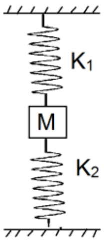
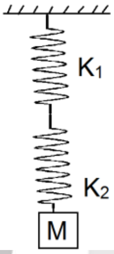
Dpp : Springs
Subject: Physics
Batch: Endeavour
Topic: Laws of Motion

1. Force on the block by upper spring.



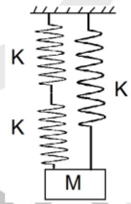
(a) Mg
(b) $Mg\frac{K_1}{K_2}$
(c) $Mg\frac{K_2}{K_1}$
(d) $Mg\frac{K_1}{K_1+K_2}$

2. Force by upper spring on the lower spring.



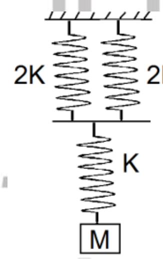
(a) Mg
(b) $Mg\frac{K_1}{K_2}$
(c) $Mg\frac{K_2}{K_1}$
(d) $Mg\frac{K_1}{K_1+K_2}$

3. Elongation in spring connected between block and the roof.



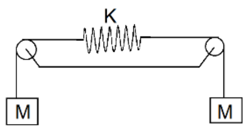
(a) Mg / K
(b) Mg / 2K
(c) Mg / 3K
(d) 2Mg / 3K

4. Elongation in upper springs.



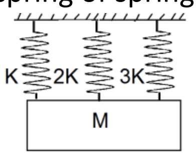
(a) $\frac{Mg}{K}$
(b) $\frac{5Mg}{4K}$
(c) $\frac{4Mg}{5K}$
(d) $\frac{Mg}{4K}$

5. Elongation in the spring.



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

6. Force on the block by spring of spring constant K.



(a) $\frac{Mg}{6}$ (b) Mg (c) $\frac{5Mg}{6}$ (d) $\frac{Mg}{3}$

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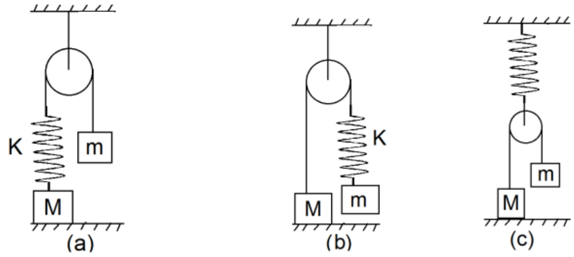
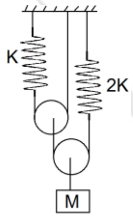
7. In which of the case, elongation of spring is greater. (Given M > m)



(a) in case (a). (b) in case (b).
(c) in case (c). (d) same in all cases.

8. Block is at equilibrium. Ratio of elongation in spring of spring constants K & 2K is respectively.

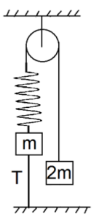


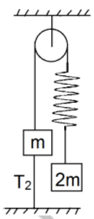
(a) 1 : 1 (b) 1 : 2 (c) 2 : 1 (d) 1 : 4

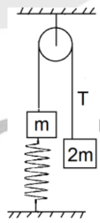
9. A spring is cut in three parts. Ratio of the length of three parts are 1 : 1 : 2. Two smaller parts are connected in parallel with each other and the combination is connected in series with the longer part. If original spring was stretched by length x when a block of mass M was hung with it. Then elongation of the smaller springs of the combination when same mass is hung by the new combination

(a) $\frac{5x}{2}$ (b) $\frac{5x}{4}$ (c) $\frac{x}{8}$ (d) $\frac{5x}{8}$

10. In which case, elongation is minimum in spring while its spring constant is same

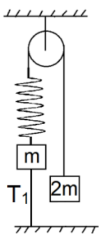
(a) 

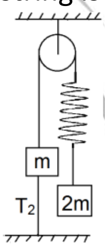
(b) 

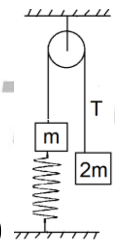
(c) 

(d) same in all

11. In which case, tension T in string is minimum.

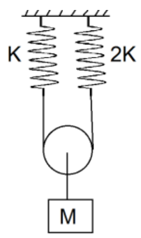
(a) 

(b) 

(c) 

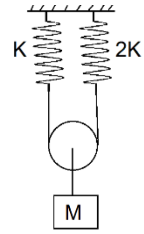
(d) same in all

12. Elongation in spring of spring constant K & 2K are respectively.



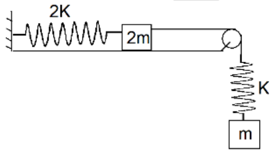
(a) $\frac{Mg}{2K}, \frac{Mg}{K}$ (b) $\frac{Mg}{K}, \frac{Mg}{2K}$ (c) $\frac{Mg}{2K}, \frac{Mg}{4K}$ (d) $\frac{Mg}{4K} \frac{Mg}{2K}$

