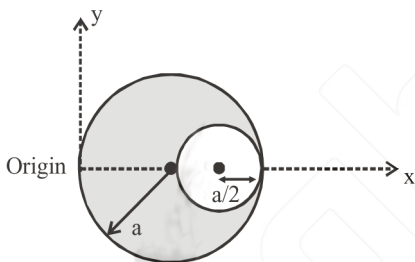


MOMENTUM

PHYSICS

(24 Feb 2021) Shift-2

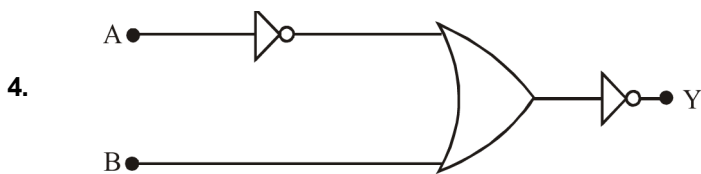
- Which of the following is correct for zener diode
 - (1) Lightly doped, depletion layer thickness is less
 - (2) Heavily doped, depletion layer thickness is less
 - (3) Lightly doped, depletion layer thickness is more
 - (4) Heavily doped, depletion layer thickness is more.
- Disc of radius $\frac{a}{2}$ is cut from disc of radius a . Find x-co-ordinate of COM from origin.



- (1) $\frac{5a}{6}$ (2) $\frac{a}{6}$ (3) $\frac{a}{3}$ (4) $\frac{a}{2}$

- A body is projected from origin with a velocity v_0 along +ve x-axis on which a force $-\alpha x^2$ is acting on it. Find the maximum distance from origin up to which the body can go. (x is the position of apticle)

- (1) $\left(\frac{3mv_0^2}{2\alpha}\right)^{\frac{1}{3}}$ (2) $\left(\frac{3mv_0^2}{2\alpha}\right)^{\frac{1}{2}}$ (3) $\left(\frac{2mv_0^2}{3\alpha}\right)^{\frac{1}{3}}$ (4) $\left(\frac{2mv_0^2}{3\alpha}\right)^{\frac{1}{2}}$



This diagram is equivalent to

- (1)
- (2)
- (3)
- (4)

- Weight at pole is 49 Newton then then weight at equator ?
 - (1) 48.83 N
 - (2) 49.17 N
 - (3) 49.83 N
 - (4) 49 N

MOMENTUM

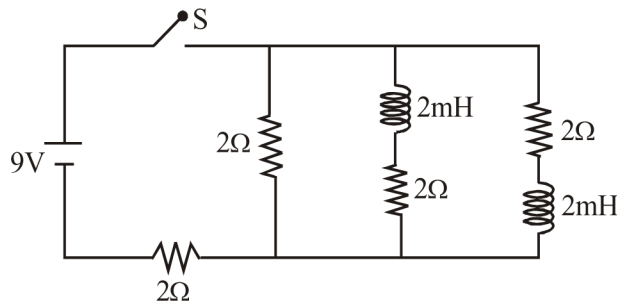
6. If the de-Broglie wavelengths of α -particle and proton are equal then the ratio of their velocity are

- (1) $\frac{1}{4}$ (2) $\frac{4}{1}$ (3) $\frac{1}{2}$ (4) 1

7. A light source emitting light and if we change light from violet to red then

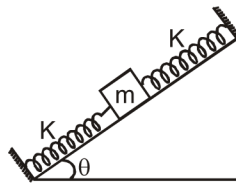
- (1) Fringes
 (2) The separation between two consecutive fringes decreases
 (3) Intensity of central maxima will increase
 (4) Intensity of central maxima will decrease

8. Switch S is closed at $t=0$. Find the current given battery just after closing the switch:



- (1) 2.25 A (2) 3.36 A (3) zero (4) 4.5 A

9. Find frequency of oscillation of spring block system shown.



- (1) $\frac{1}{2\pi} \sqrt{\frac{2K}{m}}$ (2) $\frac{1}{2\pi} \sqrt{\frac{4K}{m}}$ (3) $\frac{1}{2\pi} \sqrt{\frac{6K}{m}}$ (4) $\frac{1}{2\pi} \sqrt{\frac{K}{2m}}$

10. For which of the following transitions in Hydrogen-like atom of the frequency of emitted photon will be maximum.

- (1) $n=2$ to $n=1$ (2) $n=4$ to $n=3$ (3) $n=5$ to $n=4$ (4) $n=3$ to $n=2$

11. Two electron are fix, at separation $2d$. A middle of these two charges a proton is free to oscillate. Mass of proton is m_p and charge proton is e .

