
B.	$[Ni(CN)_4]^{2-}$	2.	sp^3
C.	$[Ni(NH_3)_6]^{2+}$	3.	d^2sp^3
D.	$[Fe(CN)_6]^{3-}$	4.	sp^3d^2

A.

A	B	C	D
1	2	3	4

B.

A	B	C	D
2	1	4	3

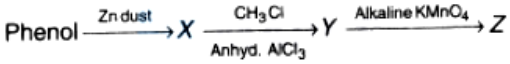
C.

A	B	C	D
1	3	2	4

D.

A	B	C	D
2	3	1	4

13. Find the product Z in the series of reaction.



A. benzaldehyde

B. benzene

C. benzoic acid

D. benzophenone

14. Which of the given reaction doesn't able to form benzaldehyde as product?

A. Rosenmund reaction

B. Etard reaction

C. Gattermann Koch reaction

D. Cannizzaro reaction

15. In which of the given form styrene exist at room temperature?

A. Liquid

B. Solid

C. Gas

D. Pseudo solid

Mathematics

1. If complex number z lies in the interior or on the boundary of circle of radius 3 units, then maximum and minimum values of |z + 1| are

A. (6,0)

B. (3,0)

C. (6,3)

D. (4,1)

2. The number of words (with or without meaning) that can be formed from all the letters of the word "LETTER" in which vowels never come together is___

Numerical

3. If a^2, b^2 and c^2 are in AP, then b + c, c + a and a + b are in

A. AP

B. GP

C. HP

D. None of these

4. If the coefficients of x^3 and x^4 in the expansion of $(1 + ax + bx^2)(1 - 2x)^{18}$ in powers of x are both zero, then (a, b) is equal to

A. $\left(14, \frac{272}{3}\right)$

B. $\left(16, \frac{272}{3}\right)$

C. $\left(16, \frac{251}{3}\right)$

D. $\left(14, \frac{251}{3}\right)$

5. Last two digits in $(9)^{50}$ be___

Numerical

6. The differential equation of all circles which pass through the origin and whose centres lies on YY-axis is

A. $\frac{dy}{dx} = \frac{xy}{x^2+y^2}$

B. $\frac{dy}{dx} = \frac{2xy}{x^2+y^2}$

C. $\frac{dy}{dx} = \frac{2xy}{x^2-y^2}$

D. None of these

7. If F : R → R is a differentiable function and $f(3) = 6$, then $\lim_{x\to 3} \int_6^{f(x)} \frac{2tdt}{(x-2)}$ is equal to

A. $18f'(3)$

B. 0

C. $24f'(3)$

D. $3f'(3)$

8. The value of $f(x) = \lim_{x\to 0} \left(\frac{8^x+2^x+4^x}{3}\right)^{2/x}$, then $f(x)'$ equals to

Numerical

9. If $\sum_{i=1}^{9} (x_i - 5) = 9$ and $\sum_{i=1}^{9} (x_i - 5)^2 = 45$, then the standard deviation of the 9 items $x_1, x_2 \ldots, x_9$ is

A. 9

B. 4

C. 3

D. 2

10. Let A = {1, 2, 3, 4, 5, 6, 7} and B = {3, 6, 7, 9}. Then, the number of elements in the set {C ⊆ AiC ∩ B ≠ ϕ} is

A. 112

B. 120

C. 108

D. 96

11. If $A = \begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 1 \\ 7 & 2 \end{bmatrix}$, then $B^T A^T$ is

A. null matrix

B. an identity matrix

C. scalar but not an identity matrix

D. such that $T_r(B^TA^T) = 4$

12. Let $f(x) = \frac{1}{\sqrt{1+x^2}}$, then

A. $f(x, y) = f(x) \cdot f(y)$

B. $f(x, y) \geq f(x) \cdot f(y)$

C. $f(x, y) \leq f(x) \cdot f(y)$

D. $f(x, y) = f(x) - f(y)$

13. Set of values of x lying in $[0,2\pi]$ satisfying the inequality $|\sin x| > 2\sin^2 x$ contains

A. $\left(0, \frac{\pi}{6}\right) \cup \left(\pi, \frac{7\pi}{6}\right)$

B. $\left(0, \frac{7\pi}{6}\right)$

C. $\pi/6$

D. None of these

14. $\int f(x)dx = g(x)$, then $\int \cos x\, f(\sin x)dx$ is equal to

A. $g(\cos x) + C$

B. $g(\sin x) + C$

C. $\int g(x) + \sin x + C$

D. $f(\sin x) + g(\cos x) + C$

15. The area bf the region bounded by the curves $y = |5 - x|$, $x = 1$, $x = 6$ and the X-axis

A. 15 sq units

B. 17/2 sq units

C. 13 sq units

D. 16 sq units

16. The area bounded by the curves $y = \tan x, -\frac{\pi}{3} \leq x \leq \frac{\pi}{3}, y = \cot x, \frac{\pi}{6} \leq x \leq \frac{\pi}{2}$ and the X-axis is

A. $\ln\sqrt{3}$

B. $\ln\sqrt{2}$

C. $\ln 2$

D. $\ln(3/2)$

17. If the vectors $p = (a+1)\hat{\mathbf{i}} + a\hat{\mathbf{j}} + a\hat{\mathbf{k}}, q = a\hat{\mathbf{i}} + (a+1)\hat{\mathbf{j}} + a\hat{\mathbf{k}}$ and $r = a\hat{\mathbf{i}} + a\hat{\mathbf{j}} + (a+1)\hat{\mathbf{k}}$ (a ∈ R) are coplanar, then the value of aa is____

Numerical

18. If the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then k is equal to

A. -1

B. $2/9$

C. $9/2$

D. 0

19. If the foot of the perpendicular drawn from the point (2, 0, 1) on a line passing through (α, 5, 1) is (7/3, 5/3, 15/4), then αα is equal to____

Numerical

20. An unbaised coin is tossed n times. If the probability of getting 5 heads is equal to the probability of getting 6 heads, then the probability of getting 3 heads is

A. ${}^{11}C_5\left(\frac{1}{2}\right)^5$

B. ${}^{11}C_6\left(\frac{1}{2}\right)^6$

C. ${}^{11}C_3\left(\frac{1}{2}\right)^{11}$

D. $\frac{11}{1024}$