# FIITJEE (JEE-Advanced)

BATCHES – Two Year CRP-2325

## PHYSICS, CHEMISTRY & MATHEMATICS

**QP Code: 100683** **RIT- 1**

**Time Allotted: 3 Hours** **Maximum Marks: 183**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

## 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

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains **Three Sections.**
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. All the section can be filled in **PART-A** of OMR.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

### B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. 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.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

### C. Marking Scheme For Only One Part.

**(i)** **Part-A (01-07) –** Contains seven (07) multiple choice questions which have ONLY ONE CORRECT answer Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer.

**(ii)** **Part-A (08-14) –** Contains seven (07) multiple choice questions which have **One or More** correct answer.
*Full Marks*: **+4** If only the bubble(s) corresponding to all the correct options(s) is (are) darkened.
*Partial Marks*: **+1** For darkening a bubble corresponding **to each correct option,** provided NO incorrect option is darkened.
*Zero Marks*: **0** If none of the bubbles is darkened.
***Negative Marks*: –2 In all other cases**.
For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–2** marks, as a wrong option is also darkened.

**(iii)** **Part-A (15-18) -** This section contains Two paragraphs. Based on each paragraph, there are Two multiple choice questions. Each question has only one correct answer and carries **+3 marks** for the correct answer and **-1 marks** for wrong answer.

**Name of the Candidate :**_____

**Batch :**_____ **Date of Examination :**_____

**Enrolment Number :**_____

# SECTION-1 : PHYSICS

## PART – A

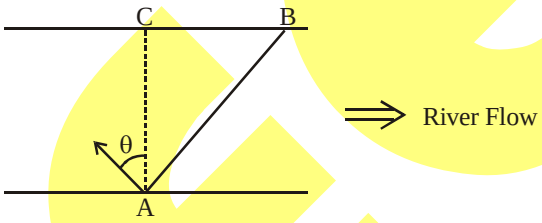
### (Single Correct Choice Type)

This section contains **7 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. The resultant of $\bar{P}$ and $\bar{Q}$ is perpendicular to $\bar{P}$. What is the angle between $\bar{P}$ and $\bar{Q}$

(A) $\cos^{-1}(P/Q)$ (B) $\cos^{-1}(-P/Q)$ (C) $\sin^{-1}(P/Q)$ (D) $\sin^{-1}(-P/Q)$

2. Width of a river is 60 m. A swimmer wants to cross the river such that he reaches from A to B directly. Point B is 45 m ahead of line AC (perpendicular to river) Assume speed of river and speed of swimmer as equal. Swimmer must try to swim at angle $\theta$ with line AC. Value of $\theta$ is




(A) 37º (B) 53º (C) 30º (D) 16º

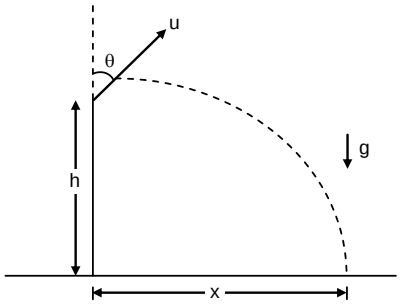
3. A stone is projected vertically upwards so as to reach a height h passes points P and Q with velocities $\frac{v}{2}$ and $\frac{v}{3}$, where v is initial velocity with which the body is thrown. The distance between P and Q in terms of h is:

(A) $\frac{7}{36}h$ (B) $\frac{5}{36}h$ (C) $\frac{9}{36}h$ (D) $\frac{8}{36}h$

4. The relation between time t and distance x moved by a particle is $t = \alpha x^2 + \beta x$ where $\alpha$ and $\beta$ are constants. The retardation is (if v represents velocity)

(A) $2\alpha V^3$ (B) $2\beta V^3$ (C) $2\alpha\beta V^3$ (D) $2\beta^2 V^3$

5. A ball is projected with speed u, from a height of tower h as shown in figure. The value of $\theta$ for which x is maximum.




