FIITJEE PET – III (REG_1ST YEAR)

MAINS_SET–A

DATE: 23.06.2018

Time: 3 hours **Maximum Marks: 360**

INSTRUCTIONS:

Instructions to the Candidates

1. This Test Booklet consists of **90 questions**.

   Use **Blue/Black ball Point Pen only** for writing particulars and bubbling of OMR.

2. For each correct answer **4 Marks** will awarded and for each wrong answer **1 Mark** will be deducted.

3. Attempt all questions.

4. In case you have not darkened any bubble you will be awarded 0 mark for that question.

5. Use of calculator/logarithmic table is not permitted.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐☐

1. Value of $\frac{\sin(A+B)+\sin(A-B)}{\cos(A+B)+\cos(A-B)}$ =

   (A) tan A (B) cot A (C) –tan A (D) none of these

2. tan 15° + tan 30° + tan 15° . tan 30° =

   (A) 1 (B) –1 (C) 0 (D) none of these

3. If cos A + cos B = m and sin A + cos B = n; then value of $m^2 + n^2 - 2$

   (A) sin (A + B) (B) 2 sin (A + B) (C) sin (A – B) (D) 2 sin (A – B)

4. If tan A = x tan B, then $\frac{\sin(A-B)}{\sin(A+B)}$ =

   (A) $\frac{x+1}{x-1}$ (B) $\frac{x-1}{x+1}$ (C) $\frac{x^2-1}{x+1}$ (D) none of these

5. Value of $\cos\left(-1025\frac{\pi}{2}+\frac{\pi}{6}\right)$

   (A) $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $-\frac{\sqrt{3}}{2}$ (D) none of these

6. Value of $\tan\left(102\frac{\pi}{2}-\frac{\pi}{3}\right)$

   (A) $-\sqrt{3}$ (B) $\sqrt{3}$ (C) $-\frac{1}{\sqrt{3}}$ (D) none of these

7. Value of $\operatorname{cosec}\left(-1038\frac{\pi}{2}+\frac{\pi}{6}\right)$

   (A) $\frac{1}{2}$ (B) 2 (C) $\frac{2}{\sqrt{3}}$ (D) none of these

8. Value of $\tan\left(3955\frac{\pi}{2}+\frac{\pi}{5}\right)$

   (A) 1 (B) –1 (C) 0 (D) none of these

Space for rough work

9. Value of $\sin\left(1080\pi - \frac{2\pi}{3}\right)$

(A) $-\frac{1}{2}$ (B) $-\frac{\sqrt{3}}{2}$ (C) $\frac{\sqrt{3}}{2}$ (D) $+\frac{1}{2}$

10. Value of $\cos\left(132\frac{\pi}{4} + \frac{\pi}{6}\right)$

(A) $\frac{\sqrt{3}}{2}$ (B) $-\frac{1}{2}$ (C) $-\frac{\sqrt{3}}{2}$ (D) none of these

11. Value of $\cos\left(-315\frac{\pi}{2} + \frac{\pi}{3}\right)$

(A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

12. $\tan A = \frac{m}{m-1}$ and $\tan B = \frac{1}{2m-1}$, then value of tan (A – B)

(A) –1 (B) 1 (C) 0 (D) none of these

13. Value of $\tan 40° + 2\tan 10°$

(A) – tan 50° (B) tan 50° (C) $\tan^2 40°$ (D) none of these

14. Value of $\frac{\cot 21° + \tan 66°}{1 - \cot 21° \cdot \tan 66°} =$

(A) 1 (B) –1 (C) $\sqrt{3}$ (D) none of these

15. If $\sin\alpha = A\sin(\alpha + \beta)$, $A \neq 0$, then value of $\frac{A\sin\beta}{1 - A\cos\beta}$

(A) $\tan\alpha$ (B) $\tan\beta$ (C) $-\tan\alpha$ (D) none of these

16. If $\sin\alpha \cdot \sin\beta - \cos\alpha \cdot \cos\beta + 1 = 0$, then value of $\cot\alpha \cdot \tan\beta =$

(A) 1 (B) –1 (C) 0 (D) none of these

Space for rough work

17. Value of sin 390° . cos 420° + tan 120° . tan 300°

(A) $\frac{13}{4}$ (B) $-\frac{11}{4}$ (C) $-\frac{13}{4}$ (D) none of these

18. Value of $\sin\left(4\pi+\frac{\pi}{6}\right)\cdot\operatorname{cosec}\left(4\pi+\frac{\pi}{6}\right)-\cos\left(4\pi-\frac{\pi}{6}\right)\cdot\sec\left(4\pi-\frac{\pi}{6}\right)$

(A) 0 (B) 1 (C) –1 (D) none of these

19. Value of $\operatorname{cosec}\left(31\pi+\frac{\pi}{4}\right)\cos\left(21\pi-\frac{\pi}{4}\right)$

(A) 1 (B) –1 (C) 2 (D) none of these

20. Which of the value is possible

(A) $\sin\theta=\frac{5}{4}$ (B) $\cos\theta=\frac{5}{4}$ (C) $\tan\theta=1024$ (D) $\sec\theta=-\frac{1}{2}$

21. Which of the value of not possible

(A) $\sin\theta=\frac{1}{\sqrt{6}}$ (B) $\cos\theta=\sqrt{\frac{6}{13}}$ (C) $\cot\theta=5$ (D) $\operatorname{cosec}\theta=-\frac{1}{2}$

22. Value of 2 sin 75° . cos 15°

(A) $\frac{2+\sqrt{3}}{4}$ (B) $\frac{2-\sqrt{3}}{4}$ (C) $\frac{1+\sqrt{3}}{4}$ (D) none of these

23. Value of tan 36° + tan 9° + tan 36° . tan 9°

(A) –1 (B) 0 (C) 1 (D) none of these

24. sin (A + B) . sin (A – B)

(A) $\sin^2B-\sin^2A$ (B) $\sin^2B+\sin^2A$ (C) $\sin^2A-\sin^2B$ (D) none of these

25. Value of $\cos^2\left(67\frac{1}{2}\right)^\circ-\sin^2\left(22\frac{1}{2}\right)^\circ$

(A) 1 (B) 0 (C) –1 (D) none of these

Space for rough work

26. If A + B = 45°, then value of (sin A + cos A)(sin B + cos B)
(A) 2 sin A cos A (B) 2 sin B cos B (C) 2 sin A cos B (D) 2 cos A cos B

27. Value of tan 75°
(A) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ (B) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$ (C) $\frac{\sqrt{3}-1}{2\left(\sqrt{3}+1\right)}$ (D) none of these

28. sin (–300°) . cos (–300°) tan (–300°) cot (–300°) =
(A) $-\frac{\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}}{4}$ (C) $\frac{\sqrt{3}}{2}$ (D) none of these

29. $\cos^2 76° + \cos^2 16° - \cos 76° . \cos 16° =$
(A) $-\frac{1}{4}$ (B) $\frac{1}{2}$ (C) 0 (D) $\frac{3}{4}$

