Max Marks: 200 **Date: 03.10.2022**

JB 2 MR BATCH
PHYSICS : PART TEST
Topic: Work Energy Power

1. An ice cream has a marked value of 700 kcal. How many kilowatt hour of energy will it deliver to the body as it is digested

(a) 0.81 kWh (b) 0.90 kWh (c) 1.11 kWh (d) 0.71 kWh

2. A metallic wire of length L metres extends by l metres when stretched by suspending a weight Mg to it. The mechanical energy stored in the wire is

(a) 2 Mgl (b) Mgl (c) $\frac{Mgl}{2}$ (d) $\frac{Mgl}{4}$

3. Consider the following two statements

1. Linear momentum of a system of particles is zero
2. Kinetic energy of a system of particles is zero

Then

(a) 1 implies 2 and 2 implies 1 (b) 1 does not imply 2 and 2 does not imply 1

(c) 1 implies 2 but 2 does not imply 1 (d) 1 does not imply 2 but 2 implies 1

4. A running man has half the kinetic energy of that of a boy of half of his mass. The man speeds up by 1 m/s sp as to have same K.E. as that of boy. The original speed of the man will be

(a) $\sqrt{2}$m/s (b) $(\sqrt{2}-1)$m/s (c) $\frac{1}{(\sqrt{2}-1)}$m/s (d) $\frac{1}{\sqrt{2}}$m/s

5. A body of mass 10 kg at rest is acted upon simultaneously by two forces 4N and 3 N at right angles to each other. The kinetic energy of the body at the end of 10 sec is

(a) 100 J (b) 300 J (c) 50 J (d) 125 J

6. If the momentum of a body increases by 0.01%, its kinetic energy will increase by

(a) 0.01 % (b) 0.02% (c) 0.04 % (d) 0.08 %

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7. If the momentum of a body is increased by 100 %, then the percentage increase in the kinetic energy is

(a) 150 % (b) 200 % (c) 225 % (d) 300 %

8. A body of mass 5 kg is moving with a momentum of 10 kg-m/s. A force of 0.2 N acts on it in the direction of motion of the body for 10 seconds. The increase in its kinetic energy is

(a) 2.8 J (b) 3.2 J (c) 3.8 J (d) 4.4 J

9. Two masses of 1 g and 9 g are moving with equal kinetic energies. The ratio of the magnitudes of their respective linear momenta is

(a) 1 : 9 (b) 9 : 1 (c) 1 : 3 (d) 3 : 1

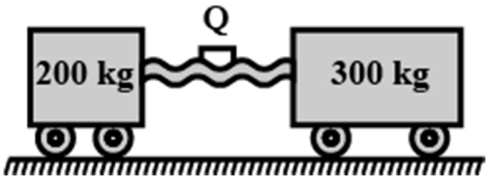
10. A body of mass 2 kg is thrown upward with an energy 490 J. the height at which its kinetic energy would become half of its initial kinetic energy will be

(a) 35 m (b) 25 m (c) 12.5 m (d) 10 m

11. A 300 g mass has a velocity of $(3\hat{i}+4\hat{j})$m/sec at a certain instant. What is its kinetic energy?

(a) 1.35 J (b) 2.4 J (c) 3.75 J (d) 7.35 J

12. Two carts on horizontal straight rails are pushed apart by an explosion of a powder charge Q placed between the carts. Suppose the coefficients of friction between the carts and rails are identical. If the 200 kg card travels a distance of 36 metre and stops, the distance covered by the cart weighing 300 kg is



(a) 32 meters (b) 24 meters (c) 16 meters (d) 12 meters

13. An unloaded bus and a loaded bus are both moving with the same kinetic energy. The mass of the latter is twice that of the former. Brakes are applied to both, so as to exert equal retarding force. If x_1 and x_2 be the distance covered by the two buses respectively before coming to a stop, then