(A) 45°

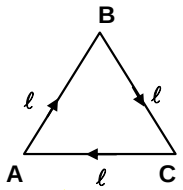
(B) 90°

(C) $45^o + \frac{1}{2}\sin^{-1}\left(\frac{gh}{u^2+gh}\right)$

(D) $45^o + \frac{1}{2}\sin^{-1}\left(\frac{2gh}{u^2+2gh}\right)$

***Space For Rough Work***

6. A particle moves over the sides of an equilateral triangle of side $\ell$ with constant speed v as shown in figure. The magnitude of average acceleration as it moves from A to C is




(A) $\frac{v^2}{\ell}$ (B) $\frac{\sqrt{3}}{2}\frac{v^2}{\ell}$

(C) $\frac{\sqrt{3}v^2}{\ell}$ (D) $\frac{v^2}{2\ell}$

7. Rectilinear motion under constant acceleration the displacement in $n^{th}$ second $\vec{S}_{n^{th}} = \vec{u} + \frac{\vec{a}}{2}(2n-1)$ where $\vec{u}$ is initial velocity and $\vec{a}$ is acceleration then choose the correct option regarding this equation
(A) Dimension of each term is the dimension of displacement.
(B) Dimension of each term is the dimension of velocity.
(C) Dimension of each term is the dimension of acceleration.
(D) none of these

## (Multi Correct Choice Type)

This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

8. A bus starts from rest with an acceleration of 1 m/s$^2$. A car which is 48 m behind the bus is moving with a uniform velocity of 10 m/s. the time at which of passenger of car can jump into the bus.
(A) 6.4 s (B) 8 s (C) 12 s (D) 12.4 s

9. Two particles are projected from the same point with same speed *u* at angles of projection $\alpha$ and $\beta$ from horizontal strike the horizontal ground. The maximum heights attained by projectiles is $h_1$ and $h_2$ respectively, *R* is the range for both and $t_1$ and $t_2$ are their time of flights respectively then:

(A) $\alpha+\beta=\frac{\pi}{2}$ (B) $R=4\sqrt{h_1h_2}$ (C) $\frac{t_1}{t_2}=\tan\alpha$ (D) $\tan\alpha=\sqrt{h_1/h_2}$

10. A rocket is fired vertically up from the ground with a resultant acceleration of 10 m/s$^2$ upward. The fuel is finished in 1 minute and it continuous to move up (g = 10 m/s$^2$)
(A) the maximum height reached by rocket from ground is 18 km.
(B) the maximum height reached by rocket from ground is 36 km.
(C) the time from initial in which rocket again at ground is 240 s.
(D) the time from initial in which rocket again at ground is (120+60$\sqrt{2}$)s.

***Space For Rough Work***

11. Two vectors $\vec{A}$ and $\vec{B}$ are drawn from a common point and $\vec{C} = \vec{A} + \vec{B}$

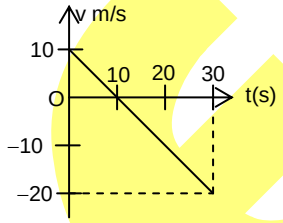
(A) If $C^2 = A^2 + B^2$, the angle between vectors $\vec{A}$ and $\vec{B}$ is 90°

(B) If $C^2 < A^2 + B^2$, the angle between $\vec{A}$ and $\vec{B}$ is greater than 90°

(C) If $C^2 > A^2 + B^2$ then angle between the vectors $\vec{A}$ and $\vec{B}$ is between 0° and 90°

(D) If C = A – B, angle between $\vec{A}$ and $\vec{B}$ is 180°

12. The velocity-time graph for a particle moving on a straight line is shown in figure.




(A) the particle has constant acceleration

(B) the particle has never turned around

(C) the particle has zero displacement at t = 30 s.

(D) the average speed in the interval 0 to 10 s is the same as the average speed in the interval 10 s to 20 s.

13. A man who can swim at a speed v relative to the water wants to cross a river of width d, flowing with a speed u. The point opposite him across the river is P.

(A) The minimum time in which he can cross the river is $\frac{d}{v}$.

(B) He can reach the point P in time $\frac{d}{v}$.

(C) He can reach the point P in time $\frac{d}{\sqrt{v^2 - u^2}}$

(D) He cannot reach P if u > v.

14. The magnitude of component of a vector may be

(A) greater than the magnitude of that vector.

