Yakeen NEET 2.0 (2026)

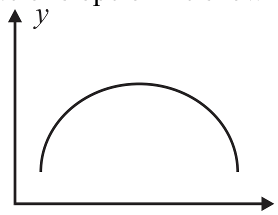
KPP-07

Physics by Saleem Sir
Basic Maths and Calculus (Mathematical Tools)

Time limit 60 minutes

1. A particle moves along the straight line $y = 3x + 5$. Which coordinate changes at a faster rate?
(1) x-coordinate
(2) y-coordinate
(3) Both x and y coordinates
(4) Data insufficient.

2. Magnitude of slope of the shown graph.



(1) First increases then decreases
(2) First decreases then increases
(3) Increases
(4) Decreases

3. The equation of a curve is given as
$y = x^2 + 2 - 3x$.
The curve intersects the x-axis at.
(1) (1, 0)
(2) (2, 0)
(3) Both (1) and (2)
(4) No where

4. Two particles A and B are moving in XY-plane. Their positions vary with time t according to relation
$x_A(t) = 3t,\quad x_B(t) = 6$
$y_A(t) = t,\quad y_B(t) = 2 + 3t^2$
Distance between two particles at $t = 1$ is:
(1) 5 (2) 3
(3) 4 (4) $\sqrt{12}$

5. The side of a square is increasing at the rate of 0.2 cm/s. The rate of increase of perimeter w.r.t. time is:
(1) 0.2 cm/s (2) 0.4 cm/s
(3) 0.6 cm/s (4) 0.8 cm/s

6. $f(x) = \cos x + \sin x$ then value of $f(\pi/2)$ will be:
(1) 2 (2) 1
(3) 3 (4) 0

Direction (No. 7 to 8): Derivative of given function with respect to corresponding independent variable is:

7. $s = 5t^3 - 3t^5$
(1) $\frac{ds}{dt} = 15t^2 + 15t^4$
(2) $\frac{ds}{dt} = 15t^4 + 15t^3$
(3) $\frac{ds}{dt} = 15t^4 - 15t^2$
(4) $\frac{ds}{dt} = 15t^2 - 15t^4$

8. $y = 5\sin x$
(1) $\frac{dy}{dx} = 3\cos x$ (2) $\frac{dy}{dx} = 5\cos x$
(3) $\frac{dy}{dx} = 5\sin x$ (4) $\frac{dy}{dx} = 3\sin x$

Direction (No. 9 to 12): First derivative and second derivative of given functions with respect to corresponding independent variable is:

9. $y = 6x^2 - 10x - 5x^{-2}$
(1) $12x - 10 + 10x^{-3}$, $12 - 30x^{-4}$
(2) $10x - 12 + 20x^{-3}$, $15 - 30x^{-4}$
(3) $12x - 10 + 15x^{-3}$, $12 - 30x^{-4}$
(4) $10x - 15 + 12x^{-3}$, $12 - 30x^{-4}$

10. $r = \frac{12}{\theta} - \frac{4}{\theta^3} + \frac{1}{\theta^4}$
(1) $12\theta^{-2} - 12\theta^{-4} + 4\theta^{-5}, 24\theta^{-3} + 48\theta^{-5} + 20\theta^{-6}$
(2) $-12\theta^{-2} + 12\theta^{-4} - 4\theta^{-5}, 24\theta^{-3} - 48\theta^{-5} + 20\theta^{-6}$
(3) $-6\theta^{-2} + 12\theta^{-4} - 8\theta^{-5}, 12\theta^{-3} - 24\theta^{-5} + 10\theta^{-6}$
(4) $-8\theta^{-2} + 12\theta^{-4} - 6\theta^{-5}, 24\theta^{-3} - 24\theta^{-5} + 10\theta^{-6}$

11. $\omega = 3z^7 - 7z^3 + 21z^2$
(1) $21z^6 + 21z^2 - 42z, 126z^5 + 42z - 42$
(2) $14z^6 - 28z^2 + 22z, 120z^5 - 21z + 42$
(3) $28z^6 - 14z^2 + 42z, 122z^5 - 42z + 21$
(4) $21z^6 - 21z^2 + 42z, 126z^5 - 42z + 42$