Now if proton is slightly displaced perpendicular to line joining of charge then find it's angular frequency of oscillation.

- (1) $\sqrt{\frac{e^2}{2\pi \epsilon_0 m_p d^3}}$ (2) $\sqrt{\frac{2e^2}{\pi \epsilon_0 d^2 m_p}}$ (3) $\sqrt{\frac{2e^2 \epsilon_0 m_p}{\pi d^2}}$ (4) $\sqrt{\frac{2 \epsilon_0 e^2 m_p}{\pi d^2}}$

12. If soft iron (ferromagnetic substance) is placed in external uniform magnetic field.

- (1) Size of domain will change and orientation also change
 (2) Size of domain will increase
 (3) Size of domain will decrease
 (4) Does not depend on external magnetic field.

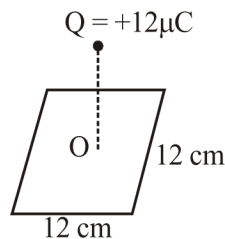
MOMENTUM

19. Which of the following curve represents curve represent relation between velocity with displacement of particle performing simple harmonic motion.
 (1) ellipse (2) circle (3) hyperbola (4) straight line

20. Which of the following is most appropriate regarding Bohr model.

- (1) speed $\propto \frac{Z}{n}$ (2) frequency of oscillation $\propto \frac{Z^3}{n^3}$
 (3) coulombic force attraction $\propto \frac{Z^3}{n^4}$ (4) Kinetic Energy $\propto \frac{Z^2}{n^2}$

21. A point charge $Q = +12\mu\text{C}$ at distance 6 cm from centre of square of side 12cm as shown in figure. Electric flux through square is $x \times 10^3$ S.I. units. Find x.



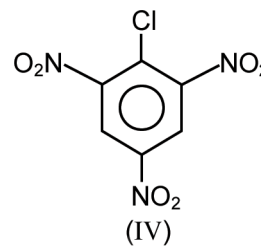
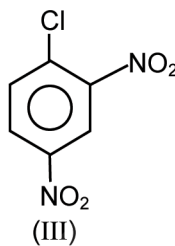
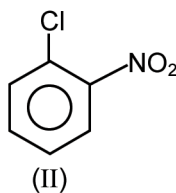
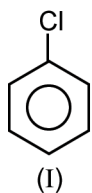
22. A rod of length 2.4m and mass 6 kg is bent to form a regular hexagon. Find the moment of inertia (kgm^2) of the hexagon about the axis perpendicular to the plane of hexagon passing through centre.
23. Two objects of mass ratio 1 : 2 have ratio of kinetic energy A : 1. If their momentum are same find A?
24. Two carb A and B both are moving towards each other with a speed of 7.2 km/hr. Source A produces a sound of frequency 676 Hz. Find the beat frequency (Hz) heard by the person sitting in carb A. (speed of sound is 340 m/sec in air)
25. On applying force to a rod along its length, the rod gets elongated by 0.04m. If the length of rod is doubled and diameter is also doubled and same force is applied along the length and it is found that the rod gets elongated by $x \times 10^{-2}$ m. Find the value of x.
26. There is a cylindrical wire radius 0.5 mm and conductance $5 \times 10^7 \Omega\text{m}^{-1}$. If the potential gradient along the length of cylindrical wire is 10 m V/m and the current flowing through cylindrical wire is $x^3 \times \pi \text{mA}$. Find the value of x.
27. In series LCR circuit at resonance power consumption in circuit is 16 W if voltage source of frequency 10^5rad/s is 120 V then find resistance (Ω) of circuit.
28. A gas is at rms speed 200 m/sec at 27°C and 1 atm pressue . If it's rms speed is $\frac{x}{\sqrt{3}}$ m/s where temp is 127°C and 2 atm pressure, find value of x.