(B) equal to the magnitude of that vector

(C) smaller then the magnitude of that vector

(D) zero

## (Paragraph Type)

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

### Paragraph for Question no. 15 to 16

Two cars A and B, travel in a straight line. The distance of A from the starting point is given as a function of time by $x_A(t) = at + bt^2$, with a = 4 m/s and b = 2 m/s$^2$. The distance of B from the starting point is $x_B(t) = ct^2 + dt^3$, with c = 2 m/s$^2$ and d = 1 m/s$^3$.

15. At what time the cars are at the same point?

(A) 2 s (B) $\frac{2}{\sqrt{3}}$ s (C) 3 s (D) $\frac{2}{3}$ s

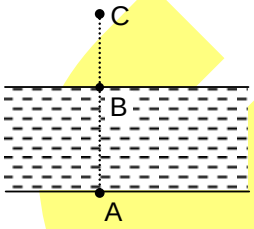
***Space For Rough Work***

16. At what time do A has half acceleration of B ?

(A) 2 s (B) $\frac{2}{\sqrt{3}}$ s (C) 3 s (D) $\frac{2}{3}$ s

**Paragraph for Question no. 17 to 18**

A river of width *d* is flowing with uniform velocity *u*. A boat starts moving from point *A* (one bank of river) with speed *u* relative to the river. The direction of resultant velocity is always perpendicular to line joining boat and fixed point *C* (see figure). Point *B* is on the opposite side of the river and *A*, *B*, *C* are in straight line. If *AB* = *BC* = *d*.




17. The path of boat is

(A) straight line (B) parabolic (C) elliptical (D) none of these

18. The distance from *B* where the boat will reach the other bank of river is

(A) d (B) $d\sqrt{2}$ (C) $\frac{d}{2}$ (D) $d\sqrt{3}$

***Space For Rough Work***

# SECTION-2 : CHEMITRY

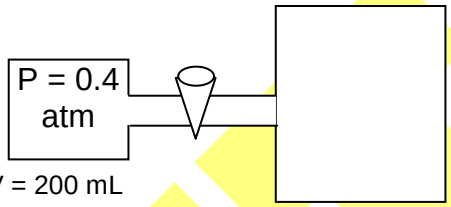
## PART – A

### (Single Correct Choice Type)

This section contains **7 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. Fe(Z = 26), Co(Z = 27), Ni(Z = 28), Cu(Z = 29)
Which statement is correct for the four atoms which atomic numbers are given above?
(A) Each atom contains same number of electrons with $\ell = 0$, '$\ell$' is the azimuthal quantum number of electrons.
(B) Each atom contains the same number of electrons which orbital angular momentum is $\sqrt{6}\frac{h}{2\pi}$.
(C) Each atom contains same number(maximum) of electrons with s = +½ or –½.(s is the spin quantum numbers)
(D) Each atom contains the same number of unpaired electrons.

2. In which reaction, the equivalent mass of carbon has the highest value?
(A) $C + O_2 \longrightarrow CO_2$ (B) $CO_2 + C \longrightarrow 2CO$
(C) $ZnO + C \longrightarrow Zn + CO$ (D) $SiO_2 + 3C \longrightarrow SiC + 2CO$

3. 

The containers are at constant temperature. When the stop cock is closed, the pressure in the smaller vessel is 0.4 atm. What will be the pressure in the larger vessel if the stop cock is opened till pressure in both containers becomes identical.
(A) 0.01 atm (B) 0.8 atm (C) 0.08 atm (D) 0.1 atm

4. Five moles of a gas is confined in a closed container of volume 112 litre. The gas will exert 1 atm pressure if the temperature is maintained at 273 K. Choose correct statement for the gas.
(A) All the molecules of the gas will move with same velocity at constant temperature.
(B) The compressibility factor(Z) of the gas is independent of temperature and pressure.
(C) Intermolecular collision is only responsible for the zig-zag motion of gas molecules as well as the pressure produced by them in the container.
(D) The average kinetic energy of the gas is directly proportional to temperature and pressure.

