BJNP

विद्या ददाति विनयम्
Knowledge is Discipline

Learning with the Speed of Mumbai and the Tradition of Kota

Max. Marks: 100 **Date: 03.10.2022**

JB 3 MR BATCH
PHYSICS : PART TEST
Topic: Work Energy Power

1. Two springs A and B are identical, but A is harder than B($k_A > k_B$). Let W_A and W_B represent the work done when the springs are stretched through the same distance and W'_A and W'_B are the work done when these are stretched by equal forces, then which of the following is true

(a) $W_A > W_B$ and $W'_A = W'_B$ (b) $W_A > W_B$ and $W'_A < W'_B$

(c) $W_A > W_B$ and $W'_A > W'_B$ (d) $W_A < W_B$ and $W'_A < W'_B$

2. A particle in a certain conservative force field has a potential energy given by $U = \frac{20xy}{z}$. The force exerted on it is

(a) $\left(\frac{20y}{z}\right)\hat{i} + \left(\frac{20x}{z}\right)\hat{j} + \left(\frac{20xy}{z^2}\right)k$ (b) $-\left(\frac{20y}{z}\right)\hat{i} - \left(\frac{20x}{z}\right)\hat{j} + \left(\frac{20xy}{z^2}\right)k$

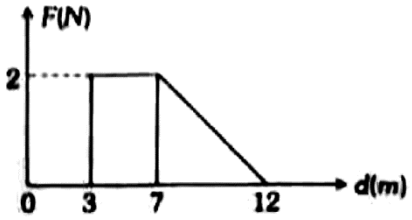
(c) $-\left(\frac{20y}{z}\right)\hat{i} - \left(\frac{20x}{z}\right)\hat{j} - \left(\frac{20xy}{z^2}\right)k$ (d) $\left(\frac{20y}{z}\right)\hat{i} + \left(\frac{20x}{z}\right)\hat{j} - \left(\frac{20xy}{z^2}\right)k$

3. A body of mass 0.5 kg travels in a straight line with velocity $v = ax^{3/2}$ where $a = 5m^{-1/2}s^{-1}$. The work done by the net force during its displacement from x = 0 to x = 2 m is

(a) 1.5 J (b) 50 J (c) 10 J (d) 100 J

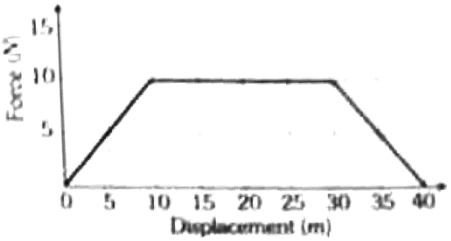
Space for Rough Work

4. Force F on a particle moving in a straight line varies with distance d as shown in the figure. The work done on the particle during its displacement of 12 m



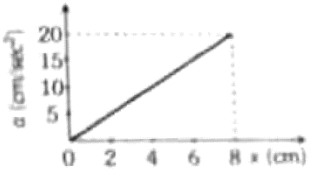
(a) 13 J (b) 18 J (c) 21 J (d) 26 J

5. Adjacent figure shows the force-displacement graph of a moving body, the work done in displacing body from x = 0 and x = 35 m is equal to



(a) 50 J (b) 25 J (c) 287.5 J (d) 200 J

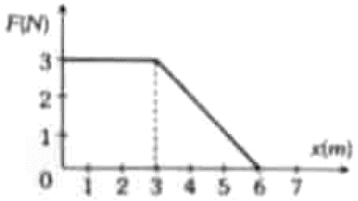
6. A 10 kg mass moves along x-axis. Its acceleration as a function of its position is shown in the figure. What is the total work done on the mass by the force as the mass moves from x = 0 to x = 8 cm



(a) 8×10^{-2} joules (b) 16×10^{-2} joules (c) 4×10^{-4} joules (d) 1.6×10^{-3} joules

