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Knowledge is Discipline
BJNP
Learning with the Speed of Mumbai and the Tradition of Kota

Max Marks: 60 **Date: 02.10.2022**

JB 1 MR BATCH
PHYSICS : DCT
Topic: Work Energy Power

1. A body of mass 5 kg is placed at the origin, and can move only on the x-axis. A force of 10 N is acting on it in a direction making an angle of 60º with the x-axis and displaces it along the x-axis by 4 metres. The work done by the force is

   (a) 2.5 J (b) 7.25 J (c) 40 J (d) 20 J

2. A force $F = (5\hat{i} + 3\hat{j})N$ is applied over a particle which displaces it from its origin to the point $r = (2\hat{i} - 1\hat{j})$ meters. The work done on the particle is

   (a) –7 J (b) +13 J (c) +7 J (d) +11 J

3. A horizontal force of 5 N is required to maintain a velocity of 2 m/s for a block of 10 kg mass sliding over a rough surface. The work done by this force in one minute is

   (a) 600 J (b) 60 J (c) 6 J (d) 6000 J

4. A box of mass 1 kg is pulled on a horizontal plane of length 1 m by a force of 8 N, then it is raised vertically to a height of 2m, the net work done is

   (a) 28 J (b) 8 J (c) 18 J (d) None of these

5. A 10 kg satellite completes one revolution around the earth at a height of 100 km in 108 minutes. The work done by the gravitational force of earth will be

   (a) 108 × 100 × 10 J (b) $\frac{108\times10}{100}$J (c) $\frac{100\times10}{108}$J (d) Zero

6. A position dependent force $\vec{F} = (7 - 2x + 3x^2)N$ acts on a small object of mass 2 kg to displace it from x = 0 to x = 5m. The work done in joule is

   (a) 70 J (b) 270 J (c) 35 J (d) 135 J

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7. A particle moves under the effect of a force F = Cx from x = 0 to x = x_1. The work done in the process is

(a) Cx_1^2 (b) $\frac{1}{2}Cx_1^2$ (c) Cx_1 (d) Zero

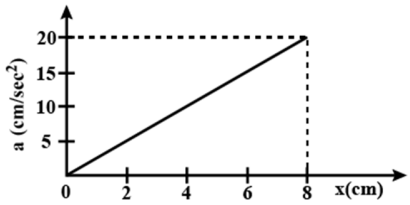
8. The vessels A and B of equal volume and weight are immersed in water to a depth h. The vessel A has an opening at the bottom through which water can enter. If the work done in immersing A and B are W_A and W_B respectively, then

(a) $W_A = W_B$ (b) $W_A < W_B$ (c) $W_A > W_B$ (d) $W_A > = < W_B$

9. Work done in time t on a body of mass m which is accelerated from rest to a speed υ in time t_1 as a function of time t is given by

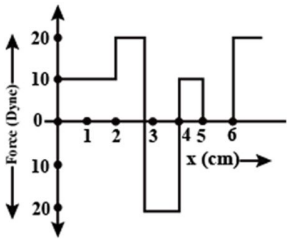
(a) $\frac{1}{2}m\frac{v}{t_1}t^2$ (b) $m\frac{v}{t_1}t^2$ (c) $\frac{1}{2}\left(\frac{mv}{t_1}\right)^2 t^2$ (d) $\frac{1}{2}m\frac{v^2}{t_1^2}t^2$

10. 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} J (b) 16×10^{-2} J (c) 4×10^{-4} J (d) 1.6×10^{-3} J

11. The relationship between force and position is shown in the figure given (in one dimensional case). The work done by the force in displacing a body from x = 1 cm to x = 5 cm is



(a) 20 ergs (b) 60 ergs (c) 70 ergs (d) 700 ergs

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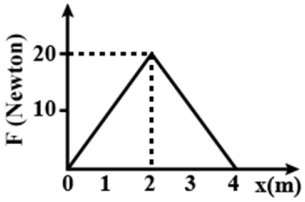
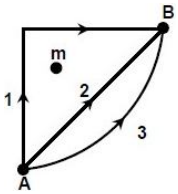
12. The graph between the resistive force F acting on a body is shown in the figure. The mass of the body is 25 kg and initial velocity is 2 m/s. When the distance covered by the body is 5 m, its kinetic energy would be