***Space For Rough Work***

5. The bond energy of $H_2$ gas is 431 kJ $mol^{-1}$. One mole of $H_2$ gas in an ionization chamber is supplied with 3050 kJ of energy. If the ionization energy of an hydrogen atom is 13.6 eV/atom, what will he the sum of kinetic energies of the ejected electrons in kJ unit?
[1eV = $1.6 \times 10^{-19}$ Jouls, N = $6 \times 10^{23}$]

(A) 15.6 (B) 7.8 (C) 3.9 (D) None

6. 10 g of $CaCO_3$ was dissolved in 600 mL of 0.4 M HCl solution. After complete reaction between $CaCO_3$ and HCl, the excess acid required 400 mL of 0.1 NaOH for neutralization.
(A) 0.2 mole of $CO_2$ gas is evolved in the reaction.
(B) 0.4 mole of HCl was added in excess which gets neutralized by NaOH.
(C) If $CaCl_2$ is completely ionized in water, the molarity of $Cl^-$ ions in the solution becomes 0.24 M.
(D) The concentration of $H^+$ ions in the solution is $10^{-14}$ M.

7. The nodal plane of which atomic orbital is oriented in between the coordinate axis?
(A) $d_{x^2-y^2}$ (B) $d_{xz}$ (C) $d_{xy}$ (D) $d_{z^2}$

## (Multi Correct Choice Type)

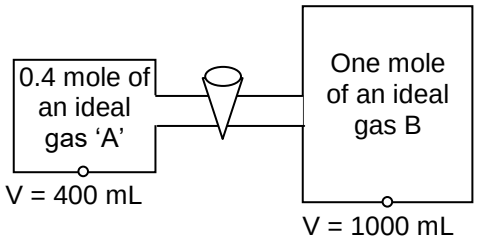
This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

8. $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$

Balance the above equation and then choose the correct statement(s).
(A) The ratio of stoichiometric coefficients of $MnO_4^-$ : $CO_2$ in the equation is 1 : 5.
(B) The equivalent mass of $CO_2$ is 44 g $equ^{-1}$.
(C) HCl can't be used in above reaction to acidify the $KMnO_4$ solution.
(D) All the $CO_2$ produced in the reaction are evolved from the reaction mixture.

***Space For Rough Work***

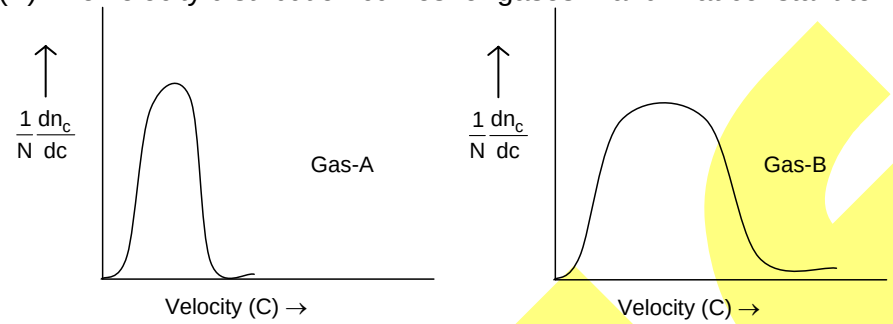
9.




Both the containers are at constant temperature. A and B gases effuse through the orifice made on the containers. The relative rate of effusion of the gases $r_A : r_B = 2 : 1$.
Choose the correct statement.

(A) If gas 'A' is He, gas 'B' will be $CH_4$

(B) The velocity distribution curves for gases A and B at constant temperature are




(C) If both 'A' and 'B' are monoatomic gases, then the boiling point of 'B' is higher than that of 'A'

(D) Both gases can deviate from ideal behaviour if the temperature is reduced and pressure is increased.

10. The correct statement(s) regarding the $4p_z$ orbital is/are

(A) it has two radial nodes

(B) it's wave function is expressed as $\psi_{4,1,0}$

(C) it can hold a maximum of six electrons

(D) in chromium, this orbital contains one electron

11. One litre aqueous solution contains 4 g of NaOH and 0.1 mole of $Na_2CO_3$. In the presence of phenolphthalein indicator the solution required 800 mL of HCl for titration. Choose correct statement(s).

(A) The molarity of the HCl solution used for titration is 0.25 M.

(B) One of the reactions taking place during titration is $Na_2CO_3 + HCl \longrightarrow NaHCO_3 + NaCl$

(C) If methyl orange indicator is used instead of phenolphthalein, then the same quantity of HCl, i.e. 800 mL would have been consumed for the titration.