12. $y = \sin x + \cos x$
(1) $\cos x - \cos x, -\sin x - \sin x$
(2) $\sin x - \sin x, -\sin x - \cos x$
(3) $\cos x - \sin x, -\sin x - \cos x$
(4) $\sin x + \cos x, -\cos x - \cos x$

Direction (No. 13 to 15): Derivative of given functions with respect to the independent variable x is:

13. $y = x \sin x$
(1) $\sin x + x\cos x$ (2) $\sin x - x\cos x$
(3) $\cos^2 x - x\sin^2 x$ (4) $\sin^2 x - x\cos^2 x$

14. $y = e^x \ln x$
(1) $e^x \ln x - \frac{e^x}{x}$ (2) $e^x \ln x - \frac{e^x}{x^2}$
(3) $e^x \ln x + \frac{e^x}{x^2}$ (4) $e^x \ln x + \frac{e^x}{x}$

15. $y = (x-1)\left(x^2+x+1\right)$
(1) $\frac{dy}{dx} = 3x$ (2) $\frac{dy}{dx} = 3x^2$
(3) $\frac{dy}{dx} = 2x^2$ (4) $\frac{dy}{dx} = 2x$

Direction (No. 16 to 18): Derivative of given function with respect to the independent variable is:

16. $y = \frac{\sin x}{\cos x}$
(1) $\sec^2 x$ (2) $\sec x$
(3) $\sec^2 2x$ (4) $\sec^3 2x$

17. $y = \frac{2x+5}{3x-2}$
(1) $y' = \frac{-19}{(3x-2)^2}$
(2) $y' = \frac{19}{(3x-2)^2}$
(3) $y' = \frac{19}{(3x-2)}$
(4) $y' = \frac{-19}{(3x+2)^2}$

18. $z = \frac{2x+1}{x^2-1}$
(1) $\frac{-2x^2-2x+2}{\left(x^2+1\right)^2}$
(2) $\frac{-2x^2-2x-2}{\left(x^2-1\right)^2}$
(3) $\frac{-2x^2+2x+2}{(x+1)^2}$
(4) $\frac{-2x^2-2x-2}{\left(x^2-1\right)}$

Direction (No. 19 to 20): $\frac{dy}{dx}$ for following functions is:

19. $y = (4 - 3x)^9$
(1) $-8(4 - 3x)^8$ (2) $-27(4 - 3x)^9$
(3) $-27(4 + 3x)^9$ (4) $-27(4 - 3x)^8$

20. $y = 2 \sin(\omega x + \phi)$ where ω and ϕ constants
(1) $2\omega\cos(\omega x + \phi)$
(2) $2\omega\cos(\omega x - \phi)$
(3) $\omega\cos(\omega x + \phi)$
(4) $2\omega\text{cosec}(\omega x + \phi)$

21. Find the slope of tangent of curve $y = 1 + x^2 - 2x$ at (3, 3).
(1) 1 (2) 2
(3) 3 (4) 4

22. Find the slope of tangent of curve $y = 5x^2 + 2x + 1$ at (0, 0).
(1) 1 (2) 2
(3) 3 (4) 4

23. The slope of the normal to the curve $y = x^2 - \frac{1}{x^2}$ at (–1, 0) is:
(1) $\frac{1}{4}$ (2) $-\frac{1}{4}$
(3) 4 (4) –4

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

(1) $\frac{dA}{dt}=\pi r\frac{dr}{dt}$ (2) $\frac{dA}{dt}=\pi r^2\frac{dr}{dt}$

(3) $\frac{dA}{dt}=2\pi r^2\frac{dr}{dt}$ (4) $\frac{dA}{dt}=2\pi r\frac{dr}{dt}$

25. $y = 2u^3$, $u = 8x - 1$. Find $\frac{dy}{dx}$

(1) $48(8x-1)^2$ (2) $48(8x+1)^2$

(3) $48(8x-1)$ (4) $48(8x+1)$

26. $y = \sin u$, $u = 3x + 1$. Find $\frac{dy}{dx}$

(1) $3\cos(3x-1)$ (2) $3\cos(3x+1)$

(3) $3\sin(3x-1)$ (4) $3\sin(3x+1)$

27. $y = 3t^2 - 1$, $x = t^2$. Find $\frac{dy}{dx}$.

