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Class: XI (PCM) **Time allowed : 90 Minutes** **Maximum Marks : 120**

PLEASE READ THE INSTRUCTIONS IN QUESTION BOOKLET BEFORE ANSWERING THE QUESTION PAPER.

1. Before starting the paper, fill up the required details in the given space provided in the question paper cum answer sheet.
2. The question paper consists of '30' objective type questions. Each question carry 4 marks and all of them are compulsory.
3. Each question contains four alternatives out of which only ONE is correct.
4. There is **NEGATIVE** marking **– 1** for incorrect responses against a question.
5. For rough work, use the space provided at the bottom of each page. No extra sheet will be provided for rough work and you are not supposed to bring the same.
6. Use of **blank papers**, **clip boards**, **log tables**, **calculator**, **slide rule**, **mobile** or any other electronic gadgets in any form is "**NOT PERMISSIBLE**".
7. You must not carry mobile phone even if you have the same, give it to your Invigilator before commencement of the test and take it back from him/her after the exam.
8. The answers of the questions must be marked by **ticking correct on the options** against the question by dark Black/Blue Ball point Pen only.

Name of the students:_____

Class: _____

Contact Number: _____

Exam Centre: _____

Mathematics

1. The graph of the function $y = f(x)$ is symmetrical about the line $x = 2$, then

(a) $f(x) = -f(-x)$ (b) $f(2 + x) = f(2 - x)$

(c) $f(x) = f(-x)$ (d) $f(x + 2) = f(x - 2)$

2. Let the function $f : R \to R$ be defined by $f(x) = 2x + \sin x, x \in R$. Then f is

(a) One-to-one and onto

(b) One-to-one but not onto

(c) Onto but not one-to-one

(d) Neither one-to-one nor onto

3. If $f : R \to S$ defined by $f(x) = \sin x - \sqrt{3}\cos x + 1$ is onto, then the interval of S is

(a) [–1, 3] (b) [1, 1]

(c) [0, 1] (d) [0, –1]

4. The function $f(x) = \frac{\sec^{-1} x}{\sqrt{x - [x]}}$, where [.] denotes the greatest integer less than or equal to x is defined for all x belonging to

(a) R

(b) $R - \{(-1, 1) \cup (n | n \in Z)\}$

(c) $R^+ - (0, 1)$

(d) $R^+ - \{n | n \in N\}$

5. If 'n' is an integer, the domain of the function $\sqrt{\sin 2x}$ is

(a) $\left[n\pi - \frac{\pi}{2}, n\pi\right]$ (b) $\left[n\pi, n\pi + \frac{\pi}{2}\right]$

(c) $[(2n - 1)\pi, 2n\pi]$ (d) $[2n\pi, (2n + 1)\pi]$

6. The function $f(x) = \sin\left(\log(x + \sqrt{x^2 + 1})\right)$ is

(a) Even function (b) Odd function

(c) Neither even nor odd (d) Periodic function

7. Let $f(\theta) = \sin\theta(\sin\theta + \sin 3\theta)$, then $f(\theta)$

(a) ≥ 0 only when $\theta \geq 0$ (b) ≤ 0 for all real θ

(c) ≥ 0 for all real θ (d) ≤ 0 only when $\theta \leq 0$

Space For Rough Work

8. Let $f(x)=\sin x+\cos x, g(x)=x^2-1$. Thus $g(f(x))$ is invertible for $x\in$

(a) $\left[-\frac{\pi}{2},0\right]$ (b) $\left[-\frac{\pi}{2},\pi\right]$

(c) $\left[-\frac{\pi}{2},\frac{\pi}{4}\right]$ (d) $\left[0,\frac{\pi}{2}\right]$

9. If $f(x)=\frac{x}{\sqrt{1+x^2}}$, then $(fofof)(x)=$

(a) $\frac{3x}{\sqrt{1+x^2}}$ (b) $\frac{x}{\sqrt{1+3x^2}}$

(c) $\frac{3x}{\sqrt{1+x^2}}$ (d) None of these

10. If $f(x)=\frac{\alpha x}{x+1}, x\neq -1$. Then, for what value of α is $f(f(x))=x$

(a) $\sqrt{2}$ (b) $-\sqrt{2}$

(c) 1 (d) –1

Space For Rough Work

11. **A piece of wood of mass 0.03 kg is dropped from the top of a 100 m height building. At the same time, a bullet of mass 0.02 Kg is fired vertically upward, with a velocity 100 m/s, from the ground. The bullet gets embedded in the wood. Then the maximum height to which the combined system reaches above the top of the building before falling below is (g = 10 m/s)**

(a)10 m

(b)30 m

(c)20 m

(d)40 m

12. **A passenger train of length 60 m travels at a speed of 80 km/hr. Another freight train of length 120 m travels at a speed of 30 km/hr. The ratio of times taken by the passenger train to completely cross the freight train when: (i) they are moving in the same direction, and (ii) in the opposite direction, is**
(a) 25/11
(b) 3/2
(c) 5/2
(d) 11/5

13. **An automobile, travelling at 40 km/h, can be stopped at a distance of 40 m by applying brakes. If the same automobile is travelling at 80 km/h, the minimum stopping distance, in metres, is (assume no skidding)**
(a) 100 m
(b) 75 m
(c) 160 m
(d) 150 m