(D) The molarity of the $Na^+$ ions after completion of titration with phenolphthalein indicator becomes $\frac{1}{8}M$.

***Space For Rough Work***

12.

| | | |
|---|---|---|
| P(g)<br>Q(g)<br>R(g) | Q(g)<br>R(g) | R(g) |
| (I) | (II) | (III) |

P, Q and R are monoatomic ideal gases. The container (I), (II) and (III) are of equal volume and are maintained with constant temperature.
The pressure produced in the container (I), (II) and (III) respectively are 20 atm, 6 atm and 2 atm. Choose correct statement(s).

(A) The partial pressure of P(g) is 14 atm.

(B) The mole fraction of Q(g) in the second container is $\frac{2}{3}$.

(C) If only gas Q is enclosed in any one of the three containers separately the pressure of the container become 4 atm.

(D) If the temperature of the containers are doubled, the pressure produced by the gases in container(II) becomes 12 atm.

13. Which of the following statement(s) is/are correct according to Bohr's theory?

(A) The fourth orbit of the hydrogen atom has 16 degenerated orbitals.

(B) If $\lambda_x$ is the wavelength of radiation associated with the first Balmer line of hydrogen emission spectrum and $\lambda_y$ is the wavelength of the first line of Lyman series, then the ratio $\frac{\lambda_x}{\lambda_y} = \frac{27}{5}$.

(C) If '$a_0$' be the radius of the first orbit of H-atom, then the wavelength of the motion of electron in the fourth orbit of H-atom will be $8\pi a_0$.

(D) if '$a_0$' is the radius of the first orbit of H-atom, then the difference between the radii of the $2^{nd}$ and $4^{th}$ orbit of H-atom is $2a_0$.

14. In which molecule or species, oxygen atom shows positive oxidation states?

(A) $OF_2$ (B) $N_2O$

(C) $H_2O_2$ (D) $O_2F_2$

***Space For Rough Work***

## (Paragraph Type)

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

### Paragraph for Question no. 15 to 16

de-Broglie wavelength of microscopic particles like electrons, protons, alpha particles etc can be determined by using the following formulae.

$$\lambda = \frac{h}{p} = \frac{h}{mu} = \frac{h}{\sqrt{2mE}} = \frac{h}{\sqrt{2mqV}}$$

Where p = Momentum of particles
u = Velocity of the particles
E = Kinetic energy of the particles
q = Charge on the particles
V = Potential difference
m = Mass of the particles
$h = 6 \times 10^{-34}$ Js
1 amu = $1.6 \times 10^{-24}$ g = $1.6 \times 10^{-27}$ Kg
$N = 6 \times 10^{23}$
$R = 8.4\ JK^{-1}\ mol^{-1}$

15. The de-Brogle wavelength of an electron at 1000 K is
(mass of electron = $9 \times 10^{-31}$ Kg)
(Assuming the electron behave as an ideal gas at that temperature)
(A) $1.3 \times 10^{-10}$ m (B) $3 \times 10^{-10}$ m (C) $30 \times 10^{-10}$ m (D) $13 \times 10^{-10}$ m

16. If an alpha particle($He^{2+}$) is accelerated through a potential difference of 1000 volt, what will be it's de-Broglie wavelength?
(A) $3 \times 10^{-13}$ m (B) $8 \times 10^{-14}$ m (C) $12 \times 10^{-13}$ m (D) $16 \times 10^{-14}$ m

### Paragraph for Question no. 17 to 18

$$MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$$

Above reaction is a redox reaction, in which $MnO_2$ behaves as an oxidizing agent which oxidizes $Cl^-$ into $Cl_2$. Not all the $Cl^-$ ions are oxidized only half of $Cl^-$ ions are oxidized. To start the reaction 8.7 g of $MnO_2$(molar mass = 87 g $mol^{-1}$) powder is dissolved in 800 mL of 0.25 M HCl solution in a reaction container. Answer the following question.

