

Physics

1. If the displacement of a particle changes with respect to time as $x(t) = (2t^2 - 4t + 3)$ velocity of the particle at $t = 2$ sec is
 A) 2m/s B) 4m/s
 C) 3m/s D) 1m/s
2. Displacement of a particle is given by $x(t) = 4t^3 - 3t^2$, velocity of the particle at time $t = 1$ sec is
 A) 6m/s B) 10m/s
 C) 5m/s D) -3m/s
3. Force acting on body is defined as the rate of change in momentum of the body the rate of change in momentum of the body. If momentum varies with time as $\vec{p}(t) = 5t - \frac{1}{t}$, find the force at time $t=1$ sec
 A) 5N B) 6N
 C) 10N D) 3N
4. If $f(x) = e^x + e^{-x}$, find $\frac{df}{dx}$?
 A) Zero B) $\frac{1}{e^x + e^{-x}}$
 C) $e^x - e^{-x}$ D) e^{2x}
5. If $f(x) = a \log x + bx^2 + x$, Find $\frac{df}{dx}$?
 A) $a + 2bx + 1$ B) $\frac{a}{x} + 2b$
 C) $ax + 2bx + 1$ D) $\frac{a}{x} + 2bx + 1$
6. The velocity of a particle is given by $v = (t^2 - 4t + 5)m/s$. Find its acceleration at $t=1$ sec?
 A) $1m/s^2$ B) $-2m/s^2$
 C) $2m/s^2$ D) $-1m/s^2$
7. The velocity of the body depends on time according to the equation $v = 20 + 0.1t^2$. The acceleration as a function of time is
 A) $(0.2t)m/s^2$ B) $(0.1t)m/s^2$
 C) $20m/s^2$ D) Zero
8. The speed v of a car moving on a straight road changes according to the equation $v = a + bx$, where a, b are positive constants. The magnitude of acceleration
 A) Increases B) Decreases
 C) Constant D) First decreases and then increases
9. The displacement of the body as a function of is $S = 5t^2 - 6t$. The time at which the velocity of the body becomes zero is
 A) $\frac{3}{5}$ sec B) $\frac{2}{5}$ sec
 C) 2 sec D) 1 sec
10. A particle moves along a straight line with displacement given by $x = 3t^2 + 2t + 5$. Find its instantaneous velocity at $t = 4$ sec
 A) 26m/s B) 62m/s
 C) 25m/s D) 8m/s
11. A body is dropped from a height and its displacement after time t is given by $x = \frac{1}{2}gt^2$. Find its velocity at any instant?
 A) g B) $2gt$
 C) gt D) $\frac{1}{2}gt$
12. If $f(x) = \frac{4}{x^2} + \frac{1}{7x^5} - \frac{1}{2x}$. The rate of change of $f(x)$ with respect to x is
 A) $-\frac{8}{x^3} - \frac{5}{7x^6} + \frac{1}{2x^2}$ B) $\frac{8}{x^3} + \frac{5}{x^6} + \frac{1}{x^6}$
 C) $-\frac{8}{x^3} - \frac{5}{x^6} - \frac{2}{x^6}$ D) $\frac{9}{x^3} - \frac{5}{7x^6} - \frac{1}{2x^2}$
13. A soccer ball is kicked into the air so that path of its flight can be modelled by the function, where t is in seconds and x is in meters $x(t) = -4.9t^2 + 9.8t + 5$. Velocity of the particle varies with time as
 A) $9.8t$ B) $9.8t - 1$
 C) $9.8(1 - t)$ D) $9.8(t - 1)$
14. Find the rate of change of the area of a circle with respect to its radius r when $r = 6cm$
 A) $12\pi cm$ B) $24\pi cm$
 C) $10\pi cm$ D) $5\pi cm$

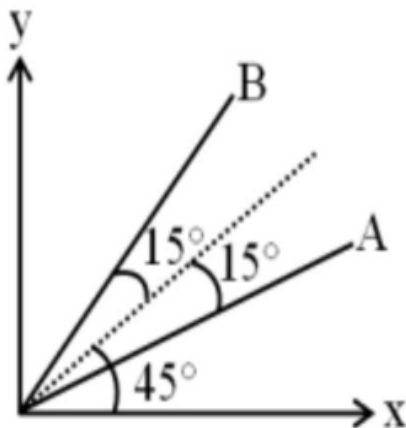
15. If a particle moves in space according to the function $x(t) = t^3 - 4t^2$, where t is time in seconds and x is the displacement from the origine in centi-meters. Find the velocity at time $t=1$ sec

- A) 5cm/sec B) 10cm/sec
C) 1cm/sec D) -5cm/sec

16. If $y = f(x)$ represents a curve, the slope of the curve is given by $\frac{dy}{dx}$. Find the slope of the curve at a point (1,3) is
 $y = x^4 - 6x^3 + 13x^2 - 10x + 5$

- A) 1 B) 2
C) 3 D) 4

17. Choose the incorrect statement:-



- A) Slope of A is $\tan 45^\circ$ B) Slope of B is greater than A
C) Slope of B is $\tan 60^\circ$ D) Slope of A is $\tan 30^\circ$

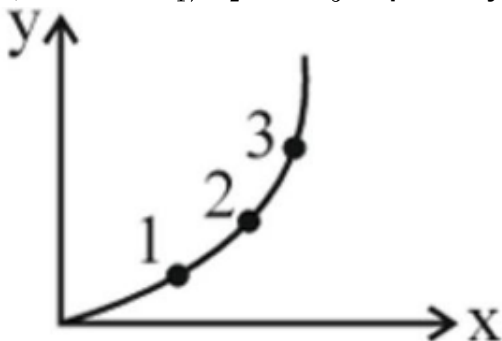
18. If $y = -x^2 + 5x$, then y is greatest at :-

- A) $x = 0$ B) $x = -1/2$
C) $x = 4$ D) $x = 5/2$

19. If $y = \sqrt{6x+5}$ then $\frac{dy}{dx} = ?$

- A) $3\sqrt{6x+5}$ B) $\frac{6}{\sqrt{6x+5}}$
C) $\frac{3x}{\sqrt{6x+5}}$ D) $\frac{3}{\sqrt{6x+5}}$

20. The slope of graph as shown in figure at points 1,2 and 3 is m_1, m_2 and m_3 respectively then :



- A) $m_1 > m_2 > m_3$ B) $m_1 < m_2 < m_3$
C) $m_1 = m_2 = m_3$ D) $m_1 = m_2 > m_3$

21. For a spherical balloon, the rate of change of radius with respect to time is $2/\pi\text{cm/s}$. Find the rate of change of volume, when radius is $\frac{1}{2}\text{cm}$.

- A) $1\text{cm}^3/\text{s}$ B) $2\text{cm}^3/\text{s}$
C) $3\text{cm}^3/\text{s}$ D) $4\text{cm}^3/\text{s}$

22. $y = \frac{t^2-1}{t^2+1}$ Find $\frac{dy}{dt}$

- A) 1 B) $\frac{4t^2}{(t^2+1)}$
C) $\frac{4t}{(t^2+1)}$ D) $\frac{4t}{(t^2+1)^2}$

23. Given that $y = \frac{10}{\sin x + \sqrt{3}\cos x}$. Minimum value of y is

- A) zero B) 2
C) 5 D) $\frac{10}{1+\sqrt{3}}$

24. Suppose that the radius r and area $A = \pi r^2$ of a circle are differentiable functions of t . Write an equation that relates dA/dt to dr/dt .

- A) $\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$ B) $\frac{dr}{dt} = 2\pi r \frac{dA}{dt}$
C) $\frac{dA}{dt} = \pi r \frac{dr}{dt}$ D) $\frac{dr}{dt} = \pi r \frac{dA}{dt}$

25. Velocity of a particle is $V = (t^2 + 2)\text{m/sec}$ what is the ratio of acceleration at $t = 1\text{sec}$ and $t = 4\text{sec} : -$

- A) 1:3 B) 3: 1
C) 1: 4 D) 4: 1

26. The value of $\frac{dy}{dx}$ for $y = \sin^2 x + \cos^2 x$ is equal to :-

- A) $\sin 2x$ B) $\cos 2x$
C) zero D) $(\cos^2 x - \sin 2x)$

27. A particular straight line passes through origin and a point whose abscissa is double of ordinate of the point. The equation of such straight line is :

- A) $y = \frac{x}{2}$ B) $y = 2x$
C) $y = -4x$ D) $y = -\frac{x}{4}$

28. If $f(x) = x^3 - 2x$, then the value of $\int f(x)dx$ is

- A) $\frac{x^4}{4} - x^2 + c$ B) $\frac{x^5}{5} - x^3 + c$
C) $\frac{x^2}{3} + x + c$ D) $x^2 + x + c$