14. **A parachutist after bailing out falls 50 m without friction. When the parachute opens, it decelerates at 2 m/s^2. He reaches the ground with a speed of 3 m/s. At what height, did he bailout?**
(a) 293 m
(b) 111 m
(c) 91 m
(d) 182 m

15. **A car, starting from rest, accelerates at the rate f through a distance s, then continues at a constant speed for time t and then decelerates at the rate f/2 to come to rest. If the total distance traversed in 15 s, then**
(a) s= ½ft^2
(b) s= (¼)ft^2
(c) s = ft
(d) s= (1/72)ft^2

16. **From a building, two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically). If v_A and v_B are their respective velocities on reaching the ground, then**
(a) $v_B > v_A$
(b) $v_A = v_B$
(c) $v_A > v_B$
(d) their velocities depend on their masses

Space For Rough Work

17. **If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?**
(a) 1 cm
(b) 2 cm
(c) 3 cm
(d) 4 cm

18. **In the formula $X = 3YZ^2$, X and Z have dimensions of capacitance and magnetic induction respectively. What are the dimensions of Y in MKS system ?**
a) $\left[M^{-3}L^{-1}T^{3}Q^{4}\right]$ b) $\left[M^{-3}L^{-2}T^{4}Q^{4}\right]$
c) $\left[M^{-2}L^{-2}T^{4}Q^{4}\right]$ d) $\left[M^{-3}L^{-2}T^{4}Q^{1}\right]$

19. **Which of the following sets have different dimensions ?**
(a)Pressure, Young's modulus, stress
(b)Emf, potential difference, electric potential
(c)Heat, work done, energy
(d)Dipole moment, electric flux, electric field

20. **The density of a solid ball is to be determined in an experiment. The diameter of the ball is measured with a screw gauge, whose pitch is 0.5 mm and there are 50 divisions on the circular scale. The reading on the main scale is 2.5 mm and that on the circular scale is 20 divisions. If the measured mass of the ball has a relative error of 2%, the relative percentage error in the density is**
(a) 0.9% (b) 2.4% (c) 3.1% (d) 4.2%

Space For Rough Work

CHEMISTRY

21. **If the kinetic energy of an electron is increased four times, the wavelength of the de-Broglie wave associated with it would become**
(a) Two times
(b) Half
(c) One fourth
(d) Four times

22. **The radius of the second Bohr orbit for the hydrogen atom is :**
(Planck's constant, h = 6.262×10^{-34}Js: Mass of electron = 9.1091×10^{-31}kg; Charge of electron e = 1.60210×10^{-19}C; permittivity of vacuum $\varepsilon_0 = 8.854185\times10^{-12}kg^{-1}m^{-3}A^2$)
(a) 1.65 A
(b) 4.76 A
(c) 0.529 A
(d) 2.12 A

23. **The frequency of light emitted for the transition n = 4 to n = 2 of He+ is equal to the transition in H atom corresponding to which of the following**
(a) n = 3 to n = 1
(b) n = 2 to n = 1
(c) n = 3 to n = 2
(d) n = 4 to n = 3

24. **Based on the equation $\Delta E = -2.0\times10^{-18}$ J $(1/n_2^2 - 1/n_1^2)$ the wavelength of the light that must be absorbed to excite hydrogen electron from level n = 1 to level n= 2 will be (h = 6.625×10^{-34} Js, C = 3×10^8 ms^{-1})**
(a) 2.650×10^{-7}m
(b) 1.325×10^{-7}m
(c) 1.325×10^{-10}m
(d) 5.300×10^{-10}m

25. **In the Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit jumps of the electron for Bohr orbits in an atom of hydrogen**
(a) 5 → 2
(b) 4 → 1
(c) 2→ 5
(d) 3→ 2

26. **Which of the following sets of quantum numbers is correct for an electron present in 4f orbital?**
(a) n = 4, l = 3, m = +4, s = +½
(b) n = 3, l = 2, m = -2, s = +½
(c) n = 4, l = 3, m = +1, s = +½
(d) n = 4, l = 4, m = -4, s = -½

27. **Which of the following sets of quantum numbers represents the highest energy of an atom?**
(a)n=3, l =2, m=l, s= +½
(b)n=3, l =2, m=l, s= +½
(c)n=4, l =0, m=0, s= +½
(d)n=3, l =0, m=0, s= +½

Space For Rough Work

28. **The ratio of mass percent of C and H of an organic compound ($C_xH_yO_z$) is 6 : 1. If one molecule of the above compound ($C_xH_yO_z$) contains half as much oxygen as required to burn one molecule of compound C_XH_Y completely to CO_2 and H_2O. The empirical formula of compound $C_xH_yO_z$ is :**
(a) C_2H_4O
(b) $C_3H_4O_2$
(c) $C_2H_4O_3$
(d) $C_3H_6O_3$

29. **The concentrated sulphuric acid that is peddled commercially is 95% H_2SO_4 by weight. If the density of this commercial acid is 1.834 g cm^{-3}, the molarity of this solution is :-**
(a) 17.8 M
(b) 15.7 M
(c) 10.5 M
(d) 12.0 M

30. **The ratio of masses of oxygen and nitrogen in a particular gaseous mixture is 1 : 4. The ratio of number of their molecule is :**
(a) 1 : 8
(b) 3 : 16
(c) 1 : 4
(d) 7 : 32

Space For Rough Work