30. $\tan 20° + \tan 40° + \sqrt{3} \tan 20° \tan 40° =$
(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) $-\frac{1}{\sqrt{3}}$ (D) $-\sqrt{3}$

31. If $\vec{A}\times\vec{B}=\vec{C}+\vec{D}$, then select the correct alternative
(A) $\vec{B}$ is parallel to $\vec{C}+\vec{D}$
(B) $\vec{A}$ is perpendicular to $\vec{C}$
(C) component of $\vec{C}$ along $\vec{A}$ = component of $\vec{D}$ along $\vec{A}$
(D) component of $\vec{C}$ along $\vec{A}$ = – component of $\vec{D}$ along $\vec{A}$

32. If $\vec{A}=\vec{B}+\vec{C}$, and the magnitudes of $\vec{A},\vec{B},\vec{C}$ are 5,4 and 3 units, then the angle between $\vec{A}$ and $\vec{C}$ is
(A) $\cos^{-1}\left(\frac{3}{5}\right)$ (B) $\cos^{-1}\left(\frac{4}{5}\right)$ (C) $\sin^{-1}\left(\frac{3}{4}\right)$ (D) $\frac{\pi}{2}$

33. The angle which the vector $\vec{A}=2\hat{i}+3\hat{j}$ makes with the y –axis, where $\hat{i}$ and $\hat{j}$ are unit vectors along x – axes and y –axes, respectively, is
(A) $\cos^{-1}(3/5)$ (B) $\cos^{-1}(2/3)$ (C) $\tan^{-1}(2/3)$ (D) $\sin^{-1}(2/3)$

Space for rough work

34. Given $\vec{A} = 4\hat{i} + 6\hat{j}$ and $\vec{B} = 2\hat{i} + 3\hat{j}$. Which of the following is correct

(A) $\vec{A} \times \vec{B} = \vec{0}$ (B) $\vec{A}.\vec{B} = 24$ (C) $\frac{|\vec{A}|}{|\vec{B}|} = \frac{1}{2}$ (D) $\vec{A}$ and $\vec{B}$ are antiparallel

35. The components of a vector along the x –and y –directions are (n+1) and 1, respectively. if the coordinate system is rotated by an angle $\theta = 60^0$, then the components change to n and 3. The value of n is

(A) 2 (B) cos 60° (C) sin 60° (D) 3.5

36. If $p^3 + 4pq - 3q^2 = 2$, find $\frac{dp}{dq}$.

(A) $\frac{6q + 49}{3p^2 + 4q}$ (B) $\frac{3p + 4q}{6q + 4p}$

(C) $\frac{6q - 4p}{\left(3p^2 + 4q\right)}$ (D) $\frac{3p^2 + 4q}{\left(6q - 4p\right)}$

37. What is the component of $3\hat{i} + 4\hat{j}$ along $\hat{i} + \hat{j}$.

(A) $\frac{1}{2}\left(\hat{i} + \hat{j}\right)$ (B) $\frac{3}{2}\left(\hat{i} + \hat{j}\right)$ (C) $\frac{5}{2}\left(\hat{i} + \hat{j}\right)$ (D) $\frac{7}{2}\left(\hat{i} + \hat{j}\right)$

38. The velocity of a particle varies with time as per the law $\vec{V} = \vec{a} + \vec{b}t$ where $\vec{a}$ and $\vec{b}$ are two constant vectors. The time at which velocity of the particle is perpendicular to velocity of the particle at t= 0 is

(A) $-\frac{|\vec{a}|}{\vec{a}.\vec{b}}$ (B) $-\frac{|\vec{a}|^2}{\vec{a}.\vec{b}}$ (C) $-\frac{\vec{a}.\vec{b}}{|\vec{a}|^2}$ (D) None of these

39. If $\vec{A}, \vec{B}, \vec{C}$ are mutually perpendicular vectors then which of the following statements is wrong ?

(A) $\vec{C} \times \left(\vec{A} \times \vec{B}\right) = 0$ (B) $\frac{\vec{A} \times \vec{B}}{|\vec{A} \times \vec{B}|} = \frac{\vec{C}}{|\vec{C}|}$

(C) $\vec{A}.\vec{B} = \vec{B}.\vec{C} = \vec{C}.\vec{A} = 0$ (D) $\left(\vec{B} + \vec{C}\right)$ is perpendicular to $\vec{A}$

Space for rough work

40. Differentiate $y = x^2 \sin x$

(A) $x^2 \cos x + 2x \sin x$ (B) $2x \cos x$

(C) $x^2 \sin x + 2x \cos x$ (D) None

41. Find the value of $\frac{dy}{dt}$ at $t = 0$ if $y = 3 \sin 2x$ and $x = t^2 + \pi$.

(A) 0 (B) 6 (C) 3 (D) π

42. Circle's changing area: The radius of a circle is changing at the rate of $-\frac{2}{\pi}\frac{m}{sec}$. At what rate is the circle's area changing when $r = 10$ m?

(A) –80 (B) +40 (C) –40 (D) +80

43. Find the points on the curve $y = x^4 - 6x^2 + 4$ where the tangent line is horizontal.

(A) $x = 0, \pm\sqrt{3}$ (B) $x = \pm\sqrt{3}$ (C) $x = -\sqrt{3}$ (D) None of these

44. Two vectors $\vec{A}$ and $\vec{B}$ have magnitudes 2 and $2\sqrt{2}$ respectively. It is found that $\vec{A}.\vec{B} = \left|\vec{A} \times \vec{B}\right|$, then the value of $\left|\frac{\vec{A}+\vec{B}}{\vec{A}-\vec{B}}\right|$ will be

(A) 5 (B) $\sqrt{5}$ (C) $\frac{\sqrt{2}+1}{\sqrt{2}-1}$ (D) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$

45. If the resultant of two vectors having magnitudes of 7 and 4 is 3, then the magnitude of the cross product of the two vectors will be.

(A) 28 (B) $\sqrt{65}$ (C) $\sqrt{33}$ (D) zero

46. The adjacent sides of a parallelogram is represented by vectors $2\hat{i} + 3\hat{j}$ and $\hat{i} + 4\hat{j}$. The area of the parallelogram is

(A) 5 units (B) 3 units (C) 8 units (D) 11 units

Space for rough work

47. When t = 0, a particle at (1,0,0) moves towards (4,4,12) with a constant speed of 65 m/s. The position of the particle is measured in metres and time in sec. Assuming constant velocity, the position of the particle at t = 2 sec is

(A) $\left(13\hat{i}-120\hat{j}+40\hat{k}\right)m$ (B) $\left(40\hat{i}+31\hat{j}-120\hat{k}\right)m$

(C) $\left(13\hat{i}-40\hat{j}+12\hat{k}\right)m$ (D) $\left(31\hat{i}+40\hat{j}+120\hat{k}\right)m$

48. If $y=\sin(x)+\ln\left(x^2\right)+e^{2x}$ then $\frac{dy}{dx}$ will be

(A) $\cos x+\frac{2}{x}+e^{2x}$ (B) $\cos x+\frac{2}{x}+2e^{2x}$

(C) $-\cos x+\frac{2}{x^2}+e^{2x}$ (D) $-\cos x-\frac{2}{x^2}+2e^{2x}$

49. If velocity of particle is given by v = $2t^4$ then its acceleration $\left(\frac{dv}{dt}\right)$ at any time t will be given by

(A) $8t^3$ (B) 8t (C) $-8t^3$ (D) t^2

50. A force $\vec{F}=3\hat{j}$ acts on the rod at a point P(1,0,0). Here centre of rod is taken as origin(0). Then the torque about O is

(A) $3\hat{k}$ (B) $-3\hat{k}$ (C) $\frac{\hat{k}}{3}$ (D) $-\frac{\hat{k}}{3}$

51. The vector $\left(\vec{a}+3\vec{b}\right)$ is perpendicular to $\left(7\vec{a}-5\vec{b}\right)$ and $\left(\vec{a}-4\vec{b}\right)$ is perpendicular to $\left(7\vec{a}-2\vec{b}\right)$. Find the angle between $\vec{a}\&\vec{b}$.

