P40-16

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ADVANCED PATTERN PART TEST-5(APT-5)

TARGET : JEE (MAIN+ADVANCED) 2017

REVISION PLAN-2 COURSE : VIJETA (ADP), VIJAY (ADR)

Date : 10-05-2017 **Time: 3 Hours** **Maximum Marks : 222**

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 **60** 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 Three 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	Single Correct Option	6	+4 If only the bubble corresponding to the correct option is darkened	–	0 If none of the bubbles is darkened	–2 In all other cases	24
2	One or More Correct Option(s)	8	+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	–1 In all other cases	32
3	Single digit Integer (0-9)	6	+3 If only the bubbles corresponding to the correct answer is darkened	–	0 if not attempted	–1 In all other cases	18

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. Don 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

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

PART : I MATHEMATICS

SECTION – 1 : (Maximum Marks : 24)

- This section contains **SIX** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- Marking scheme :

  +4 If only the bubble corresponding to the correct option is darkened

  0 If none of the bubble is darkened

  –2 In all other cases

1. $\int \frac{x^3+5x^2-3x+4}{\sqrt{x^2+x+1}}dx$ is equal to

(A) $\left(\left(\frac{1}{33}\right)x^2+\left(\frac{25}{12}\right)x-\left(\frac{163}{24}\right)\right)\sqrt{x^2+x+1}+\left(\frac{85}{16}\right)\int\frac{1}{\sqrt{x^2+x+1}}dx$

(B) $\left(\left(\frac{1}{3}\right)x^2+\left(\frac{25}{12}\right)x-\left(\frac{163}{24}\right)\right)\sqrt{x^2+x+1}+\left(\frac{95}{16}\right)\int\frac{1}{\sqrt{x^2+x+1}}dx$

(C) $\left(\left(\frac{1}{3}\right)x^2+\left(\frac{25}{12}\right)x-\left(\frac{161}{24}\right)\right)\sqrt{x^2+x+1}+\left(\frac{85}{16}\right)\int\frac{1}{\sqrt{x^2+x+1}}dx$

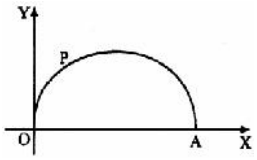
(D) $\left(\left(\frac{1}{3}\right)x^2+\left(\frac{25}{12}\right)x-\left(\frac{163}{24}\right)\right)\sqrt{x^2+x+1}+\left(\frac{85}{16}\right)\int\frac{1}{\sqrt{x^2+x+1}}dx$

Space for Rough Work

2. If f(x) be a twice differentiable function from R $\to$ R^+ such that $t^2f(x) - 2t\,f'(x) + f''(x) = 0$ has two equal values of t for all x and f(0) = 1, f '(0) = 2, then $\lim\limits_{x\to 0}\left(\frac{f(x)-1}{x}-\frac{t}{2}\right)$ is

(A) – 1 (B) 1 (C) $\frac{1}{2}$ (D) 0

3. Find the area enclose between one arc of the cycloid $x = a(\theta - \sin\theta), y = a(1-\cos\theta)$, and its base.



(A) $3a^2\pi$ (B) $4a^2\pi$ (C) $5a^2\pi$ (D) $6a^2\pi$

4. Solve $x^2(x^2-1)\frac{dy}{dx} + x(x^2+1)y = (x^2-1)$.

(A) $y\left(\frac{x^2-1}{x}\right) = \log x + \frac{1}{2x^2} + c$ (B) $y\left(\frac{x^2+1}{x}\right) = \log x + \frac{1}{2x^2} + c$

(C) $y\left(\frac{x^2-1}{x}\right) = \log x + \frac{1}{x^2} + c$ (D) none of these

Space for Rough Work

5. For $\int_0^{\infty} e^{-\alpha x} \frac{\sin\beta x}{x} dx$, where $\alpha \geq 0$,

(A) $\int_0^{\infty} \frac{\sin\beta x}{x} dx = \begin{cases} \pi/2, & \text{if } \beta > 0, \\ 0, & \text{if } \beta = 0, \\ -\pi/2, & \text{if } \beta < 0, \end{cases}$