17. How many moles of $Cl_2$ gas is produced in the reaction?
(A) 0.1 mol (B) 0.05 mol (C) 0.25 mol (D) 0.4 mol

18. Which statement is correct?
(A) In the reaction the molar mass and the equivalent mass of HCl are different.
(B) $MnO_2$ is the limiting reactant
(C) $MnO_2$ undergoes complete reaction
(D) HCl is the excess reactant

***Space For Rough Work***

# SECTION-3 : MATHEMATICS

## PART – A

### (Single Correct Choice Type)

This section contains **7 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. Solution of $\left|\frac{x^2-5x+4}{x^2-4}\right| \le 1$ is _____.

(A) $\left[0, \frac{8}{5}\right] \cup \left[\frac{5}{2}, \infty\right)$ (B) $\left(-\infty, \frac{8}{5}\right] \cup \left[\frac{5}{2}, \infty\right)$

(C) $\left[0, \frac{8}{5}\right] \cup \left[\frac{5}{4}, \infty\right)$ (D) $\left[0, \frac{8}{3}\right] \cup \left[\frac{5}{2}, \infty\right)$

2. The value of $81^{\left(\frac{1}{\log_5 3}\right)} + 27^{\log_9 36} + 3^{\frac{4}{\log_7 9}}$ is equal to

(A) 49 (B) 625 (C) 216 (D) 890

3. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha} = x$ then $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha} = .....$

(A) $\frac{1}{x}$ (B) $x$ (C) $1-x$ (D) $1+x$

4. If $x = \sin\alpha, y = \sin\beta, z = \sin(\alpha+\beta)$, then $\cos(\alpha+\beta) =$

(A) $\frac{z^2-x^2-y^2}{xy}$ (B) $\frac{z^2-x^2-y^2}{2xy}$ (C) $\frac{z^2+x^2+y^2}{xy}$ (D) $\frac{x^2+y^2+z^2}{2xy}$

5. If $\theta$ lies in the second quadrant, then the value of $\sqrt{\left(\frac{1-\sin\theta}{1+\sin\theta}\right)} + \sqrt{\left(\frac{1+\sin\theta}{1-\sin\theta}\right)}$ is:

(A) $2\sec\theta$ (B) $-2\sec\theta$ (C) $2\operatorname{cosec}\theta$ (D) 1

6. $\lim\limits_{x\to\infty} \frac{5+3x^2-\sqrt{7}x^3-x^5}{4x^4-10x^3+9}$ is equal to

(A) $\frac{4}{5}$ (B) $\frac{5}{4}$ (C) 1 (D) None of these

***Space For Rough Work***

7. $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$, then $\frac{dy}{dx}$ is

(A) $\tan\theta/2$ (B) $\cot\theta/2$ (C) $\tan\theta$ (D) $\cot\theta$

## (Multi Correct Choice Type)

This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

8. The value of $2\left[\cos^4\frac{\pi}{8}+\cos^4\frac{3\pi}{8}+\cos^4\frac{5\pi}{8}+\cos^4\frac{7\pi}{8}\right]$ is _____

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

9. Which of the following options are correct
(A) The minimum value of cos(cos x) is 0
(B) The maximum value of cos(cos x) is 1
(C) The minimum value of cos(cos x) is cos1
(D) The maximum value of cos(cos x) is cos 1

10. Solution of $\frac{(2-x^2)(x-3)^3}{(x+1)(x^2-3x-4)} \geq 0$ contains which of the following intervals.

(A) $\left[-\sqrt{2}, -1\right)$ (B) $\left[-\sqrt{2}, -1\right) \cup \left(-1, \sqrt{2}\right] \cup [2, 4)$
(C) $\left(-1, \sqrt{2}\right]$ (D) $[3, 4)$

11. $\int \frac{\ell n(\ell n x)}{x\,\ell n x} dx =$

(A) $\frac{1}{2}(\log x)^2 + c$ (B) $\frac{1}{2}(\log(\log x))^2 + c$
(C) $(\log(\log x))^2 + c$ (D) $\frac{1}{2}(\log(\log x))^2 - c$

12. If $f(x) = \frac{(x+1)(x-3)^5(x+2)^3}{(x-3)(x+4)^2}$ then

(A) $x \in ]-\infty, -4[ \cup ]-4, -2[ \cup ]-1, 3[ \cup ]3, \infty[$ for $f(x) > 0$
(B) f(x) is not defined for $x \in \{-4, 3\}$
(C) $x \in ]-\infty, -4[ \cup ]-4, -2[ \cup ]-1, 3[ \cup ]3, \infty[$ for $f(x) < 0$
(D) f(x) is not defined for $x \in (-4, 3)$

