

FIITJEE - JEE (Main)

PHYSICS, CHEMISTRY & MATHEMATICS

BATCHES: NWCM2024O1S & O2S

PHASE TEST – II

Q.P. CODE: 100041

Time Allotted: 3 Hours

Maximum Marks: 300

- Do not open this Test Booklet until you are asked to do so.
- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

Important Instructions

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

- Attempt ALL the questions. Answers have to be marked on the OMR sheets.
- This question paper contains **Three Sections**.
- Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
- Each **Section** is further divided into **Two Parts: Part-A & B** in the OMR.
- Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
- No candidate is allowed to carry any textual material, printed or written, bits of papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices ext. except the Admit Card inside the examination hall / room.

B. Filling of OMR Sheet:

- Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
- On the OMR sheet, darken the appropriate bubble with **Blue/Black Ball Point Pen** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
- OMR sheet contains alphabets, numerals & special characters for marking answers.
- Do not fold or make any stray marks on the Answer Sheet.**

C. Marking Scheme for All Two Parts:

- Part-A (01-20)** – Contains Twenty (20) multiple choice objective questions which have four (4) options each and only one correct option. Each question carries **+4 marks** which will be awarded for every correct answer and **-1 mark** will be deducted for every incorrect answer.
- Part-B (01-05)** contains five (05) Numerical based questions, the answer of which may be positive or negative numbers or decimals to **Two decimal places** (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+4 marks** for correct answer and **there will be no negative marking**.

Name of the Candidate : _____

Batch : _____ Date of Examination : _____

Enrolment Number : _____

Physics

PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

- A particle at rest suddenly disintegrates into two parts of equal masses which start moving. The two fragments will

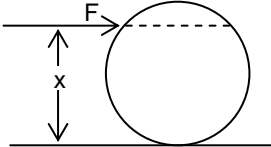
(A) Move in the same direction with equal speeds.
 (B) Move in opposite direction with equal speeds.
 (C) Move in any two direction with arbitrary speeds.
 (D) Move in opposite direction with unequal speeds.
- If the momentum of a body is increases by 50% its kinetic energy increases by

(A) 50% (B) 100% (C) 125% (D) 150%
- If R is the radius of the earth, then the height above the earth's surface where the value of g will be half of its value at the earth's surface, is

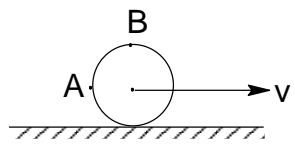
(A) R (B) $\sqrt{2}R$ (C) $(2 - \sqrt{2})R$ (D) $(\sqrt{2} - 1)R$
- If the velocity is $\vec{v} = 3\hat{i} + 2\hat{j} + 4\hat{k}$ and the position vector is $\hat{r} = -\hat{i} + 3\hat{j} - 2\hat{k}$ for a body of mass m, the angular momentum $\vec{L} =$

(A) $m(12\hat{i} - 4\hat{j} + 7\hat{k})$ (B) $m(8\hat{i} - 6\hat{j} + 10\hat{k})$
 (C) $m(16\hat{i} - 2\hat{j} - 11\hat{k})$ (D) $m(18\hat{i} - 2\hat{j} - 11\hat{k})$
- A constant horizontal force F is applied on a solid sphere. The solid sphere is placed on rough horizontal surface, if $x = \frac{8R}{5}$, then direction of frictional force that exist on sphere due to ground is

(A) forward (towards right) (B) backward (towards left)
 (C) friction force is zero (D) it can be in any direction

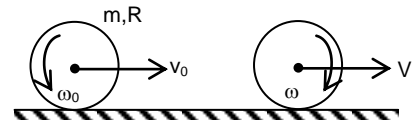

- A ring is rolling on a rough horizontal surface without slipping with a linear speed 'v'. Referring to the figure, ratio of speeds of points B and A is ie $\frac{V_B}{V_A} :$

(A) 1 : 1 (B) 1 : 2
 (C) $\sqrt{2} : 1$ (D) 1 : $\sqrt{2}$



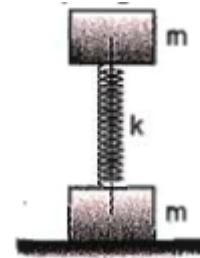
Space For Rough Work

7. A uniform disc of mass m and radius R is given a linear speed v_0 and a reverse spin such that its angular speed is ω_0 as shown in figure. If v and ω represent the linear and angular speeds of the disc when it starts pure rolling on the ground then



