


ADVANCED PATTERN PART TEST-1(APT-1)
TARGET : JEE (MAIN + ADVANCED) 2020
PAPER-2
COURSE : VIJAY (RJ1)
Date : 14-07-2019
Time: 3 Hours
Maximum Marks : 180

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

GENERAL %

1. The sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
2. The question paper CODE is printed on the right hand top corner of this sheet.
3. Use the Optical Response Sheet (ORS) provided separately for answering the question.
4. Blank spaces are provided within this booklet for rough work.
5. Write your Name and Roll Number in the space provided on the below cover.
6. After the open booklet, verify that the booklet contains all the **54** questions along with the options are legible.

QUESTION PAPER FORMAT AND MARKING SCHEME :

7. The question paper has three parts : **Mathematics, Physics and Chemistry**. Each part has two sections.
8. Each section as detailed in the following table :

Section	Question Type	Number of Questions	Category-wise Marks for Each Question				Maximum Marks of the Section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	Double digit Integer (00-99)	12	+3 If only the bubbles corresponding to the correct answer is darkened	–	0 If none of the bubbles is darkened	No negative marks	36
2	One or More Correct Option(s)	6	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	–2 In all other cases	24

OPTICAL RESPONSE SHEET :

9. Darken the appropriate bubbles on the original by applying sufficient pressure.
10. The original is machine-gradable and will be collected by the invigilator at the end of the examination.
11. Do not tamper with or mutilate the ORS.
12. Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose on the original. **Do not write any of these details anywhere else.** Darken the appropriate bubble under each digit of your roll number.

DARKENING THE BUBBLES ON THE ORS :

13. Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
14. Darken the bubble **COMPLETELY**.
15. Darken the bubble **ONLY** if you are sure of the answer.
16. The correct way of darkening a bubble is as shown here : ●
17. There is **NO** way to erase or "un-darkened bubble.
18. The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

NAME OF THE CANDIDATE :

ROLL NO. :

 I have read all the instructions
and shall abide by them

 I have verified the identity, name and roll number
of the candidate.

 Signature of the Candidate

 Signature of the Invigilator

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DO NOT BREAK THE SEAL WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

PPART : I MATHEMATICS

SECTION – 1 : (Maximum Marks : 36)

- This section contains **TWELVE** questions
- The answer to each question is a **DOUBLE DIGIT INTEGER** ranging from 00 to 99, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
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+3 If the bubble corresponding to the answer is darkened
0 If none of the bubbles is darkened

1. If $\alpha + \beta + \gamma = 3$, $\alpha^2 + \beta^2 + \gamma^2 = 7$, $\alpha^3 + \beta^3 + \gamma^3 = 12$ then the value of $\alpha^4 + \beta^4 + \gamma^4 =$
2. Find the value of $2 \left(\sin \frac{\pi}{10} + \sin \frac{13\pi}{10} \right) - 4 \sin \frac{\pi}{10} \sin \frac{13\pi}{10}$.
3. Number of integral values of x less than 11 satisfying the equation $\left| \frac{x}{x-1} \right| + |x| = \frac{x^2}{|x-1|}$ are
4. What is the smallest integral value of k for which the equation $2x(kx - 4) - x^2 + 6 = 0$ has no real roots?
5. If $M = \sum_{r=1}^4 \log_2 \left(\sin \left(\frac{r\pi}{5} \right) \right)$, then value of $(2)^{M+4}$ is equal to

Space for Rough Work

6. If $\frac{2x}{2x^2 + 5x + 2} > \frac{1}{x+1}$, then complete solution set is $(a, -1) \cup (b, c)$. Find $5|a + 3b + 2c|$.
7. If $y = 2[x] + 3y = 3[x - 2] + 5$ then find value of $[x + y - 6]$.
(where $[.]$ denotes greatest integer function)
8. The number of solution of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$ is
9. Find the sum of all the integral values of x satisfying the inequation $-2 \leq ||x| + 2| < 5$.
10. The number of solutions of the equation $\operatorname{sgn}(x^2) = |x|$ is equal to
(where $\operatorname{sgn}(\cdot)$ denotes the signum function)
11. The number of solutions of the equation $\frac{[x]}{x - [x]} = 6$ is (where $[]$ represents greatest integer function)
12. Solution of inequality $[x]^2 - 9[x] - 52 < 0$ is $[a, b)$. Find $8(2a + b)$ (where $[.]$ denotes greatest integer function)

Space for Rough Work

SECTION – 2 : (Maximum Marks : 24)

- This section contains **SIX** questions.
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- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
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 Full Marks : **+4** If only (all) the correct option(s) is (are) chosen.
 Partial Marks : **+3** If all the four options are correct but **ONLY** three options are chosen.
 Partial Marks : **+2** If three or more options are correct but **ONLY** two options are chosen and both of which are correct.
 Partial Marks : **+1** If two or more options are correct but **ONLY** one option is chosen and it is a correct option.
 Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 Negative Marks : **-2** In all other cases.