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

13. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 respectively (as shown) in the gravitational field of a point mass m, find the correct relation



(a) $W_1 > W_2 > W_3$ (b) $W_1 = W_2 = W_3$ (c) $W_1 < W_2 < W_3$ (d) $W_2 > W_1 > W_3$

14. A particle of mass 0.01 kg travels along a curve with velocity given by $4\hat{i}+16\hat{k}$ ms^{-1}. After some time, its velocity becomes $8\hat{i}+20\hat{j}$ ms^{-1} due to the action of a conservative force. The work done on particle during this interval of time is

(a) 0.32 J (b) 6.9 J (c) 9.6 J (d) 0.96 J

15. A particle of mass 'm' and charge 'q' is accelerated through a potential difference of 'V' volt. Its energy is

(a) qV (b) mqV (c) $\left(\frac{q}{m}\right)V$ (d) $\frac{q}{mV}$

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JB 1 MR BATCH
MATHEMATICS : DCT
Topic: Permutation

16. In how many ways can a cricket eleven choose a captain and a vice-captain from amongst themselves?

(a) 19 (b) 21 (c) 90 (d) 110

17. Three prizes are to be distributed in a class of 10 students. If a students can get only one prize, then this can be done in

(a) 30 ways (b) 720 ways (c) 13 ways (d) None of these

18. How many 2-digit number can be formed from the digits 1, 3, 5, 7, 9 if repetition is not allowed?

(a) 9 (b) 20 (c) 25 (d) 16

19. How many 3-digit numbers can be formed from the digits 3, 4, 6, 0, 7, 8 if repetition is not allowed?

(a) 29 (b) 100 (c) 180 (d) None of these

20. How many 4-digit number greater than 7000 can be formed from the digits 1, 2, 3, 5, 7, 8, 9, if repetition is not allowed?

(a) 160 (b) 260 (c) 360 (d) None of these

21. How many 5-digit number, divisible by 5, can be formed from the digits 3,1 , 7, 0, 9, 5, if repetition is not allowed?

(a) 960 (b) 560 (c) 216 (d) 384

22. If ${}^{n}P_{7} = 210\ ({}^{n}P_{5})$, then : n =

(a) 21 (b) 20 (c) 10 (d) None of these

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23. If ${}^{2n}P_3 = 2({}^{n}P_4)$, then : n =

(a) 8 (b) 6 (c) 12 (d) 4

24. If ${}^{2n}P_{n+1} : {}^{2n-2}P_n = 56 : 3$, then : n =

(a) 4 (b) 67 (c) 10 (d) 3

25. If ${}^{10}P_r = {}^{9}P_5 + 5\,({}^{9}P_4)$

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

26. If ${}^{15}P_r : {}^{16}P_r = 3 : 4$, then : r =

(a) 2 (b) 3 (c) 4 (d) 7

27. $(n + 1) . {}^{n}P_r =$

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

28. Number of arrangements of letters of the word STRANGE in which the vowels are never separated from each other is

(a) 1440 (b) 3600 (c) 5040 (d) None of these

29. Number of distinct (distinguishable) permutations of letters of the word MISSISSIPPI is

(a) $\frac{(11)!}{(4+4+2)!}$ (b) $\frac{(11)!}{2(4!)^2}$ (c) (11)! (d) None of these

30. If ${}^{n+3}P_6 : {}^{n+2}P_4 = 14 : 1$, then : n =

(a) 2 (b) 4 (c) 8 (d) 6

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JB 1 MR BATCH
PHYSICS : DCT ANSWER KEY
Topic: Work Energy Power

1.	(d)	2.	(c)	3.	(a)	4.	(a)	5.	(d)
6.	(d)	7.	(b)	8.	(b)	9.	(d)	10.	(a)
11.	(a)	12.	(d)	13.	(b)	14.	(d)	15.	(a)

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JB 1 MR BATCH
MATHEMATICS : DCT ANSWER KEY
Topic: Permutation

16.	(d)	17.	(b)	18.	(b)	19.	(b)	20.	(c)
21.	(c)	22.	(b)	23.	(a)	24.	(a)	25.	(b)
26.	(c)	27.	(c)	28.	(a)	29.	(b)	30.	(b)