- (A) $V = \frac{2}{3}(V_0 + R\omega_0)$ (B) $V = \frac{3}{2}\left(V_0 - \frac{R\omega_0}{2}\right)$
 (C) $\omega = \frac{2}{3R}(V_0 + R\omega_0)$ (D) $\omega = \frac{2}{3R}\left(V_0 - \frac{R\omega_0}{2}\right)$

8. A system consists of two identical slabs each of mass m linked by compressed weightless spring of stiffness (k) as shown in given figure. The slabs are also connected by a thread which is burnt at a certain moment. Value of Δl , the initial compression of spring is such that the lower slab will bounce up after the thread is burnt through. Maximum displacement of centre of mass is



- (A) $\frac{3mg}{k}$ (B) $\frac{2mg}{k}$ (C) $\frac{mg}{k}$ (D) $\frac{4mg}{k}$

9. A particle executes simple harmonic motion with frequency 2.5 Hz and amplitude 2 m. The speed of the particle 0.3 second after crossing the equilibrium position is

- (A) zero (B) 2π m/s
 (C) 4π m/s (D) π m/s

10. A Block at the end of a spring executes simple harmonic motion with a period t_1 , while the corresponding period of another spring is t_2 . If the period of oscillation with the two springs in series is T , then

- (A) $T = t_1 + t_2$ (B) $T^2 = t_1^2 + t_2^2$
 (C) $T^{-1} = t_1^{-1} + t_2^{-1}$ (D) $T^2 = t_1^{-2} + t_2^{-2}$

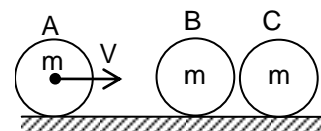
11. A particle moves with simple harmonic motion in a straight line. In first τ s after starting from rest it travels distance a , and in next τ s it travels $2a$, in same direction, then:

- (A) amplitude of motion is $3a$ (B) time period of oscillations is 8τ
 (C) amplitude of motion is $4a$ (D) time period of oscillations is 6τ

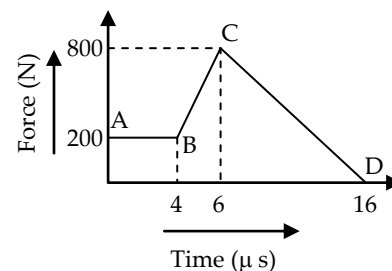
Space For Rough Work

12. The ratio of Earth's orbital angular momentum (about the Sun) to its mass is $4.4 \times 10^{15} \text{ m}^2\text{s}^{-1}$. The area enclosed by the earth's orbit is approximately.
 (A) $1 \times 10^{22} \text{ m}^2$ (B) $3 \times 10^{22} \text{ m}^2$
 (C) $5 \times 10^{22} \text{ m}^2$ (D) $7 \times 10^{22} \text{ m}^2$
13. A planet is revolving around a star in an elliptical path. Eccentricity of elliptical path is $e = 0.5$. Ratio of maximum speed to minimum speed of planet in one revolution is
 (A) 3 (B) 6
 (C) 9 (D) 2
14. Which statements are incorrect?
 (A) B represent bulk modulus of elasticity, then $B_{\text{solid}} > B_{\text{liquid}} > B_{\text{gas}}$
 (B) Adiabatic elasticity is greater than isothermal elasticity.
 (C) With increase in temperature, modulus of elasticity increases.
 (D) In case of bending of a beam of length ℓ , breadth b and thickness d , by a load Mg at the middle, depression δ is given by $\delta = \frac{MgL^3}{4bd^3Y}$

15. The ball A collides elastically with an identical ball B with a speed V . The ball B hit elastically another identical ball C. The velocity of C, after the impact is equal to
 (A) V (B) $\frac{V}{2}$
 (C) $\frac{V}{4}$ (D) None of these

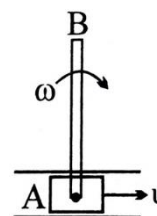


16. The magnitude of the force (in N) acting on body varies with time t (in $\mu\text{ s}$) as shown. AB, BC and CD are straight line segments. The magnitude of the total impulse of the force on the body from $t = 4 \mu\text{ s}$ to $t = 16 \mu\text{ s}$ is
 (A) $5 \times 10^{-3} \text{ N s}$ (B) $5.8 \times 10^{-3} \text{ N s}$
 (C) $5.8 \times 10^3 \text{ N s}$ (D) $5 \times 10^3 \text{ N s}$