(A) 30^0 (B) 90^0 (C) 60^0 (D) 150^0

52. Two different vectors $\vec{a}$ and $\vec{b}$ of same magnitude are lying in x- y plane. Their projection on vector $\hat{i}+\hat{j}$ is equal. Vector $\vec{a}$ is $3\hat{i}+4\hat{j}$ then find vector $\vec{b}$

(A) $\vec{b}=4\hat{i}-3\hat{j}$ (B) $\vec{b}=4\hat{i}+3\hat{j}$

(C) $\vec{b}=5\hat{i}$ (D) $\vec{b}=3\hat{i}-4\hat{j}$

Space for rough work

53. Given $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. The component of vector $\vec{A}$ along vector $\vec{B}$ is

(A) $\frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$ (B) $\frac{3}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$

(C) $\frac{5}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$ (D) $\frac{7}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$

54. If $\vec{a}$ is perpendicular to $\vec{b}$ and $\vec{c}$, then

(A) $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = 1$ (B) $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = 0$

(C) $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = -1$ (D) None of these

55. Which of the following statement is correct ?

(A) A force has magnitude 20 N. Its component in a direction making an angle of 60^0 with the force is $10\sqrt{3}$N

(B) A force $\left(3\hat{i} + 4\hat{j}\right)$N acting on a particle causes a displacement of $5\hat{j}$ meters. The work done by the force is 25 J

(C) If $\vec{a}$ and $\vec{b}$ represent two adjacent sides of a parallelogram, $\left|\vec{a} \times \vec{b}\right|$ do not give the area of that parallelogram

(D) The magnitude of vector $\left(3\hat{i} + 4\hat{j}\right)$ is 5

56. If $\vec{A} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{B} = \hat{i} + 3\hat{j} + 5\hat{k}$, then $\vec{A}.\left(\vec{A} \times \vec{B}\right)$ is

(A) 15 (B) $\sqrt{29}$ (C) 45 (D) zero

57. A disoriented man drives 5 km east, then 4 km south, then 2 km west. Find the magnitude and direction of the resultant displacement.

(A) 5km, 53^0 south of west (B) 5km, 37^0 south of east

(C) 5km, 53^0 south of east (D) 5km, 37^0 south of west

58. $f(x) = x^3 - 6x^2 + 9x + 10$. The local minimum and maximum value of $f(x)$ are

(A) 4,14 (B) 4,16 (C) 2,12 (D) 10,14

Space for rough work

59. The minimum value of $(x-\alpha)(x-\beta)$ is

(A) 0 (B) $\alpha\beta$ (C) $\frac{1}{4}(\alpha-\beta)^2$ (D) $-\frac{1}{4}(\alpha-\beta)^2$

60. The function $f(x) = ax^2 + bx + c$ has a minima if

(A) c > 0 (B) a > 0 (C) a < 0 (D) $\frac{a}{b} > 0$

61. Line spectra is characteristic of :
(A) molecules (B) atoms (C) radicals (D) none of these

62. The spectrum produced from an element is :
(A) atomic spectrum (B) line spectrum
(C) absorption spectrum (D) any one of the above

63. Electronic transition in He^+ ion takes from n_2 to n_1 shell such that :
$2n_2 + 3n_1 = 18$
$2n_2 - 3n_1 = 6$
What will be the total number of photons emitted when electrons transit to n_1 shell ?
(A) 21 (B) 15 (C) 20 (D) 10

64. Which of the following expressions represents the spectrum of Balmer series (If n is the principal quantum number of higher energy level) in Hydrogen atom?
(A) $\bar{\upsilon} = \frac{R(n-1)(n+1)}{n^2} cm^{-1}$ (B) $\bar{\upsilon} = \frac{R(n-2)(n+2)}{4n^2} cm^{-1}$
(C) $\bar{\upsilon} = \frac{R(n-2)(n+2)}{n^2} cm^{-1}$ (D) $\bar{\upsilon} = \frac{R(n-1)(n+1)}{4n^2} cm^{-1}$

65. With increasing principle quantum number, the energy difference between adjacent energy levels in H–atom :
(A) decrease (B) increase
(C) remains constant
(D) decrease for low value of Z and increases for higher value of Z.

Space for rough work

66. A hydrogen atom in the ground state is excited by monochromatic radiation of wavelength λ $\overset{0}{A}$. The resulting spectrum consists of maximum 15 different lines. What is the wavelength λ ?
(R_H = 109737 cm^{-1})
(A) 937.3 $\overset{0}{A}$ (B) 1025 $\overset{0}{A}$ (C) 1236 $\overset{0}{A}$ (D) none of these

67. The H–spectrum show :
(A) Heisenberg's uncertainty principle (B) Diffraction
(C) Polarization (D) Presence of quantized energy level

68. Splitting of spectral lines under the influence of magnetic field is called
(A) Zeeman effect (B) Stark effect
(C) Photoelectric effect (D) None of these

69. The maximum probability of finding electron in the d_{xy} orbital is :
(A) along the x –axis (B) along the y–axis
(C) at an angle of 45° from the x–and y – axis
(D) at an angle of 90 from the x– and y – axis

70. Which is the de–Broglie equation :
(A) $h = p\lambda$ (B) $h = p\lambda^{-1}$ (C) $h = \lambda p^{-1}$ (D) $h = p + \lambda$

71. The de–Broglie wavelength dissociated with a particle of mass 10^{-6}kg with a velocity of 10 ms^{-1} is :
(A) 6.63 x 10^{-22} m (B) 6.63 x 10^{-29} m (C) 6.63 x 10^{-31} m (D) 6.63 x 10^{-34} m

72. An excited state of H atom emits a photon of wavelength λ and returns in the ground state, the principal quantum number of excited state is given by
(A) $\sqrt{\lambda(\lambda R - 1)}$ (B) $\sqrt{\frac{\lambda R}{(\lambda R - 1)}}$
(C) $\sqrt{\lambda R(\lambda R - 1)}$ (D) $\sqrt{\frac{(\lambda R - 1)}{\lambda R}}$