(B) $\int_0^{\infty} \frac{\sin\beta x}{x} dx = \begin{cases} -\pi/2, & \text{if } \beta > 0, \\ 0, & \text{if } \beta = 0, \\ \pi/2, & \text{if } \beta < 0, \end{cases}$

(C) $\int_0^{\infty} \frac{\sin\beta x}{x} dx = \begin{cases} -\pi/3, & \text{if } \beta > 0, \\ 0, & \text{if } \beta = 0, \\ \pi/3, & \text{if } \beta < 0, \end{cases}$

(D) None of these

6. For positive integers k = 1, 2, 3, ..., n, let S_k denotes the area of ΔAOB_k (where 'O' is origin) such that $\angle AOB_k = \frac{k\pi}{2n}$, OA = 1 and $OB_k = k$. The value of the $\lim_{n\to\infty} \frac{1}{n^2} \sum_{k=1}^{n} S_k$ is

(A) $\frac{2}{\pi^2}$ (B) $\frac{4}{\pi^2}$ (C) $\frac{8}{\pi^2}$ (D) $\frac{1}{2\pi^2}$

Space for Rough Work

SECTION – 2 : (Maximum Marks : 32)

- This section contains **EIGHT** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If only the bubble(s) corresponding to all the correct option(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	:	–1	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 –1 marks, as a wrong option is also darkened.

7. Through any point (x, y) of a curve which passes through the origin, lines are drawn parallel to the coordinate axes. The curve, given that it divides the rectangle formed by the two lines and the axes into two areas, one of the which is twice the other, represent a family of

(A) Conics (B) parabola (C) ellipse (D) none of these

8. The value of $\int_3^4 \frac{dx}{\sqrt[3]{\ell nx}}$ is

(A) Less than one (B) Less than two (C) Greater than $\frac{1}{2}$ (D) Greater than $\frac{1}{4}$

Space for Rough Work

9. Let 'e' be the eccentricity of a hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $f(e)$ be the eccentricity of a conjugate hyperbole $\frac{y^2}{b^2}-\frac{x^2}{a^2}=1$, then $\int_1^3 (\underbrace{fff....f}_{n\text{times}}(e))de$, is equal to

(A) 2, if n is even (B) 4, if n is even (C) $2\sqrt{2}$, if n is odd (D) $4\sqrt{2}$, if n is odd

10. A curve passes through (1, 1) such that the triangle formed by the co-ordinates axis and the tangent at any point of the curve is in the first quadrant and has its area equal to 2. The equation of the curve can be

(A) $xy=1$ (B) $x+y=2$ (C) $x^2+y^2-y=1$ (D) $y=e^{x^2+x-2}$

11. Let $f(x)=\int_0^x \frac{dt}{\sqrt{1+t^3}}$, Suppose g(x) is the inverse of f(x). Then which of the following statements is true ?

(A) $g'=2g^2+3$ (B) $(g')^2=1+g^3$ (C) $g''=4g$ (D) $2g''=3g^2$

Space for Rough Work

12. Let $\ell_1 = \lim\limits_{x\to\infty} \sqrt{\dfrac{x-\cos^2 x}{x+\sin x}}$ and $\ell_2 = \lim\limits_{h\to 0^+} \displaystyle\int_{-1}^{1} \dfrac{h\,dx}{h^2+x^2}$. Then

(A) both ℓ_1 and ℓ_2 are less than $\dfrac{22}{7}$

(B) one of the two limits is rational and other irrational.

(C) $\ell_2 > \ell_1$

(D) ℓ_2 is greater than 3 times of ℓ_1.