MOMENTUM

CHEMISTRY

(24 Feb 2021) Shift-2

1. Compare the rate of aromatic nucleophilic substitution reaction of the following compounds



(1) IV > II > III > I

(2) III > II > I > IV

(3) I > II > III > IV

(4) IV > III > II > I

2. What is S in Buna-S ?

(1) Sulphure

(2) Styrene

(3) Rubber

(4) Strength

3. Which of the following set of the reagent is used to convert nitrobenzene 1,3-Dibromobenzene ?

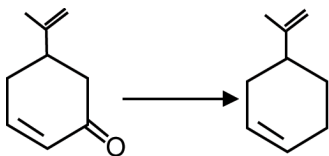
(1) $\text{Br}_2/\text{Fe} \longrightarrow \text{Sn}/\text{HCl} \longrightarrow \text{NaNO}_2/\text{HCl} \longrightarrow \text{CuBr}/\text{HBr}$

(2)

(3)

(4)

4. The reagent used to convert the following is ?



(1) $\text{NH}_2 - \text{NH}_2 / \text{C}_2\text{H}_5\text{O}^- \text{Na}^\oplus$

(2) Red P/ Cl_2

(3) Ni/H_2

(4) NaBH_4

5. Match the following

Column - I

(a) Valium

(b) Morphine

(c) Norethindrone

(d) Vitamin B-12

Column - II

(p) Pernicious anaemia

(q) Analgesic

(r) Tranquilizer

(s) Antifertility

6. **Statement-I** : BOD is the parameter that can be helpful for survival of aquatic life.

Statement-II : Optimum value of BOD is 6.5 ppm.

(1) Statement I is true, Statement II is false

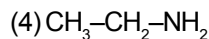
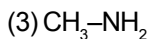
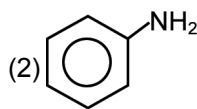
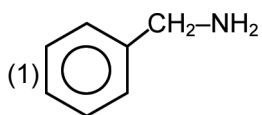
(2) Statement I is false, Statement II is true

(3) Statement I, II both are true

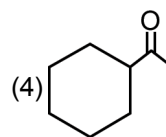
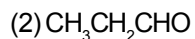
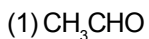
(4) Statement I, II both are false

MOMENTUM

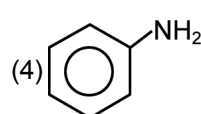
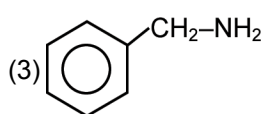
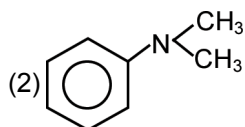
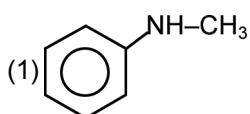
7. How many of the following amines can be prepared by Gabriel phthalimide synthesis ?



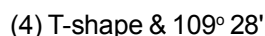
8. Which of the following compound cannot be prepared by the reaction of alkyne with $\text{HgSO}_4/\text{dil. H}_2\text{SO}_4$?



9. Diazonium salt of which of the following will give coloured dye on reaction with β -Naphthol in NaOH



10. The correct bond angle & shape of I_3^- is



11. Correct statements

(a) K.E. $\propto \frac{Z^2}{n^2}$

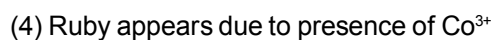
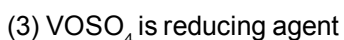
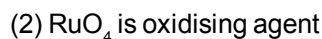
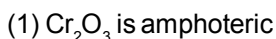
(b) $(nv) \propto Z^2$

(c) Frequency $\propto \frac{Z^3}{n^3}$

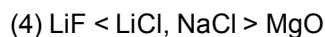
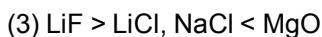
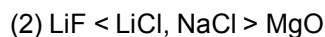
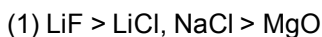
(d) Electrostatic force $\propto \frac{Z^3}{n^4}$

(1) a & d are correct (2) a & b are correct (3) b & c are correct (4) b & d are correct

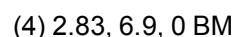
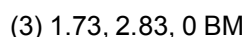
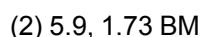
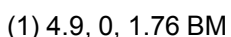
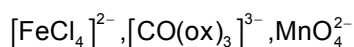
12. Which of the following is incorrect ?