29. If $f(x) = (x + \frac{1}{x})$ then the value of integral $\int f(x)dx$ is

- A) $\frac{x^2}{2} + x^{-2}$ B) $\frac{x^2}{2} + \ln x + c$
C) $\frac{x^2}{2} - x^2$ D) $\frac{x^2}{2} - x$

30. If $f(x) = \sin ax + \cos bx$ then the value of $\int f(x)dx$ is

- A) $\frac{\cos ax}{a} - \frac{\sin bx}{b} + c$ B) $\frac{\sin bx}{b} - \frac{\cos ax}{a} + c$
 C) $\frac{\cos ax}{a} + \frac{\sin bx}{b} - c$ D) $\frac{\sin bx}{b} + \frac{\cos ax}{a} + c$

31. Which of the following is correct? I.

acceleration $\vec{a} = \frac{d\vec{v}}{dt}$ II. velocity $\vec{v} = \int \vec{a}dt$ III.
 displacement $\vec{x} = \int \vec{a}dt$

- A) I and II only B) I, II, III
 C) II and III only D) III only

32. Consider a body having instantaneous

acceleration $a(t) = (3t^2 - 5t + 6)m/s$. Its
 velocity is given by ($\vec{a} = \int \vec{v}dt$)

- A) $t^3 - \frac{5t^2}{2} + 6t + c$ B) $t^3 - 5t^2 - 6t + c$
 C) $t^3 - t^2 + t + c$ D) $t^3 - t^2 + 3t + c$

33. If $f(x) = x + \frac{1}{x}$, $\int f(x)dx =$

- A) $\frac{x^2}{2} + \frac{2}{x^2} + c$ B) $\frac{x^2}{2} + e^x + c$
 C) $\frac{x^2}{2} + \ln x + c$ D) $x^2 + \frac{1}{x^2}$

34. Let the instantaneous velocity of a rocket, just
 after launching be given by $v(t) = 2t + 3t^2$.

Find the distance travelled as a function of time

- A) $t^2 + t$ B) $t(t + t^2)$
 C) $t^2 + 1$ D) $t^3 + 1$

35. If $f(t) = 5t^4 - 4t^3 + 3t^2 + 5$, then $\int f(t)dt?$

- A) $t^5 - t^4 + t^3 + 5t$ B) $t^5 + t^4 - t^3 - 5t$
 C) $t^4 - 5t^2 - t + 7$ D) $t^5 - 3t^2 + t + 7$

36. If $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$, then $\int f(x)dx$ is

- A) $\frac{2}{3}x^{3/2} + 2x^{1/2}$ B) $\frac{2}{3}x^{1/2} + x^{3/2}$
 C) $x^{3/2} + x^{1/2}$ D) $x + x^{3/2}$

37. The displacement of a particle is given by

$x(t) = t^3 - 3t^2 + 4t$. Find the velocity of the
 particle at $t = 2$ seconds.

- A) $2m/s$ B) $4m/s$
 C) $6m/s$ D) $8m/s$

38. If $f(x) = x^2 + \frac{1}{x^3}$, then $\int f(x)dx$ is

- A) $\frac{1}{3}x^3 - \frac{1}{2x^2} + C$ B) $\frac{1}{3}x^3 + \frac{1}{2x^2} + C$
 C) $2x - \frac{3}{x^4} + C$ D) $\frac{1}{2}x^3 - \frac{1}{3x^2} + C$

39. If $f(t) = 6t^5 - 3t^2 + 2t + 4$, then $\int f(t)dt?$

- A) $t^6 - t^3 + t^2 + 4t$ B) $6t^6 - 3t^3 + 2t^2 + 4t$
 C) $t^6 - t^3 + t^2 + 4$ D) $t^5 - t^2 + t + 4t$

40. Which of the following physical relationships
 regarding motion in a straight line is correct? I.

Velocity is the rate of change of displacement:

$v = \frac{dx}{dt}$ II. Acceleration is the rate of change of

velocity: $a = \frac{dv}{dt}$ III. Displacement is the rate of
 change of acceleration: $x = \frac{da}{dt}$

- A) I and II only B) II and III only
 C) I, II, and III D) I only

41. If $f(x) = \cos(3x) + \sin(2x)$, then the value of
 $\int f(x)dx$ is

- A) $\frac{\sin(3x)}{3} - \frac{\cos(2x)}{2} + C$ B) $\frac{\sin(3x)}{3} + \frac{\cos(2x)}{2} + C$
 C) $3\sin(3x) - 2\cos(2x) + C$ D) $3\sin(3x) + 2\cos(2x) + C$

42. If $f(x) = 3x^2 + 4x$, then the value of $\int f(x)dx$
 is

- A) $x^3 + 2x^2 + C$ B) $x^3 + 4x^2 + C$
 C) $3x^3 + 2x^2 + C$ D) $x^3 + 2x + C$

43. If $f(x) = 3\log(x) + 2x^3 + 5x$, find $\frac{df}{dx}?$

- A) $\frac{3}{x} + 6x^2 + 5$ B) $3 + 6x^2 + 5$
 C) $\frac{3}{x} + 2x^2 + 5$ D) $\frac{1}{x} + 6x^2 + 5$

44. The velocity of a particle is given by

$v = (3t^2 + 2t + 4)m/s$. Find its acceleration at
 $t = 2$ sec?

- A) $10m/s^2$ B) $12m/s^2$
 C) $14m/s^2$ D) $16m/s^2$

45. If the displacement of a body is given by

$S(t) = 2t^2 - 3t + 5$, find the time at which the
 velocity of the body becomes zero.

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

Chemistry

46. In $[Ni(CO)_4]$, the oxidation state of Ni is:

- A) 4 B) 0
 C) 2 D) 8

47. The oxidation number of nitrogen in NH_2OH
 is:

- A) 0 B) +1
 C) -1 D) -2

48. Of the following elements, which one has the
 same oxidation state in all of its compounds?

- A) Hydrogen B) Fluorine
 C) Carbon D) Oxygen

49. Oxidation number of fluorine in OF_2 is:

- A) +1 B) +2
C) -1 D) -2

50. The oxidation number of C in CH_4 , CH_3Cl , CH_2Cl_2 , $CHCl_3$ and CCl_4 are respectively:

- A) +4, +2, 0, -2, -4 B) +2, +4, 0, -4, -2
C) -4, -2, 0, +2, +4 D) -2, -4, 0, +4, +2

51. Phosphorus has the oxidation state of +3 in:

- A) Ortho phosphoric acid B) Phosphorus acid
C) Meta phosphoric acid D) Pyrophosphoric acid

52. Oxidation state of oxygen in hydrogen peroxide is:

- A) -1 B) +1
C) 0 D) -2

53. Which one of the following statements is not correct?

- A) Oxidation state of S in $(NH_4)_2S_2O_8$ is +6 B) Oxidation number of Os in OsO_4 is +8
C) Oxidation state of S in H_2SO_5 is +8 D) Oxidation number of O in KO_2 is $-\frac{1}{2}$

54. Which of the following shows highest oxidation number in combined state:

- A) Os B) Ru
C) Both A and B D) None

55. Oxidation number of sodium in sodium amalgam (Na-Hg) is:

- A) +2 B) +1
C) -3 D) Zero

56. Oxidation number of C in HNC is:

- A) +2 B) -3
C) +3 D) Zero

57. Oxidation number of Fe in $Fe_{0.94}O$ is:

- A) 200 B) 200/94
C) 94/200 D) None

58. Oxidation number of carbon in carbon suboxide (C_3O_2) is:

- A) $+\frac{2}{3}$ B) $+\frac{4}{3}$
C) +4 D) $-\frac{4}{3}$

59. Oxidation number of sulphur in $Na_2S_2O_3$ would be:

- A) +2 B) +4
C) -2 D) 0

60. Two oxidation states for chlorine are found in the compound:

- A) $CaOCl_2$ B) KCl
C) $KClO_3$ D) Cl_2O_7

61. $-\frac{1}{3}$ oxidation state of nitrogen will be obtained in case of:

- A) Ammonia (NH_3) B) Hydrazoic acid (N_3H)
C) Nitric oxide (NO) D) Nitrous oxide (N_2O)

62. Compound $YBa_2Cu_3O_7$ is a super conductor. The O.N. of the copper in the compound will be: [O.No. of Y = +3]

- A) $+\frac{7}{3}$ B) zero
C) +2 D) +1

63. The oxidation state of iodine in $H_4IO_6^-$ is:

- A) +7 B) -1
C) +5 D) +1

64. Amongst the following, identify the species with an atom in +6 oxidation state:

- A) MnO_4^- B) $Cr(CN)_6^{3-}$
C) NiF_6^{2-} D) CrO_2Cl_2

65. The oxidation state of +1 for phosphorous is found in:

- A) Phosphorous acid (H_3PO_3) B) Orthophosphoric acid (H_3PO_4)
C) Hypo phosphorous acid (H_3PO_2) D) Hypo phosphoric acid ($H_4P_2O_6$)