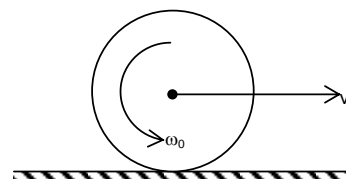
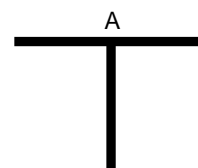


Space For Rough Work

17. A mechanism consists a part which is translated with a velocity u and a rod AB of length L and mass M hinged at A. The rod rotates about axis A with angular velocity ω . The kinetic energy of rod when it is vertical as shown is



- (A) $\frac{1}{2}Mu^2 + \frac{1}{6}ML^2\omega^2$ (B) $\frac{1}{2}Mu^2 + \frac{1}{6}ML\omega u$
 (C) $\frac{1}{2}Mu^2 + \frac{1}{6}ML^2\omega^2 + \frac{1}{2}ML\omega u$ (D) none of these
18. The orbital velocity of an artificial satellite in a circular orbit just above the earth's surface is v . For a satellite orbiting at an altitude of half the earth's radius, the orbital velocity is
- (A) $\frac{3}{2}v$ (B) $\sqrt{\frac{3}{2}}v$ (C) $\sqrt{\frac{2}{3}}v$ (D) $\frac{2}{3}v$
19. A physical pendulum consists of two stick each 1m long and having same mass. Sticks are joint together as shown in Fig. What is the pendulum's period of oscillation about a pin inserted through Point A? ($g = 10 \text{ m/sec}^2$)
- (A) $\frac{\pi}{\sqrt{2}} \text{ sec}$ (B) $\sqrt{2}\pi \text{ sec}$
 (C) $\frac{\pi}{4\sqrt{2}} \text{ sec}$ (D) $\frac{\pi}{\sqrt{3}} \text{ sec}$
20. A uniform solid sphere of radius 'R' is placed on a rough horizontal surface and given a linear velocity v_0 and angular velocity ω_0 as shown in figure. The sphere comes to rest after moving some distance to the right. It follows that:
- (A) $v_0 = \omega_0 R$ (B) $2v_0 = 5\omega_0 R$
 (C) $5v_0 = 2\omega_0 R$ (D) $2v_0 = \omega_0 R$

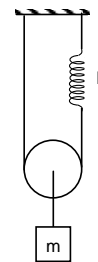


PART-B
Numerical Type

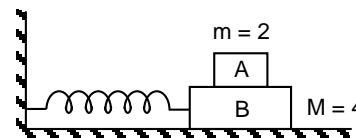
1. A tangential force F acts at the top of a thin spherical shell of mass m and radius R . If it rolls without slipping then acceleration is given by $a = \frac{x F}{m}$. What is the value of x

Space For Rough Work

2. Figure shows a massless pulley, a spring of spring constant $K = 250 \text{ N/m}$ and a mass 1 kg . On displacing the mass slightly, find frequency of its vertical oscillation. (Take: $\sqrt{10} = \pi$)

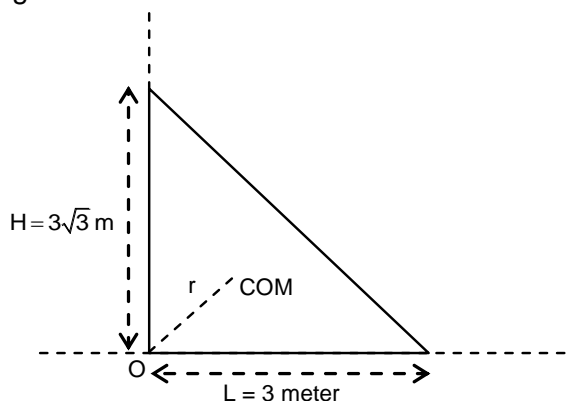


3. Block B of mass 4 kg resting on a frictionless horizontal surface and connected with spring of spring constant $K = 10$ as shown in figure.



Another block A of mass 2 kg is placed on the top of block B. Co-efficient of friction between the blocks is $\mu = 0.5$. Body B is displaced and released such that both bodies are moving together and perform simple harmonic motion. Maximum oscillation amplitude that permits body A and B to move together without slipping between the surfaces in contact of body A and B. (Consider $g = 10 \text{ m/sec}^2$).