13. Which of the following order of melting point is correct



14. Spin only magnetic moment of the following complexes



MOMENTUM

MATHEMATICS

(24 Feb 2021) Shift-2

1. Find the value of ${}^{n+1}C_2 + 2({}^2C_2 + {}^3C_2 + \dots + {}^nC_2) = ?$
(1) $\frac{n(n+1)(2n-1)}{6}$ (2) $\frac{n(n+1)(2n+1)}{6}$ (3) $\frac{(n-1)n(n+1)}{6}$ (4) $\frac{n(n+1)}{2}$
2. If A and B are subset s of $X = \{1, 2, 3, 4, 5\}$ then find the probability such that $n(A \cap B) = 2$
(1) $\frac{65}{2^7}$ (2) $\frac{65}{2^9}$ (3) $\frac{35}{2^9}$ (4) $\frac{135}{2^9}$
3. Given $f(0) = 1$, $f(2) = e^2$ also $f'(x) = f'(2-x)$, then the value of $\int_0^2 f(x)dx$ is
(1) $1 - e^2$ (2) $1 + e^2$ (3) e (4) e^2
4. A curve $y=f(x)$ passing through the point $(1, 2)$ satisfies the differential equation $x \frac{dy}{dx} + y = bx^4$ such that $\int_1^2 f(y)dy = \frac{62}{5}$. The value of b is
(1) 10 (2) 11 (3) $\frac{32}{2}$ (4) $\frac{62}{5}$
5. The area of the region defined by $5x^2 \leq y \leq 2x^2 + 9$ is
(1) $6\sqrt{3}$ (2) $12\sqrt{3}$ (3) $18\sqrt{3}$ (4) $9\sqrt{3}$
6. A aeroplane is flying horizontally with sped of 432 km/hr at height h meter from ground its angle of elevation from a point on ground is 60° . After 20 sec its angle of elevation from same point is 30° then the 'h' is equal to
(1) $1200\sqrt{3}$ (2) $600\sqrt{3}$ (4) $1800\sqrt{3}$ (4) $1000\sqrt{3}$
7. A curve $y = ax^2 + bx + c$ passing through the point $(1, 2)$ has slope at origin equal to 1 then ordered triplet (a, b, c) may be
(1) $(1, 1, 0)$ (2) $\left(\frac{1}{2}, 1, 0\right)$ (3) $\left(-\frac{1}{2}, 1, 1\right)$ (4) $(2, -1, 0)$
8. The value of $\tan\left(\frac{1}{4}\sin^{-1}\frac{\sqrt{63}}{8}\right)$ is
(1) $\frac{1}{\sqrt{7}}$ (2) $\frac{1}{\sqrt{5}}$ (3) $\frac{2}{\sqrt{3}}$ (4) None of these