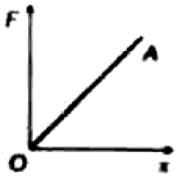
Space for Rough Work

7. A force F acting on an object varies with distance x as shown here. The force is in newton and x in metre. The work done by the force in moving the object from x = 0 to x = 6 m is



(a) 4.5 J (b) 13.5 J (c) 9.0 J (d) 18.0 J

8. The force required to stretch a spring varies with the distance as shown in the figure. If the experiment is performed with the above spring of half length, the line OA will

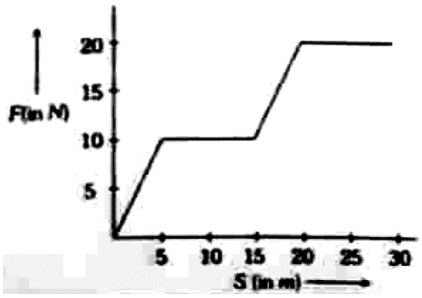


(a) Shift towards F-axis (b) Shift towards X-axis

(c) Remain as it is (d) Become double in length

Space for Rough Work

9. The work done by a force acting on a body is as shown in the graph. The total work done in covering an initial distance of 20 m is



(a) 225 J (b) 200 J (c) 400 J (d) 175 J

10. A block of mass M is attached to the lower end of a vertical spring. The spring is hung from a ceiling and has force constant value k. The mass is released from rest with the spring initially unstretched. The maximum extension produced in the length of the spring will be

(a) 1 Mg/k (b) 2 Mg/k (c) 4 Mg/k (d) Mg/2k

11. In a shotput event an athlete throws the shotput of mass 10 kg with an initial speed of 1 ms^{-1} at 45° from a height 1.5 m above ground. Assuming air resistance to be negligible and acceleration due to gravity to be 10 ms^{-2}, the kinetic energy of the shotput when it just reaches the ground will be

(a) 2.5 J (b) 5.0 J (c) 52.5 J (d) 155.0 J

12. An open knife edge of mass 'm' is dropped from a height 'h' on a wooden floor. If the blade penetrates upto the depth 'd' into the wood, the average resistance offered by the wood to the knife edge is

(a) mg (b) $mg\left(1-\frac{h}{d}\right)$ (c) $mg\left(1+\frac{h}{d}\right)$ (d) $mg\left(1+\frac{h}{d}\right)^2$

Space for Rough Work

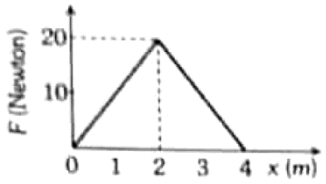
13. Two identical cylindrical vessels with their bases at same level each contains a liquid of density ρ. The height of the liquid in one vessel is h_1 and that in the other vessel is h_2. The area of either base is A. The work doen by gravity in equalizing the levels when the two vessels are connected, is

(a) $(h_1 - h_2)g\rho$ (b) $(h_1 - h_2)gA\rho$ (c) $\frac{1}{2}(h_1 - h_2)^2 gA\rho$ (d) $\frac{1}{4}(h_1 - h_2)^2 gA\rho$

14. Two identical blocks A and B, each of mass 'm' resting on smooth floor are connected by a light spring of natural length L and spring constant K, with the spring at its natural length. A third identical block 'C' (mass m) moving with a speed v along the line joining A and B collides with A. The maximum compression in the spring is

(a) $v\sqrt{\frac{m}{2k}}$ (b) $m\sqrt{\frac{v}{2k}}$ (c) $\sqrt{\frac{mv}{k}}$ (d) $\frac{mv}{2k}$

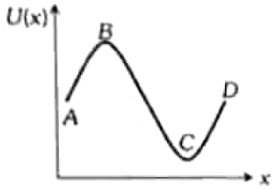
15. The graph between the resistive force F acting on a body and the distance covered by the body is shown in the figure. The mass of the body is 25 kg and initial velocity is 2 m/s. When the distance covered by the body is 4 m, its kinetic energy would be