13. Let f(x) be a polynomial of degree less than or equal to 3 with leading coefficient unity, f(0) = 4 and f(2) = 0. If $\displaystyle\int \frac{f(x)\,dx}{x(x+1)^2(x-2)^3}$ is a logarithmic function, then

(A) f(1) = 2 (B) $f'(2) = 0$ (C) $\displaystyle\int_0^4 f(x)\,dx = 16$ (D) $f'''(3) = 4$

14. If the function f(x) is continuous and differentiable for all x (and not zero every where) such that

$$f^2(x) = \int_0^x \frac{f(t)\sin t}{2+\cos t}\,dt$$

(A) f(x) is an even function (B) f(x) is an odd function

(C) f(x) is periodic function (D) $f(x) < 1\ \forall\ x \in R$

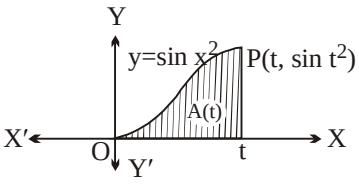
Space for Rough Work

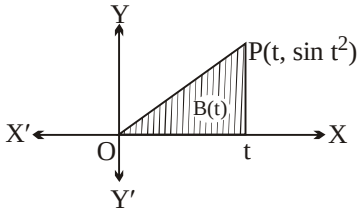
SECTION – 3 : (Maximum Marks : 18)

- This section contains **SIX** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
- Marking scheme :
  - +3 If the bubble corresponding to the answer is darkened
  - 0 If none of the bubbles is darkened
  - –1 In all other cases

15. Let $I_n = \int_{-1}^{1} |x| \left(1 + x + \frac{x^2}{2} + \frac{x^3}{3} + ... + \frac{x^{2n}}{2n}\right) dx$. If $\lim_{n\to\infty} I_n$ can be expressed as rational $\frac{p}{q}$ in the lowest form, then find the value of $p + q$.

16. The figure shows two regions in the first quadrant. A(t) is the area under the curve $y = \sin x^2$ from 0 to t and B(t) is the area of the triangle with vertices O, P(t, $\sin t^2$) and M(t, 0). $\lim_{t\to0} \frac{A(t)}{B(t)} = \ell$ then 3ℓ is equals to :





Space for Rough Work

17. The order of the differential equation whose general solution is

$$y = C_1 \cos 2x + C_2 \cos^2 x + C_3 \sin^2 x + C_4$$ is

18. Area enclosed by the curve $y = (x^2 + 2x)e^{-x}$ and the positive x-axis is

19. If $S = \sum_{r=1}^{\infty}\left(\frac{1}{r^2}\right)$, then $\int_0^1 \ell n\, x \cdot \ell n(1-x)\, dx = a + bS$, $a, b \in R$. Then value of $\left(a^2 + b^2\right)$ is equal to

20. If $\int \frac{3x^2 + 2x}{x^6 + 2x^5 + x^4 + 2x^3 + 2x^2 + 5} dx = F(x)$, then the absolute value of [F(0) – F(1)] is

(where [.] represents greatest integer function)

Space for Rough Work

PART-II : PHYSICS

SECTION – 1 : (Maximum Marks : 24)

- This section contains **SIX** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- Marking scheme :
  - +4 If only the bubble corresponding to the correct option is darkened
  - 0 If none of the bubble is darkened
  - –2 In all other cases

21. An open organ pipe containing air resonates in fundamental mode due to a tuning fork. The measured values of length ℓ (in cm) of the pipe and radius r (in cm) of the pipe are $\ell = 94.0 \pm 0.1$, $r = 5.0 \pm 0.05$. The velocity of the sound in air is accurately known. The maximum percentage error in the measurement of the frequency of that tuning fork by this experiment, will be

(A) 0.16 (B) 0.64 (C) 1.2 (D) 1.6

22. A wire of length L having linear density of 1×10^{-3} kg/m is stretched between two rigid supports with a tension of 40N. It is observed that the wire vibrating in P segments resonates at a frequency of 420Hz. The next higher frequency at which the wire resonates is 490Hz. The value of P and L are :

(A) P = 6, L = $\left(\frac{10}{7}\right)$ m (B) P = 7, L = $\left(\frac{60}{49}\right)$ m

(C) P = 6, L = $\left(\frac{60}{49}\right)$ m (D) P = 7, L = $\left(\frac{10}{7}\right)$ m