66. In which of the following compounds iron has lowest oxidation state:

- A) B) $K_4[Fe(CN)_6]$
 $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$
C) $[Fe(CO)_5]$ D) $FeO_{0.94}$

67. Select the compound in which the oxidation number of oxygen is -1:

- A) H_2O B) O_2F_2
C) Na_2O D) BaO_2

68. Match List - I (compound) with list - II (Oxidation state of N) and select the correct answer using the codes given below the list

List - I	List-II
(A) KNO_3	(a) $-1/3$
(B) HNO_2	(b) -3
(C) NH_4Cl	(c) 0
(D) NaN_3	(d) $+3$
	(e) $+5$

- A) (A)-e, (B)-d, (C)-b, (D)-a
 B) (A)-e, (B)-b, (C)-d, (D)-a
 C) (A)-d, (B)-e, (C)-a, (D)-c
 D) (A)-b, (B)-c, (C)-d, (D)-e

69. In which of the following pair, oxidation number of Fe is same:

- A) $\text{K}_3[\text{Fe}(\text{CN})_6]$, Fe_2O_3
 B) $\text{Fe}(\text{CO})_5$, Fe_2O_3
 C) Fe_2O_3 , FeO
 D) $\text{Fe}_2(\text{SO}_4)_3$, $\text{K}_4[\text{Fe}(\text{CN})_6]$

70. In the conversion of Br_2 to BrO_3^- , the oxidation state of bromine changes from:

- A) 0 to 5
 B) 1 to 5
 C) 0 to -3
 D) 2 to 5

71. The sum of oxidation states of sulphur in $\text{H}_2\text{S}_2\text{O}_8$ is:

- A) $+2$
 B) $+6$
 C) $+7$
 D) $+12$

72. In which of the following compounds of Cr, the oxidation number of Cr is not $+6$:

- A) CrO_3
 B) CrO_2Cl_2
 C) Cr_2O_3
 D) $\text{K}_2\text{Cr}_2\text{O}_7$

73. Oxidation state of cobalt in $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{SO}_4$ is:

- A) 0
 B) $+4$
 C) -2
 D) $+3$

74. Oxidation number of carbon in graphite is:

- A) Zero
 B) $+1$
 C) $+4$
 D) $+2$

75. Oxidation number of 'N' in N_3H (hydrazoic acid) is:

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

76. Which of the following doesn't have $+5$ oxidation state of phosphorus?

- A) Phosphorus acid (H_3PO_3)
 B) Orthophosphoric acid (H_3PO_4)
 C) Meta phosphoric acid (HPO_3)
 D) Pyro phosphoric acid ($\text{H}_4\text{P}_2\text{O}_7$)

77. The oxidation number of arsenic atom in H_3AsO_4 is:

- A) -1
 B) -3
 C) $+3$
 D) $+5$

78. In substance $\text{Mg}(\text{HXO}_3)$, the oxidation number of X is:

- A) 0
 B) $+2$
 C) $+3$
 D) $+4$

79. The oxidation number of phosphorus in PH_4^+ , PO_2^{3-} , PO_4^{3-} and PO_3^{3-} are respectively:

- A) $-3, +1, +3, +5$
 B) $-3, +3, +5, +1$
 C) $+3, -3, +5, +1$
 D) $-3, +1, +5, +3$

80. Which of the following compounds are arranged in increasing oxidation number of S:

- A) $\text{H}_2\text{SO}_3, \text{H}_2\text{S}, \text{H}_2\text{SO}_4, \text{H}_2\text{S}_2\text{O}_3$
 B) $\text{H}_2\text{SO}_3, \text{H}_2\text{S}, \text{H}_2\text{SO}_4, \text{H}_2\text{S}_2\text{O}_3$
 C) $\text{H}_2\text{S}, \text{H}_2\text{SO}_3, \text{H}_2\text{SO}_4, \text{H}_2\text{S}_2\text{O}_3$
 D) $\text{H}_2\text{S}, \text{H}_2\text{SO}_3, \text{H}_2\text{SO}_4, \text{H}_2\text{S}_2\text{O}_3$

81. Iodine shows the highest oxidation state in the compound:

- A) KI
 B) KI_3
 C) IF_5
 D) KIO_4

82. The sum of the oxidation states of all the carbon atoms present in the compound $\text{C}_6\text{H}_5\text{CHO}$ is:

- A) -4
 B) 3
 C) $+5$
 D) $-4/7$

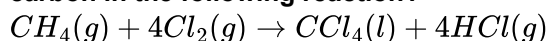
83. The oxidation states not shown by Mn in the following reaction are:



(A) $+6$ (B) $+2$ (C) $+4$ (D) $+7$ (E) $+3$ Choose the most appropriate answer from the options given below

- A) D and E only
 B) B and D only
 C) A and B only
 D) B and E only

84. What is the change in oxidation number of carbon in the following reaction?



- A) 0 to $+4$
 B) -4 to $+4$
 C) 0 to -4
 D) $+4$ to $+4$

85. 62 The oxidation states of Cr in $[Cr(H_2O)_6]Cl_3$, $[Cr(C_6H_6)_2]$, and $K_2[Cr(CN)_2(O)_2(NH_3)]$ respectively are:

- A) +3, +4, and +6 B) +3, +2, and +4
C) +3, 0, and +6 D) +3, 0, and +4

86. The oxidation states of transition metal atoms in $K_2Cr_2O_7$, $KMnO_4$ and K_2FeO_4 , respectively, are x, y and z. The sum of x, y and z is:

- A) 19 B) 18
C) 20 D) 15

87. The sum of oxidation states of two silver ions in $[Ag(NH_3)_2][Ag(CN)_2]$ complex is:

- A) 2 B) 1
C) 0 D) 4

88. 46 Identify the process in which change in the oxidation state is five:

- A) $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$ B) $MnO_4^- \rightarrow Mn^{2+}$
C) $CrO_4^{2-} \rightarrow Cr^{3+}$ D) $C_2O_4^{2-} \rightarrow 2CO_2$

89. The difference in the oxidation numbers of the two types of sulphur atoms in $Na_2S_4O_6$ is

- A) 2 B) 4
C) 5 D) 6

90. A compound contains atoms A, B and C. The oxidation number of A is +2, of B is +5 and of C is -2. The possible formula of the compound is:

- A) ABC_2 B) $B_2(AC_3)_2$
C) $A_3(BC_4)_2$ D) $A_3(B_4C)_2$

Botany

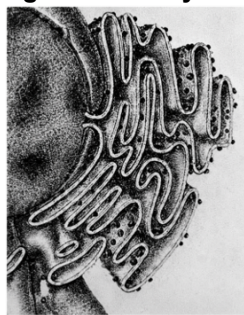
91. The Golgi complex plays a major role:

- A) in post translational modification of proteins and glycosidation of lipids B) in trapping the light and transforming it into chemical energy
C) in digesting proteins and carbohydrates D) as energy transferring organelles

92. A major site for synthesis of lipids is:

- A) Nucleoplasm B) RER
C) SER D) Symplast

93. Which one of the following organelle in the figure correctly matches with its function?



- A) Rough endoplasmic reticulum, protein synthesis B) Rough endoplasmic reticulum, formation of glycoproteins
C) Golgi apparatus, protein synthesis D) Golgi apparatus, formation of glycolipids

94. Important site for formation of glycoproteins and glycolipids is

- A) Golgi apparatus B) plastid
C) lysosome D) vacuole

95. The rough endoplasmic reticulum (RER) in the cells are because of the presence of

- A) mitochondria associated with ER B) ribosomes on the surface of ER
C) volutin granules on the surface of ER D) sulphur granules on the surface of ER

96. Elaioplasts store

- A) starch B) proteins
C) fats D) essential amino acids

97. The difference between rough endoplasmic reticulum and smooth endoplasmic reticulum is that rough endoplasmic reticulum

- A) does not contain ribosomes B) contains ribosomes
C) does not transport proteins D) transports proteins

98. Consider the following statements and choose the correct options: I. The endomembrane system include plasma membrane, ER Golgi complex, lysosomes and vacuoles. II. ER helps in the transport of substances, synthesis of proteins, lipoproteins and glycogen. III. Ribosomes are involved in protein synthesis. IV. Mitochondria help in oxidative phosphorylation and generation of ATP.

- A) II, III and IV are correct B) I is correct
C) II is correct D) III is correct

99. Which one of the following has its own DNA?

- A) Mitochondria B) Dictyosome
C) Lysosome D) Peroxisome

100.

Mitochondria are semi-autonomous as they possess

- A) DNA
- B) DNA and RNA
- C) DNA, RNA and ribosomes
- D) protein

101.

Thylakoids occur inside

- A) mitochondria
- B) chloroplast
- C) Golgi apparatus
- D) endoplasmic reticulum

102.