4. In a uniform triangular lamina of side $L = 3 \text{ m}$ and $H = 3\sqrt{3} \text{ m}$ as shown in figure, distance of centre of mass from origin r is



5. A person of mass M stands at one end of a plank of length L , which lies at rest on a frictionless surface. The person walks to the other end of the plank. If the mass of the plank is $M/3$ and distance moved by the person relative to the ground is kL . The value of 'k' is?

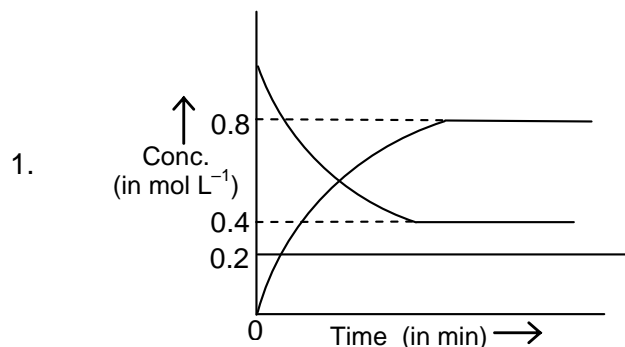
Space For Rough Work

Chemistry

PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

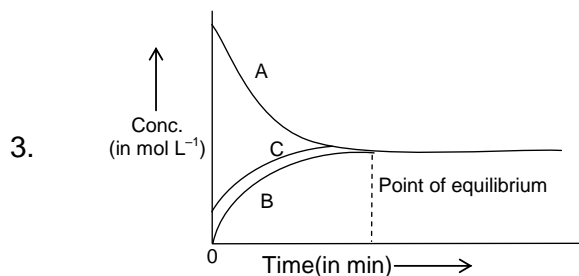


What is the equilibrium constant (K_c) of the reaction $A(g) + B(s) \rightleftharpoons C(g)$. Which has been represented in above figure?

- (A) 1 (B) $\frac{1}{2}$
(C) 2 (D) 4

2. HA is a weak monobasic acid. The degree of dissociation of the acid is 0.8 when its concentration is 0.2 M. What is the ionization constant of the acid?

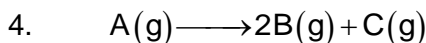
- (A) 3.57×10^{-1} (B) 64×10^{-2}
(C) 12.8×10^{-2} (D) 8×10^{-2}



For the reaction, $A(g) \rightleftharpoons B(g) + C(g)$. The equilibrium pressure is 1.2 atm. What is the equilibrium constant K_p of the reaction?

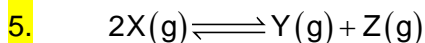
- (A) 0.16 (B) 0.4
(C) 0.2 (D) 0.04

Space For Rough Work



The half-life of A in above first order reaction is 40 sec. How much B(g) will be formed after 200 sec from the start of reaction? [Assume one mole L^{-1} of A taken initially]

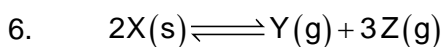
- (A) $\frac{31}{32}M$ (B) $\frac{15.5}{32}M$
 (C) $\frac{31}{16}M$ (D) $\frac{15.5}{16}M$



In above reaction, $P_X^\circ = 800$ mm of Hg. $P_Y^\circ = P_Z^\circ = \text{zero}$

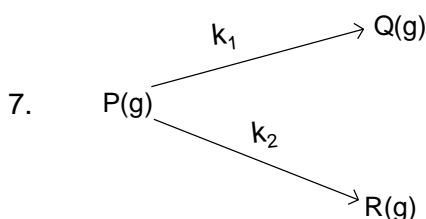
Which expression is correct at equilibrium?

- (A) $P_{\text{equm}} = P_X$ (B) $P_X > P_{\text{equm}}$
 (C) $P_X < P_{\text{equm}}$ (D) $K_P = \frac{1}{2}$



If the partial pressure of Y is doubled at equilibrium, then how much time will the partial pressure of Z change?

