

Date: 18.09.2022

JB 2 MR BATCH PHYSICS : DCT Topic: Newton's Laws of Motion

1. A mass of 4 kg is suspended by a rope of length 4 m from a ceiling. A force of 20 N in the horizontal direction is applied at the mid-point of the rope as shown in figure. What is the angle which the rope makes with the vertical in equilibrium? Neglect the mass of the rope. Take $g = 10 \text{ ms}^{-2}$



- (a) $\tan^{-1}2$ (b) $\tan^{-1}\left(\frac{1}{2}\right)$ (c) $\tan^{-1}\sqrt{2}$ (d) $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$
- 2. In the figure, a block of weight 60 N is placed on a rough surface. The coefficient of friction between the block and the surfaces is 0.5. What should be the weight W such that the block does not slip on the surface?





3. A man is raising himself and the crate on which he stands with an acceleration of 5 m/s² by a massless rope-andpulley arrangement. Mass of the man is 100 kg and that of the crate is 50 kg. If $g = 10 \text{ m/s}^2$, the contact force between man and the crate is



4. Two blocks of masses M_1 and M_2 are connected with a string passing over a pulley as shown in figure. The block M_1 lies on horizontal surface. The coefficient of friction between the block M_1 and the horizontal surface is μ . The system accelerates. What additional mass m should be placed on the block M_1 so that the system does not accelerate?





5. Two blocks A and B of masses 10 kg and 15 kg are placed in contact with each other rest on a rough horizontal surface as shown in the figure. The coefficient of friction between the blocks and surface is 0.2. A horizontal force of 200 N is applied to block A. The acceleration of the system is (Take $g = 10 \text{ ms}^{-2}$)



6. A trolley of mass 20 kg is attached to a block of mass 4 kg by a massless string passing over a frictionless pulley as shown in the figure. If the coefficient of kinetic friction between trolley and the surface is 0.02, then the acceleration of the trolley and block system is (Take $g = 10 \text{ ms}^{-2}$)



7. Block A of weight 100 N rests on a frictionless inclined plane of slope angle 30° as shown in the figure. A flexible cord attached to A passes over a frictionless pulley and is connected to block B of weight W. Find the weight W for which the system is in equilibrium.





8. Two blocks of masses 10 kg and 20 kg are connected by a massless string and are placed on a smooth horizontal surface as shown in the figure. If a force F = 600 N is applied to 10 kg block, then the tension in the string is



9. Two masses of 5 kg and 3 kg are suspended with the help of massless inextensible strings as shown in figure. The whole system is going upwards with an acceleration of 2 m s⁻². The tensions T_1 and T_2 are respectively (Take g = 10 m s⁻²)



10. Two blocks each of mass M are resting on a frictionless inclined plane as shown in figure. Then



- (a) The block A moves down the plane
- (c) Both the blocks remain at rest
- (b) The block B moves down the plane
- (d) Both the blocks move down the plane



- 11. In the system shown in the figure, the acceleration of 1 kg mass is



12. A monkey of mass 40 kg climbs on a massless rope which can stand a maximum tension of 500 N. In which of the following cases will the rope break? (Take $g = 10 \text{ m s}^{-2}$)

- (a) The monkey climbs up with an acceleration of 5 m s^{-2}
- (b) The monkey climbs down with an acceleration of 5 m s⁻²
- (c) The monkey climbs up with a uniform speed of 5 m $\rm s^{-1}$
- (d) The monkey falls down the rope freely under gravity.
- 13. A mass of 1 kg is suspended by means of a thread. The system is (i) lifted up with an acceleration of 4.9 m s² (ii) lowered with an acceleration of 4.9 m s⁻². The ratio of tension in the first and second case is
 - (a) 3:1 (b) 1:2 (c) 1:3 (d) 2:1