Membrane that covers the vacuole in a plant cell is called

- A) tonoplast
- B) tonoplasm
- C) jacket
- D) cell membrane

103.

Nuclear membrane is continuous with

- A) rough endoplasmic reticulum
- B) smooth endoplasmic reticulum
- C) cell membrane
- D) Golgi bodies

104.

Which of the following cell organelles stores hydrolytic enzymes?

- A) Centriole
- B) Lysosome
- C) Chromoplast
- D) Chloroplast

105.

Which of the following is responsible for the origin of lysosome?

- A) Chloroplast
- B) Mitochondria
- C) Golgi body
- D) Ribosome

106.

Which of the following does not contain DNA?

- A) Mitochondria
- B) Chloroplast
- C) Peroxisome
- D) Nucleus

107.

F_1 particles are present in

- A) chloroplast
- B) mitochondria
- C) ribosome
- D) rough ER

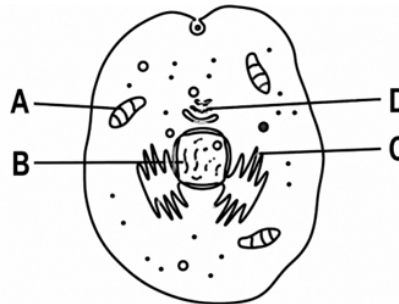
108.

Red colour of tomato is due to

- A) P-carotene
- B) anthocyanin
- C) lycopene
- D) erythrocyanin

109.

The RER in the cell synthesised protein which would be later used in building the plasma membrane. But it is observed that the protein in the membrane is slightly different from the protein made in the RER. The protein was probably modified in another cell organelle. Identify that organelle in the given diagram.



- A) D
- B) A
- C) B
- D) C

110.

Analyse the following pairs and identify the correct options given. I. Chromoplasts — Contain pigments other than chlorophyll II. Leucoplasts — Devoid of any pigments III. Amyloplasts — Store proteins IV. Aleuroplasts — Store oils and fats V. Elaioplasts — Store carbohydrates

- A) II and III are correct
- B) III and IV are correct
- C) IV and V are correct
- D) I and II are correct

111.

Long flattened, usually unbranched units arranged in parallel stacks in endoplasmic reticulum are called

- A) cisternae
- B) cristae
- C) vesicles
- D) tubules

112.

Vacuole in a plant cell

- A) is membrane bound and contains storage proteins and lipids
- B) is membrane bound and contains water and excretory substance
- C) lacks membrane and contains air
- D) lacks membrane and contains water and excretory substance

113.

The two subunits of ribosome remain united at a critical ion level of

- A) copper
- B) manganese
- C) magnesium
- D) calcium

114.

Golgi apparatus is absent in

- A) higher plant
- B) yeast
- C) bacteria and blue-green algae
- D) liver cells

115.

Subunits of 80 S ribosome are

- A) 40 S
- B) 60 S
- C) Both A and B
- D) None of these

116.

Protein synthesis takes place in

- A) ribosome
- B) chloroplast
- C) mitochondria
- D) Golgi bodies

117.

Acid hydrolase is found in

- A) Golgi body
- B) ER
- C) lysosome
- D) vacuole

118.

The largest subunit of prokaryotic ribosomes is

- A) 30 S
- B) 40 S
- C) 50 S
- D) 60 S

119.

Which of the following is a part of endomembrane system of eukaryotic cell?

- A) Peroxisomes
- B) Chloroplasts
- C) Mitochondria
- D) Golgi complex

120.

Nucleic acid occurs in

- A) Golgi body
- B) lysosomes
- C) cytoplasm
- D) mitochondria and chloroplast

121.

Select the wrong statement from the following.

- A) Both chloroplasts and mitochondria contain an inner and an outer membrane
- B) Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane
- C) Both chloroplasts and mitochondria contain DNA
- D) The chloroplasts are generally much larger than mitochondria

122.

Subunits in prokaryotic ribosomes are

- A) 60 S, 40 S
- B) 50 S, 30 S
- C) 40 S, 30 S
- D) 50 S, 20 S

123.

Enzyme found functional in lysosome is

- A) acid phosphatase
- B) basic phosphatase
- C) oxidoreductase
- D) liases

124.

Fat storing granules are

- A) elaioplast
- B) amyloplast
- C) aleuroplast
- D) None of these

125.

Ribosomes may also be called

- A) microsome
- B) dictyosome
- C) ribonucleoprotein
- D) oxysomes

126.

Export firm of the body is

- A) Golgi bodies
- B) ER
- C) nucleus
- D) mitochondria

127.

Main component of ribosome are

- A) DNA and RNA
- B) RNA and protein
- C) DNA and protein
- D) protein and lipids

128.

Which one is single membrane cell organelle?

- A) Endoplasmic reticulum
- B) Mitochondria
- C) Lysosomes
- D) Chloroplast

129.

In multicellular organisms, the 70 S ribosomes are found in the following parts of the cells

- A) lysosomes
- B) mitochondria
- C) nucleus
- D) endoplasmic reticulum

130.

Statement A: The number of mitochondria in a cell correspond to the function of the cell.

Statement B: Mitochondria are common to both plant and animal cells.

- A) Statement A is correct, B is incorrect
- B) Statement B is correct, A is incorrect
- C) Both the Statements A and B are correct
- D) Both the Statements A and B are incorrect

131.

Which of the following subunits of ribosome is composed of 23 S rRNA and a 5 S mRNA + 32 different proteins?

- A) 50 S
- B) 70 S
- C) 30 S
- D) 60 S

132.

Match the items in column I with column II and choose the correct option.

Column I	Column II
A. Sap vacuole	1. Contain digestive enzyme
B. Contractile vacuole	2. Store metabolic gases
C. Food vacuole	3. Osmoregulation
D. Air vacuole	4. Store lipids
E. Spherosomes	5. Store and concentrate mineral salts and nutrients

- A) A-5, B-3, C-1, D-2, E-4 B) A-2, B-3, C-4, D-5, E-1
C) A-5, B-2, C-3, D-1, E-4 D) A-5, B-3, C-2, D-4, E-1

133.

Suicidal bags are

- A) lysosomes B) Golgi bodies
C) ribosomes D) chloroplast

134.

Which of the following is the site of lipid synthesis?

- A) Rough ER B) Smooth ER
C) Golgi bodies D) Ribosome

135.

Three of the following statements regarding cell organelles are correct, while one is wrong. Which one is wrong?

- A) Lysosomes are double B) Endoplasmic reticulum
membraned vesicles consists of a network of
budded off from Golgi membranous tubule and
apparatus and contain helps in transport,
digestive enzymes synthesis and secretion
C) Leucoplasts are bound D) Ribosomes are non-
by two membranes, lack membrane bound and are
pigment but contain their associated with synthesis
own DNA and protein of proteins
synthesising machinery

Zoology

136.

Any plane passing through the central axis of the body dividing the organism into two identical halves is known as:

- A) Asymmetry B) Radial symmetry
C) Bilateral symmetry D) Spherical symmetry

137.

Coelenterates, ctenophores, and adult echinoderms exhibit which type of body symmetry?

- A) Radial symmetry B) Bilateral symmetry
C) Asymmetry D) Both A and B

138.

Animals in which the developing embryo has a third germinal layer, the mesoderm, are termed:

- A) Diploblastic B) Triploblastic
C) Uniblastic D) Acoelomate

139.

Which of the following groups represents triploblastic animals?

- A) Porifera to B) Platyhelminthes to
Coelenterates Chordates
C) Aschelminthes only D) Coelenterates to
Chordates

140.

The undifferentiated layer present between the ectoderm and endoderm in diploblastic animals is called:

- A) Mesoderm B) Mesoglea
C) Pseudocoelom D) Coelom

141.

The body cavity lined by mesoderm is referred to as:

- A) Pseudocoelom B) Gastrovascular cavity
C) Coelom D) Mesoglea

142.

Which of the following is a pseudocoelomate?

- A) Platyhelminthes B) Aschelminthes
C) Annelids D) Molluscs

143.

In pseudocoelomates, the mesoderm is present as:

- A) A solid layer lining the B) Scattered pouches
body wall between ectoderm and
endoderm
C) An undifferentiated D) A lining over the gut
layer called mesoglea wall

144.

Animals in which the body cavity is entirely absent are called:

- A) Coelomates B) Pseudocoelomates
C) Acoelomates D) Hemichordates

145.

Metamerism is defined as:

- | | |
|---|--|
| A) Division of labor among loose cells | B) The presence of scattered mesodermal pouches |
| C) The body being externally and internally divided into segments with a serial repetition of at least some organs | D) The presence of an incomplete digestive system |

146.

Which of the following animals exhibits metameric segmentation?

- | | |
|-------------------------|----------------------|
| A) Earthworm | B) Sponges |
| C) Aschelminthes | D) Ctenophora |

147.