- (A) $\frac{1}{2}$ (B) $\left(\frac{1}{2}\right)^{1/3}$
 (C) $\left(\frac{1}{2}\right)^3$ (D) $\left(\frac{1}{2}\right)^{2/3}$



The reaction is started only with P, the concentration of Q is equal to R at all time. After time(t), all the three concentrations are equal i.e., $[P] = [Q] = [R]$. So 't' is expressed as

- (A) $t = \frac{1}{2k_2} \ln \frac{1}{3}$ (B) $t = \frac{1}{k_1} \ln 3$
 (C) $t = \frac{1}{2k_1} \ln 3$ (D) $t = \frac{1}{k_2} \ln 3$

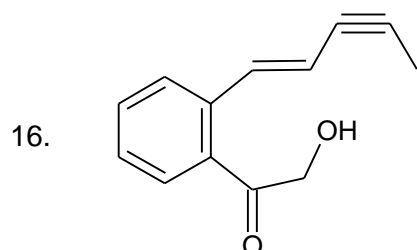
Space For Rough Work

8. The degree of dissociation of two weak monoprotic acids HA and HB are same ($\alpha = 0.2$). If 0.01 mole of HA and 0.0001 mole of HB are mixed and diluted to one litre. What is the pH of the resulting solution? [$\log 202 = 2.31$]
- (A) 6.21 (B) 4.8
(C) 2.69 (D) 3.91
9. $A(g) \rightleftharpoons B(g)$
In above reversible reaction, the half-lives of A and B are respectively 4 and 6 min respectively. What is the equilibrium constant of the reaction?
- (A) $\frac{1}{3}$ (B) $\frac{2}{3}$
(C) $\frac{3}{2}$ (D) $\frac{1}{2}$
10. Rate of reaction increases by increasing temperature, because
- (A) the activation energy of the reaction decreases.
(B) of increase in the number of collisions between molecules which energy is higher than activation energy.
(C) of increases in the average energy of reactants.
(D) decrease in threshold energy so that more number of reactants can cross this energy barrier.
11. Which of the following solution has the highest pH?
- (A) 0.01 M of NaCl
(B) 0.01 M HA (weak acid) ($K_a = 10^{-3}$)
(C) 0.1 M KCN (K_a of HCN = 10^{-10})
(D) 400 mL of 0.01 M NaHCO_3
(K_{a_1} and K_{a_2} of H_2CO_3 are $10^{-6.37}$ and $10^{-10.32}$ respectively)
12. H_2A is a weak dibasic acid. The pH of a solution of 0.8 M HA^- and 0.4 M A^{2-} is 11.3. Which statement is correct for the solution? [$\log 2 = 0.3$]
- (A) Solution can be called as an acidic buffer
(B) K_{a_2} of $\text{H}_2\text{A} = 1 \times 10^{-11}$
(C) pH of the solution is determined by applying the formula
$$\text{pH} = \frac{1}{2}(\text{p}K_w + \text{p}K_a + \log C)$$

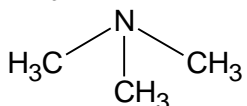
(D) Hydrolysis of A^{2-} ion forms an acidic solution
13. $\text{CH}_3 - \underset{\substack{| \\ \text{X}}}{\text{CH}} - \underset{\substack{| \\ \text{Y}}}{\text{CH}} - \text{COOH}$
Above acid will be most acidic if X and Y are respectively
- (A) F and F (B) F and Cl
(C) Cl and F (D) Cl and Cl

Space For Rough Work

14. C_2H_5 shows the most +I effect in
 (A) C_2H_5Cl (B) $C_2H_5NO_2$
 (C) C_2H_5Br (D) C_2H_5OH
15. In which of the following compound, delocalisation of electrons takes place?
 (A) $CH_3CH = CH - CH_2 - CH_2 - CH = CH - CH_2CH_3$
 (B) $CH_3CH = CH - CH_2 - CH_2 - CH = CH - CH = CH - CH_3$
 (C) $CH_2 = CH - CH_2 - CH = CH - CH_2 - CH = CH - CH_3$
 (D) $CH_3CH = CH - CH_2 - CH = CH - CH_2 - CH_2 - CH = CH_2$