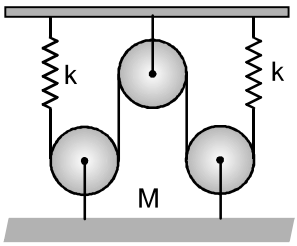
Space for Rough Work

PHYSICS

23. A sonometer wire stretched with 64 Newton is vibrating in its fundamental tone and in resonance with a vibrating tuning fork. The distance between two fixed points of the wire is 10 cm and the mass is 1 gram. Vibrating tuning fork is moved away from vibrated wire with a constant speed and an observer standing near the sonometer observes 1 beat per second. If the speed of sound in the air is 300 m/s then the speed of tuning fork will approximately be :

(A) 0.25 m/s (B) 0.60 m/s (C) 0.67 m/s (D) 0.75 m/s

24. The natural frequency of the system shown in figure is:
{The pulleys are smooth and massless.}



(A) $\frac{1}{\pi}\sqrt{\frac{2k}{M}}$ (B) $\frac{2}{\pi}\sqrt{\frac{2k}{M}}$ (C) $\frac{1}{\pi}\sqrt{\frac{k}{M}}$ (D) $\frac{1}{\pi}\sqrt{\frac{4k}{M}}$

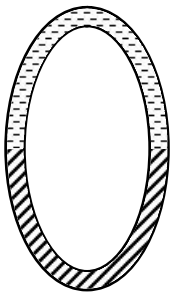
25. What will be time period of SHM (along x-axis) of small amplitude around mean position if potential energy of a particle of mass m has the form U (x) = $\frac{a}{x^2}-\frac{b}{x}$, where a and b are positive constants and x is x-coordinate of the particle ?

(A) $\frac{\pi a}{b^2}\sqrt{2ma}$ (B) $\frac{4\pi a}{b^2}\sqrt{ma}$ (C) $\frac{4\pi a}{b^2}\sqrt{2ma}$ (D) $\frac{\pi a}{b^2}\sqrt{ma}$

Space for Rough Work

PHYSICS

26. A tube of given shape has cross-sectional area S. its bottom and upper halves and filled with two non-viscous, non-compressible liquids of densities 3ρ, ρ respectively. If the liquid interface is slightly displaced then find its angular frequency. The circumference of the tube is 2L.



(A) It is not SHM

(B) $\sqrt{\frac{3g}{2L}}$

(C) $\sqrt{\frac{2g}{L}}$

(D) $\sqrt{\frac{g}{L}}$

Space for Rough Work

SECTION – 2 : (Maximum Marks : 32)

- This section contains **EIGHT** questions
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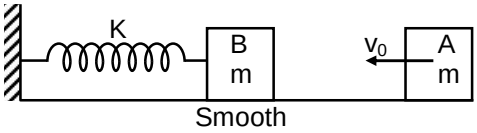
Full Marks	:	+4	If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–1	In all 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 –1 marks, as a wrong option is also darkened.

27. A block A of mass m is given a velocity v_0 towards another block B of same mass. B is attached to an ideal spring of spring constant K. A makes a head on perfectly inelastic collision with B. Choose the correct option(s).



(A) Time after the collision B attains its initial position again for the second time is $\pi\sqrt{\frac{m}{K}}\ (\sqrt{2}+1)$.

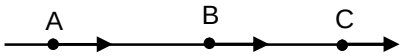
(B) Time after the collision B attains its initial position again for the second time is $\pi\sqrt{\frac{2m}{K}}$.

(C) Maximum elongation in the spring during subsequent motion is $\frac{1}{2}\sqrt{\frac{mv_0^2}{K}}$.

(D) Maximum elongation in the spring during subsequent motion is $\sqrt{\frac{mv_0^2}{2K}}$.

Space for Rough Work

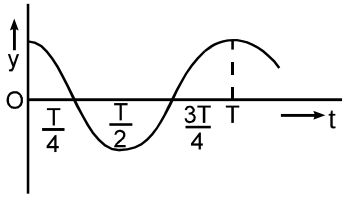
28. Three cars A,B & C are moving on a straight line with velocity 5m/s, 10m/s and 5m/s respectively. They all give horn of same frequency f. Speed of sound is 320 m/s. Passenger in each car observer sound of horn from other cars. Select correct alternative(s).