(a) 50 J (b) 40 J (c) 20 J (d) 10 J

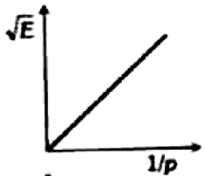
Space for Rough Work

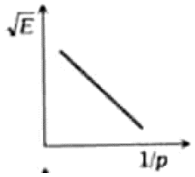
16. The potential energy of a particle varies with distance x as shown in the graph. The force acting on the particle is zero at

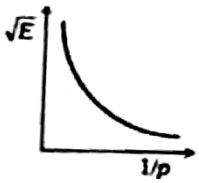


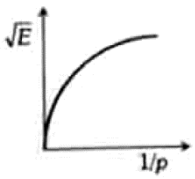
(a) C (b) B (c) B and C (d) A and D

17. The graph between $\sqrt{E}$ and 1/p is (E = kinetic energy and p = momentum)

(a) 

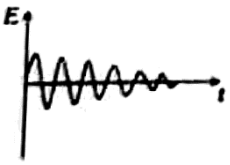
(b) 

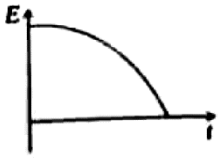
(c) 

(d) 

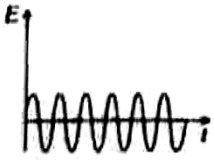
Space for Rough Work

18. Which of the diagrams shown in figure represent variation of total mechanical energy of a pendulum oscillating in air as function of time

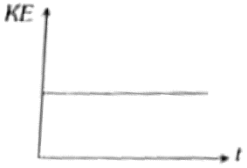
(a) 

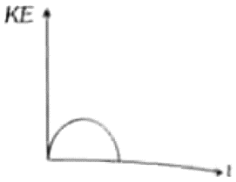
(b) 

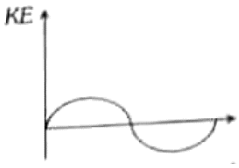
(c) 

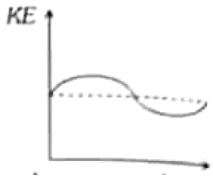
(d) 

19. Which of the diagrams shown in figure most closely shows the variation in kinetic energy of the earth as it moves once around the sun in its elliptical orbit

(a) 

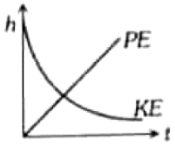
(b) 

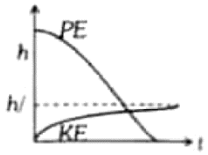
(c) 

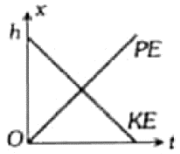
(d) 

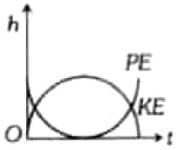
Space for Rough Work

20. A raindrop falling from a height h above ground, attains a near terminal velocity when it has fallen through a height (3/4)h. Which of the diagrams shown in figure correctly shows the change in kinetic and potential energy of the drop during its fall up to the ground

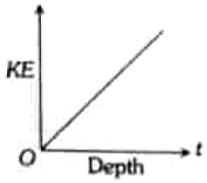
(a) 

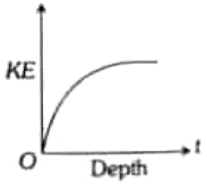
(b) 

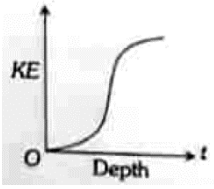
(c) 

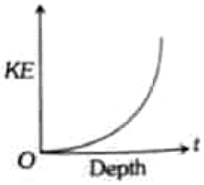
(d) 

21. Which of the diagrams in figure correctly shows the change in kinetic energy of iron sphere falling freely in a lake having sufficient depth to impart it a terminal velocity

(a) 

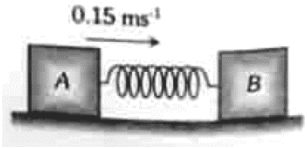
(b) 

(c) 

(d) 