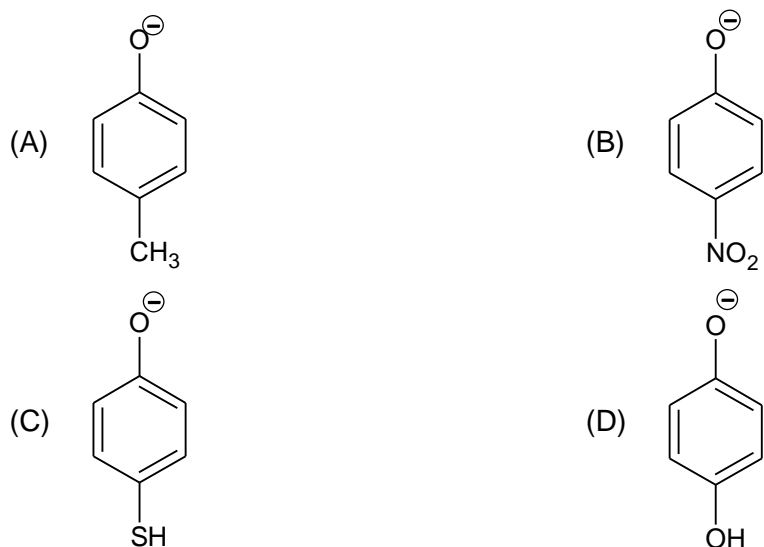
Which is the wrong statement for above compound?

- (A) It contains nine sp^2 -hybridized carbon atoms
 (B) The hybridization of both oxygen atoms is sp^2
 (C) It contains two sp -hybridized carbon atoms
 (D) It contains two sp^3 -hybridized carbon atoms
17. The most basic compound out of the following in gaseous state is
 (A) $CH_3CH_2CH_2NH_2$ (B) $CH_3CH_2NHCH_3$
 (C)  (D) $CH_3CH_2CH = NH$

18. $A \rightarrow$ Product is a first order reaction. Which property of 'A' decreases by increasing temperature?
 (A) Rate of reaction (B) Rate constant
 (C) Half-life period (D) Number of collisions

Space For Rough Work

19. Which is the most stable conjugate base?



20. For a reversible reaction, the relationship $\Delta G = \Delta G^\circ + RT \ln K_p$ is followed. If the values of $\Delta G > 0$ and $\Delta G^\circ > 0$, then which is correct?

Q_p = Reaction Quotient

(A) $Q_p < K_p$

(B) $Q_p > K_p$

(C) $Q_p = K_p$

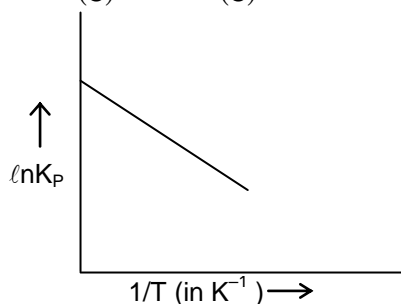
(D) $K_p = \text{zero}$

PART-B
Numerical Type

1. $A(g) \longrightarrow B(g) + 2C(g)$

Rate of the above reaction increases by a factor of 1.44 when the concentration of A increases by a factor of 1.2. What is the order of the reaction.

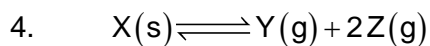
2. For reaction $A(g) \longrightarrow B(g)$, the following graph is given



Slope of above graph is -10, what is the standard enthalpy change (ΔH°) of the reaction in joule unit? ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

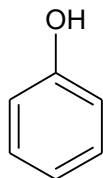
Space For Rough Work

3. What is the pH of 0.001 N HCl solution?



The reaction was started by taking only X(s) in a one litre container. The equilibrium constant (K_p) of above reaction is $32 \times 10^{-3} \text{ atm}^3$. What is the equilibrium pressure of the reaction in atm unit?

5.



The resonating structures of phenol contains negative charges at carbon atoms numbered by letters x, y, z of the benzene ring. What is the value of (x + y + z) according to IUPAC nomenclature?

Space For Rough Work

Mathematics

PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. Suppose p and q are two real numbers which do not take simultaneously the values $p = 0$; $q = 1$ and also suppose that the equation

$$\left(1 - q + \frac{p^2}{2}\right)x^2 + p(1 + q)x + q(q - 1) + \frac{p^2}{2} = 0$$

has two real and equal roots, then the point (p, q)

- (A) lies on a circle with radius 2 units.
 (B) lies on a straight line
 (C) lies on a parabola
 (D) lies on a hyperbola

2. The complete set of values of a for which the equation

$$x^2 + (3 - 2a)x + a = 0$$

has exactly one root on $(-1, 2)$

(A) $\left(-\infty, \frac{2}{3}\right) \cup \left(\frac{10}{3}, \infty\right)$

(B) $\left(-\infty, \frac{2}{3}\right] \cup \left[\frac{10}{3}, \infty\right)$

(C) $\left(\frac{2}{3}, \frac{10}{3}\right)$

(D) $\left[\frac{2}{3}, \frac{10}{3}\right]$

3. Let $f(x) = 4x^2 - 4ax + a^2 - 2a + 2$ be a quadratic polynomial in x , a be any real number. If exactly one root of $f(x) = 0$ lies on the interval $(0, 2)$ then $a \in$