13. Let $f(x) = 2x^3 - 3x^2 - 12x + 3$. Which of the following option(s) is (are) true ?
 (A) Two roots of $f(x) = 0$ are imaginary. (B) Three roots of $f(x) = 0$ are real.
 (C) Two roots of $f(x) = 0$ are negative. (D) One root of $f(x) = 0$ is negative.
14. The set of all solution of the inequality $\left(\frac{1}{3}\right)^{x^2-3x} > 9$ is contained by the set
 (A) $(-\infty, 0)$ (B) $(0, 2)$ (C) $(0, 1)$ (D) $\left(\frac{1}{2}, 3\right)$
15. If $\log_4 5 = x$ and $\log_5 6 = y$ then
 (A) $\log_4 6 = xy$ (B) $\log_6 4 = xy$ (C) $\log_3 2 = \frac{1}{2xy-1}$ (D) $\log_2 3 = \frac{1}{2xy-1}$

Space for Rough Work

16. Which of the following equation(s) have no real solutions ?

(A) $x^2 - x + 6 + e^x = 0$

(B) $x^4 - 2x^2 \sin^2 \frac{\pi x}{2} + 1 = 0$

(C) $\log_{\{x\}} \frac{1}{2} = -2$ (where $\{.\}$ denotes fractional part function)

(D) $\cos x = |x|$

17. If the solution set of inequation $\frac{1 - \log_{1/2}(-x)}{\sqrt{-2 - 6x}} < 0$ is (a, b) then

(A) a and b are rationals

(B) $2a - 3b = 0$

(C) $\log_{36\sqrt{6}}(b - a) = -\frac{2}{5}$

(D) $\sec \theta$ can take value between a and b for some θ

18. Let a & b be arbitrary real numbers and the smallest natural number 'b' for which the equation

$x^2 + 2(a + b)x + (a - b + 8) = 0$ has unequal real roots for all $a \in \mathbb{R}$ is λ then

(A) $4\lambda + 2 = 22$

(B) $3\lambda - 3 = 12$

(C) $4\lambda + 2 = 18$

(D) $3\lambda - 3 = 9$

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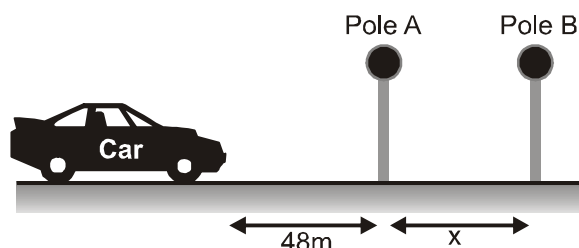
SECTION – 1 : (Maximum Marks : 36)

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19. The velocity of a particle is given by $\vec{v} = 2\hat{i} - \hat{j} + 2\hat{k}$ in m/s for time interval $t = 0$ to $t = 10$ sec. Find the distance travelled by the particle in given time interval.
20. A particle moving along a straight line with a constant acceleration of -4 m/s^2 passes through a point A on the line with a velocity of $+8 \text{ m/s}$ at some moment. Find the distance travelled by the particle in 5 seconds after that moment (in meter).

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21. Consider a car moving on a straight road as shown in figure. At some time $t = t_0$ when car is 48m from pole A. Speed and acceleration of car are 10m/sec and 4m/sec² respectively. If car takes equal time in reaching to A from this position and B from A than find out the distance between pole A and B. (Assume acceleration of car is constant)



22. A balloon is ascending vertically with an acceleration of 0.4 m/s⁻². Two stones are dropped from it at an interval of 2 sec. Find the distance between them 1.5 sec after the second stone is released. ($g = 10 \text{ m/sec}^2$)
23. A stone is dropped from the top of building and at the same time a second stone is thrown vertically upward from the bottom of the building with a speed of 20 ms⁻¹. They pass each other 3 seconds later. Find the height of the building.

