SAMPLE PAPER

GRADE – 12th & 12th PCM

SECTION – A (English)

In each of the following questions, a part of the sentence is underlined. Four alternatives are given for the underlined part. Select the alternative that best improves the sentence and makes it grammatically and contextually correct.

1. **He was elected the captain of the team despite being one of its youngest members.**
   (A) a captain of the team (B) captain of the team
   (C) an captain of the team (D) the captain of the team
2. **There is few hope of completing the project on time unless additional resources are provided.**
   (A) a few hope (B) the few hope
   (C) little hope (D) a little hope
3. **The principal prevented the students to enter the examination hall after the gates had been closed.**
   (A) prevented the students from entering (B) prevented the students for entering
   (C) prevented the students from enter (D) prevented the students to entering
4. **You had better to revise these rules thoroughly before appearing for the examination.**
   (A) had better revised (B) had better revise
   (C) had better revising (D) had better to revising
5. **Nobody informed you about the change in the examination schedule, didn't he?**
   (A) did they? (B) did he?
   (C) hadn't they? (D) doesn't he?
6. **The accused was acquitted from all the charges due to lack of sufficient evidence.**
   (A) acquitted with (B) acquitted of
   (C) acquitted by (D) acquitted against
7. **The government has decided to bring out several reforms to improve the recruitment process.**
   (A) bring about (B) bring up
   (C) bring off (D) bring down
8. **Neither of the explanations given by the witnesses seem convincing to the investigating officer.**
   (A) seems convincing (B) have seemed convincing
   (C) are seeming convincing (D) were seemed convincing
9. **The authorities made the contractor to repair the damaged portion of the road immediately.**
   (A) to repairing (B) repaired
   (C) repair (D) repairing
10. **The candidates are looking forward to receive their appointment letters after the final verification.**
    (A) to receiving (B) for receiving
    (C) to have received (D) to receive

Choose the alternative which best expresses the meaning of the given sentence in one word.

11. One who can use both hands equally well

(A) Ambivalent (B) Ambidextrous

(C) Ambiguous (D) Amphibious

Select the correctly spelt word.

12. (A) Perseverence (B) Perseverance

(C) Perserverance (D) Persevarance

Select the correctly spelt word.

13. (A) Conscientious (B) Conscentious

(C) Consciencious (D) Conscientous

Choose the alternative which best expresses the meaning of the given idiom phrase.

14. Not hold water

(A) To remain unsuccessful (B) To be unable to keep a secret

(C) To be unconvincing or illogical (D) To lose patience quickly

Change the narration.

15. She asked me whether I had seen her documents the previous day.

(A) She said to me, "Did you see my documents yesterday?"

(B) She said to me, "Have you seen my documents yesterday?"

(C) She said to me, "Had you seen her documents the previous day?"

(D) She asked me, "Did I see your documents yesterday?"

SECTION – B (Physics)

16. An electric dipole of moment ρ is placed in a uniform electric field E. The work done in rotating the dipole from its stable equilibrium orientation through an angle of 180° is :

(A) $-\rho E$ (B) Zero (C) $+\rho E$ (D) $+2\rho E$

17. Two concentric conducting spherical shells of radii R and $2R$ carry charges $+Q$ and $-2Q$ respectively. The electric potential at a distance r from the common centre (where $R < r < 2R$) is :

(A) $\left[\frac{1}{(4\pi\varepsilon 0)}\right]\left[-\frac{Q}{r}\right]$ (B) $\left[\frac{1}{(4\pi\varepsilon 0)}\right]\left[\left(\frac{Q}{r}\right)-\left(\frac{Q}{R}\right)\right]$

(C) $\left[\frac{1}{(4\pi\varepsilon 0)}\right]\left[\left(\frac{Q}{r}\right)-\left(\frac{2Q}{2R}\right)\right]$ (D) Zero

18. A parallel plate capacitor is charged by a battery and then disconnected. A dielectric slab of constant $K(>1)$ is now inserted completely between the plates. Which quantity remains unchanged ?