Space for Rough Work

22. Two rectangular blocks A and B of masses 2 kg and 3 kg respectively are connected by a spring of spring constant 10.8 Nm^{-1} and a placed on a frictionless horizontal surface. The block A was given an initial velocity of 0.15 ms^{-1} in the direction shown in the figure. The maximum compression of the spring during the motion is

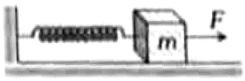


(a) 0.01 m (b) 0.02 m (c) 0.05 m (d) 0.03 m

23. A body of mass 4 kg moving with velocity 12 m/s collides with another body of mass 6 kg at rest. If two bodies stick together after collision, then the loss of kinetic energy of system is

(a) Zero (b) 288 J (c) 172.8 J (d) 144 J

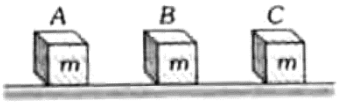
24. A block of mass m, lying on a smooth horizontal surface, is attached to a spring (of negligible mass) of spring constant k. The other end of the spring is fixed, as shown in the figure. The block is initially at rest in its equilibrium position. If now the block is pulled with a constant force F, the maximum speed of the block is



(a) $\frac{F}{\pi\sqrt{mK}}$ (b) $\frac{\pi F}{\sqrt{mK}}$ (c) $\frac{F}{\sqrt{mK}}$ (d) $\frac{2F}{\sqrt{mK}}$

Space for Rough Work

25. Three blocks A, B and C are lying on a smooth horizontal surface, as shown in the figure. A and B have equal masses m while C has mass M. Block A is given a brutal speed v towards B due to which it collides with B perfectly inelastically $\frac{5}{6}$ th of the initial kinetic energy is lost in whole process. What is value of M/m



(a) 2 (b) 4 (c) 5 (d) 3

Space for Rough Work

Date: 03.10.2022

JB 3 MR BATCH
MATHEMATICS : PART TEST
Topic: Permutation

26. If $4({}^{n}P_3) = 5({}^{n-1}P_3)$, then : n =

(a) 12 (b) 13 (c) 14 (d) 15

27. If ${}^{n}P_3 = {}^{n-1}P_3 + 3\,({}^{7}P_2)$, then : n =

(a) 6 (b) 7 (c) 8 (d) None of these

28. If ${}^{2n}P_3 = 100\,({}^{n}P_2)$, then : n =

(a) 10 (b) 12 (c) 13 (d) None of these

29. If ${}^{7}P_r = 60\,({}^{7}P_{r-3})$, then : r =

(a) 3 (b) 4 (c) 5 (d) None of these

30. If ${}^{11}P_6 + 6\,({}^{11}P_{r-1}) = {}^{12}P_6$, then : r =

(a) 6 (b) 7 (c) 8 (d) None of these

31. If ${}^{56}P_{r+6} : {}^{56}P_{r+3} = 1320 : 1$, then : r =

(a) 49 (b) 48 (c) 41 (d) None of these

32. $(n-1)\,.\,{}^{n}P_r$ =

(a) ${}^{n+1}P_r$ (b) ${}^{n}P_{r+1}$ (c) ${}^{n-r+1}P_{r+1}$ (d) None of these

33. ${}^{n-1}P_r + r({}^{n-1}P_{r-1})$ =

(a) ${}^{n}P_r$ (b) ${}^{n}P_{r-1}$ (c) ${}^{n-1}P_r$ (d) ${}^{n+1}P_r$

34. X and Y are amongst five persons who are to be seated on chairs in a row. If X and Y always sit together, then number of arrangements is

(a) 48 (b) 84 (c) 72 (d) None of these

Space for Rough Work

35. A, B, C are amongst seven persons who are to be seated in a row. Number of arrangements in which A, B, C sit together in any order is

(a) 120 (b) 240 (c) 720 (d) None of these

36. There are 6 men and 4 women. Number of ways in which they can be seated in a row so that no two women are together is

(a) $(4!)\ {}^{10}P_6$ (b) $(6!)\ {}^{10}P_4$ (c) $(6!)\ {}^{7}P_4$ (d) None of these