73. Be^{3+} and a proton are accelerated by the same potential, their de–Broglie wavelengths have the ratio (assume mass of proton = mass of neutron) :
(A) 1 : 2 (B) 1 : 4 (C) 1 : 1 (D) $1 : 3\sqrt{3}$

Space for rough work

74. The de–Broglie wavelength of an electron accelerated by an electric field of V volts is given by :

(A) $\lambda = \frac{1.23}{\sqrt{m}}$ (B) $\lambda = \frac{1.23}{\sqrt{h}}m$

(C) $\lambda = \frac{1.23}{\sqrt{V}}nm$ (D) $\lambda = \frac{1.23}{V}$

75. An electron travels with a velocity of x ms^{-1}. For a proton to have the same de–Broglie wavelength, the velocity will be approximately :

(A) $\frac{1840}{x}$ (B) $\frac{x}{1840}$ (C) 1840 x (D) x

76. The momentum (in kg–m/s) of photon having 6 MeV energy is :

(A) 3.2×10^{-21} (B) 2.0

(C) 1.6×10^{-21} (D) none of these

77. The number of photons of light having wave number 'x' in 10 J of energy source is :

(A) 10hcx (B) $\frac{hc}{10x}$ (C) $\frac{10}{hcx}$ (D) none of these

78. If a_0 be the radius of first Bohr's orbit of H–atom, the de–Broglie's wavelength of an electron revolving in the second Bohr's orbit will be :

(A) $6\pi a_0$ (B) $4\pi a_0$ (C) $2\pi a_0$ (D) none of these

79. Energy required to ionize 2 mole of gaseous He^+ ion present in its ground state is :

(A) 54.4 eV (B) 108.8 N_A eV (C) 54.4 N_A eV (D) 108.8 eV

80. The mass of a particle is 10^{-10} g and its radius is 2×10^{-4} cm. If its velocity is 10^{-6} cm sec^{-1} with 0.0001% uncertainty in measurement, the uncertainty in its position is :

(A) 5.2×10^{-8} (B) 5.2×10^{-7} m (C) 5.2×10^{-6} m (D) 5.2×10^{-9}

81. If an electron is traveling at 200 m/s within 1% uncertainty, what is the theoretical uncertainty in its position in μm (micrometer) ?

(A) 14.5 (B) 29 (C) 58 (D) 114

Space for rough work

82. The angular momentum of an electron in a Bohr's orbit of He^+ is 3.1652 x 10^{-34} kg–m^2 / sec. What is the wave number in terms of Rydberg constant (R) of the spectral line emitted when an electron falls from this level to the first excited state. [Use h = 6.626 x 10^{-34} J.s]

(A) 3R (B) $\frac{5R}{9}$ (C) $\frac{3R}{4}$ (D) $\frac{8R}{9}$

83. When an electron makes a transition from (n + 1) state to nth state, the frequency of emitted radiations is related to n according to (n > > 1) :

(A) $\upsilon = \frac{2cRZ^2}{n^3}$ (B) $\upsilon = \frac{cRZ^2}{n^4}$

(C) $\upsilon = \frac{cRZ^2}{n^2}$ (D) $\upsilon = \frac{2cRZ^2}{n^2}$

84. In a collection of H–atoms, all the electrons jump from n = 5 to ground level finally (directly or indirectly), without emitting any line in Balmer series. The number of possible different radiations is :

(A) 10 (B) 8 (C) 7 (D) 6

85. An electron is allowed to move freely in a closed cubic box of length of side 10 cm. The uncertainty in its velocity will be :

(A) 3.35 x 10^{-4} m sec^{-1} (B) 5.8 x 10^{-4} m sec^{-1}

(C) 4 x 10^{-5} m sec^{-1} (D) 4 x 10^{-6} m sec^{-1}

86. The energy of a I, II and III energy levels of a certain atom are E, $\frac{4E}{3}$ and 2E respectively. A photon of wavelength λ is emitted during a transition from III to I. What will be the wavelength of emission for transition II to I ?

(A) $\frac{\lambda}{2}$ (B) λ (C) 2λ (D) 3λ

Space for rough work

87. Balmer gave an equation for wavelength of visible region of H–spectrum as $\lambda = \frac{Kn^2}{n^2 - 4}$ where n = principal quantum number of energy level, K = constant in terms of R (Rydberg constant). The value of K in terms of R is :

(A) R (B) $\frac{R}{2}$ (C) $\frac{4}{R}$ (D) $\frac{5}{R}$

88. The energy of separation of an electron in a Hydrogen like atom in excited state is 3.4 eV. The de–Broglie wave length (in $\overset{0}{A}$) associated with the electron is :

(Given radius of first orbit of H–atom is 0.53 $\overset{0}{A}$)

(A) 3.33 (B) 6.66 (C) 13.31 (D) None of these

89. If radiation corresponding to second line of "Balmer series" of Li^{2+} ion, knocked out electron from first excited state of h–atom, then kinetic energy of ejected electron would be :

(A) 2.55 eV (B) 4.25 eV (C) 11.25 eV (D) 19.55 eV

90. The correct set of four quantum numbers of outermost electron of potassium (Z = 19) is :

(A) 3, 1, 0, $\frac{1}{2}$ (B) $4,1,0,\frac{1}{2}$ (C) $3,0,0,\frac{1}{2}$ (D) $4,0,0,\frac{1}{2}$

Space for rough work

FIITJEE PET – III (REG_1ST YEAR)

MAINS_SET–A_ANSWERS

DATE: 23.06.2018

MATHEMATICS

1.	**A**	2.	**A**	3.	**Bonus**	4.	**B**
5.	**A**	6.	**A**	7.	**D**	8.	**D**
9.	**B**	10.	**C**	11.	**A**	12.	**B**
13.	**B**	14.	**B**	15.	**A**	16.	**B**
17.	**A**	18.	**A**	19.	**A**	20.	**C**
21.	**D**	22.	**D**	23.	**C**	24.	**C**
25.	**B**	26.	**D**	27.	**B**	28.	**B**
29.	**D**	30.	**B**				

PHYSICS

31.	**D**	32.	**A**	33.	**C**	34.	A
35.	**D**	36.	**C**	37.	**D**	38.	B
39.	**B**	40.	**A**	41.	**A**	42.	C
43.	**A**	44.	**Bonus**	45.	**D**	46.	A
47.	**D**	48.	**B**	49.	**A**	50.	A
51.	**C**	52.	**B**	53.	**Bonus**	54.	B
55.	**D**	56.	**D**	57.	**C**	58.	D
59.	**D**	60.	**B**				

CHEMISTRY

61.	**B**	62.	**D**	63.	**D**	64.	**B**
65.	**A**	66.	**A**	67.	**D**	68.	**A**
69.	**C**	70.	**A**	71.	**B**	72.	**B**
73.	**D**	74.	**C**	75.	**B**	76.	**A**
77.	**C**	78.	**B**	79.	**B**	80.	**A**
81.	**B**	82.	**B**	83.	**A**	84.	**D**
85.	**A**	86.	**D**	87.	**C**	88.	**B**
89.	**D**	90.	**D**				

FIITJEE PET – III (REG_1ST YEAR)

MAINS_SET–B

DATE: 23.06.2018

Time: 3 hours **Maximum Marks: 360**

INSTRUCTIONS:

Instructions to the Candidates

1. This Test Booklet consists of **90 questions**.

   Use **Blue/Black ball Point Pen only** for writing particulars and bubbling of OMR.