(A) passenger in A will observe minimum frequency
(B) passenger in B will observe maximum frequency
(C) passenger in B will observe maximum beat frequency
(D) passenger in C will observe maximum beat frequency

29. A pipe closed at one end resonates at its fundamental frequency of 300 Hz. Which one of the following statements is correct ?
(A) If the temperature rises, the fundamental frequency increases.
(B) If the pressure rises, the fundamental frequency increases.
(C) The first overtone is of frequency 900 Hz.
(D) An open pipe with the same fundamental frequency has twice the length.

30. The displacement time graph of a particle executing S.H.M. (in straight line) is shown. Which of the following statements is/are true ?



(A) the speed is maximum at t = T/2
(B) the magnitude of acceleration is maximum at t = T
(C) the force is zero at t = 3T/4
(D) the potential energy equals the total oscillation energy at t = T/2

Space for Rough Work

PHYSICS

31. A source emit sound waves of frequency 1000 Hz. The source moves to the right with a speed of 32 m/s relative to ground. On the right a reflecting surface moves towards left with a speed of 64 m/s relative to ground. The speed of sound in air is 332 m/s :

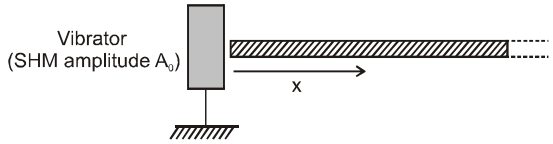
(A) wavelength of sound in ahead of source is 0.3 m

(B) number of waves arriving per second which meets the reflected surface is 1320

(C) speed of reflected wave is 268 m/s

(D) wavelength of reflected waves is nearly 0.2 m

32. Consider rigid rod of Young's modulus Y, its density varies according to $\rho = \rho_0(1 + kx)$ from the end shown in figure. Area of cross section of the rod remain constant along its lengths. If amplitude of vibrator performing SHM is A_0 and frequency is f_0 respectively, then : (Assume amplitude of SHM of vibrator is small and rod remains stationary)



(A) Amplitude of a point at a distance x from end is $\frac{A_0}{\sqrt{1+Kx}}$

(B) Wave length of wave motion as a function x is given by, $\lambda = \frac{1}{f_0}\sqrt{\frac{Y}{(1+Kx)\rho_0}}$

(C) time taken by pulse to reach at a distance x $\frac{2}{3}\sqrt{\left(\frac{1+Kx}{K^2}\right)^3\frac{\rho_0}{Y}}$ is

(D) frequency of wave throught rod independent of x

Space for Rough Work

33. In case of mechanical wave particle oscillates and during oscillation its kinetic energy and potential energy changes. Select correct statement(s) :

(A) When small segment of travelling wave is passing through mean position, potential energy is maximum

(B) When small segment of travelling wave is at extreme position, potential energy is maximum

(C) When small segment between node and antinode in standing wave are passing through their mean position, kinetic energy is maximum.

(D) When small segment between node and antinode in standing wave is at extreme position, potential energy is maximum

34. An organ pipe of length 80 cm is open at x = 0 and closed at x = 80 cm. Speed of sound in the air column is 320 m/sec. If standing waves are generated in the closed organ pipe, then the correct equation(s) of standing waves is/are (Here s = longitudinal displacement , P_{ex} = pressure excess) (Neglect the end correction.)

