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Class: XII (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 function $f(x)=\frac{\log(1+ax)-\log(1-bx)}{x}$ is not defined at $x=0$. The value which should be assigned to f at x =0 so that it is continuos at $x=0$, is

   (a) $a-b$ (b) $a+b$

   (c) $\log a+\log b$ (d) $\log a-\log b$

2. At which points the function $f(x)=\frac{x}{[x]}$, where $[.]$ is greatest integer function, is discontinuous

   (a) Only positive integers

   (b) All positive and negative integers and (0, 1)

   (c) All rational numbers

   (d) None of these

3. Let $h(x)=\min\{x,x^2\}$, for every real number of x. Then

   (a) h is continuous for all x

   (b) h is differentiable for all x

   (c) $h'(x)=1$, for all $x>1$

   (d) h is not differentiable at two values of x

4. Let $[x]$ denotes the greatest integer less than or equal to x. If $f(x)=[x\sin\pi x]$, then $f(x)$ is

   (a) Continuous at $x=0$ (b)Continuous in $(-1,0)$

   (c) Differentiable in (–1,1) (d) All the above

5. The left-hand derivative of $f(x)=[x]\sin(\pi x)$ at $x=k,\ k$ is an integer and $[x]$ = greatest integer $\le x,$ is

   (a) $(-1)^k\ (k-1)\pi$ (b) $(-1)^{k-1}(k-1)\pi$

   (c) $(-1)^k k\pi$ (d) $(-1)^{k-1}k\pi$

6. The function $f(x)=(x^2-1)|\ x^2-3x+2|+\cos(|\ x|)$ is not differentiable at

   (a) –1 (b) 0

   (c) 1 (d) 2

Space For Rough Work

7. If $f(x)$ is twice differentiable polynomial function such that $f(1)=1, f(2)=-4, f(3)=9$, then

(a) $f''(x)=2, \forall x \in R$

(b) There exist at least one $x \in (1,3)$ such that $f''(x)=2$

(c) There exist at least one $x \in (2,3)$ such that $f'(x)=5=f''(x)$

(d) There exist at least one $x \in (1,2)$ such that $f(x)=3$

8. 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) $[2n\pi, (2n+1)\pi]$

9. 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

10. 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

PHYSICS

11. A parallel plate capacitor having capacitance 12 pF is charged by a battery to a potential difference of 10 V between its plates. The charging battery is now disconnected and a porcelain slab of dielectric constant 6.5 is slipped between the plates. The work done by the capacitor on the slab is

(a) 508 pJ

(b) 692 pJ

(c) 560 pJ

(d) 600 pJ

12. **A solid conducting sphere, having a charge Q, is surrounded by an uncharged conducting hollow spherical shell. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be V. If the shell is now given a charge of –4 Q, the new potential difference between the same two surfaces is**

(a) 4 V

(b) V

(c) 2 V

(d) –2 V

13. Two identical conducting spheres A and B, carry equal charge. They are separated by a distance much larger than their diameters, and the force between them is F. A third identical conducting sphere, C, is uncharged. Sphere C is first touched to A, then to B, and then removed. As a result, the force between A and B would be equal to

(a) 3F/8

(b) F/2

(c) 3F/4

(d) F

14. There is a uniform electrostatic field in a region. The potential at various points on a small sphere centred at P, in the region, is found to vary between in the limits 589.0 V to 589.8 V. What is the potential at a point on the sphere whose radius vector makes an angle of 60^0 with the direction of the field?

(A) 589.5 V

(B) 589.2 V

(C) 589.4 V

(D) 589.6 V

15. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 volts. The potential at the centre of the sphere is

(A) zero

(B) 10 volts

(C) same as at a point 5 cm away from the surface

(D) same as at a point 25 cm away from the surface

16. A magnetic dipole is acted upon by two magnetic fields which are inclined to each other at an angle of 75°. One of the fields has a magnitude of 15 mT. The dipole attains stable equilibrium at an angle of 30° with this field. The magnitude of the other field (in mT) is close to

(a) 1

(b) 11

(c) 36

(d) 1060

17. Two short bar magnets of length 1 cm each have magnetic moments 1.20 Am^2 and 1.00 A m^2 respectively. They are placed on a horizontal table parallel to each other with their N poles pointing towards the South. They have a common magnetic equator and are separated by a distance of 20.0 cm. The value of the resultant horizontal magnetic induction at the mid-point O of the line joining their centres is close to

(Horizontal component of earth's magnetic induction is 3.6 × 10^{-5} Wb/m^2)