(A) Electric field between plates (B) Charge on the plates

(C) Potential difference (D) Electrostatic energy stored

19. A biconvex lens of focal length *f* and refractive index 1 .5 is immersed in a liquid of refractive index 1 .6. The lens will now act as a :

(A) Converging lens of focal length >*f* (B) Diverging lens of focal length 8*f*

(C) Diverging lens of focal length 4*f* (D) Converging lens of focal length 8*f*

20. A ray of light is incident at an angle of 60° on one face of an equilateral prism. If the ray undergoes minimum deviation through the prism, the refractive index of the prism material is :

(A) $\sqrt{3}$ (B) 1.5 (C) $\sqrt{2}$ (D) $\frac{4}{3}$

21. An astronomical telescope has an objective lens of focal length 100 cm and an eyepiece of focal length 5 cm. In normal adjustment, its magnifying power and tube length are respectively :

(A) 20 and 95 cm (B) 20 and 105 cm (C) 25 and 105 cm (D) 500 and 100 cm

22. A magnetic needle placed in a uniform magnetic field experiences :

(A) A torque but no net force (B) A net force but no torque

(C) Both a torque and a net force (D) Neither a force nor a torque

23. The magnetic susceptibility (χ) of a specimen of material is −0.00015. The specimen is :

(A) Ferromagnetic (B) Paramagnetic

(C) Diamagnetic (D) Non – magnetic conductor

24. At a certain location on Earth, the horizontal component of Earth's magnetic field is equal to its vertical component. The angle of dip at this location is :

(A) 0° (B) 30° (C) 45° (D) 90°

25. In Bohr's model of the hydrogen atom, if the radius of the ground state orbit is r_0, then the radius of the orbit corresponding to the second excited state (n = 3) is :

(A) 3r0 (B) 4r0 (C) 9r0 (D) 16r0

26. The ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series of the hydrogen emission spectrum is :

(A) $\frac{5}{27}$ (B) $\frac{4}{9}$ (C) $\frac{27}{5}$ (D) $\frac{1}{4}$

27. Two nuclei have mass numbers in the ratio 1 : 8. The ratio of their respective nuclear densities is :

(A) 1 : 2 (B) 1 : 8 (C) 2 : 1 (D) 8 : 1

28. In a nuclear reaction $_1^2H + _1^2H \rightarrow _2^4He + Q$, the binding energy per nucleon of $_1^2H$ and $_2^4He$ are 1.1 MeV and 7.0 MeV respectively. The energy released Q is :

(A) 5.9 MeV (B) 23.6 MeV (C) 28.0 MeV (D) 11.8 MeV

29. Which of the following statements is INCORRECT regarding nuclear forces ?

(A) They are short-range forces. (B) They depend strongly on electric charge.

(C) They exhibit saturation property. (D) They are much stronger than Coulomb forces.

30. Assertion (A) : When light travels from an optically denser to rarer medium, it bends away from the normal.
Reason (R) : The speed of light is higher in a rarer medium compared to a denser medium.

(A) Both (A) and (R) are true, and (R) is correct explanation of (A)

(B) Both (A) and (R) are true, but (R) is NOT correct explanation of (A)

(C) (A) is true, but (R) is false

(D) (A) is false, but (R) is true

SECTION – C (Chemistry)

31. An organic compound A (C_3H_6O) on treatment with dilute NaOH followed by acidification gives B ($C_6H_{10}O$). B on heating with I_2 /NaOH yields iodoform and a sodium salt of a carboxylic acid. Identify A and the type of reaction involved in formation of B :

(A) Propanal; Aldol condensation (B) Propanone; Aldol condensation

(C) Propanal; Cannizzaro reaction (D) Propanone; Cannizzaro reaction

32. Which of the following amines will give a positive carbylamine test and also dissolve in aqueous KOH after reaction with Hinsberg reagent ?

(A) $CH_3CH_2NH_2$ (B) $(CH_3)_2NH$ (C) $(CH_3)_3N$ (D) $C_6H_5NHCH_3$

33. The major product obtained when 3 – methylbut – 1 – ene is treated with HBr in presence of peroxide followed by hydrolysis with aqueous KOH is:

(A) 3 – methylbutan – 2 – ol (B) 2 – methylbutan – 1 – ol

(C) 3 – methylbutan – 1 – ol (D) 2 – methylbutan – 2 – ol

34. In the reaction of 1 – bromobutane with alcoholic KOH, the major product is but – 1 – ene. However, when 2 – bromobutane is treated under identical conditions, a mixture of but – 1 – ene and but – 2 – ene is obtained with but – 2 – ene as major product. This is best explained by :

(A) Saytzeff rule only

(B) Hofmann rule only

(C) Saytzeff rule and greater stability of more substituted alkene

(D) Steric hindrance in the transition state of E_2

35. Which of the following statements is correct regarding the mutarotation of α – D – glucose ?

(A) It involves the opening of the pyranose ring to the open – chain aldehyde form followed by reclosure.

(B) It is catalysed only by acids.