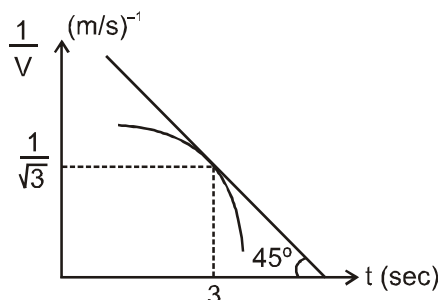
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24. Two balls begin to fall freely from rest from same height, in duration of 1 sec. If after x (in seconds), after the first ball begins to fall, two balls be 15m apart, then value of $8x$ will be :
($g = 10 \text{ m/s}^2$)
25. A particle is moving along a straight line. Its velocity varies as $v = 6 - 2t$ where v is in m/s and t in seconds. Find the difference between distance covered and magnitude of displacement in first 4 seconds.
26. A particle is projected from ground in vertical direction at $t = 0$. At $t = 0.8 \text{ sec}$, it reaches $h = 14\text{m}$. It will again come to same height at $t = \frac{x}{2} \text{ sec}$. after the motion begins, then find x : [$g = 10 \text{ m/s}^2$]
27. A particle is projected with speed $v = \sqrt{150} \text{ m/s}$ from the horizontal surface such that its range on the horizontal plane is twice the greatest height attained by it. The range of the projectile in metre is : (use $g = 10 \text{ m/s}^2$)

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28. The graph shows the variation of $\frac{1}{V}$ (where V is the velocity of the particle) with respect to time.

Then find the value of acceleration at $t = 3$ sec in meter/sec².



29. The position vector of a particle is given as $\vec{r} = (t^2 - 4t + 6) \hat{i} + (t^2) \hat{j}$. The time in second, after which the velocity vector and acceleration vector becomes perpendicular to each other is :
30. A particle moves in a straight line such that it moves in the same direction but its speed decreases uniformly with time to zero in time interval $T = 10$ s. It travels a total distance ' S ' = 12.5 m. Find the velocity (in m/s) at any intermediate time $t = 6$ s.

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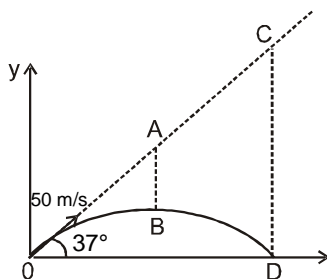


SECTION – 2 : (Maximum Marks : 24)

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Zero Marks	:	0 If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	:	-2 In all other cases.

31. A particle is projected with speed 50m/s at angle 37° with horizontal from ground as shown. AB and CD are parallel to y-axis and B is highest point of trajectory of particle. Choose the correct options :

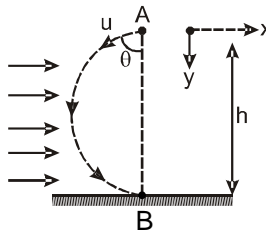


- (A) $AB = 45\text{m}$ (B) $BC = 90\text{ m}$ (C) $AB = 90\text{ m}$ (D) $CD = 180\text{m}$

Space for Rough Work



32. A particle is moving along x-axis such that its position is given by $x = 4 - 9t + \frac{t^3}{3}$ where t is time in seconds, x is in meters. Mark the correct statement(s) :
- (A) Direction of motion is not changing at any of the instants
 (B) Direction of the motion is changing at $t = 3$ seconds
 (C) For $0 < t < 3$ sec. the particle slowing down
 (D) For $3 < t < 6$ sec. the particle is speeding up
33. A particle is projected at point 'A' with initial velocity 5 m/s at an angle $\theta = 37^\circ$ with the vertical y axis. A strong horizontal wind gives the particle a constant horizontal acceleration 6 m/s^2 in the x direction. If the particle strikes the ground at a ground directly under its released position, The downward y acceleration is taken as the constant $g = 10 \text{ m/s}^2$, take $\left(\sin 37^\circ = \frac{3}{5}, \cos 37^\circ = \frac{4}{5} \right)$. choose the correct option(s):