14. A block of mass m is on an inclined plane of angle θ . The coefficient of friction between the block and the plane is μ and tan $\theta > \mu$. The block is held stationary by applying a force P parallel to the plane. The direction of force pointing up the plane is taken to be positive. As P is varied from P₁ = mg(sin $\theta - \mu cos\theta$) to P₂ = mg(sin $\theta + \mu cos\theta$), the frictional force f versus P graph will look like

15. What is the maximum value of the force F such that the block shown in the arrangement, does not move?

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JB 2 MR BATCH CHEMISTRY: DCT Topic: Periodic & Moles (Till Titration)+ States of Matter

16.	10 mL resultir	of 0.5 N HCl, 30 m	L of 0.1	N HNO ₃ and 75 mL	of 0.1 N	$1 H_2 SO_4$ are mixed to	gether.	The normality of the			
	(a)	0.2 N	(b)	0.1 N	(c)	0.4 N	(d)	0.5 N			
17.	The amount of KMnO ₄ required to prepare 100 mL of a 0.1 N solution in an acidic medium is:										
	(a)	3.16 g	(b)	1.58 g	(c)	0.316 g	(d)	31.6 g			
18.	0.185 g	g of an iron wire co	ntaining	99.8% iron is dissol	ved in a	n acid to form ferrou	s ions. 7	The solution requires			
	33 mL of $K_2Cr_2O_7$ solution for complete reaction. The normality of the $K_2Cr_2O_7$ solution is:										
	(a)	0.05	(b)	0.02	(c)	0.20	(d)	0.10			
19.	Volum solution	e of 0.1 M ferrous n.	oxalate	solution required to	react co	ompletely with 60 m	l of 0.1	N acidified KMnO ₄			
	(a)	30 mL	(b)	20 mL	(c)	150 mL	(d)	10 mL			
20.	26.8 g	of Na ₂ SO ₄ . nH ₂ O c	ontains	12.6 g of water. The	value of	n is:					
	(a)	1	(b)	10	(c)	6	(d)	7			
21.	Which	th of the following series of compounds have same mass percentage of carbon?									
	(a)	CO ₂ , CO			(b)	CH_4, C_6H_6, C_2H_2					
	(c)	$C_2H_2, C_6H_6, C_{10}H_8$			(d)	HCHO, CH ₃ COOH, C ₆ H ₁₂ O ₆					
22.	A com	pound contains 38.8	% C, 16	0.0% H and 45.2% N.	The emp	pirical formula of the	compou	and would be:			
	(a)	CH ₃ NH ₂	(b)	CH ₃ CN	(c)	C_2H_5CN	(d)	CH ₂ (NH) ₂			
23.	Helium atom is two times heavier, than a hydrogen molecule at 298 K. The average kinetic energy of helium is										
	(a)	two times that of h	ydrogen	molecule							
	(b)	same as that of hyd	drogen n	nolecule							
	(c)	four times that of h	nydrogei	n molecule							
	(d)	half that of hydrog	en mole	cule							


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Which of the following properties of liquids arise (s) due to the molecular and thermal interaction?
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(a)	Vapour pressure	(b)	Surface tension	(c)	Viscosity	(d)	All of these
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JB 2 MR BATCH MATHEMATICS : DCT Topic: Log + Complex Number + Quadratic Equation