37. There are 7 English, 5 Marathi and 4 Hindi Books. Number of ways in which they can be arranged on a shelf so that books of the same language are together is

(a) $(7 + 5 + 4)!$ (b) $\frac{(7 + 5 + 4)!}{7!5!4!}$ (c) $3! \times 4! \times 5! \times 7!$ (d) None of these

38. How many different numbers can be formed using all of the digits 3, 3, 4, 5, 5, 8?

(a) 720 (b) 240 (c) 420 (d) None of these

39. When the product $(a + b)(c + d + e)(f + g + h)(i + j)$ is simplified, the number of terms will be

(a) 10 (b) 36 (c) 46 (d) None of these

40. Number of numbers formed from the digits 1, 2, 3, 4, 3, 2, 1 by placing the odd digits in odd places is

(a) 7! (b) $\frac{7!}{2!2!}$ (c) 18 (d) None of these

41. A family consisting of an old man, 6 adults and 4 children is to be seated in a row for dinner. The children wish to occupy the two seats at each end and the old man refuses to have a child on wither side to him. Number of such arrangements is

(a) 84600 (b) 86400 (c) 80460 (d) None of these

42. Number of distinct arrangements of letters of the word RANGOON in which the two N's are together but not the two O's is

(a) 240 (b) 660 (c) 900 (d) None of these

Space for Rough Work

43. Number of distinct arrangements of letters of the word RANGOON in which neither the N's nor the O's are together is

(a) 900 (b) 240 (c) 660 (d) None of these

44. Number of distinct arrangements of letters of the word RANGOON in which the two N's are never together is

(a) 240 (b) 900 (c) 960 (d) None of these

45. In how many ways can 4 boys and 3 girls be arranged in a row so that boys and girls are placed alternatively?

(a) $3! \times 2!$ (b) $6!$ (c) $7!$ (d) $3! \times 4!$

46. In how many was can 7 persons seat along a round table so that two particular persons are never together?

(a) 100 (b) 120 (c) 140 (d) None of these

47. Number of arrangements of the letters a, b, c, d in which b does not follow a, c does not follow b and d does not follow c, is

(a) 12 (b) 14 (c) 13 (d) 11

48. If ${}^{n-1}P_3 : {}^{n+1}P_3 = 5 : 12$, then : n =

(a) 4 (b) 8 (c) 1 (d) None of these

49. Number of arrangements of letters of the word MOBILE in which consonants occupy odd places is

(a) 16 (b) 36 (c) 26 (d) None of these

50. Number of arrangements of 3 boys and 5 girls in a row so that all the boys are together is

(a) 7208 (b) 4320 (c) 86400 (d) None of these

Space for Rough Work

BJNP

विद्या ददाति विनयम्
Knowledge is Discipline

Learning with the Speed of Mumbai and the Tradition of Kota

Max. Marks: 200 **Date: 03.10.2022**

JB 3 MR BATCH
PHYSICS : PART TEST ANSWER KEY
Topic: Work Energy Power

1.	(b)	2.	(b)	3.	(b)	4.	(a)	5.	(c)
6.	(a)	7.	(b)	8.	(a)	9.	(b)	10.	(b)
11.	(d)	12.	(c)	13.	(d)	14.	(a)	15.	(d)
16.	(c)	17.	(c)	18.	(c)	19.	(d)	20.	(b)
21.	(b)	22.	(c)	23.	(c)	24.	(c)	25.	(b)

Date: 03.10.2022

JB 3 MR BATCH
MATHEMATICS : PART TEST ANSWER KEY
Topic: Permutation

26.	(d)	27.	(c)	28.	(c)	29.	(c)	30.	(a)
31.	(c)	32.	(b)	33.	(a)	34.	(a)	35.	(c)
36.	(c)	37.	(c)	38.	(c)	39.	(b)	40.	(c)
41.	(b)	42.	(a)	43.	(c)	44.	(b)	45.	(d)
46.	(c)	47.	(d)	48.	(b)	49.	(b)	50.	(b)