(a) $x_1 = x_2$ (b) $2x_1 = x_2$ (c) $4x_1 = x_2$ (d) $8x_1 = x_2$

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14. A bus can be stopped by applying a retarding force F when it is moving with a speed υ on a level road. The distance covered by it before coming to rest is s. if the load of the bus increases by 50% because of passengers, for the same speed and same retarding force, the distance covered by the bus to come to rest shall be

(a) 1.5 s (b) 2 s (c) 1 s (d) 2.5 s

15. A vehicle is moving on a rough horizontal road with velocity υ. The stopping distance will be directly proportional to

(a) $\sqrt{v}$ (b) υ (c) v^2 (d) v^3

16. The potential energy of a body is given by $A - Bx^2$ (where x is the displacement). The magnitude of force acting on the particle is

(a) Constant (b) Proportional to x

(c) Proportional to x^2 (d) Inversely proportional to x

17. A particle moves in a potential region given by $U = 8x^2 - 4x + 400$ J. Its state of equilibrium will be

(a) x = 25 m (b) x = 0.25 m (c) x = 0.025 m (d) x = 2.5 m

18. A long spring is stretched by 2 cm, its potential energy is U. if the spring is stretched by 10 cm, the potential energy stored in it will be

(a) U / 25 (b) U / 5 (c) 5 U (d) 25 U

19. A spring of spring constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required to stretch it further by another 5 cm is

(a) 6.25 N-m (b) 12.50 N-m (c) 18.75 N-m (d) 25.00 N-m

20. Two springs of spring constants 1500 N/m and 300 N/m respectively are stretched with the same force. They will have potential energy in the ratio

(a) 4 : 1 (b) 1 : 4 (c) 2 : 1 (d) 1 : 2

21. a body is attached to the lower end of a vertical spiral spring and it is gradually lowered to its equilibrium position. This stretches the spring by a length x. if the same body attached to the same spring is allowed to fall suddenly, what would be the maximum stretching in this case

(a) x (b) 2x (c) 3x (d) x/2

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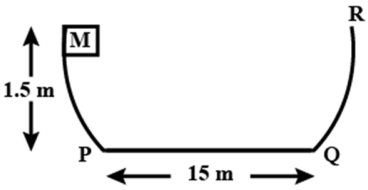
22. Two equal masses are attached to the two ends of a spring of spring constant k. The masses are pulled out symmetrically to stretch the spring by a length x over its natural length. The work done by the spring on each mass is

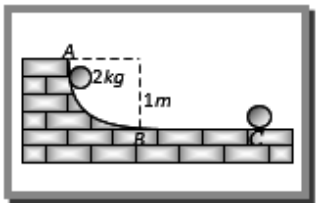
(a) $\frac{1}{2}kx^2$ (b) $-\frac{1}{2}kx^2$ (c) $\frac{1}{4}kx^2$ (d) $-\frac{1}{4}kx^2$

23. A block of mass M slides along the sides of a bowl as shown in the figure. The walls of the bowl are frictionless and the base has coefficient of friction 0.2. If the block is released from the top of the side, which is 1.5 m high, where will the block come to rest? Given that the length of the base is 15 m



(a) 1 m from P (b) Mid point (c) 2 m from P (d) At Q

24. A block of mass 2 kg is released from A on the track that is one quadrant of a circle of radius 1 m. It slides down the track and reached B with a speed of 4 ms^{-1} and finally stops at C at a distance of 3 m from B. The work done against the force of friction is



(a) 10 J (b) 20 J (c) 2 J (d) 6 J

25. A stone projected vertically upwards from the ground reaches a maximum height h. When it is at a height $\frac{3h}{4}$, the ratio of its kinetic and potential energies is

(a) 3 : 4 (b) 1 : 3 (c) 4 : 3 (d) 3 : 1

Space for Rough Work

Date: 03.10.2022

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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

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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

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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

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PHYSICS : PART TEST ANSWER KEY
Topic: Work Energy Power

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

Date: 03.10.2022

JB 2 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)