13. Find equivalent spring constant of combination.



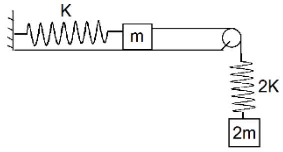
(a) $3K$ (b) $\frac{2}{3}K$ (c) $\frac{8}{3}K$ (d) $\frac{4}{3}K$

14. Elongation in springs of spring constants K & 2K are respectively.



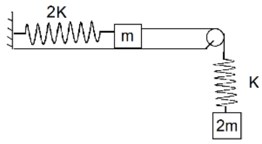
(a) $\frac{mg}{K},\frac{mg}{2K}$ (b) $\frac{2mg}{K},\frac{mg}{K}$
(c) $\frac{mg}{2K},\frac{mg}{K}$ (d) $\frac{mg}{K},\frac{2mg}{K}$

15. Elongation in springs of spring constants K & 2K are respectively.



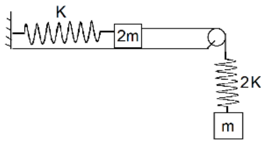
(a) $\frac{mg}{K},\frac{mg}{2K}$ (b) $\frac{2mg}{K},\frac{mg}{K}$
(c) $\frac{mg}{2K},\frac{mg}{K}$ (d) $\frac{mg}{K},\frac{2mg}{K}$

16. Elongation in springs of spring constants K & 2K are respectively.



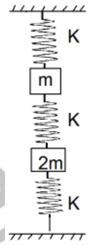
(a) $\frac{mg}{K},\frac{mg}{2K}$ (b) $\frac{2mg}{K},\frac{mg}{K}$
(c) $\frac{mg}{2K},\frac{mg}{K}$ (d) $\frac{mg}{K},\frac{2mg}{K}$

17. Elongation in springs of spring constants K & 2K are respectively.



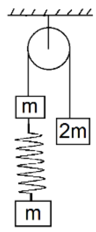
(a) $\frac{mg}{K},\frac{mg}{2K}$ (b) $\frac{2mg}{K},\frac{mg}{K}$ (c) $\frac{mg}{2K},\frac{mg}{K}$ (d) $\frac{mg}{K},\frac{2mg}{K}$

18. Elongation or compression in each spring from top to bottom respectively are



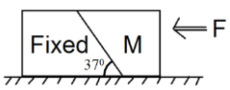
(a) $\frac{mg}{3K},\frac{4mg}{3K},\frac{5mg}{3K}$
(b) $\frac{4mg}{3K},\frac{mg}{3K},\frac{5mg}{3K}$
(c) $\frac{2mg}{3K},\frac{4mg}{3K},\frac{2mg}{K}$
(d) $\frac{4mg}{3K},\frac{2mg}{3K},\frac{2mg}{K}$

19. If string connected with block of mass 2m is cut then acceleration of each block immediately after cutting the string are



(a) g downwards of each block
(b) g downwards of 2m mass, zero of lower m mass, 2g downwards of upper m mass.
(c) g downwards of 2m mass, zero of upper m mass, 2g downwards of lower m mass.
(d) g downwards of 2m mass, zero of lower m mass, 3g downwards of upper m mass.

20. Minimum force F required so that block M start slipping on the fixed wedge.



(a) $\frac{4Mg}{3}$ (b) $\frac{3Mg}{4}$ (c) $\frac{5Mg}{3}$ (d) $\frac{3Mg}{5}$

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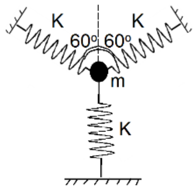
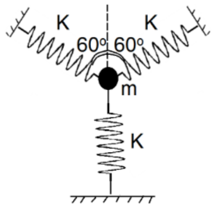
21. Springs are arranged as shown in figure in vertical plane. Initially all spring are at their natural lengths. A ball is released from rest. Find compression in the lower spring, when ball of mass m come to equilibrium.