The notochord is derived from which embryonic layer?

- | | |
|--------------------|--------------------|
| A) Ectoderm | B) Endoderm |
| C) Mesoderm | D) Mesoglea |

148.

The notochord is formed on which side of the body during embryonic development?

- | | |
|------------------------|-------------------------|
| A) Ventral side | B) Dorsal side |
| C) Lateral side | D) Anterior side |

149.

Animals that do not form a notochord are called non-chordates. This group includes:

- | | |
|--|-----------------------------------|
| A) Hemichordates to Chordates | B) Porifera to Echinoderms |
| C) Platyhelminthes to Chordates | D) Arthropods to Chordates |

150.

Read the following statements: Statement I: In sponges, cells are arranged as loose cell aggregates. Statement II: Sponges exhibit a tissue level of organisation.

- | | |
|--|--|
| A) Both Statement I and Statement II are correct | B) Both Statement I and Statement II are incorrect |
| C) Statement I is correct but Statement II is incorrect | D) Statement I is incorrect but Statement II is correct |

151.

Consider the statements: Statement I: Platyhelminthes have a complete digestive system. Statement II: A complete digestive system has two separate openings, mouth and anus.

- | | |
|---|---|
| A) Both are correct | B) Both are incorrect |
| C) Statement I is correct, II is incorrect | D) Statement I is incorrect, II is correct |

152.

Read the following statements: Statement I: In a closed circulatory system, blood is circulated through a series of vessels of varying diameters. Statement II: Arteries, veins, and capillaries are present in a closed circulatory system.

- | | |
|---|---|
| A) Both are correct | B) Both are incorrect |
| C) I is correct, II is incorrect | D) I is incorrect, II is correct |

153.

Read the following statements: Statement I: Sponges are mostly asymmetrical. Statement II: Any plane passing through the centre of an asymmetrical animal divides it into equal halves.

- | | |
|---|---|
| A) Both are correct | B) Both are incorrect |
| C) I is correct, II is incorrect | D) I is incorrect, II is correct |

154.

Consider the statements regarding symmetry: Statement I: Animals like annelids and arthropods exhibit bilateral symmetry. Statement II: In bilateral symmetry, the body can be divided into identical left and right halves in only one plane.

- | | |
|---|---|
| A) Both Statement I and II are correct | B) Both Statement I and II are incorrect |
| C) Statement I is correct, II is incorrect | D) Statement I is incorrect, II is correct |

155.

Read the following: Statement I: Coelenterates are diploblastic animals. Statement II: Mesoderm is present in between the ectoderm and endoderm in diploblastic animals.

- | | |
|---|---|
| A) Both are correct | B) Both are incorrect |
| C) I is correct, II is incorrect | D) I is incorrect, II is correct |

156.

Consider the statements on body cavities:
Statement I: The body cavity lined by mesoderm is called a coelom. Statement II: Aschelminthes are examples of coelomates.

- A) Both are correct B) Both are incorrect
C) I is correct, II is incorrect D) I is incorrect, II is correct

157.

Read the following: Statement I: The notochord is a mesodermally derived rod-like structure. Statement II: It is formed on the ventral side during embryonic development in some animals.

- A) Both are correct B) Both are incorrect
C) I is correct, II is incorrect D) I is incorrect, II is correct

158.

Consider the classification of animals:
Statement I: Ctenophora exhibits bilateral symmetry. Statement II: Platyhelminthes are acoelomates.

- A) Both are correct B) Both are incorrect
C) I is correct, II is incorrect D) I is incorrect, II is correct

159.

Read the following: Statement I: Echinoderms exhibit an organ system level of organisation. Statement II: All members of Animalia exhibit the exact same pattern of cellular organisation.

- A) Both are correct B) Both are incorrect
C) I is correct, II is incorrect D) I is incorrect, II is correct

160.

Match Column I (Level of Organisation) with Column II (Phylum) and choose the correct option:

Column I	Column II
a. Cellular level	1. Platyhelminthes
b. Tissue level	2. Coelenterata
c. Organ level	3. Arthropoda
d. Organ system level	4. Porifera
A) a-4, b-2, c-1, d-3	B) a-4, b-1, c-2, d-3
C) a-2, b-4, c-1, d-3	D) a-4, b-2, c-3, d-1

161.

Match Column I (Symmetry) with Column II (Examples) and choose the correct option:

Column I	Column II
a. Asymmetrical	1. Annelids
b. Radial symmetry	2. Sponges
c. Bilateral symmetry	3. Ctenophores
A) a-2, b-1, c-3	B) a-2, b-3, c-1
C) a-3, b-2, c-1	D) a-1, b-2, c-3

162.

Match Column I (Coelom type) with Column II (Phylum):

Column I	Column II
a. Coelomates	1. Platyhelminthes
b. Pseudocoelomates	2. Aschelminthes
c. Acoelomata	3. Mollusca
A) a-3, b-2, c-1	B) a-1, b-2, c-3
C) a-2, b-3, c-1	D) a-3, b-1, c-2

163.

Match Column I (Germ layers) with Column II (Characteristics):

Column I	a. Diploblastic	b. Triploblastic	c. Mesoglea
Column II	1. Mesoderm is present	2. Coelenterates	3. Undifferentiated layer
A) a-2, b-1, c-3	B) a-1, b-2, c-3		
C) a-3, b-1, c-2	D) a-2, b-3, c-1		

164.

Match Column I (Animal Group) with Column II (Feature):

Column I	a. Earthworm	b. Platyhelminthes	c. Chordates	d. Arthropods
Column II	1. Notochord present	2. Metamerism	3. Organ system level with bilateral symmetry and coelom	4. Incomplete digestive system
A) a-2, b-4, c-1, d-3	B) a-1, b-2, c-3, d-4			
C) a-2, b-1, c-4, d-3	D) a-4, b-3, c-2, d-1			

165.

Match the phylum to its classification trait based on the provided flowchart:

Column I	a. Porifera	b. Coelenterata	c. Aschelminthes	d. Annelida
Column II	1. Radial symmetry	2.True coelom	3.False coelom	4. Cellular level
A) a-4, b-1, c-3, d-2	B) a-4, b-3, c-1, d-2			
C) a-1, b-4, c-3, d-2	D) a-2, b-1, c-3, d-4			

166.

Match the term with its definition:

Column I

Column II

- | | |
|--------------------------------|--|
| a. Open circulatory system | 1. Blood circulated through vessels |
| b. Closed circulatory system | 2. Two openings (mouth and anus) |
| c. Incomplete digestive system | 3. Single opening serves as mouth and anus |
| d. Complete digestive system | 4. Cells directly bathed in blood |

- A) a-4, b-1, c-3, d-2 B) a-1, b-4, c-2, d-3
C) a-4, b-1, c-2, d-3 D) a-3, b-2, c-4, d-1

167.

Assertion (A.): Sponges exhibit a cellular level of organisation. **Reason (R):** In sponges, cells are arranged as loose cell aggregates and there is some division of labour among them.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

168.

Assertion (A.): Platyhelminthes have an incomplete digestive system. **Reason (R):** Their digestive system has a single opening to the outside of the body that serves as both mouth and anus.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

169.

Assertion (A.): Earthworms exhibit metamerism. **Reason (R):** The body of an earthworm is externally and internally divided into segments with a serial repetition of at least some organs.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

170.

Assertion (A.): Aschelminthes are considered coelomates. **Reason (R):** Their body cavity is lined by mesoderm.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

171.

Assertion (A.): Coelenterates are diploblastic animals. **Reason (R):** Their cells are arranged in two embryonic layers, an external ectoderm and an internal endoderm.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

172.

Assertion (A.): In closed circulatory systems, cells and tissues are directly bathed in blood. **Reason (R):** Blood is pumped out of the heart into open spaces.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

173.

Assertion (A.): Echinoderms possess a notochord during their embryonic development. **Reason (R):** Echinoderms are classified under non-chordates.

- A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
B) Both are true but Reason is not the correct explanation
C) Assertion is true but Reason is false
D) Both are false

174.

An unidentified animal is found to possess bilateral symmetry, a triploblastic body plan, and lacks any body cavity. Based on the classification chart, which phylum does this animal belong to?

- A) Coelenterata B) Platyhelminthes
C) Aschelminthes D) Annelida

175.

Which of the following sequence of phyla correctly represents the progression from acoelomate to pseudocoelomate to coelomate?

- | | |
|--|--|
| A) Platyhelminthes →
Aschelminthes →
Annelida | B) Aschelminthes →
Platyhelminthes →
Annelida |
| C) Ctenophora →
Platyhelminthes →
Aschelminthes | D) Annelida →
Aschelminthes →
Platyhelminthes |

176.

If an organism is observed to have a body cavity containing scattered pouches of mesoderm between the ectoderm and endoderm, it would be classified as a:

- | | |
|---------------------------|---------------------------------|
| A) Coelomate | B) Acoelomate |
| C) Pseudocoelomate | D) Diploblastic organism |

177.