(1) 3 (2) 2

(3) 1/3 (4) 1/2

28. Maximum and minimum values of function $2x^3 - 15x^2 + 36x + 11$ respectively is:

(1) 39, 38 (2) 93, 83

(3) 45, 42 (4) 59, 58

29. Find out minimum/maximum value of $y = 1 - x^2$ also find out those points where value is minimum/maximum.

(1) max 2, $x = -1$ (2) max 1, $x = 0$

(3) min 1, $x = -1$ (4) min 2, $x = 0$

30. For $y = (x - 2)^2$, what is the maximum/minimum value and the point at which y is maximum/minimum?

(1) max 2, $x = 0$ (2) max 0, $x = 0$

(3) min 1, $x = -1$ (4) min 0, $x = 2$

31. Particle's position as a function of time is given by $x = -t^2 + 4t + 4$, find the maximum value of position co-ordinate of particle.

(1) 2 (2) 4

(3) –8 (4) 8

32. Find minimum value of the function:
$y = 25x^2 + 5 - 10x$

(1) 4 (2) 3

(3) 2 (4) 1

33. Determine the position where potential energy will be minimum if $U(x) = 100 - 50x + 1000x^2$.

(1) 0.25×10^{-2} (2) 2.5×10^{-2}

(3) 2.5×10^{-1} (4) 250×10^{-2}

34. Find out minimum/maximum value of $y = 4x^2 - 2x + 3$ also find out those points where value is minimum/maximum.

(1) $\min=\frac{11}{4}, x=\frac{1}{2}$

(2) $\max=\frac{11}{4}, x=\frac{1}{4}$

(3) $\min=\frac{11}{4}, x=\frac{1}{4}$

(4) $\max=\frac{11}{4}, x=\frac{1}{2}$

35. $\int\left(x^2-2x+1\right)dx$ will be

(1) $\frac{x^3}{3}-x^2-x+C$

(2) $\frac{x^3}{3}-x^2+x+C$

(3) $\frac{x^3}{3}+x^2-x+C$

(4) $\frac{x^3}{3}+x^2+x+C$

36. $\int\left(-3x^{-4}\right)dx$ will be:

(1) $x^{-3}+C$ (2) x^3+C

(3) $-3x^{-3}+C$ (4) $3x^{-3}+C$

37. $\int\left(\frac{5}{x^2}\right)dx$ will be:

(1) $-\frac{5}{x}+C$ (2) $\frac{5}{x}+C$

(3) $\frac{x}{5}+C$ (4) $-\frac{x}{5}+C$

38. $\int\left(\frac{3}{2\sqrt{x}}\right)dx$ will be:

(1) $2\sqrt{x^3}+C$ (2) $3\sqrt{x}+C$

(3) $\sqrt{x^3}+C$ (4) $\sqrt{x^4}+C$

39. $\int\left(\frac{1}{3\sqrt[3]{x}}\right)dx$ will be

(1) $\frac{x^{\frac{3}{4}}}{2}+C$ (2) $\frac{x^{\frac{2}{3}}}{3}+C$

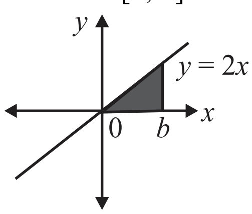
(3) $x^{\frac{2}{3}}+C$ (4) $\frac{x^{\frac{2}{3}}}{2}+C$

40. $\int(3\sin x)dx$ will be

(1) $+3\cos x+C$ (2) $+4\cos x+C$

(3) $-3\cos x+C$ (4) $-4\cos x+C$

41. Use a definite integral to find the area of the region between the given curve $y = 2x$ and the x-axis on the interval $[0, b]$.