2. For each correct answer **4 Marks** will awarded and for each wrong answer **1 Mark** will be deducted.

3. Attempt all questions.

4. In case you have not darkened any bubble you will be awarded 0 mark for that question.

5. Use of calculator/logarithmic table is not permitted.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐

1. Which of the value of not possible

(A) $\sin\theta = \frac{1}{\sqrt{6}}$ (B) $\cos\theta = \sqrt{\frac{6}{13}}$ (C) $\cot\theta = 5$ (D) $\operatorname{cosec}\theta = -\frac{1}{2}$

2. Value of $2\sin 75^\circ \cdot \cos 15^\circ$

(A) $\frac{2+\sqrt{3}}{4}$ (B) $\frac{2-\sqrt{3}}{4}$ (C) $\frac{1+\sqrt{3}}{4}$ (D) none of these

3. Value of $\tan 36^\circ + \tan 9^\circ + \tan 36^\circ \cdot \tan 9^\circ$

(A) –1 (B) 0 (C) 1 (D) none of these

4. $\sin(A+B) \cdot \sin(A-B)$

(A) $\sin^2 B - \sin^2 A$ (B) $\sin^2 B + \sin^2 A$ (C) $\sin^2 A - \sin^2 B$ (D) none of these

5. Value of $\cos^2\left(67\frac{1}{2}\right)^\circ - \sin^2\left(22\frac{1}{2}\right)^\circ$

(A) 1 (B) 0 (C) –1 (D) none of these

6. If $\sin\alpha \cdot \sin\beta - \cos\alpha \cdot \cos\beta + 1 = 0$, then value of $\cot\alpha \cdot \tan\beta =$

(A) 1 (B) –1 (C) 0 (D) none of these

7. Value of $\sin 390^\circ \cdot \cos 420^\circ + \tan 120^\circ \cdot \tan 300^\circ$

(A) $\frac{13}{4}$ (B) $-\frac{11}{4}$ (C) $-\frac{13}{4}$ (D) none of these

8. Value of $\sin\left(4\pi+\frac{\pi}{6}\right)\cdot\operatorname{cosec}\left(4\pi+\frac{\pi}{6}\right)-\cos\left(4\pi-\frac{\pi}{6}\right)\cdot\sec\left(4\pi-\frac{\pi}{6}\right)$

(A) 0 (B) 1 (C) –1 (D) none of these

9. Value of $\operatorname{cosec}\left(31\pi+\frac{\pi}{4}\right)\cos\left(21\pi-\frac{\pi}{4}\right)$

(A) 1 (B) –1 (C) 2 (D) none of these

Space for rough work

10. Which of the value is possible

(A) $\sin\theta = \frac{5}{4}$ (B) $\cos\theta = \frac{5}{4}$ (C) $\tan\theta = 1024$ (D) $\sec\theta = -\frac{1}{2}$

11. Value of $\frac{\sin(A+B)+\sin(A-B)}{\cos(A+B)+\cos(A-B)} =$

(A) tan A (B) cot A (C) –tan A (D) none of these

12. $\tan 15° + \tan 30° + \tan 15° \cdot \tan 30° =$

(A) 1 (B) –1 (C) 0 (D) none of these

13. If cos A + cos B = m and sin A + cos B = n; then value of $m^2 + n^2 - 2$

(A) sin (A + B) (B) 2 sin (A + B) (C) sin (A – B) (D) 2 sin (A – B)

14. If tan A = x tan B, then $\frac{\sin(A-B)}{\sin(A+B)} =$

(A) $\frac{x+1}{x-1}$ (B) $\frac{x-1}{x+1}$ (C) $\frac{x^2-1}{x+1}$ (D) none of these

15. Value of $\cos\left(-1025\frac{\pi}{2}+\frac{\pi}{6}\right)$

(A) $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $-\frac{\sqrt{3}}{2}$ (D) none of these

16. If A + B = 45°, then value of (sin A + cos A)(sin B + cos B)

(A) 2 sin A cos A (B) 2 sin B cos B (C) 2 sin A cos B (D) 2 cos A cos B

17. Value of tan 75°

(A) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ (B) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$ (C) $\frac{\sqrt{3}-1}{2\left(\sqrt{3}+1\right)}$ (D) none of these

Space for rough work

18. $\sin(-300°) \cdot \cos(-300°) \tan(-300°) \cot(-300°) =$

(A) $-\frac{\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}}{4}$ (C) $\frac{\sqrt{3}}{2}$ (D) none of these

19. $\cos^2 76° + \cos^2 16° - \cos 76° \cdot \cos 16° =$

(A) $-\frac{1}{4}$ (B) $\frac{1}{2}$ (C) 0 (D) $\frac{3}{4}$

20. $\tan 20° + \tan 40° + \sqrt{3} \tan 20° \tan 40° =$

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) $-\frac{1}{\sqrt{3}}$ (D) $-\sqrt{3}$

21. Value of $\cos\left(-315\frac{\pi}{2}+\frac{\pi}{3}\right)$

(A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

22. $\tan A = \frac{m}{m-1}$ and $\tan B = \frac{1}{2m-1}$, then value of $\tan(A - B)$

(A) –1 (B) 1 (C) 0 (D) none of these

23. Value of $\tan 40° + 2 \tan 10°$

(A) $-\tan 50°$ (B) $\tan 50°$ (C) $\tan^2 40°$ (D) none of these

24. Value of $\frac{\cot 21° + \tan 66°}{1 - \cot 21° \cdot \tan 66°} =$

(A) 1 (B) –1 (C) $\sqrt{3}$ (D) none of these

25. If $\sin\alpha = A \sin(\alpha + \beta)$, $A \neq 0$, then value of $\frac{A\sin\beta}{1 - A\cos\beta}$

(A) $\tan\alpha$ (B) $\tan\beta$ (C) $-\tan\alpha$ (D) none of these

Space for rough work

26. Value of $\tan\left(102\frac{\pi}{2}-\frac{\pi}{3}\right)$

(A) $-\sqrt{3}$ (B) $\sqrt{3}$ (C) $-\frac{1}{\sqrt{3}}$ (D) none of these

27. Value of $\operatorname{cosec}\left(-1038\frac{\pi}{2}+\frac{\pi}{6}\right)$

(A) $\frac{1}{2}$ (B) 2 (C) $\frac{2}{\sqrt{3}}$ (D) none of these

28. Value of $\tan\left(3955\frac{\pi}{2}+\frac{\pi}{5}\right)$

(A) 1 (B) –1 (C) 0 (D) none of these

29. Value of $\sin\left(1080\pi-\frac{2\pi}{3}\right)$

(A) $-\frac{1}{2}$ (B) $-\frac{\sqrt{3}}{2}$ (C) $\frac{\sqrt{3}}{2}$ (D) $+\frac{1}{2}$

30. Value of $\cos\left(132\frac{\pi}{4}+\frac{\pi}{6}\right)$

(A) $\frac{\sqrt{3}}{2}$ (B) $-\frac{1}{2}$ (C) $-\frac{\sqrt{3}}{2}$ (D) none of these

31. The vector $\left(\vec{a}+3\vec{b}\right)$ is perpendicular to $\left(7\vec{a}-5\vec{b}\right)$ and $\left(\vec{a}-4\vec{b}\right)$ is perpendicular to $\left(7\vec{a}-2\vec{b}\right)$. Find the angle between $\vec{a}\&\vec{b}$.