(A) $S = A\cos\left(\frac{5\pi}{4}x\right)\sin(400\pi t)$

(B) $S = A\cos\left(\frac{15\pi}{8}x\right)\cos(600\pi t)$

(C) $P_{ex} = A\cos\left(\frac{5\pi}{8}x\right)\sin(200\pi t)$

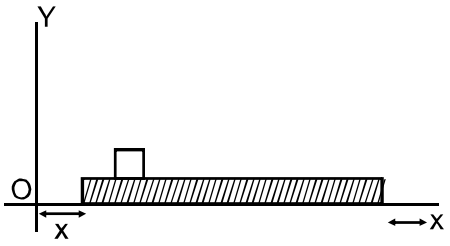
(D) $P_{ex} = A\sin\left(\frac{25\pi}{8}x\right)\cos(1000\pi t)$

Space for Rough Work

SECTION – 3 : (Maximum Marks : 18)

- This section contains **SIX** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
- Marking scheme :
  +3 If the bubble corresponding to the answer is darkened
  0 If none of the bubbles is darkened
  –1 In all other cases

35. A small block is kept on a platform executing SHM in the horizontal plane, described by $x = A \sin\omega t$. The time period of SHM is T and the coefficient of friction between the block and the platform is μ. The condition that the block does not slip on the platform at any instant is $\mu \geq \frac{x\pi^2 A}{gT^2}$ then write the value of 'x'.



36. A disc is hinged such that it can freely rotate in a vertical plane about a point on its radius (axes of rotation is perpendicular to plane of disc). If radius of disc is 'R', then minimum time period of its simple harmonic motion is $2\pi\sqrt{\frac{\sqrt{y}R}{g}}$, then value of y will be :

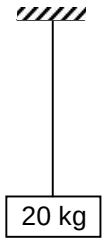
Space for Rough Work

37. Sinusoidal waves 5.00 cm in amplitude are to be transmitted along a string having a linear mass density equal to 4.00×10^{-2} kg/m. If the source can deliver a average power of 90 W and the string is under a tension of 100 N. The highest frequency at which the source can operate is f. Find $\frac{3f}{10}$ (take $\pi^2 = 10$) :

38. An ant with mass m is standing peacefully on top of a horizontal stretched rope. The rope has mass per unit length μ and is under tension F. Without warning a student starts a sinusoidal transverse wave of wavelength λ propagating along the rope. The motion of the rope is in a vertical plane. What minimum wave amplitude (in mm) will make the ant feel weight less momentarily ? Assume that m is so small that the pressure of the ant has no effect on the propagation of the wave. (Given $\lambda = 0.5$m, $\mu = 0.1$ kg/m, F = 3.125 N, Take $g = \pi^2$)

Space for Rough Work

39. A load of 20 kg is suspended by a steel wire as shown in figure. Velocity of longitudinal waves when is 20 times the velocity of the transverse waves in the same string when it is plucked. If area of cross section of the wire is $x \times 10^{-7}$ m^2. Find x (Y for steal is 19.6×10^{10} N/m^2 and g = 9.8 m/s^2 :



40. Two forks A and B when sounded together produce 4 beats/sec. The fork A is in unison with 30 cm length of a sonomter wire and B is in unison with 25 cm length of the same wire at the same tension in same mode. If their frequency are f_A and f_B and $f_A + f_B = 11N$. Then find the value of N.

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]

SECTION – 1 : (Maximum Marks : 24)

- This section contains **SIX** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- Marking scheme :
  - +4 If only the bubble corresponding to the correct option is darkened
  - 0 If none of the bubble is darkened
  - –2 In all other cases

41. The colourless salt that gives white precipitate with $BaCl_2$ in aqueous HCl is :

(A) K_2SO_4 (B) K_2SO_3 (C) KNO_3 (D) KBr

42. Select the incorrect process for the given extraction of metal:

	Process used
(A) $Cu_2S \longrightarrow Cu$	Froth floatation / Roasting / Self reduction
(B) $PbS \longrightarrow Pb$	Froth floatation / Roasting / Self reduction
(C) $Fe_2O_3 \longrightarrow Fe$	Froth floatation / Roasting / Carbon reduction
(D) $Al_2O_3.2H_2O \longrightarrow Al$	Leaching / Electrolytic reduction

Space for Rough Work

43. $FeS + H_2SO_4 \longrightarrow B\uparrow$, which is incorrect about gas 'B' **?**

(A) It produce white ppt. with $FeCl_3$.

(B) It produce black ppt. with $(CH_3COO)_2Pb$.

(C) It decolorise the purple colour of $KMnO_4$.

(D) It produce purple colour solution with sodium nitroprusside.