31.	The n	umber of zeros com	ing imm	ediately after the deci	imal poi	nt in the value of $(5)^{23}$	⁵ is:	
	(a)	16	(b)	17	(c)	18	(d)	None of these
32.	The n	umber of solutions of	of log ₂ (y	(x + 5) = 6 - x is:				
	(a)	2	(b)	0	(c)	3	(d)	None of these
33.	The se	et of real values of x	for whi	ch $\log_{0.2} \frac{x+2}{x} \le 1$ is:				
	(a)	$\left(-\infty,-\frac{5}{2}\right]\cup(0,+\infty)$	∞)		(b)	$\left[\frac{5}{2},+\infty\right)$		
	(c)	$(-\infty,-2)\cup(0,+\infty)$)		(d)	none of these		
34.	If the	number $\frac{(1-i)^n}{(1+i)^{n-2}}$ is	s real and	d positive, then n is:				
	(a)	any integer	(b)	2λ	(c)	$4\lambda + 1$	(d)	none of these
35.	$i^n + i^{n+1}$	$i^{+1} + i^{n+2} + i^{n+3}$ is equal	al to:					
	(a)	1	(b)	-1	(c)	0	(d)	none of these
36.	If b +	ic = $(1 + a)z$ and a^2	$+b^{2}+c^{2}$	$2^2 = 1$, then $\frac{1+iz}{1-iz}$ is equivalent.	qual to:			
	(a)	$\frac{a-ib}{1-c}$	(b)	$\frac{a-ib}{1+c}$	(c)	$\frac{a+ib}{1-c}$	(d)	$\frac{a+ib}{1+c}$
37.	(1+i)	$\left(\frac{2+i}{3+i}\right)$ is equal to	:					
	(a)	$-\frac{1}{2}$	(b)	$\frac{1}{2}$	(c)	1	(d)	-1
				Space for Rou	ugh Wo	<u>rk</u>		

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38.	If $z = 1 + I$, then the multiplicative inverse of z^2 is:								
	(a)	1 – i	(b)	$\frac{i}{2}$	(c)	$-\frac{i}{2}$	(d)	2i	
39.	The v	alues of x and y whi	ich satist	fy the equation $\frac{(1+1)^2}{2}$	$\frac{i}{3}x - 2i}{3+i} + i$	$\frac{(2-3i)y+i}{3-i} = i$ are:			
	(a)	x = 0, y = 1	(b)	x = 1, y = 0	(c)	x = 3, y = -1	(d)	x = -1, y = 3	
40.	If (x +	$(-iy)^{1/3} = a + ib$, then	$\frac{x}{a} + \frac{y}{b} =$	=					
	(a)	$2(a^2 - b^2)$	(b)	$4(a^2 - b^2)$	(c)	$8(a^2 - b^2)$	(d)	none of these	
41.	If(1 +	- i) (1+2i) (1+3i)	(1 +	ni) = α + i β , then 2.2	5.10 ($(1 + n^2) =$			
	(a)	$\alpha-i\beta$	(b)	$\alpha^2-\beta^2$	(c)	$\alpha^2 + \beta^2$	(d)	none of these	
42.	$\sqrt{-1}$ -	$-\sqrt{-1-\sqrt{-1to\infty}}$	=						
	(a)	1	(b)	-1	(c)	-ω	(d)	ω^2	
43.	The v	alue of α and β for	r which	α, β are roots of x^2	– 3ax + f	3 = 0 are			
	(a)	$1, \frac{1}{2}$	(b)	1,1	(c)	2, 1	(d)	1,2	
44.	If α, f	3 are roots of $ax^2 + b^2$	bx + c =	0 such that $\alpha^2 + \beta^2$	$^{2} = 1$, the	en:			
	(a)	$b^2 + a^2 + 2ac = 0$	(b)	$b^2 - a^2 = 2ac$	(c)	$b^2 + a^2 + 2ac$	(d)	None of these	
45.	If 9 ^x –	$4(3^{x+2}) + 3^5 = 0$, the	en the sc	lution pair is					
	(a)	(1,3)	(b)	(2, 4)	(c)	(1, 2)	(d)	(2, 3)	
				* * *	* *				

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JB 2 MR BATCH PHYSICS: DCT ANSWER KEY Topic: Newton's Laws of Motion

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

Max Marks: 60

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JB 2 MR BATCH CHEMISTRY: DCT ANSWER KEY Topic: Periodic & Mole (Till titration), States of Matter

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

Max Marks: 60

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JB 2 MR BATCH MATHEMATICS: DCT ANSWER KEY Topic: Log + Complex Number + Quadratic Equation

31.	(b)	32.	(d)	33.	(a)	34.	(c)	35.	(c)
36.	(d)	37.	(c)	38.	(c)	39.	(c)	40.	(b)
41.	(c)	42.	(d)	43.	(d)	44.	(b)	45.	(d)