(A) 30^0 (B) 90^0 (C) 60^0 (D) 150^0

Space for rough work

32. Two different vectors $\vec{a}$ and $\vec{b}$ of same magnitude are lying in x- y plane. Their projection on vector $\hat{i}+\hat{j}$ is equal. Vector $\vec{a}$ is $3\hat{i}+4\hat{j}$ then find vector $\vec{b}$

(A) $\vec{b}=4\hat{i}-3\hat{j}$ (B) $\vec{b}=4\hat{i}+3\hat{j}$

(C) $\vec{b}=5\hat{i}$ (D) $\vec{b}=3\hat{i}-4\hat{j}$

33. Given $\vec{A}=2\hat{i}+3\hat{j}$ and $\vec{B}=\hat{i}+\hat{j}$. The component of vector $\vec{A}$ along vector $\vec{B}$ is

(A) $\frac{1}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$ (B) $\frac{3}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$

(C) $\frac{5}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$ (D) $\frac{7}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$

34. If $\vec{a}$ is perpendicular to $\vec{b}$ and $\vec{c}$, then

(A) $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=1$ (B) $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=0$

(C) $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=-1$ (D) None of these

35. Which of the following statement is correct ?

(A) A force has magnitude 20 N. Its component in a direction making an angle of 60^0 with the force is $10\sqrt{3}$N

(B) A force $\left(3\hat{i}+4\hat{j}\right)$N acting on a particle causes a displacement of $5\hat{j}$ meters. The work done by the force is 25 J

(C) If $\vec{a}$ and $\vec{b}$ represent two adjacent sides of a parallelogram, $\left|\vec{a}\times\vec{b}\right|$ do not give the area of that parallelogram

(D) The magnitude of vector $\left(3\hat{i}+4\hat{j}\right)$ is 5

36. The adjacent sides of a parallelogram is represented by vectors $2\hat{i}+3\hat{j}$ and $\hat{i}+4\hat{j}$. The area of the parallelogram is

(A) 5 units (B) 3 units (C) 8 units (D) 11 units

Space for rough work

37. When t = 0, a particle at (1,0,0) moves towards (4,4,12) with a constant speed of 65 m/s. The position of the particle is measured in metres and time in sec. Assuming constant velocity, the position of the particle at t = 2 sec is

(A) $\left(13\hat{i}-120\hat{j}+40\hat{k}\right)m$ (B) $\left(40\hat{i}+31\hat{j}-120\hat{k}\right)m$

(C) $\left(13\hat{i}-40\hat{j}+12\hat{k}\right)m$ (D) $\left(31\hat{i}+40\hat{j}+120\hat{k}\right)m$

38. If $y=\sin(x)+\ln\left(x^2\right)+e^{2x}$ then $\frac{dy}{dx}$ will be

(A) $\cos x+\frac{2}{x}+e^{2x}$ (B) $\cos x+\frac{2}{x}+2e^{2x}$

(C) $-\cos x+\frac{2}{x^2}+e^{2x}$ (D) $-\cos x-\frac{2}{x^2}+2e^{2x}$

39. If velocity of particle is given by v = $2t^4$ then its acceleration $\left(\frac{dv}{dt}\right)$ at any time t will be given by

(A) $8t^3$ (B) 8t (C) $-8t^3$ (D) t^2

40. A force $\vec{F}=3\hat{j}$ acts on the rod at a point P(1,0,0). Here centre of rod is taken as origin(0). Then the torque about O is

(A) $3\hat{k}$ (B) $-3\hat{k}$ (C) $\frac{\hat{k}}{3}$ (D) $-\frac{\hat{k}}{3}$

41. If $\vec{A}\times\vec{B}=\vec{C}+\vec{D}$, then select the correct alternative

(A) $\vec{B}$ is parallel to $\vec{C}+\vec{D}$

(B) $\vec{A}$ is perpendicular to $\vec{C}$

(C) component of $\vec{C}$ along $\vec{A}$ = component of $\vec{D}$ along $\vec{A}$

(D) component of $\vec{C}$ along $\vec{A}$ = – component of $\vec{D}$ along $\vec{A}$

42. If $\vec{A}=\vec{B}+\vec{C}$, and the magnitudes of $\vec{A},\vec{B},\vec{C}$ are 5,4 and 3 units, then the angle between $\vec{A}$ and $\vec{C}$ is

(A) $\cos^{-1}\left(\frac{3}{5}\right)$ (B) $\cos^{-1}\left(\frac{4}{5}\right)$ (C) $\sin^{-1}\left(\frac{3}{4}\right)$ (D) $\frac{\pi}{2}$

Space for rough work

43. The angle which the vector $\vec{A} = 2\hat{i} + 3\hat{j}$ makes with the y –axis, where $\hat{i}$ and $\hat{j}$ are unit vectors along x – axes and y –axes, respectively, is

(A) $\cos^{-1}(3/5)$ (B) $\cos^{-1}(2/3)$ (C) $\tan^{-1}(2/3)$ (D) $\sin^{-1}(2/3)$

44. Given $\vec{A} = 4\hat{i} + 6\hat{j}$ and $\vec{B} = 2\hat{i} + 3\hat{j}$. Which of the following is correct

(A) $\vec{A} \times \vec{B} = \vec{0}$ (B) $\vec{A}.\vec{B} = 24$ (C) $\frac{|\vec{A}|}{|\vec{B}|} = \frac{1}{2}$ (D) $\vec{A}$ and $\vec{B}$ are antiparallel

45. The components of a vector along the x –and y –directions are (n+1) and 1, respectively. if the coordinate system is rotated by an angle $\theta = 60^0$, then the components change to n and 3. The value of n is

(A) 2 (B) cos 60° (C) sin 60° (D) 3.5

46. If $\vec{A} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{B} = \hat{i} + 3\hat{j} + 5\hat{k}$, then $\vec{A}.(\vec{A} \times \vec{B})$ is

(A) 15 (B) $\sqrt{29}$ (C) 45 (D) zero

47. A disoriented man drives 5 km east, then 4 km south, then 2 km west. Find the magnitude and direction of the resultant displacement.