(C) The specific rotation changes from +112° to +19° without any change in molecular structure.

(D) β – D – glucose does not undergo mutarotation.

36. An acid chloride (C_4H_7OCl) on reaction with excess CH_3MgBr followed by hydrolysis gives a tertiary alcohol that does not respond to Lucas test at room temperature but gives turbidity within 5 minutes on heating. The acid chloride is :

(A) $(CH_3)_2CHCOCl$ (B) $CH_3CH_2CH_2COCl$

(C) CH_3CH_2COCl (D) $(CH_3)_3CCOCl$

37. For a first – order reaction A → Products, the concentration of A falls from 0.8 M to 0.4 M in 15 minutes and from 0.4 M to 0.2 M in the next 15 minutes. The half – life of the reaction is :

(A) 15 min

(B) 30 min

(C) 7.5 min

(D) Independent of initial concentration, but value cannot be determined from data

38. The standard electrode potential of Zn^{2+}/Zn is –0.76 V and that of Cu^{2+}/Cu is +0.34 V. The standard free energy change (ΔG°) for the cell reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ at 298 K is (F = 96500 C mol^{-1}) :

(A) –212.3 kJ mol^{-1} (B) –106.15 kJ mol^{-1}

(C) +212.3 kJ mol^{-1} (D) –424.6 kJ mol^{-1}

39. A 0.5 molal aqueous solution of a weak electrolyte ($K_a = 1.0 \times 10^{-5}$) is 1% dissociated. The freezing point of the solution is (K_f for water = 1.86 K kg mol^{-1}) :

(A) –0.93°C (B) –0.9393°C

(C) –1.86°C (D) –0.186°C

40. Which of the following is incorrect regarding physisorption ?

(A) It is multilayer and non – specific.

(B) Enthalpy of adsorption is low (20–40 kJ mol^{-1}).

(C) It increases with increase in temperature.

(D) It is reversible.

41. In a face – centred cubic lattice of an ionic compound, the edge length is 400 pm. The radius of the cation (assuming anion occupies the corners and cation occupies face centres, and they touch along the face diagonal) is approximately :

(A) 141.4 pm (B) 100 pm (C) 70.7 pm (D) 200 pm

42. The complex $[Co(NH_3)_5NO_2]Cl_2$ shows linkage isomerism. The two linkage isomers differ in :

(A) Coordination number of cobalt

(B) Oxidation state of cobalt

(C) The atom of the ambidentate ligand attached to the metal

(D) Geometry of the complex

43. Which of the following oxoacids of phosphorus contains P–P bond and has two types of P – OH groups ?

(A) $H_4P_2O_5$ (B) $H_4P_2O_6$

(C) $H_4P_2O_7$ (D) H_3PO_3

44. The correct order of the spin – only magnetic moments (in BM) of $[MnCl_3]^{2-}$, $[Mn(CN)_6]^{3-}$ and $[Mn(CN)_6]^{4-}$ is :

(A) $[MnCl_4]^{2-} > [Mn(CN)_6]^{3-} > [Mn(CN)_6]^{4-}$

(B) $[MnCl_4]^{2-} > [Mn(CN)_6]^{4-} > [Mn(CN)_6]^{3-}$

(C) $[Mn(CN)_6]^{3-} > [MnCl_4]^{2-} > [Mn(CN)_6]^{4-}$

(D) $[Mn(CN)_6]^{4-} > [MnCl_4]^{2-} > [Mn(CN)_6]^{3-}$

45. In the extraction of copper from copper pyrites, the role of silica added during roasting/smelting is to :

(A) Convert FeO to $FeSiO_3$ slag (B) Convert Cu_2O to Cu_2S

(C) Act as a reducing agent (D) Remove SO_2

SECTION – D (Mathematics)

46. A relation from *P* to *Q* is :

(A) A universal set of $P \times Q$ (B) $P \times Q$

(C) An equivalent set of $P \times Q$ (D) A subset of $P \times Q$

47. Let *R* be a relation over the set *N* × *N* and it is defined by $(a,b)R(c,d) \Rightarrow a+d=b+c.$ Then *R* is :

(A) Reflexive only (B) Symmetric only

(C) Transitive only (D) An equivalence relation

48. The range of the function $f(x) = {}^{7-x}P_{x-3}$ is :

(A) {1, 2, 3, 4, 5} (B) {1, 2, 3, 4, 5, 6}

(C) {1, 2, 3, 4} (D) {1, 2, 3}

49. If *f* is an even function defined on the interval (–5, 5), then four real values of *x* satisfying the equation $f(x) = f\left(\frac{x+1}{x+2}\right)$ are :