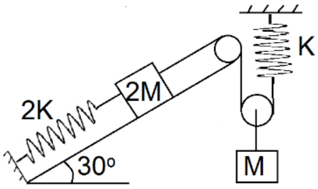
(a) $\frac{mg}{2K}$ (b) $\frac{2mg}{3K}$ (c) $\frac{3mg}{2K}$ (d) $\frac{3mg}{K}$

22. Springs are arranged as shown in figure in horizontal plane. Length of each spring is *l*. Initially each spring is at its natural length. A ball is released from rest. Vertical displacement of ball when it comes to equilibrium position is. (Given, mg << K*l*)



(a) $\frac{4mg}{3K}$ (b) $\left(\frac{2mgl^2}{3K}\right)^{1/3}$ (c) $\left(\frac{mgl^2}{3K}\right)^{1/3}$ (d) $\left(\frac{3mgl^2}{2K}\right)^{1/3}$

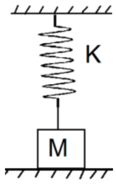
23. Elongation or compression in springs of spring constant K and 2K respectively are



(a) $\frac{Mg}{2K}, \frac{Mg}{4K}$ (b) $\frac{Mg}{2K}, \frac{Mg}{2K}$

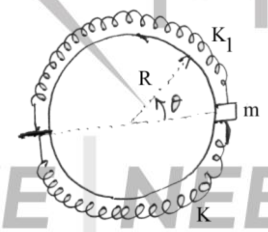
(c) $\frac{Mg}{K}, zero$ (d) $\frac{Mg}{2K}, zero$

24. Spring is at natural length (= *l*) initially and block is gradually displaced in horizontal direction. Elongation in spring when block leaves contact with floor.



(a) $l\left(\frac{Mg}{Kl+Mg}\right)$ (b) $l\left(\frac{Mg}{Kl-Mg}\right)$ (c) $\left(\frac{Mg}{K}\right)$ (d) $l\left(\frac{Kl}{Kl+Mg}\right)$

25. Radius of rigid ring is 40 cm. Complete system is fixed on a smooth horizontal floor as shown in figure. One end of each spring is attached with a peg fixed on the ring and other end is attached with a very small block of mass m. Spring constants of spring are $K_1 = \left(\frac{1000}{\pi}\right)$ N / m & $K_2 = \left(\frac{2000}{\pi}\right)$ N / m. If block is displaced by angle θ = π / 3 then net force on the block at new position. Initially springs are at their natural lengths.



(a) 100 N (b) 200 N (c) 300 N (d) 400 N

26. Spring is at natural length (= 20 meter) and block is at rest initially as shown in figure 1. Spring constant of spring is $(2+\sqrt{3})$ N/m and mass of the block is 1 kg. Normal reaction on the hemispherical surface by block when angular displacement of spring is 30° as shown in figure 2, is

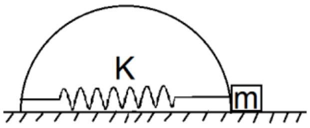


Figure 1

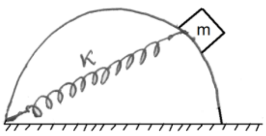


Figure 2

(a) $5\sqrt{3}\ N$ (b) $5\ N$ (c) $10\sqrt{3}\ N$ (d) 0

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27. Spring is at natural length and attached with a movable wedge as shown in figure (i). When a ball of mass M and radius R is placed gradually on the wedge, it just able to touch the horizontal surface as shown in figure (ii). Spring constant of the spring is

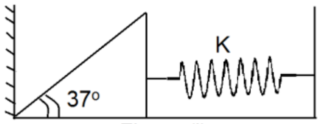


Figure (i)

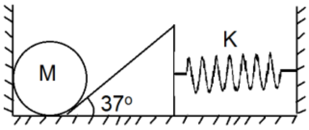


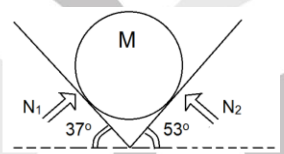
Figure (ii)

(a) $\frac{9Mg}{25R}$ (b) $\frac{9Mg}{16R}$ (c) $\frac{16Mg}{25R}$ (d) $\frac{3Mg}{4R}$

28. A spring of spring constant K is cut in 36 identical parts. Springs are connected as follows.1, 3, 5, 7, 9, 11 identical parts of spring is connected in parallel to each other and then all the sets are connected in series. Find equivalent spring constant of combination.

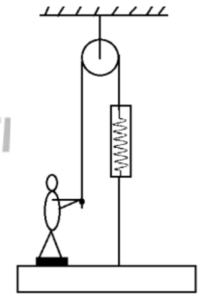
(a) $\frac{1485}{67}K$ (b) $\frac{1485}{63}K$ (c) $\frac{495}{67}K$ (d) $\frac{135}{67}K$

29. N_1 & N_2 are



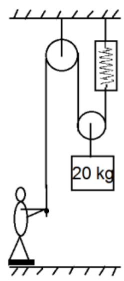
(a) $\frac{4Mg}{5}, \frac{3Mg}{5}$ (b) $\frac{3Mg}{5}, \frac{4Mg}{5}$ (c) $\frac{4Mg}{3}, \frac{3Mg}{4}$ (d) $\frac{3Mg}{4}, \frac{4Mg}{3}$