44. When NO_2^- and NO_3^- both ions are present in a salt. Amongs the following find the total number of reagent(s) which will decompose NO_2^- :

Urea, thiourea, sodium azide, NH_4Cl, Sulphamic acid

(A) 5 (B) 4 (C) 3 (D) 2

45. Match List-I with List-II and select the correct answer using the codes gives below the lists :

List-I	**List-II**
P. White turbidity	1. $IO_3^- + SO_2 + \text{starch} \longrightarrow$
Q. Rotten egg smell	2. $SO_3^{2-} + MnO_4^- + H^+ \longrightarrow$
R. Decolourisation	3. $SO_3^{2-} + Zn + H^+ \longrightarrow$
S. Blue colour	4. $CO_2 + Ca(OH)_2 \longrightarrow$

Code :

	P	Q	R	S
(A)	1	3	2	4
(B)	3	2	4	1
(C)	4	3	2	1
(D)	4	1	2	3

Space for Rough Work

46. Match List-I with List-II

List-I	**List-II**
(P) Haematite	(1) Slag formation during roasting, smelting and bessemerisation.
(Q) Copper pyrites	(2) Reduction by carbon monoxide (mainly) as well as carbon at different temperature.
(R) Argentite	(3) Electrolytic reduction.
(S) Bauxite	(4) Leaching by NaCN followed by reduction with Zn.

Code :

	P	Q	R	S
(A)	3	1	2	4
(B)	2	1	4	3
(C)	1	2	3	4
(D)	4	1	2	3

Space for Rough Work

SECTION – 2 : (Maximum Marks : 32)

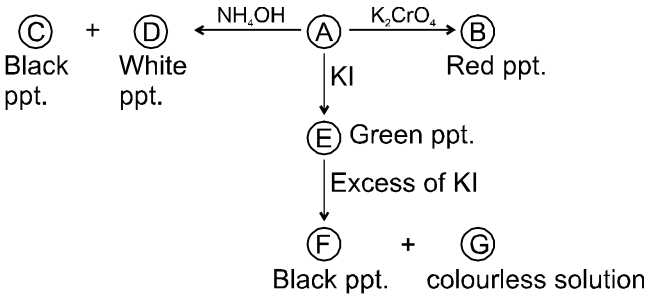
- This section contains **EIGHT** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If only the bubble(s) corresponding to all the correct option(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	:	–1	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 –1 marks, as a wrong option is also darkened.

Space for Rough Work

47.



Which of the following is/are correct?

(A) 'A' show disproportionation reaction in ammonia solution.

(B) Sulphide salt of metal presenting in 'C' is soluble in aquaregia.

(C) B is Ag_2CrO_4.

(D) Anionic part of compound B has tetra-hedral shape.

48. Salt A $\xrightarrow{NaOH}$ Gas B + solution C

Solution C + Zn + NaOH $\longrightarrow$ Gas B

Salt 'A' may be ————

(A) $NaNO_3$ (B) $AgNO_2$ (C) NH_4NO_3 (D) NH_4NO_2

49. Electrorefining method is applicable for purification of metal(s) like :

(A) Al and Ni (B) Cu and Zn (C) Sn and Au (D) Pb and Ag

Space for Rough Work

50. Which of the following statements is/are correct when a mixture of NaCl and $K_2Cr_2O_7$(s) is gently warmed with conc. H_2SO_4?

(A) Deep red vapours are liberated.

(B) Deep red vapours dissolve in NaOH(aq.) forming a yellow colour solution.

(C) Greenish yellow gas is liberated.

(D) Deep red vapours dissolve in water forming yellow colour solution.

51. For which of the following metals, NaCN act as a complexing agent in their metallurgy ?

(A) Al (B) Au (C) Ag (D) Mg

52. Choose the correct statement(s) from the following:

(A) In the metallurgy of Cu, copper matte obtained from roasting consist of Cu_2S(major) + FeS.

(B) In zone refining, impurities are more soluble in liquid phase than in solid.

(C) Froth floatation is a method of concentration of ore depending on the difference in wettability of gangue and the ore particles.