(A) $\frac{-3-\sqrt{5}}{2}, \frac{-3+\sqrt{5}}{2}, \frac{3-\sqrt{5}}{2}, \frac{3+\sqrt{5}}{2}$

(B) $\frac{-5+\sqrt{3}}{2}, \frac{-3+\sqrt{5}}{2}, \frac{3+\sqrt{5}}{2}, \frac{3-\sqrt{5}}{2}$

(C) $\frac{3-\sqrt{5}}{2}, \frac{3+\sqrt{5}}{2}, \frac{-3-\sqrt{5}}{2}, \frac{5+\sqrt{3}}{2}$

(D) $-3-\sqrt{5}, -3+\sqrt{5}, 3-\sqrt{5}, 3+\sqrt{5}$

50. If $f(x) = \sin^2 x + \sin^2\left(x+\frac{\pi}{3}\right) + \cos x \cos\left(x+\frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 1$, then $(gof)(x) =$?

(A) –2 (B) –1

(C) 2 (D) 1

51. The number of real solutions of $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2+x+1} = \frac{\pi}{2}$ is :

(A) Zero (B) One

(C) Two (D) Infinite

52. $2\tan^{-1}\left[\sqrt{\frac{a-b}{a+b}}\tan\frac{\theta}{2}\right] =$?

(A) $\cos^{-1}\left(\frac{a\cos\theta+b}{a+b\cos\theta}\right)$ (B) $\cos^{-1}\left(\frac{a+b\cos\theta}{a\cos\theta+b}\right)$

(C) $\cos^{-1}\left(\frac{a\cos\theta}{a+b\cos\theta}\right)$ (D) $\cos^{-1}\left(\frac{b\cos\theta}{a\cos\theta+b}\right)$

53. $\tan\left[\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right] + \tan\left[\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right] =$?

(A) $\frac{2a}{b}$ (B) $\frac{2b}{a}$

(C) $\frac{a}{b}$ (D) $\frac{b}{a}$

54. If $a_1, a_2, a_3, \ldots\ldots, a_n, \ldots\ldots$ are in G.P. and $a_i > 0$ for each *i*, then the value of the determinant $\Delta = \begin{vmatrix} \log a_n & \log a_{n+2} & \log a_{n+4} \\ \log a_{n+6} & \log a_{n+8} & \log a_{n+10} \\ \log a_{n+12} & \log a_{n+14} & \log a_{n+16} \end{vmatrix}$ is equal to :

(A) 1 (B) 2

(C) 0 (D) None of these

55. The system of linear equations $x+y+z=2$, $2x+y-z=3$, $3x+2y+kz=4$ has a unique solution if :

(A) $k \neq 0$ (B) $-1 < k < 1$

(C) $-2 < k < 2$ (D) $k = 0$

56. If $A=\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ and $A^n = O$, then the minimum value of *n* is :

(A) 2 (B) 3

(C) 4 (D) 5

57. Which of the following is incorrect ?

(A) $A^2 - B^2 = (A+B)(A-B)$

(B) $(A^T)^T = A$

(C) $(AB)^n = A^n B^n$, where *A*, *B* commute

(D) $(A-I)(I+A) = O \Leftrightarrow A^2 = I$

58. If *E* and *F* are events with $P(E) \leq P(F)$ and $P(E \cap F) > 0$, then :

(A) Occurrence of $E \Rightarrow$ Occurrence of *F*

(B) Occurrence of $F \Rightarrow$ Occurrence of *E*

(C) Non – occurrence of $E \Rightarrow$ Non-occurrence of *F*

(D) None of the above implications holds

59. If $(1+3p)/3, (1-p)/4$ and $(1-2p)/2$ are the probabilities of three mutually exclusive events, then the set of all values of *p* is :

(A) $\frac{1}{3} \leq p \leq \frac{1}{2}$ (B) $\frac{1}{3} < p < \frac{1}{2}$

(C) $\frac{1}{2} \leq p \leq \frac{2}{3}$ (D) $\frac{1}{2} < p < \frac{2}{3}$

60. Let *X* be a set containing *n* elements. If two subsets *A* and *B* of *X* are picked at random, the probability that *A* and *B* have the same number of elements, is :

(A) $\frac{^{2n}C_n}{2^{2n}}$ (B) $\frac{1}{^{2n}C_n}$

(C) $\frac{1.3.5.....(2n-1)}{2^n}$ (D) $\frac{3^n}{4^n}$