Which fundamental feature is shared by both Annelids and Arthropods?

- | | |
|--|--|
| A) Radial symmetry | B) Pseudocoelom |
| C) Bilateral symmetry and True Coelom | D) Cellular level of organisation |

178.

Which of the following animals does NOT exhibit bilateral symmetry?

- | | |
|----------------------|---------------------------|
| A) Annelid | B) Arthropod |
| C) Ctenophore | D) Platyhelminthes |

179.

Identify the incorrect pairing of an animal group with its characteristic:

- | | |
|---|---|
| A) Sponges - Asymmetrical | B) Coelenterates - Radial symmetry |
| C) Platyhelminthes - Organ level of organisation | D) Echinoderms - Pseudocoelomates |

180.

Which circulatory system is characterized by blood being pumped out of the heart to directly bathe cells and tissues?

- | | |
|-------------------------|-----------------------|
| A) Closed type | B) Open type |
| C) Arterial type | D) Venous type |

ANSWER KEY

Physics

1.	2	13.	3	25.	3	37.	2
2.	1	14.	1	26.	3	38.	1,3
3.	2	15.	4	27.	1	39.	1
4.	3	16.	2	28.	1	40.	1
5.	4	17.	3	29.	2	41.	1
6.	2	18.	4	30.	2	42.	1
7.	1	19.	4	31.	1	43.	1
8.	3	20.	2	32.	1	44.	3
9.	1	21.	2	33.	3	45.	1
10.	1	22.	4	34.	2		
11.	3	23.	3	35.	1		
12.	1	24.	1	36.	1		

Chemistry

46.	2	58.	2	70.	1	82.	1
47.	3	59.	1	71.	4	83.	4
48.	2	60.	1	72.	3	84.	2
49.	3	61.	2	73.	4	85.	3
50.	3	62.	1	74.	1	86.	1
51.	2	63.	1	75.	1	87.	1
52.	1	64.	4	76.	1	88.	2
53.	3	65.	3	77.	4	89.	3
54.	3	66.	3	78.	3	90.	3
55.	4	67.	4	79.	4		
56.	1	68.	1	80.	4		
57.	2	69.	1	81.	4		

Botany

91.	1	103.	1	115.	3	127.	2
92.	3	104.	2	116.	1	128.	3
93.	1	105.	3	117.	3	129.	2
94.	1	106.	3	118.	3	130.	1
95.	2	107.	2	119.	4	131.	1
96.	3	108.	3	120.	4	132.	1
97.	2	109.	1	121.	2	133.	1
98.	1	110.	4	122.	2	134.	2
99.	1	111.	1	123.	1	135.	1
100.	3	112.	2	124.	1		
101.	2	113.	3	125.	3		
102.	1	114.	3	126.	1		

Zoology.

136.	2	148.	2	160.	1	172.	4
137.	1	149.	2	161.	2	173.	2
138.	2	150.	3	162.	1	174.	2
139.	2	151.	4	163.	1	175.	1
140.	2	152.	1	164.	1	176.	3
141.	3	153.	3	165.	1	177.	3
142.	2	154.	1	166.	1	178.	3
143.	2	155.	3	167.	1	179.	4
144.	3	156.	3	168.	1	180.	2
145.	3	157.	3	169.	1		
146.	1	158.	4	170.	4		
147.	3	159.	3	171.	1		

SOLUTIONS

Q1.

Answer: B

Explanation:

The displacement is given by $x(t) = 2t^2 - 4t + 3$.

Velocity is the rate of change of displacement with respect to time: $v(t) = \frac{dx}{dt}$.

Q2.

Answer: A

Explanation:

The displacement of the particle is given by

$x(t) = 4t^3 - 3t^2$. Velocity is the derivative of displacement with respect to time: $v(t) = \frac{dx}{dt}$.

Q3.

Answer: B

Explanation:

Force is defined as the rate of change of momentum with

respect to time: $F(t) = \frac{d\vec{p}}{dt}$. Given momentum:

$\vec{p}(t) = 5t - \frac{1}{t}$. Differentiate and evaluate at $t = 1$ s.

Q4.

Answer: C

Explanation:

Given $f(x) = e^x + e^{-x}$. Differentiate each term with respect to x .

Q5.

Answer: D

Explanation:

Given $f(x) = a \log x + bx^2 + x$. Differentiate each term with respect to x using the sum rule.

Q6.

Answer: B

Explanation:

The acceleration of a particle is the rate of change of velocity with respect to time. Given $v(t) = t^2 - 4t + 5$.

Therefore, $a(t) = \frac{dv}{dt}$.

Q7.

Answer: A

Explanation:

The acceleration of a body is the derivative of velocity with respect to time. Given $v(t) = 20 + 0.1t^2$. Therefore,

$a(t) = \frac{dv}{dt}$.

Q8.

Answer: C

Explanation:

Given the speed-position relation $v = a + bx$, where a and b are positive constants. Acceleration is $a_x = \frac{dv}{dt}$. Using the

chain rule, $\frac{dv}{dt} = \frac{dv}{dx} \frac{dx}{dt}$. Since $v = a + bx$, we have

$\frac{dv}{dx} = b$. Also, $\frac{dx}{dt} = v$. Therefore, $a_x = bv$. Substituting $v = a + bx$, $a_x = b(a + bx)$. Since $b > 0$ and v increases with x

Q9.

Answer: A

Explanation:

The displacement is given by $S = 5t^2 - 6t$. Velocity is the derivative of displacement with respect to time: $v = \frac{dS}{dt}$.

The velocity becomes zero when $v = 0$.

Q10.

Answer: A

Explanation:

The displacement of the particle is $x = 3t^2 + 2t + 5$.

Instantaneous velocity is the derivative of displacement with respect to time: $v = \frac{dx}{dt}$.

Q11.

Answer: C

Explanation:

The displacement of the body is given by $x = \frac{1}{2}gt^2$.

Velocity is the rate of change of displacement with respect to time: $v = \frac{dx}{dt}$.

Q12.

Answer: A

Explanation:

Given $f(x) = \frac{4}{x^2} + \frac{1}{7x^5} - \frac{1}{2x}$. Rewrite using negative

powers: $f(x) = 4x^{-2} + \frac{1}{7}x^{-5} - \frac{1}{2}x^{-1}$. Differentiate term-by-term using the power rule.

Q13.

Answer: C

Explanation:

The position of the soccer ball is given by

$x(t) = -4.9t^2 + 9.8t + 5$. Velocity is the derivative of position with respect to time: $v(t) = \frac{dx}{dt}$.

Q14.

Answer: A

Explanation:

The area of a circle is given by $A = \pi r^2$. The rate of change of the area with respect to the radius is found by differentiating A with respect to r .

Q15.

Answer: D

Explanation:

The velocity of a particle is the derivative of its position function with respect to time. Given: $x(t) = t^3 - 4t^2$
Velocity: $v(t) = \frac{dx}{dt}$

Q16.

Answer: B

Explanation:

The slope of a curve at a point is given by the derivative of the function evaluated at the corresponding x -value. Given: $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ The point is $(1, 3)$, so we need to find: $\left. \frac{dy}{dx} \right|_{x=1}$

Q17.

Answer: C

Explanation:

The slope of a line that makes an angle θ with the positive x -axis is $m = \tan \theta$ From the diagram: • Line A makes an angle of 45° with the x -axis. • The dotted line is 15° above A . • Line B is another 15° above the dotted line. Therefore, $\angle B = 45^\circ + 15^\circ + 15^\circ = 75^\circ$ Hence, $m_A = \tan 45^\circ$ and $m_B = \tan 75^\circ$

Q18.

Answer: D

Explanation:

Given $y = -x^2 + 5x$ To find where y is greatest, we find the critical point by setting the first derivative equal to zero and then verify that it corresponds to a maximum.

Q19.

Answer: D

Explanation:

Given $y = \sqrt{6x+5}$ Rewrite the square root in exponential form: $y = (6x+5)^{1/2}$ Use the chain rule:
 $\frac{d}{dx}(u^{1/2}) = \frac{1}{2}u^{-1/2} \cdot \frac{du}{dx}$ where $u = 6x+5$ and $\frac{du}{dx} = 6$.

Q20.

Answer: B

Explanation:

The slope of a curve at a point is the slope of the tangent line, which is given by $m = \frac{dy}{dx}$. From the figure, the curve becomes steeper as we move from point 1 to point 2 to point 3. Therefore, the slope increases from point 1 to point 3.

Q21.

Answer: B

Explanation:

For a sphere, $V = \frac{4}{3}\pi r^3$ Differentiate with respect to time t using the chain rule: $\frac{dV}{dt} = \frac{d}{dt}\left(\frac{4}{3}\pi r^3\right) = 4\pi r^2 \frac{dr}{dt}$ Given $\frac{dr}{dt} = \frac{2}{\pi}$ cm/s and $r = \frac{1}{2}$ cm.