(1) b^2 (2) b^3

(3) $2b^2$ (4) $\frac{b^3}{3}$

42. Find $\frac{dy}{dx}$ and $\frac{dy}{dt}$.

(1) $y = \sin^2(x^2 + 5x)$

(2) $y = \sin^3(x^3 + 3x^2)$

(3) $y = ln\,(x^2 + 2)$

43. Find slope of tangent at $x = 2$ in following curve.

(a) $y = x^2$

(b) $y = x^3$

(c) $y = x^2 - 5x + 6$

(d) $y = 4x^3 - 3x^2 + 10$

(e) $y = e^{-x}$

(f) $y = e^x$

44. Find slope of tangent at $x = \pi/2$

(a) $y = \sin x$

(b) $y = \sin^2 x$

(c) $y = \cos x$

(d) $y = \tan x$

(e) $y = \sin x + \cos x$

45. If $i = i_0(1 - e^{-t})$.
Find rate of charge of current at $t = 1$sec wrt tin

46. If $q = 50(1 - e^{-2t})$. Draw 'q' vs 't' graph also find current at $t = 0$. $\left(\text{use } i=\frac{dq}{dt}\right)$

47. If particle is moving on x-axis such that $x = 5t^2 - 9t + 3$. Find x_{max} and plot the x-t graph.

48. If $y=\frac{\sin x}{x+\cos x}$, then find $\frac{dy}{dx}$. at $x=\pi/2$

49. If $y=4e^{x^2-2x}$, find $\frac{dy}{dx}$

50. If $y = (x^2 + 1)^{1/2}$, find $\frac{dy}{dx}$

51. Find the derivative of $y = \sin(x^2 - 4)$.

52. If $y = \cos^2 x$, then find $\frac{dy}{dx}$.

53. If $y = \cos x^3$, then find $\frac{dy}{dx}$.

54. If $x = at^4$, $y = bt^3$, then find $\frac{dy}{dx}$.

55. If $f(x) = x\cos x$, find $f'(x)$.

56. The position of a particle as a function of time is given as $x = 5t^2 - 9t + 3$. Here x is in metre and t is in sec. Find the maximum/minimum value of position of the particle and plot the graph.

57. A particle starts from rest and its angular displacement (in rad) is given by $\theta=\frac{t^2}{20}+\frac{t}{5}$. Calculate the angular velocity at the end of $t = 4$ s.

58. A metallic disc is being heated. Its area A (in m^2) at any time t (in second) is given by $A = 5t^2 + 4t + 8$. Calculate the rate of increase in area at $t = 3$ s.

59. Integrate $\int (2\cos x + 6x^2) dx$

60. A stone is dropped into a quiet lake and waves moves in circles at the speed of 5 cm/s. At the instant when the radius of circular wave is 8 cm, how fast is the enclosed area increasing?

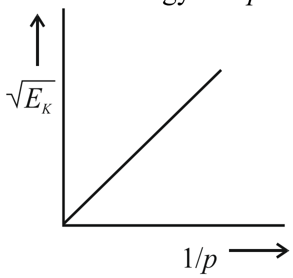
61. If $y = 3t^2 - 4t$, then find minima of y.

62. Find maximum and minimum value of y in $y = x^3 - 6x^2 + 9x + 15$

63. The graph between $\sqrt{E_K}$ and $\frac{1}{p}$ is

(E_K = kinetic energy and p = momentum)

(1)



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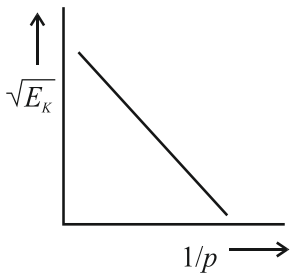

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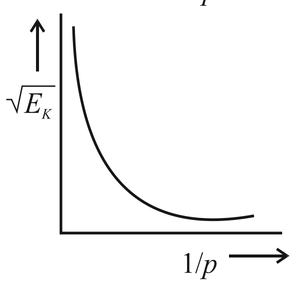