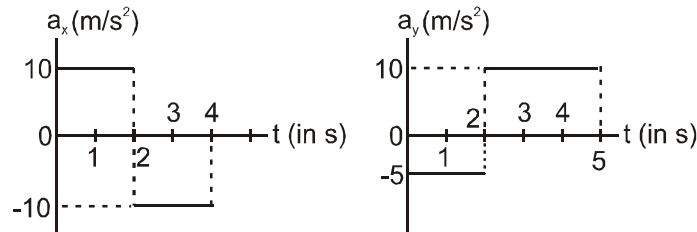


- (A) Height h of point A is 9m
 (B) time taken by particle to reach point B is 1 second
 (C) time taken by particle to reach point B is 2 second
 (D) Height h of point A is 28m

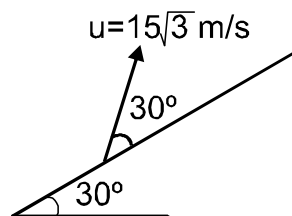
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34. A particle which is initially at rest at the origin, is subjected to an acceleration with x- and y-components as shown. After time $t = 5$ sec, the particle has no acceleration.



- (A) the magnitude of velocity of the particle at $t = 2$ seconds is $10\sqrt{5}$ m/s
- (B) the magnitude of average velocity of the particle between $t = 0$ and $t = 4$ seconds is $\frac{5}{2}\sqrt{17}$ m/s
- (C) farthest distance of particle from the y-axis is at 4 sec.
- (D) the magnitude of average velocity of the particle between $t = 0$ and $t = 2$ seconds is zero.
35. A particle is projected up an incline (inclination angle = 30°) with $15\sqrt{3}$ m/s at an angle of 30° with the incline (as shown in figure) ($g = 10$ m/s²)

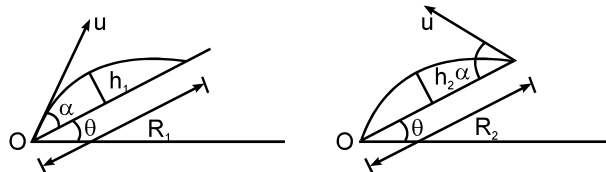


- (A) 1.5 sec later, angle between acceleration & velocity is 120° .
- (B) 1.5 sec later, angle between acceleration & velocity is 60° .
- (C) Range on the incline is 45 m
- (D) Time of flight on the incline is 3 sec.

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36. Two balls are thrown from an inclined plane at angle of projection α with the plane one up the incline plane and other down the incline as shown in the figure. If R_1 & R_2 be their respective ranges, then:

[here T_1 & T_2 are times of flight in the two cases respectively]



- (A) $h_1 = h_2$
 (B) $R_2 - R_1 = T_1^2$
 (C) $R_2 - R_1 = g \sin \theta T_2^2$
 (D) $R_2 - R_1 = g \sin \theta T_1^2$

Space for Rough Work



PART : III CHEMISTRY

Atomic masses : [H = 1, D = 2, Li = 7, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Cr = 52, Mn = 55, Fe = 56, Cu = 63.5, Zn = 65, As = 75, Br = 80, Ag = 108, I = 127, Ba = 137, Hg = 200, Pb = 207] [Assume all gases to be ideal gases]

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37. Determine the sum of total number of nodes present in 5s, 5p_x and 5d_{xy} orbitals?
38. A mixture of 4.9 g H₂SO₄ and 200 ml of $\frac{1}{4}$ M H₃PO₃ (basicity = 2) was completely neutralised by x g NaOH. Calculate 5x.
39. Given is : $a\text{Mn}^{2+} + b\text{PbO}_2 + c\text{H}^+ \longrightarrow d\text{MnO}_4^- + e\text{Pb}^{2+} + f\text{H}_2\text{O}$ which is balanced with simplest integer coefficients. Determine the value of $(b \times e) - (a + c + d + f)$.