Q22.

Answer: D

Explanation:

Given $y = \frac{t^2-1}{t^2+1}$ To find $\frac{dy}{dt}$, use the quotient rule:
 $\frac{d}{dt}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dt} - u\frac{dv}{dt}}{v^2}$ where $u = t^2 - 1$, $v = t^2 + 1$.

Q23.

Answer: C

Explanation:

Given $y = \frac{10}{\sin x + \sqrt{3} \cos x}$ To find the minimum value of y , we must maximize the denominator. Recall that $a \sin x + b \cos x \leq \sqrt{a^2 + b^2}$. Here, $a = 1$, $b = \sqrt{3}$. Therefore,
 $\sin x + \sqrt{3} \cos x \leq \sqrt{1^2 + (\sqrt{3})^2} = \sqrt{4} = 2$ The maximum value of the denominator is 2. Hence the minimum value of y is $y_{\min} = \frac{10}{2} = 5$.

Q24.

Answer: A

Explanation:

Given that the area of a circle is $A = \pi r^2$ and both A and r are functions of t , differentiate both sides with respect to t using the chain rule.

Q25.

Answer: C

Explanation:

The acceleration of a particle is the derivative of its velocity with respect to time. Given $V = t^2 + 2$ Therefore, $a = \frac{dV}{dt}$

Q26.

Answer: C

Explanation:

Using the fundamental trigonometric identity, $\sin^2 x + \cos^2 x = 1$ Therefore, $y = 1$ Since the derivative of a constant is zero, $\frac{dy}{dx} = 0$.

Q27.

Answer: A

Explanation:

The line passes through the origin and a point whose abscissa (the x -coordinate) is double its ordinate (the y -coordinate). Thus, $x = 2y$ Solving for y : $y = \frac{x}{2}$ Therefore, the equation of the line is $y = \frac{x}{2}$.

Q28.

Answer: A

Explanation:

Given $f(x) = x^3 - 2x$ We need to find $\int f(x)dx = \int (x^3 - 2x)dx$. Integrate each term separately using the power rule: $\int x^n dx = \frac{x^{n+1}}{n+1} + C$.

Q29.

Answer: B

Explanation:

Given $f(x) = x + \frac{1}{x}$ We need to evaluate $\int f(x)dx = \int \left(x + \frac{1}{x}\right)dx$. Integrate each term separately.

Q30.

Answer: B

Explanation:

Given $f(x) = \sin(ax) + \cos(bx)$ We need to evaluate $\int f(x)dx = \int (\sin(ax) + \cos(bx))dx$. Integrate each term separately using standard trigonometric integration formulas.

Q31.

Answer: A

Explanation:

Let us examine each statement. Statement I Acceleration is the rate of change of velocity: $\vec{a} = \frac{d\vec{v}}{dt}$ This is correct. Statement II Integrating acceleration with respect to time gives velocity (plus a constant vector): $\vec{v} = \int \vec{a}dt$ This is correct. Statement III Displacement is obtained by integrating velocity, not acceleration: $\vec{x} = \int \vec{v}dt$ Therefore, $\vec{x} = \int \vec{a}dt$ is incorrect. Hence only Statements I and II are correct.

Q32.

Answer: A

Explanation:

Acceleration is the derivative of velocity: $a(t) = \frac{dv}{dt}$ Therefore, velocity is obtained by integrating acceleration with respect to time. Given $a(t) = 3t^2 - 5t + 6$ we have $v(t) = \int (3t^2 - 5t + 6)dt$.

Q33.

Answer: C

Explanation:

Given $f(x) = x + \frac{1}{x}$ We need to evaluate $\int f(x)dx = \int \left(x + \frac{1}{x}\right)dx$. Integrate each term separately.

Q34.

Answer: B

Explanation:

The distance travelled (or displacement function) is obtained by integrating the velocity. Given $v(t) = 2t + 3t^2$ Therefore, $s(t) = \int v(t)dt$

Q35.

Answer: A

Explanation:

Given $f(t) = 5t^4 - 4t^3 + 3t^2 + 5$ We need to find $\int f(t)dt = \int (5t^4 - 4t^3 + 3t^2 + 5)dt$. Integrate each term using the power rule: $\int t^n dt = \frac{t^{n+1}}{n+1} + C$.

Q36.

Answer: A

Explanation:

Given $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$ We need to evaluate $\int f(x)dx = \int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)dx$. Rewrite using exponents: $f(x) = x^{1/2} + x^{-1/2}$. Apply the power rule for integration: $\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$.

Q37.

Answer: B

Explanation:

Velocity is defined as the rate of change of displacement with respect to time, which is the first derivative of the displacement function. By differentiating the given function $x(t) = t^3 - 3t^2 + 4t$ with respect to time t and substituting $t = 2$, we obtain the velocity at that specific instant.

Q38.

Answer: A,C

Explanation:

To solve the integral, rewrite the term $\frac{1}{x^3}$ as x^{-3} . Then, apply the power rule for integration, which states $\int x^n dx = \frac{x^{n+1}}{n+1} + C$, to each term separately.

Q39.

Answer: A

Explanation:

To find the integral of the given polynomial function, we apply the power rule for integration $\int t^n dt = \frac{t^{n+1}}{n+1} + C$ to each term separately.

Q40.

Answer: A

Explanation:

By the fundamental definitions of kinematics, velocity is the first derivative of displacement with respect to time, and acceleration is the first derivative of velocity with respect to time. The third statement incorrectly relates displacement and acceleration as a derivative relationship.

Q41.

Answer: A

Explanation:

To find the integral of the given trigonometric function, we use the standard integration formulas

$\int \cos(ax)dx = \frac{\sin(ax)}{a} + C$ and $\int \sin(bx)dx = -\frac{\cos(bx)}{b} + C$ and integrate each term separately.

Q42.

Answer: A

Explanation:

To find the integral of the given polynomial function, we use the power rule for integration $\int x^n dx = \frac{x^{n+1}}{n+1} + C$. By integrating each term separately, we obtain the result.

Q43.

Answer: A

Explanation:

To find the derivative of the given function, we differentiate each term individually using the standard differentiation rules. The derivative of $\log(x)$ is $\frac{1}{x}$, the power rule $\frac{d}{dx}(x^n) = nx^{n-1}$ is used for the x^3 term, and the derivative of kx is k .

Q44.

Answer: C

Explanation:

The acceleration of a particle is defined as the rate of change of velocity with respect to time. Mathematically, this is the derivative of the velocity function $v(t)$. To find the answer, we differentiate the given expression for v and evaluate it at $t = 2$ seconds.

Q45.

Answer: A

Explanation:

The velocity of a body is defined as the rate of change of displacement with respect to time, which is the first derivative of the displacement function $S(t)$. To find when the velocity is zero, we calculate the derivative of $S(t)$ and solve the resulting equation for t when set to zero.

Q46.

Answer: B

Explanation:

According to the rules for oxidation numbers, in metal carbonyl complexes where the ligand is a neutral carbon monoxide molecule (CO), the oxidation state of the central metal atom is always zero.

Q47.

Answer: C

Explanation:

The oxidation number is calculated by assigning standard values to Hydrogen (+1) and Oxygen (−2) and ensuring the sum of all oxidation states in the neutral molecule is zero.

Q48.

Answer: B

Explanation:

Fluorine is the most electronegative element. According to the specific rules for calculating oxidation numbers, the oxidation state of fluorine is −1 in all of its compounds.

Q49.

Answer: C

Explanation:

As per the fundamental rules of oxidation states, Fluorine is the most electronegative element and always exhibits an oxidation state of −1 in all its compounds, including those with Oxygen.

Q50.

Answer: C

Explanation:

The oxidation state of Carbon changes as hydrogen atoms ($H = +1$) are replaced by more electronegative chlorine atoms ($Cl = -1$).

Q51.

Answer: B

Explanation:

By calculating the oxidation states for phosphorus in various oxoacids, we find that Phosphorus acid (H_3PO_3) contains P in the +3 state.

Q52.

Answer: A

Explanation:

While Oxygen usually has an oxidation state of −2, an exception exists for peroxides (O_2^{2-}), where the oxidation state of Oxygen is −1.

Q53.

Answer: C

Explanation:

Statement C is incorrect because the maximum oxidation state for Sulphur is +6. In Caro's acid (H_2SO_5), there is a peroxide linkage, which makes the actual oxidation state of Sulphur +6, not +8.

Q54.

Answer: C

Explanation:

Osmium (Os) and Ruthenium (Ru) are both capable of reaching an oxidation state of +8 in compounds like OsO_4 and RuO_4 , which is the highest known oxidation state in the periodic table.

Q55.

Answer: D

Explanation:

According to the rules for oxidation numbers, the oxidation state of all components within an alloy (like sodium amalgam) is zero.