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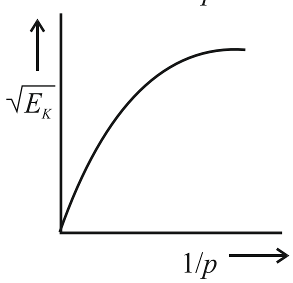
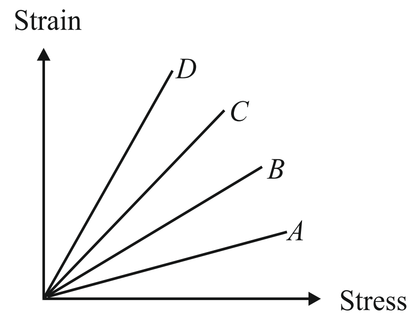


64. Water pours out at the rate of Q from a tap, into a cylindrical vessel of radius r. The rate at which the height of water level rises when the height is h, is ______.

65. Stress-strain curve for four metals are shown in figure. The maximum Young's modulus of elasticity for metal, is:

Use (stress = y strain)

$y \rightarrow$ young's modulus



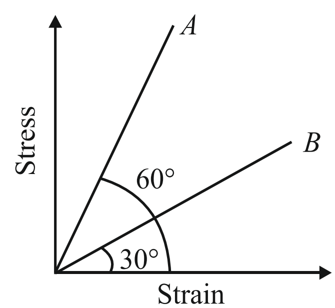
(1) A

(2) B

(3) C

(4) D

66. The stress versus strain graphs for wires of two materials A and B are as shown in the figure. If Y_A and Y_B are the Young's moduli of the materials, then



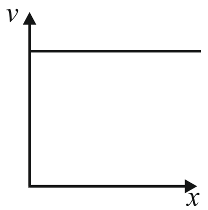
(1) $Y_B = 2Y_A$

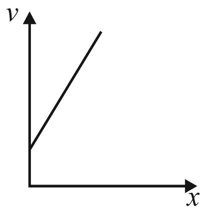
(2) $Y_A = Y_B$

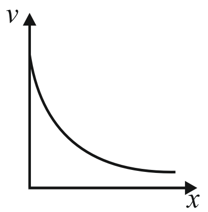
(3) $Y_B = 3Y_A$

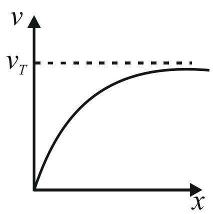
(4) $Y_A = 3Y_B$

67. From amongst the following curves, which one shows the variation of the velocity v with time t for a small sized spherical body falling vertically in a long column of a viscous liquid?
If $V = V_0(1 - e^{-kt})$

(1) 

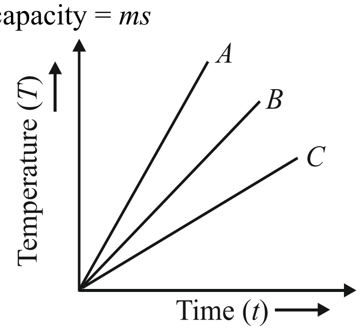
(2) 

(3) 

(4) 

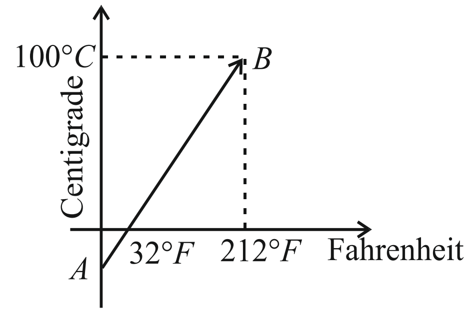
68. The temperature versus time graph is shown in figure. Which of the substance A, B and C has the lowest heat capacity, if heat is supplied to all of them at equal rates? Use $\left(\frac{d\theta}{dt} = ms\frac{dT}{dt}\right)$

Heat capacity = ms



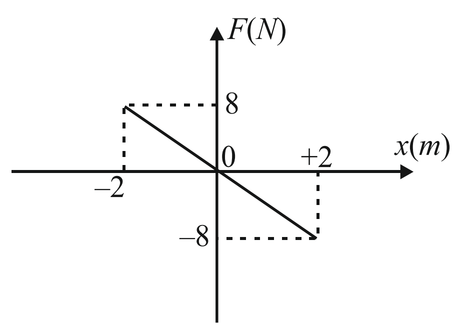
(1) A
(2) B
(3) C
(4) All have equal specific heat