(a) 5.80 × 10^{-4} Wb/m^2

(b) 3.6 × 10^{-5} Wb/m^2

(c) 2.56 × 10^{-4} Wb/m^2

(d) 3.50 ×10^{-4} Wb/m^2

18. A coil is suspended in a uniform magnetic field, with the plane of the coil parallel to the magnetic lines of force. When a current is passed through the coil it starts oscillating it is very difficult to stop. But if an aluminium plate is placed near to the coil, it stops. This is due to

(a) induction of electrical charge on the plate

(b) shielding of magnetic lines of force as aluminium is a paramagnetic material

(c) electromagnetic induction in the aluminium plate giving rise to electromagnetic damping

(d) development of air current when the plate is placed

19. A series AC circuit containing an inductor (20 mH), a capacitor (120 μF) and a resistor (60 Ω) is driven by an AC source of 24 V/50 Hz. The energy dissipated in the circuit in 60 s is

(a) 3.39 × 10^3 J

(b) 5.65 × 10^2 J

(c) 2.26 × 10^3 J

(d) 5.17 × 10^2 J

20. A circuit connected to an ac source of emf $e = e_0 \sin(100\ t)$ with t in seconds, gives a phase difference of π/4 between the emf e and current I. Which of the following circuits will exhibit this?

(a) RC circuit with R = 1 kΩ and C = 10μF

(b) RL circuit with R = 1 kΩ and L = 10mH

(c) RC circuit with R = 1 kΩ and C = 1μF

(d) RL circuit with R = 1 kΩ and L = 1mH

Space For Rough Work

CHEMISTRY

21. The mole fraction of urea in an aqueous urea solution containing 900 g of water is 0.05. If the density of the solution is 1.2 g cm^{-3}, the molarity of urea solution is _____.

(Given data: Molar masses of urea and water are 60 g mol–1 and 18 g mol–1, respectively)

A. 2.98 M

B. 1.98 M

C. 1.06 M

D. 3.98 M

22. Benzene and naphthalene form an ideal solution at room temperature. For this process,the true statement(s) is (are)

A. ΔG_{system} is positive

B. ΔS_{system} is positive

C. $\Delta S_{surroundings}$ is non-zero

D. ΔH is positive

23. In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to

(a) generate heat

(b) create a potential difference between the two electrodes

(c) produce high purity water

(d) remove adsorbed oxygen from the electrode surface.

24. Conductivity (unit Siemen's S) is directly proportional to the area of the vessel and the concentration of the solution in it and is inversely proportional to the length of the vessel then the unit of the constant of proportionality is

(a) $Sm\ mol^{-1}$

(b) $Sm^2\ mol^{-1}$

(c) $S^{-2}m^2\ mol^1$

(d) $S^2m^2\ mol^1$

25. For a cell reaction involving a two-electron change, the standard e.m.f. of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction at 25°C will be

(a) 1×10^{-10}

(b) 29.5×10^{-2}

(c) 10

(d) 1×10^{10}

Space For Rough Work

26.For the equilibrium, A(g) ⇌ B(g), ΔH is –40 kJ/mol. If the ratio of the activation energies of the forward (E_f) and reverse (E_b) reactions is 2/3 then:

(a) E_f = 60kJ / mol; E_b = 100 kJ/mol

(b) E_f = 30kJ / mol; E_b = 70 kJ/mol

(c) E_f = 80kJ / mol; E_b = 120 kJ/mol

(d) E_f = 70kJ / mol; E_b = 30 kJ/mol

27. At 518^0 C, the rate of decomposition of a sample of gaseous acetaldehyde, initially at a pressure of 363 Torr, was 1.00 s^{-1} when 5% had reacted and 0.5 Torr s^{-1} when 33% had reacted. The order of the reaction is :

(a) 3

(b) 1

(c) 0

(d) 2

28.Iodoform can be prepared from all except:-

(a) Isobutyl alcohol

(b) Ethyl methyl ketone

(c) Isopropyl alcohol

(d) 3-Methyl–2–butanone

29.In the Victor-Meyer's test, the colour given by 1^0, 2^0 and 3^0 alcohols are respectively:-

(a) Red, blue, colourless

(b) Colourless, red, blue

(c) Red, blue, violet

(d) Red, colourless, blue

30.From Amongst the following alcohols the one that would react fastest with conc.HCl and anhydrous $ZnCl_2$, is

(a) 2- Butanol

(b) 2- Methylpropan-2-ol

(c) 2-Methylpropanaol

(d) 1-Butanol

Space For Rough Work