(A) 5km, 53^0 south of west (B) 5km, 37^0 south of east

(C) 5km, 53^0 south of east (D) 5km, 37^0 south of west

48. $f(x) = x^3 - 6x^2 + 9x + 10$. The local minimum and maximum value of $f(x)$ are

(A) 4,14 (B) 4,16 (C) 2,12 (D) 10,14

49. The minimum value of $(x - \alpha)(x - \beta)$ is

(A) 0 (B) $\alpha\beta$ (C) $\frac{1}{4}(\alpha - \beta)^2$ (D) $-\frac{1}{4}(\alpha - \beta)^2$

50. The function $f(x) = ax^2 + bx + c$ has a minima if

(A) c > 0 (B) a > 0 (C) a < 0 (D) $\frac{a}{b} > 0$

Space for rough work

51. Find the value of $\frac{dy}{dt}$ at $t = 0$ if $y = 3\sin 2x$ and $x = t^2 + \pi$.

(A) 0 (B) 6 (C) 3 (D) π

52. Circle's changing area: The radius of a circle is changing at the rate of $-\frac{2}{\pi}\frac{m}{sec}$. At what rate is the circle's area changing when $r = 10$ m?

(A) –80 (B) +40 (C) –40 (D) +80

53. Find the points on the curve $y = x^4 - 6x^2 + 4$ where the tangent line is horizontal.

(A) $x = 0, \pm\sqrt{3}$ (B) $x = \pm\sqrt{3}$ (C) $x = -\sqrt{3}$ (D) None of these

54. Two vectors $\vec{A}$ and $\vec{B}$ have magnitudes 2 and $2\sqrt{2}$ respectively. It is found that $\vec{A}.\vec{B} = \left|\vec{A} \times \vec{B}\right|$, then the value of $\left|\frac{\vec{A}+\vec{B}}{\vec{A}-\vec{B}}\right|$ will be

(A) 5 (B) $\sqrt{5}$ (C) $\frac{\sqrt{2}+1}{\sqrt{2}-1}$ (D) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$

55. If the resultant of two vectors having magnitudes of 7 and 4 is 3, then the magnitude of the cross product of the two vectors will be.

(A) 28 (B) $\sqrt{65}$ (C) $\sqrt{33}$ (D) zero

56. If $p^3 + 4pq - 3q^2 = 2$, find $\frac{dp}{dq}$.

(A) $\frac{6q+49}{3p^2+4q}$ (B) $\frac{3p+4q}{6q+4p}$

(C) $\frac{6q-4p}{\left(3p^2+4q\right)}$ (D) $\frac{3p^2+4q}{\left(6q-4p\right)}$

Space for rough work

57. What is the component of $3\hat{i}+4\hat{j}$ along $\hat{i}+\hat{j}$.

(A) $\frac{1}{2}\left(\hat{i}+\hat{j}\right)$ (B) $\frac{3}{2}\left(\hat{i}+\hat{j}\right)$ (C) $\frac{5}{2}\left(\hat{i}+\hat{j}\right)$ (D) $\frac{7}{2}\left(\hat{i}+\hat{j}\right)$

58. The velocity of a particle varies with time as per the law $\vec{V}=\vec{a}+\vec{b}t$ where $\vec{a}$ and $\vec{b}$ are two constant vectors. The time at which velocity of the particle is perpendicular to velocity of the particle at t= 0 is

(A) $-\frac{|\vec{a}|}{\vec{a}.\vec{b}}$ (B) $-\frac{|\vec{a}|^2}{\vec{a}.\vec{b}}$ (C) $-\frac{\vec{a}.\vec{b}}{|\vec{a}|^2}$ (D) None of these

59. If $\vec{A},\vec{B},\vec{C}$ are mutually perpendicular vectors then which of the following statements is wrong ?

(A) $\vec{C}\times\left(\vec{A}\times\vec{B}\right)=0$ (B) $\frac{\vec{A}\times\vec{B}}{\left|\vec{A}\times\vec{B}\right|}=\frac{\vec{C}}{\left|\vec{C}\right|}$

(C) $\vec{A}.\vec{B}=\vec{B}.\vec{C}=\vec{C}.\vec{A}=0$ (D) $\left(\vec{B}+\vec{C}\right)$ is perpendicular to $\vec{A}$

60. Differentiate $y=x^2\sin x$

(A) $x^2\cos x+2x\sin x$ (B) $2x\cos x$

(C) $x^2\sin x+2x\cos x$ (D) None

61. If an electron is traveling at 200 m/s within 1% uncertainty, what is the theoretical uncertainty in its position in μm (micrometer) ?

(A) 14.5 (B) 29 (C) 58 (D) 114

62. The angular momentum of an electron in a Bohr's orbit of He^+ is 3.1652 x 10^{-34} kg–m^2 / sec. What is the wave number in terms of Rydberg constant (R) of the spectral line emitted when an electron falls from this level to the first excited state. [Use h = 6.626 x 10^{-34} J.s]

(A) 3R (B) $\frac{5R}{9}$ (C) $\frac{3R}{4}$ (D) $\frac{8R}{9}$

63. When an electron makes a transition from (n + 1) state to nth state, the frequency of emitted radiations is related to n according to (n > > 1) :

(A) $\upsilon=\frac{2cRZ^2}{n^3}$ (B) $\upsilon=\frac{cRZ^2}{n^4}$

(C) $\upsilon=\frac{cRZ^2}{n^2}$ (D) $\upsilon=\frac{2cRZ^2}{n^2}$

Space for rough work

64. In a collection of H–atoms, all the electrons jump from n = 5 to ground level finally (directly or indirectly), without emitting any line in Balmer series. The number of possible different radiations is :
(A) 10 (B) 8 (C) 7 (D) 6

65. An electron is allowed to move freely in a closed cubic box of length of side 10 cm. The uncertainty in its velocity will be :
(A) 3.35×10^{-4} m sec^{-1} (B) 5.8×10^{-4} m sec^{-1}
(C) 4×10^{-5} m sec^{-1} (D) 4×10^{-6} m sec^{-1}

66. The momentum (in kg–m/s) of photon having 6 MeV energy is :
(A) 3.2×10^{-21} (B) 2.0
(C) 1.6×10^{-21} (D) none of these

67. The number of photons of light having wave number 'x' in 10 J of energy source is :
(A) 10hcx (B) $\frac{hc}{10x}$ (C) $\frac{10}{hcx}$ (D) none of these

68. If a_0 be the radius of first Bohr's orbit of H–atom, the de–Broglie's wavelength of an electron revolving in the second Bohr's orbit will be :
(A) $6\pi a_0$ (B) $4\pi a_0$ (C) $2\pi a_0$ (D) none of these

69. Energy required to ionize 2 mole of gaseous He^+ ion present in its ground state is :
(A) 54.4 eV (B) 108.8 N_A eV (C) 54.4 N_A eV (D) 108.8 eV

70. The mass of a particle is 10^{-10} g and its radius is 2×10^{-4} cm. If its velocity is 10^{-6} cm sec^{-1} with 0.0001% uncertainty in measurement, the uncertainty in its position is :
(A) 5.2×10^{-8} (B) 5.2×10^{-7} m (C) 5.2×10^{-6} m (D) 5.2×10^{-9}

71. Line spectra is characteristic of :
(A) molecules (B) atoms (C) radicals (D) none of these

72. The spectrum produced from an element is :
(A) atomic spectrum (B) line spectrum
(C) absorption spectrum (D) any one of the above

73. Electronic transition in He^+ ion takes from n_2 to n_1 shell such that :
$2n_2 + 3n_1 = 18$
$2n_2 - 3n_1 = 6$
What will be the total number of photons emitted when electrons transit to n_1 shell ?
(A) 21 (B) 15 (C) 20 (D) 10

Space for rough work

74. Which of the following expressions represents the spectrum of Balmer series (If n is the principal quantum number of higher energy level) in Hydrogen atom?