(D) Haematite, Cassiterite and cerussite are oxide ores.

Space for Rough Work

53. $FeC_2O_4 \xrightarrow[\text{in absence of air}]{575^\circ C} \underset{\text{(Basic oxide)}}{A} + \underset{\text{(Netural oxide)}}{B} + \underset{\text{(Acidic oxide)}}{C}$

Which of the following is/are correct?

(A) The gas 'B' reduces Fe_2O_3 to Fe.

(B) The gas 'B' burns with a blue flame.

(C) The gas 'B' turns lime water milky.

(D) The gas 'C' turns lime water milky.

54. Which of the following reaction(s) does not take place in the reverberatory furnace ?

(A) $PbCO_3 \xrightarrow{\Delta} PbO + CO_2$

(B) $2Cu_2S + 3O_2 \xrightarrow{\Delta} 2Cu_2O + 2SO_2$

(C) $HgS + 2HgO \xrightarrow{\Delta} 3Hg + SO_2$

(D) $Fe_2O_3 + CO \xrightarrow{\Delta} Fe + CO_2$

Space for Rough Work

SECTION – 3 : (Maximum Marks : 18)

- This section contains **SIX** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
- Marking scheme :

  +3 If the bubble corresponding to the answer is darkened

  0 If none of the bubbles is darkened

  –1 In all other cases

55. Find the total number of acidic radicals which produce a volatile product with dil HCl ?

SO_4^{2-} , I^-, NO_2^- , NO_3^- , SO_3^{2-} , HCO_3^- , $S_2O_3^{2-}$, BO_3^{3-} , Br^-

56. How many of the following copper compounds are neither black nor white as precipitate ?

(i) CuI (ii) Cu_2S (iii) $Cu(OH)_2$

(iv) CuO (v) CuS (vi) CuSCN

(vii) CuCN (viii) Cu_2O

Space for Rough Work

57. How many of the following reaction(s) is/are redox ?

(i) Sodium nitroprusside solution + $Na_2S \longrightarrow$

(ii) CH_3COO^- + neutral $FeCl_3$ solution $\longrightarrow$

(iii) $Cr_2O_7^{2-} + H^+ + SO_2 \longrightarrow$

(iv) $KCl(s) + K_2Cr_2O_7(s) + H_2SO_4$ (conc.) $\longrightarrow$

(v) NH_4^+ + Nessler's reagent $\longrightarrow$

(vi) Hg_2^{2+} + K_2CrO_4 solution $\longrightarrow$

(vii) $NaCl + conc.H_2SO_4 \longrightarrow$

(viii) $Fe^{2+} + NO + 5H_2O \longrightarrow$

58. How many of the following statement(s) is/are correct regarding metallurgy of Al ?

(i) In Hall-Heroult process carbon lining steel cathode and graphite anode are used.

(ii) In Bayer's method bauxite is treated with NaOH.

(iii) In Hall-Heroult process Al is obtained at cathode.

(iv) Bayer's method is used for white bauxite.

(v) In Hall-Heroult process electrolyte consist of $Al_2O_3 + Na_3AlF_6$.

(vi) In Hall-Heroult process cryolite lowers the melting point of mixture and increases conductivity.

(vii) Important by-product of Serpeck's method is NH_3.

Space for Rough Work

59. Among the following find out total number of reagent(s), which give white precipitate with aqueous solution of Zn^{2+}.

NH_4OH, $(NH_4)_2S$, NaOH, $K_4[Fe(CN)_6]$, HCl

60. Find out total number of reaction(s) with their given condition(s), which converts Mn^{2+} into MnO_4^-.

(i) $Mn^{2+} + BiO_3^- \xrightarrow{+H^\oplus}$

(ii) $Mn^{2+} + PbO_2 \xrightarrow{+H^\oplus}$

(iii) $Mn^{2+} + NaOH \xrightarrow{+air}$

(iv) $Mn^{2+} + S_2O_8^{2-} + H_2O \longrightarrow$

(v) $Mn^{2+} + NH_4OH \longrightarrow$

Space for Rough Work