30. Mass of the boy is 45 kg. and mass of platform + weighing machine is 15 kg. Boy is standing on weighing machine and pulls the rope so that complete system moves upwards with a constant speed. Readings of spring balance and weighing machine respectively



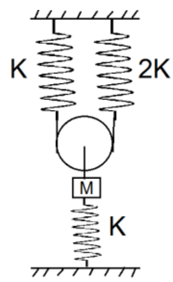
(a) 15 kg, 45 kg (b) 45 kg, 15 kg
(c) 30 kg, 15 kg (d) 15 kg, 30 kg

31. Block is in equilibrium and mass of man is 50 kg. Reading of spring balance and weighing machine are respectively



(a) 10 kg, 40 kg (b) 20 kg, 60 kg
(c) 20 kg, 30 kg (d) 10 kg, 60 kg

32. Ratio of elongation of springs of spring constant K and 2K are respectively



(a) 1 : 2 (b) 2 : 1 (c) 1 : 1 (d) 4 : 3

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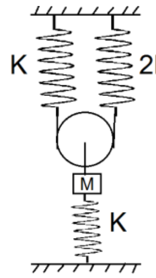
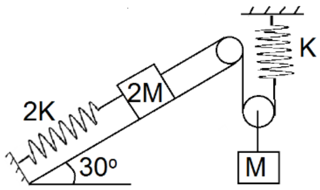
33. Equivalent spring constant of the combination is



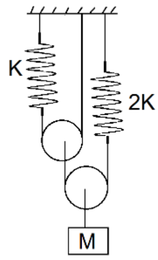
(a) 4K
(b) 4K / 3
(c) 5K / 3
(d) 11K / 3

34. If string connected between the blocks is cut, then acceleration of each block of mass M and 2M are respectively



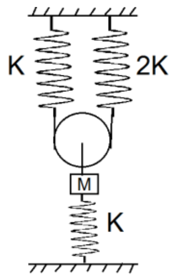
(a) g downwards and $\frac{g}{4}$ downwards to the plane
(b) $\frac{g}{2}$ downwards and $\frac{g}{2}$ downwards to the plane
(c) $\frac{g}{2}$ downwards and g upwards to the plane
(d) $\frac{g}{2}$ downwards and $\frac{g}{2}$ upwards to the plane

35. Equivalent spring constant of the combination



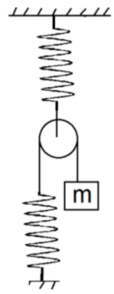
(a) $\frac{2K}{3}$ (b) $\frac{4K}{3}$ (c) $\frac{8K}{3}$ (d) $\frac{16K}{3}$

36. If lower spring is removed suddenly, then acceleration of block will be



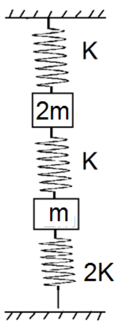
(a) g / 3 (b) 2g / 3 (c) 2g / 9 (d) 3g / 11

37. If each spring has spring constant K, then equivalent spring constant of combination is



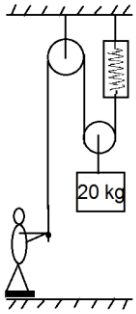
(a) 5 K
(b) 5 K / 2
(c) 2 K / 5
(d) K / 5

38. Elongation or compression in springs from top to bottom are respectively



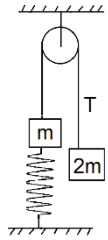
(a) $\frac{7\,Mg}{5\,K}$ elongation, $\frac{3\,Mg}{5\,K}$ compression, $\frac{4\,Mg}{5\,K}$ compression
(b) $\frac{7\,Mg}{5\,K}$ elongation, $\frac{3\,Mg}{5\,K}$ elongation, $\frac{4\,Mg}{5\,K}$ compression
(c) $\frac{4\,Mg}{5\,K}$ elongation, $\frac{3\,Mg}{5\,K}$ elongation, $\frac{7\,Mg}{5\,K}$ compression
(d) $\frac{7\,Mg}{5\,K}$ elongation, $\frac{4\,Mg}{5\,K}$ compression, $\frac{3\,Mg}{5\,K}$ compression

39. Mass of man is 50 kg. If block is moving with a constant acceleration 4 m/s^2 downwards, then reading of spring balance and weighing machine are respectively



(a) 6 kg, 44 kg (b) 8 kg, 46 kg
(c) 4 kg, 42 kg (d) 8 kg, 42 kg

40. If string between the blocks is broken then acceleration of lighter block will be



(a) g downwards (b) g / 2 downwards
(c) zero (d) 2g downwards

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Answer Key :

1	2	3	4	5	6	7	8	9	10
D	a	d	d	a	a	c	a	c	c
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
c	c	c	a	b	b	a	b	b	b
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
b	b	a	b	d	d	b	a	a	c
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
a	b	d	a	d	d	c	a	a	d

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