(A) $\bar{\upsilon} = \frac{R(n-1)(n+1)}{n^2} cm^{-1}$ (B) $\bar{\upsilon} = \frac{R(n-2)(n+2)}{4n^2} cm^{-1}$

(C) $\bar{\upsilon} = \frac{R(n-2)(n+2)}{n^2} cm^{-1}$ (D) $\bar{\upsilon} = \frac{R(n-1)(n+1)}{4n^2} cm^{-1}$

75. With increasing principle quantum number, the energy difference between adjacent energy levels in H–atom :

(A) decrease (B) increase

(C) remains constant

(D) decrease for low value of Z and increases for higher value of Z.

76. The energy of a I, II and III energy levels of a certain atom are E, $\frac{4E}{3}$ and 2E respectively. A photon of wavelength λ is emitted during a transition from III to I. What will be the wavelength of emission for transition II to I ?

(A) $\frac{\lambda}{2}$ (B) λ (C) 2λ (D) 3λ

77. Balmer gave an equation for wavelength of visible region of H–spectrum as $\lambda = \frac{Kn^2}{n^2-4}$ where n = principal quantum number of energy level, K = constant in terms of R (Rydberg constant). The value of K in terms of R is :

(A) R (B) $\frac{R}{2}$ (C) $\frac{4}{R}$ (D) $\frac{5}{R}$

78. The energy of separation of an electron in a Hydrogen like atom in excited state is 3.4 eV. The de–Broglie wave length (in $\overset{0}{A}$) associated with the electron is :

(Given radius of first orbit of H–atom is 0.53 $\overset{0}{A}$)

(A) 3.33 (B) 6.66 (C) 13.31 (D) None of these

Space for rough work

79. If radiation corresponding to second line of "Balmer series" of Li^{2+} ion, knocked out electron from first excited state of h–atom, then kinetic energy of ejected electron would be :
(A) 2.55 eV (B) 4.25 eV (C) 11.25 eV (D) 19.55 eV

80. The correct set of four quantum numbers of outermost electron of potassium (Z = 19) is :
(A) 3, 1, 0, $\frac{1}{2}$ (B) $4,1,0,\frac{1}{2}$ (C) $3,0,0,\frac{1}{2}$ (D) $4,0,0,\frac{1}{2}$

81. The de–Broglie wavelength dissociated with a particle of mass 10^{-6}kg with a velocity of 10 ms^{-1} is :
(A) 6.63 x 10^{-22} m (B) 6.63 x 10^{-29} m (C) 6.63 x 10^{-31} m (D) 6.63 x 10^{-34} m

82. An excited state of H atom emits a photon of wavelength λ and returns in the ground state, the principal quantum number of excited state is given by
(A) $\sqrt{\lambda(\lambda R-1)}$ (B) $\sqrt{\frac{\lambda R}{(\lambda R-1)}}$
(C) $\sqrt{\lambda R(\lambda R-1)}$ (D) $\sqrt{\frac{(\lambda R-1)}{\lambda R}}$

83. Be^{3+} and a proton are accelerated by the same potential, their de–Broglie wavelengths have the ratio (assume mass of proton = mass of neutron) :
(A) 1 : 2 (B) 1 : 4 (C) 1 : 1 (D) $1:3\sqrt{3}$

84. The de–Broglie wavelength of an electron accelerated by an electric field of V volts is given by :
(A) $\lambda=\frac{1.23}{\sqrt{m}}$ (B) $\lambda=\frac{1.23}{\sqrt{h}}m$
(C) $\lambda=\frac{1.23}{\sqrt{V}}nm$ (D) $\lambda=\frac{1.23}{V}$

85. An electron travels with a velocity of x ms^{-1}. For a proton to have the same de–Broglie wavelength, the velocity will be approximately :
(A) $\frac{1840}{x}$ (B) $\frac{x}{1840}$ (C) 1840 x (D) x

Space for rough work

86. A hydrogen atom in the ground state is excited by monochromatic radiation of wavelength λ $\overset{0}{A}$. The resulting spectrum consists of maximum 15 different lines. What is the wavelength λ ?
($R_H = 109737\ cm^{-1}$)
(A) 937.3 $\overset{0}{A}$ (B) 1025 $\overset{0}{A}$ (C) 1236 $\overset{0}{A}$ (D) none of these

87. The H–spectrum show :
(A) Heisenberg's uncertainty principle (B) Diffraction
(C) Polarization (D) Presence of quantized energy level

88. Splitting of spectral lines under the influence of magnetic field is called
(A) Zeeman effect (B) Stark effect
(C) Photoelectric effect (D) None of these

89. The maximum probability of finding electron in the d_{xy} orbital is :
(A) along the x –axis (B) along the y–axis
(C) at an angle of 45° from the x–and y – axis
(D) at an angle of 90 from the x– and y – axis

90. Which is the de–Broglie equation :
(A) $h = p\lambda$ (B) $h = p\lambda^{-1}$ (C) $h = \lambda\ p^{-1}$ (D) $h = p + \lambda$

Space for rough work

FIITJEE PET – III (REG_1ST YEAR)

MAINS_SET–B_ANSWERS

DATE: 23.06.2018

MATHEMATICS

1.	D	2.	D	3.	C	4.	C
5.	B	6.	B	7.	A	8.	A
9.	A	10.	C	11.	A	12.	A
13.	Bonus	14.	B	15.	A	16.	D
17.	B	18.	B	19.	D	20.	B
21.	A	22.	B	23.	B	24.	B
25.	A	26.	A	27.	D	28.	D
29.	B	30.	C				

PHYSICS

31.	C	32.	B	33.	Bonus	34.	B
35.	D	36.	A	37.	D	38.	B
39.	A	40.	A	41.	D	42.	A
43.	C	44.	A	45.	D	46.	D
47.	C	48.	D	49.	D	50.	B
51.	A	52.	C	53.	A	54.	Bonus
55.	D	56.	C	57.	D	58.	B
59.	B	60.	A				

CHEMISTRY

61.	B	62.	B	63.	A	64.	D
65.	A	66.	A	67.	C	68.	B
69.	B	70.	A	71.	B	72.	D
73.	D	74.	B	75.	A	76.	D
77.	C	78.	B	79.	D	80.	D
81.	B	82.	B	83.	D	84.	C
85.	B	86.	A	87.	D	88.	A
89.	C	90.	A				