*Space For Rough Work*

13. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$ then

(A) $\sin\theta\cos\theta = 1/x$ (B) $\sin\theta\tan\theta = y$

(C) $\left(x^2y\right)^{2/3} - \left(xy^2\right)^{2/3} = 1$ (D) $\left(x^2y\right)^{2/3} + \left(xy^2\right)^{2/3} = 1$

14. If $\tan\theta = n\tan\phi$, then maximum value of $\tan^2(\theta - \phi)$ is equal to

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

## (Paragraph Type)

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

### Paragraph for Question no. 15 to 16

The second derivative of y w.r.t.x is the function obtained by differentiating $\frac{dy}{dx}$ w.r.t.x. It is represented as $\frac{d^2y}{dx^2}$ or $y''$ or $f''(x)$

15. If $e^y(x+1) = 1$, then $\frac{d^2y}{dx^2} =$

(A) $\left(\frac{dy}{dx}\right)^2$ (B) $\left(\frac{dy}{dx}\right)^3$ (C) $\left(\frac{dy}{dx}\right)^1$ (D) none of these

16. If $y = 3e^{2x} + 2e^{3x}$, then $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y =$

(A) 1 (B) 0 (C) 2 (D) none of these

### Paragraph for Question no. 17 to 18

If $\alpha$ and $\beta$ are two distinct roots of the equation $a\tan x + b\sec x = c$,

17. $\tan(\alpha + \beta)$ is equal to

(A) $\frac{a^2 - c^2}{a^2 + c^2}$ (B) $\frac{a^2 + c^2}{a^2 - c^2}$ (C) $\frac{2ac}{a^2 + c^2}$ (D) $\frac{2ac}{a^2 - c^2}$

18. $\left(\sec(\alpha+\beta) + \operatorname{cosec}(\alpha+\beta)\right)^{-1}$ is equal to

(A) $\left(\frac{\left(a^2 - c^2\right)2ac}{2ac\left(a^2 + c^2\right) + \left(a^4 - c^4\right)}\right)$ (B) $\left(\frac{\left(a^2 - c^2\right)2ac}{2ac\left(a^2 + c^2\right) + \left(a^4 + c^4\right)}\right)$

(C) $\left(\frac{\left(a^2 - c^2\right)2ac}{2ac\left(a^2 - c^2\right) + \left(a^4 - c^4\right)}\right)$ (D) $\left(\frac{\left(a^2 - c^2\right)2ac}{4ac\left(a^2 + c^2\right) + \left(a^4 - c^4\right)}\right)$

***Space For Rough Work***

# FIITJEE INTERNAL TEST

## BATCHES: Two Year CRP-2325

### RIT – 1

## PHYSICS, CHEMISTRY & MATHEMATICS

## ANSWER KEY

**Paper Code**
**100683**

## SECTION-1 : PHYSICS

### PART – A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | B | 2. | D | 3. | B | 4. | A |
| 5. | C | 6. | B | 7. | D | 8. | BC |
| 9. | ABCD | 10. | BD | 11. | ABCD | 12. | AD |
| 13. | ACD | 14. | ABCD | 15. | A | 16. | D |
| 17. | D | 18. | D | | | | |

## SECTION – 2 : CHEMISTRY

### PART – A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | C | 2. | D | 3. | C | 4. | B |
| 5. | B | 6. | C | 7. | A | 8. | ABC |
| 9. | ACD | 10. | AB | 11. | AB | 12. | ABCD |
| 13. | ABC | 14. | AD | 15. | C | 16. | A |
| 17. | B | 18. | A | | | | |

## SECTION – 3 : MATHEMATICS

### PART – A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | A | 2. | D | 3. | B | 4. | B |
| 5. | B | 6. | D | 7. | B | 8. | AC |
| 9. | BC | 10. | ACD | 11. | BD | 12. | AB |
| 13. | ABC | 14. | AB | 15. | A | 16. | B |
| 17. | D | 18. | A | | | | |