(A) $(5 - \sqrt{7}, 5 + \sqrt{7})$

(B) $[5 - \sqrt{7}, 5 + \sqrt{7}]$

(C) $[5 - \sqrt{7}, 5 + \sqrt{7})$

(D) $(5 - \sqrt{7}, 5 + \sqrt{7}]$

Space For Rough Work

4. The values of a for which the expression $\frac{ax^2 - 7x + 5}{5x^2 - 7x + a}$ takes all real values for all real possible values of x
- (A) $(-2, 12)$ (B) $[-12, 2]$
 (C) $[-2, 12]$ (D) $(-12, 2)$
5. The complete set of values of a for which the inequality $3 - |x - a| > x^2$ is satisfied for at least one negative x is given by
- (A) $\left(-\frac{13}{4}, -3\right)$ (B) $\left(-3, \frac{13}{4}\right)$
 (C) $\left(-\frac{13}{4}, 3\right)$ (D) $\left(3, \frac{13}{4}\right)$
6. The value of $\sum_{n=1}^{\infty} \frac{n}{n^4 + 4}$ is equal to
- (A) $\frac{2}{8}$ (B) $\frac{3}{8}$
 (C) $\frac{4}{8}$ (D) $\frac{12}{8}$
7. Through the centroid of an equilateral triangle a line parallel to the base is drawn. On this line an arbitrary point P is taken inside the triangle. Let h denote the perpendicular distance of P from the base of the triangle. Let h_1 and h_2 be the perpendicular distances of P from the other two sides of the triangle, then
- (A) h is the AM of h_1 and h_2
 (B) h is the GM of h_1 and h_2
 (C) h is the HM of h_1 and h_2
 (D) None of these
8. If a, b, c are real numbers satisfying $25(9a^2 + b^2) + 9c^2 - 15(5ab + bc + 3ca) = 0$ then a, b, c are in
- (A) AP (B) GP (C) HP (D) AGP
9. The sequence $1, 2, 1, 2, 2, 1, 2, 2, 2, 1, 2, 2, 2, 2, 1, 2, 2, 2, 2, 2, 1, 2, \dots$ consists of 1's separated by blocks of 2's with n 2's is the n th block. The sum of the first 1234 terms of this sequence is
- (A) 1996 (B) 2419 (C) 2429 (D) 2439

Space For Rough Work

10. If $|z_1| = 2, |z_2| = 3$ and $|z_3| = 4$, then the maximum value of $|z_1 - z_2|^2 + |z_2 - z_3|^2 + |z_3 - z_1|^2$ equals
 (A) 110 (B) 86 (C) 87 (D) 58
11. Let $\theta_1, \theta_2, \dots, \theta_{10}$ be positive valued angles (in radian) such that $\theta_1 + \theta_2 + \dots + \theta_{10} = 2\pi$. Define the complex numbers $z_1 = e^{i\theta_1}, z_k = z_{k-1} e^{i\theta_k}$ for $k = 2, 3, \dots, 10$, where $i = \sqrt{-1}$. Consider the statements P and Q given below:
 P: $|z_2 - z_1| + |z_3 - z_2| + \dots + |z_{10} - z_9| + |z_1 - z_{10}| \leq 2\pi$
 Q: $|z_2^2 - z_1^2| + |z_3^2 - z_2^2| + \dots + |z_{10}^2 - z_9^2| + |z_1^2 - z_{10}^2| \leq 4\pi$ Then,
 (A) P is TRUE and Q is FALSE (B) Q is TRUE and P is FALSE
 (C) both P and Q are TRUE (D) both P and Q are FALSE
12. Suppose z is any root of $11z^8 + 20iz^7 + 10iz - 22 = 0$, where $i = \sqrt{-1}$. Then $S = |z|^2 + |z| + 1$ satisfies
 (A) $S \leq 3$ (B) $3 < S < 7$
 (C) $7 \leq S < 13$ (D) $S \geq 13$
13. Number of ordered pairs(s) (a, b) of real numbers such that $(a + ib)^{2008} = a - ib$ holds good, is
 (A) 2008 (B) 2009
 (C) 2010 (D) 1
14. Let AB be the diameter of a semicircle S. The locus of the centres of the circles which are tangent to AB and S is an arc of
 (A) a circle (B) an ellipse (C) a parabola (D) a cycloid
15. The points of contact Q and R of tangent from the point P (2, 3) on the parabola $y^2 = 4x$ are
 (A) (9, 6) and (1, 2) (B) (1, 2) and (4, 4)
 (C) (4, 4) and (9, 6) (D) (9, 6) and $\left(\frac{1}{4}, 1\right)$
16. From an external point P, pair of tangent lines are drawn to the parabola, $y^2 = 4x$. If θ_1 and θ_2 are the inclinations of these tangents with the axis of x such that $\theta_1 + \theta_2 = \frac{\pi}{4}$, then the locus of P is:
 (A) $x - y + 1 = 0$ (B) $x + y - 1 = 0$
 (C) $x - y - 1 = 0$ (D) $x + y + 1 = 0$