Q56.

Answer: A

Explanation:

In hydrogen isocyanide (HNC), the calculation of oxidation states based on electronegativity differences results in Carbon having a state of +2.

Q57.

Answer: B

Explanation:

In non-stoichiometric compounds, the total charge must still balance to zero. The average oxidation state of the metal is found by dividing the total negative charge by the number of metal atoms present.

Q58.

Answer: B

Explanation:

Carbon suboxide has the structure $O = C = C = C = O$. The average oxidation state is calculated based on the total charge balance within the neutral molecule.

Q59.

Answer: A

Explanation:

The average oxidation number of Sulphur in sodium thiosulphate is calculated using the standard values for Sodium (+1) and Oxygen (−2).

Q60.

Answer: A

Explanation:

$CaOCl_2$ (Bleaching powder) contains two distinct chlorine atoms: one as a chloride ion (Cl^-) and one as a hypochlorite ion (OCl^-). Consequently, it exhibits two oxidation states.

Q61.

Answer: B

Explanation:

In hydrazoic acid (N_3H), three nitrogen atoms share the charge required to balance one hydrogen atom (+1), leading to a fractional oxidation state.

Q62.

Answer: A

Explanation:

Using the provided state for Yttrium (+3) and standard states for Barium (+2) and Oxygen (-2), the average oxidation state of copper is calculated for the neutral compound.

Q63.

Answer: A

Explanation:

The oxidation number in a polyatomic ion is calculated such that the algebraic sum of all oxidation states equals the net charge of the ion.

Q64.

Answer: D

Explanation:

By calculating the oxidation states for each central atom, we find that Chromium in Chromyl chloride (CrO_2Cl_2) is in the +6 state.

Q65.

Answer: C

Explanation:

Calculation of the oxidation state in H_3PO_2 reveals Phosphorus is in the +1 state, whereas it is higher in the other oxoacids.

Q66.

Answer: C

Explanation:

Iron in a metal carbonyl complex such as $[Fe(CO)_5]$ has an oxidation state of zero, which is lower than the positive states found in the salts and non-stoichiometric oxide listed.

Q67.

Answer: D

Explanation:

Oxygen exhibits an oxidation state of −1 in peroxides. Barium peroxide (BaO_2) is an ionic peroxide containing the O_2^{2-} ion.

Q68.

Answer: A

Explanation:

Calculating the state for each nitrogen compound: KNO_3 is +5, HNO_2 is +3, NH_4Cl is −3, and NaN_3 is −1/3.

Q69.

Answer: A

Explanation:

In both $K_3[Fe(CN)_6]$ and Fe_2O_3 , iron exhibits an oxidation state of +3.

Q70.

Answer: A

Explanation:

Bromine starts in its elemental free state (0) and is oxidized to the bromate ion (+5).

Q71.

Answer: D

Explanation:

In Marshall's acid ($H_2S_2O_8$), each sulphur atom is in the +6 state. The question asks for the "sum" of the oxidation states for both sulphur atoms present in the formula.

Q72.

Answer: C

Explanation:

In Cr_2O_3 (Chromium(III) oxide), the state is +3, while the other species contain Chromium in its maximum state of +6.

Q73.

Answer: D

Explanation:

The oxidation state is found by balancing the charges of the neutral ligands (NH_3 , H_2O) and anionic ligands/ions (Cl^- , SO_4^{2-}).

Q74.

Answer: A

Explanation:

According to the rules for oxidation numbers, any element in any of its allotropic forms (such as graphite, diamond, or rhombic sulphur) has an oxidation state of zero.

Q75.

Answer: A

Explanation:

In N_3H , the algebraic sum of the states of three nitrogen atoms must balance the +1 state of hydrogen.

Q76.

Answer: A

Explanation:

In Phosphorus acid (H_3PO_3), phosphorus exists in the +3 state, while the other acids listed all contain phosphorus in the +5 state.

Q77.

Answer: D

Explanation:

Arsenic in Arsenic acid (H_3AsO_4) follows the standard charge balance for a Group 15 oxoacid.

Q78.

Answer: C

Explanation:

Sum of oxidation states in the neutral molecule $Mg(HXO_3)$ must be zero.

Q79.

Answer: D

Explanation:

Calculated by equating the sum of atoms to the net charge of each respective ion.

Q80.

Answer: D

Explanation:

The oxidation states are H_2S (-2), $H_2S_2O_3$ (+2), H_2SO_3 (+4), and H_2SO_4 (+6).

Q81.

Answer: D

Explanation:

Iodine reaches its maximum state of +7 in Potassium periodate (KIO_4).

Q82.

Answer: A

Explanation:

The question asks for the "sum" of all Carbon oxidation states in benzaldehyde (C_7H_6O). In a neutral molecule, the sum of all atoms' oxidation states must be zero.

Q83.

Answer: D

Explanation:

The reaction shows manganese in three distinct oxidation states (+6, +7, and +4). The states +2 (B) and +3 (E) from the given list are not present in any species in this specific reaction.

Q84.

Answer: B

Explanation:

In methane (CH_4), carbon is bonded to four hydrogen atoms ($H = +1$), resulting in an oxidation state of -4. In carbon tetrachloride (CCl_4), carbon is bonded to four highly electronegative chlorine atoms ($Cl = -1$), resulting in an oxidation state of +4.

Q85.

Answer: C

Explanation:

Chromium exhibits different states depending on the surrounding ligands. In the first complex, it is +3 due to the three chlorides; in the second, it is 0 because benzene is a neutral ligand; in the third, it is +6 due to oxo and peroxo ligands.

Q86.

Answer: A

Explanation:

The sum of the oxidation states (+6 for Cr, +7 for Mn, and +6 for Fe) equals 19.

Q87.

Answer: A

Explanation:

The complex dissociates into two complex ions where each Silver atom possesses an oxidation state of +1. Therefore, the sum is $1 + 1 = 2$.

Q88.

Answer: B

Explanation:

In the reduction of permanganate (MnO_4^-) to manganese(II) ion (Mn^{2+}), the oxidation number changes from +7 to +2, which is a difference of five.

Q89.

Answer: C

Explanation:

The sulphur atoms in the tetrathionate ion are found in two distinct chemical environments, leading to two different oxidation states.

Q90.

Answer: C

Explanation:

The valid molecular formula for a neutral compound must result in an algebraic sum of oxidation states equal to zero. Only Option C satisfies this requirement.

Q91.

Answer: A

Q92.

Answer: C

Q93.

Answer: A

Q94.

Answer: A

Q95.

Answer: B

Q96.

Answer: C

Q97.

Answer: B

Q98.

Answer: A

Q99.

Answer: A

Q100.

Answer: C

Q101.

Answer: B

Q102.

Answer: A

Q103.

Answer: A

Q104.

Answer: B

Q105.

Answer: C

Q106.

Answer: C

Q107.

Answer: B

Q108.

Answer: C

Q109.

Answer: A

Q110.

Answer: D

Q111.

Answer: A

Q112.

Answer: B

Q113.

Answer: C

Q114.

Answer: C

Q115.

Answer: C

Q116.

Answer: A

Q117.

Answer: C

Q118.

Answer: C

Q119.
Answer: D

Q120.
Answer: D

Q121.
Answer: B

Q122.
Answer: B

Q123.
Answer: A

Q124.
Answer: A

Q125.
Answer: C

Q126.
Answer: A

Q127.
Answer: B

Q128.
Answer: C

Q129.
Answer: B

Q130.
Answer: A

Q131.
Answer: A

Q132.
Answer: A

Q133.
Answer: A

Q134.
Answer: B

Q135.
Answer: A

Q136.
Answer: B

Q137.
Answer: A

Q138.
Answer: B

Q139.
Answer: B

Q140.
Answer: B

Q141.
Answer: C

Q142.
Answer: B

Q143.
Answer: B

Q144.
Answer: C

Q145.
Answer: C

Q146.
Answer: A

Q147.
Answer: C

Q148.
Answer: B

Q149.
Answer: B

Q150.
Answer: C

Q151.
Answer: D

Q152.
Answer: A

Q153.
Answer: C

Q154.
Answer: A

Q155.
Answer: C

Q156.
Answer: C

Q157.

Answer: C

Q158.

Answer: D

Q159.

Answer: C

Q160.

Answer: A

Q161.

Answer: B

Q162.

Answer: A

Q163.

Answer: A

Q164.

Answer: A

Q165.

Answer: A

Q166.

Answer: A

Q167.

Answer: A

Q168.

Answer: A

Q169.

Answer: A

Q170.

Answer: D

Q171.

Answer: A

Q172.

Answer: D

Q173.

Answer: B

Q174.

Answer: B

Q175.

Answer: A

Q176.

Answer: C

Q177.

Answer: C

Q178.

Answer: C

Q179.

Answer: D

Q180.

Answer: B