MOMENTUM

9. The value of $\int_1^3 [x^2 - 2x - 2] dx$ ([.] denotes greatest integers function)
- (1) /04 (2) -5 (3) $-1 - \sqrt{2} - \sqrt{3}$ (4) $1 - \sqrt{2} - \sqrt{3}$
10. Which of the following conic has tangent ' $x + \sqrt{3}y - 2\sqrt{3}$ ' at point $\left(\frac{3\sqrt{3}}{2}, \frac{1}{2}\right)$?
- (1) $x^2 + 9y^2 = 9$ (2) $y^2 = \frac{x}{6\sqrt{3}}$ (3) $x^2 - 9y^2 = 10$ (4) $x^2 = \frac{y}{6\sqrt{3}}$
11. The negation of the statement $\sim p \wedge (p \vee q)$ is
- (1) $p \wedge \sim q$ (2) $p \vee \sim q$ (3) $\sim p \wedge q$ (4) $\sim p \vee \sim q$
12. Equation of plane throug (1, 0, 2) and line of intersection of planes $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$ and $\vec{r} \cdot (\hat{i} - 2\hat{j}) = -2$ is
- (1) $\vec{r} \cdot (\hat{i} + 7\hat{j} + 3\hat{k}) = 7$ (2) $\vec{r} \cdot (3\hat{i} + 10\hat{j} + 3\hat{k}) = 7$
 (3) $\vec{r} \cdot (\hat{i} + \hat{j} - 3\hat{k}) = 4$ (4) $\vec{r} \cdot (\hat{i} + 4\hat{j} - \hat{k}) = -7$
13. A is 3 x 3 square matrix and B is 3 x 3 skew symmetric matrix and X is a 3 x 1 matrix, then equation $(A^2B^2 - B^2A^2)X = 0$ (Where O is a null matrix) has/have
- (1) Infinite solution (2) No solution
 (3) Exactly one solution (4) Exactly two solution
14. If $\begin{vmatrix} f(x) & f'(x) \\ f'(x) & f''(x) \end{vmatrix} = 0$, $f(0) = 1$ and $f'(0) = 2$
- (1) [6, 9] (2) [9, 12] (3) [8, 10] (4) [5, 7]
15. Find a point on the curve $y = x^2 + 4$ which is at shortest distance from the line $y = 4x - 1$.
- (1) (2, 8) (2) (1, 5) (3) (3, 13) (4) (-15)
16. Let $f(x) = \begin{cases} -55x & ; x < -5 \\ 2x^3 - 3x^2 - 120x & ; -5 \leq x < 4 \\ 2x^3 - 3x^2 - 36x + 10 & ; x \geq 4 \end{cases}$
- Then interval in which $f(x)$ is monotonically increasing is
- (1) $(-5, -4) \cup (4, \infty)$ (2) $(-\infty, -4) \cup (5, \infty)$
 (3) $(-5, 4) \cup (5, \infty)$ (4) $(-5, -4) \cup (3, \infty)$
17. If a, b, c are in A.P. & centroid of the triangle with vertices (a, c), (a, b), (2, b) is $\left(\frac{10}{3}, \frac{7}{3}\right)$ and α, β are roots of the equation $ax^2 + bx + 1 = 0$, then $\alpha^2 + \beta^2 - \alpha\beta$
- (1) $-\frac{71}{256}$ (2) $\frac{71}{256}$ (3) $\frac{69}{256}$ (4) $-\frac{69}{256}$

MOMENTUM

18. Given $a + \alpha = 1$, $b + \beta = 2$ and $\alpha f(x) + \alpha f\left(\frac{1}{x}\right) = bx + \frac{\beta}{x}$ then value of $\frac{f(x) + f\left(\frac{1}{x}\right)}{x + \frac{1}{x}}$
19. Find the maximum value of 'k' for which the maximum value of variance of 10 elements is 10 in which 9 values are 1 and one value of is k. (Where k is integer)
20. Distance of p (x,y) from (5, 0) is thrice as distance of P(x,y) from (-5, 0). If locus of P is circle with radius 'r' then find the value of $4r^2$.
21. Four numbers whose sum is $\frac{65}{12}$ are in G.P. Sum of their reciprocals is $\frac{65}{18}$ and product of first three of them is 1. If third term is α then find value of 2α .
22. There are 10 students S_1, S_2, \dots, S_{10} . Find the number of ways to form 3 groups G_1, G_2, G_3 such that all groups has at least 1 member and group G_3 has almost 3 members.
23. At point P (5, 7) on circle $(x - 2)^2 + (y - 3)^2 = 25$ a tangent and a normal is drawn. The area of triangle formed by this tangent normal with x axis is λ then 24λ is.

MOMENTUM

ANSWER KEY (24 Feb 2021) Shift-2

PHYSICS

1. (4)	2. (1)	3. (1)	4. (3)	5. (1)	6.(1)	7.(1)
8. (1)	9. (1)	10. (1)	11. (1)	12. (1)	13. (1)	14. (1)
15. (1)	16. (3)	17. (1)	18. (2)	19. (1)	20. (1)	21. 226
22. 0.8	23. 2	24.16	25. 2	26. 5	27. 800	28. 400

CHEMISTRY

1. (4)	2. (2)	3. (1)	4. (1)	5. (a → r; b → q; c → s; d → p)	6. (1)	
7. (3)	8. (2)	9. (4)	10. (1)	11. (1)	12. (4)	13. (3)
14. (1)	15. (1)	16. (2)	17. (150.72)	18. (243 × 10 ⁻²)	19. (1.09°C)	
20. (4)	21. (0.3776 V)	22. (8)	23. (81)	24. (5)		

MATHEMATICS

1. (2)	2. (4)	3. (2)	4. (1)	5. (2)	6. (1)	7. (1)
8. (1)	9. (3)	10. (1)	11. (2)	12. (1)	13. (1)	14. (1)
15. (1)	16. (1)	17. (1)	18. (2)	19. 11	20. 56.25	21. 3
22. 26650	23. 1225					