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40. The average molar mass of mixture containing 2 mol of NH_3 , 1 mol of CH_4 and 2 mol of unknown gas is 40 g/mol. What is molar mass (in g/mol) of unknown gas ?
41. The volume of Earth's oceans has been estimated to be about 1 billion cubic kilometres. Calculate the number of water molecules present in Earth's oceans, in scientific notation. Report the power of 10 in your final answer. Use density of water as 1 g/mL. [$N_A = 6 \times 10^{23}$]
42. On heating 4.9 g KClO_3 sample, its mass is reduced by 0.384 g. Calculate the % of original KClO_3 sample, that has been decomposed. ($\text{KClO}_3 \longrightarrow \text{KCl} + \text{O}_2 \uparrow$)
43. The formula of the magnesium salt of a monobasic acid is $\text{MgA}_2 \cdot n\text{H}_2\text{O}$ (HA is the formula of the acid).
1 gram of the salt on strong heating leaves behind 0.2 gram of MgO . Given that the molecular mass of the acid is 62. What is the value of $(10 \times n)$?
44. For 1s orbital of hydrogen atom radial wave function is given as :

$$R(r) = \frac{1}{\sqrt{\pi}} \left(\frac{1}{a_0} \right)^{3/2} e^{-r/a_0} \quad (\text{where } a_0 = 0.529 \text{ \AA})$$

The ratio of radial probability density of finding electron at $r = a_0$ to the radial probability density of finding electron at the nucleus is given as $(x \cdot e^{-y})$.

Calculate value of $(x + y)^3$.

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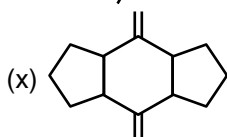
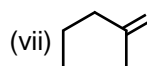
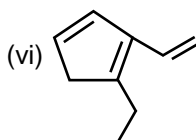
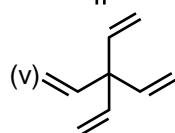
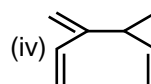
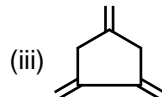
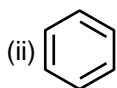
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- CC(C)C(CC)C(CC)C(CC)C(O)CC

- How many 'C' atoms present in parent chain of the given compound.

- (i) 



-



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SECTION – 2 : (Maximum Marks : 24)

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Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : **-2** In all other cases.

49. Select incorrect statement(s):

- (A) If the value of $\ell = 0$, the electrons distribution is spherical.
- (B) The shape of the orbital is given by magnetic quantum number.
- (C) Orbital angular momentum of 1s, 2s, 3s electrons is equal.
- (D) In ${}_{29}\text{Cu}$, number of electrons having $(n + \ell) \geq 4$ is 15.

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P201JRAPT1140719C1-16

50. An equimolar mixture of NO and O_2 is exploded to produce NO_2 . Which of the following statement(s) is/are correct ?
- (A) The initial vapour density of the mixture is 31.
 (B) The average molar mass of final mixture is less than that of initial mixture.
 (C) NO is limiting reagent.
 (D) Mole % of NO_2 in the final mixture is 50%.
51. Which of the following statement(s) is/are correct with respect to orbital represented by Ψ_{420} .
- (A) Number of angular nodes is 2.
 (B) Number of radial nodes is 1.
 (C) Minimum possible atomic number of element containing atleast one electron in this orbital is 30.
 (D) On equating $\Psi^2(r)$ by zero, 3 finite non-zero values of r are obtained.
52. A metal M can exist in two oxidation states +2 and +3 in which it forms two oxides MO and M_2O_3 respectively. In a mixed oxide of metal with formula $M_{0.8}O$ both oxidation states of the metal are present. Which of the following option(s) for this mixed oxide is/are true?
- (A) 50% of metal is in +2 oxidation state.
 (B) Ratio of amounts metal in +2 state to +3 state is 2.
 (C) 1 mole of mixed oxide contains 0.2 moles of metal.
 (D) Empirical formula of the mixed oxide is M_4O_5 .

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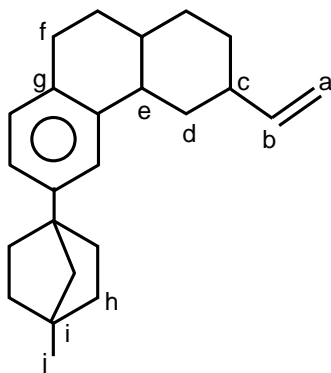
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P201JRAPT1140719C1-17

53. What is correct about the given structure



- (A) g is benzylic carbon.
 (B) c is allylic carbon.
 (C) f is benzylic carbon.
 (D) e is 3° carbon.
54. Find out correct statement/s about given molecule



- (A) Compound is homocyclic aromatic.
 (B) Compound is heterocyclic aromatic.
 (C) Number of π bonded carbon atoms are 5.
 (D) Degree of unsaturation (DU) or double bond equivalent (DBE) is five.

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