Space For Rough Work

17. A variable circle is drawn to touch the line $3x - 4y = 10$ and also the circle $x^2 + y^2 = 4$ externally then the locus of its centre is
 (A) straight line (B) circle
 (C) pair of real, distinct straight lines (D) parabola
18. Let $\alpha = \sqrt{19 - 8\sqrt{3}} + \sqrt{7 + 4\sqrt{3}}$ and $\beta = \sqrt{83 - 18\sqrt{2}} - \sqrt{6 - 4\sqrt{2}}$, then $\log_2\left(\frac{\alpha}{\beta}\right)$ lies in the interval
 (A) $(-2, -1)$ (B) $\left(-\frac{1}{2}, 0\right)$ (C) $(0, 1)$ (D) $\left(-1, \frac{-1}{2}\right)$
19. If $2^{(\log_2 3)^x} = 3^{(\log_3 2)^x}$ then the value of x is equal to
 (A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{6}$
20. For two data sets each of size is 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4 respectively, then the variance of the combined data set is:
 (A) $\frac{5}{2}$ (B) $\frac{11}{2}$ (C) 6 (D) $\frac{13}{2}$

PART-B
Numerical Type

1. The minimum value of $x^2 + 2xy + 3y^2 - 6x - 2y$ is
2. If x, y, z be real numbers such that $x + y + z = 0$; $xy + yz + zx = -3$ then the value of $x^3y + y^3z + z^3x =$
3. Consider the region $R = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x \geq 0 \text{ and } y^2 \leq 4 - x\}$. Let F be the family of all circles that are contained in R and have centres on the x – axis. Let C be the circle that has largest radius among the circle in F. Let (α, β) be a point where the circle C meets the curve $y^2 = 4 - x$. If the radius of the circle C be r then $(r + \alpha)$ equals-----
4. If $\sum_{i=1}^{18} (x_i - 8) = 9$ and $\sum_{i=1}^{18} (x_i - 8)^2 = 45$, then find the standard deviation of x_1, x_2, \dots, x_{18} is -----
5. If a, b, c, d, e are positive real numbers such that
 $a + b + c + d + e = 15$ and $ab^2c^3d^4e^5 = (120)^3 \cdot 50$
 then the value of $a^2 + b^2 + c^2 + d^2 + e^2 =$ _____

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES: NWCM2024O1S & O2S

PHYSICS, CHEMISTRY & MATHEMATICS

JEE MAIN-PHASE-II

ANSWER KEY

Paper Code
100041

SECTION – I

(PHYSICS)

PART – A

1. B	2. C	3. D	4. C
5. A	6. C	7. D	8. B
9. A	10. B	11. D	12. D
13. A	14. C	15. A	16. A
17. C	18. C	19. D	20. C

PART – B

1. 1.20	2. 5	3. 3	4. 2
5. 0.25			

SECTION – II

(CHEMISTRY)

PART – A

1. C	2. B	3. B	4. C
5. A	6. B	7. C	8. C
9. C	10. B	11. C	12. B
13. A	14. B	15. B	16. B
17. C	18. C	19. B	20. B

PART – B

1. 2	2. 83.14	3. 3	4. 0.6
5. 12			

SECTION – III (MATHEMATICS)

PART – A

1. C	2. B	3. C	4. A
5. C	6. B	7. A	8. A
9. B	10. C	11. C	12. B
13. C	14. C	15. B	16. C
17. D	18. B	19. A	20. B

PART – B

1. -11	2. -9	3. 3.5	4. 1.5
5. 55			