69. The graph AB shown in figure is a plot of temperature of a body in degree celsius and degree fahrenheit, then



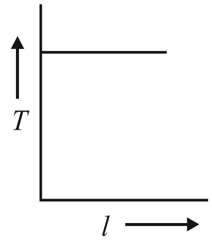
(1) slope of line AB is 9/5
(2) slope of line AB is 5/9
(3) slope of line AB is 1/9
(4) slope of line AB is 3/9

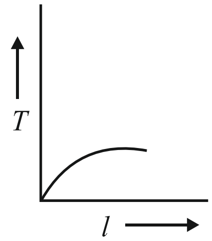
70. A body of mass 0.01 kg executes simple harmonic motion (SHM) about $x = 0$ under the influence of a force as shown in figure. The period of the SHM is: Use $\vec{F} = -k\vec{x}$, $T = 2\pi\sqrt{\frac{m}{k}}$

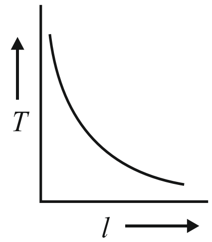


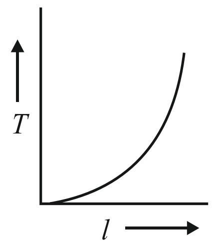
(1) 1.05 s
(2) 0.52 s
(3) 0.25 s
(4) 0.31 s

71. In case of a simple pendulum, time period versus length is depicted by: Use $T = 2\pi\sqrt{\frac{l}{g}}$.

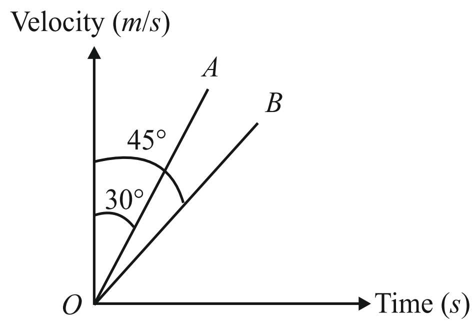
(1) 

(2) 

(3) 

(4) 

72. Two graphs between velocity and time of particles A and B are given. The ratio of their acceleration $\frac{a_A}{a_B}$ is: $\left(\text{use } a = \frac{dv}{dt}\right)$.



(1) $\frac{\sqrt{3}}{2}$

(2) $\frac{1}{\sqrt{3}}$

(3) $\sqrt{3}$

(4) $\frac{2}{\sqrt{3}}$

Answer Key

1. (2)
2. (2)
3. (3)
4. (1)
5. (4)
6. (2)
7. (4)
8. (2)
9. (1)
10. (2)
11. (4)
12. (3)
13. (1)
14. (4)
15. (2)
16. (1)
17. (1)
18. (2)
19. (4)
20. (1)
21. (4)
22. (2)
23. (1)
24. (4)
25. (1)
26. (2)
27. (1)
28. (1)
29. (2)
30. (4)
31. (4)
32. (1)
33. (2)
34. (3)
35. (2)
36. (1)
37. (1)
38. (2)
39. (4)
40. (3)
41. (1)
42. (*)
43. (*)
44. (*)
45. (*)
46. (*)
47. (*)
48. (0)
49. $8(x-1)e^{x^2-2x}$
50. $\dfrac{x}{(x^2+1)^{1/2}}$
51. (*)
52. $-\sin 2x$
53. $-3x^2 \sin x^3$
54. $\dfrac{3b}{4at}$
55. $-x \cos x - 2 \sin x$
56. -1.05 m
57. 0.6 rad/s
58. 34 m^2/s.
59. $2 \sin x + 2x^3 + c$
60. 80π cm^2/s
61. $-\dfrac{4}{3}$
62. 19, 15
63. (3)
64. $\dfrac{dh}{dt} = \dfrac{Q}{\pi r^2}$
65. (*)
66. (4)
67. (4)
68. (1)
69. (2)
70. (*)
71. (2)
72. (*)