

Max Marks: 60

Date: 28.08.2022

JB 2 MR BATCH PHYSICS : DCT Topic: Relative Motion and NLM

1. With what acceleration 'a' should the box in the figure descend so that the block of mass M exerts a force Mg/4 on the floor of the box?

- (a) g/4 (b) g/2 (c) 3g/4 (d) 4g
- 2. Consider the following statement about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table.

$$F \longrightarrow 3 \text{kg} 2 \text{kg} 1 \text{kg}$$

- A. All blocks move with the same acceleration.
- B. The net force on each block is the same

Which of these statement are/is correct?

(a) A only (b) B only (c) both A and B (d) neither A nor B

3. A body of mass 2 kg moves vertically downwards with an acceleration $a = 19.6 \text{ m/s}^2$. The force acting on the body simultaneously with the force of gravity is (g = 9.8 m/s² neglect air resistance)

(a) 19.6 N (b) 19.2 N (c) 59.2 N (d) 58.8 N

Space for Rough Work



4. A time dependent force F = 3t (F in Newton and t in second) acts on three blocks m_1 , m_2 and m_3 kept in contact on a rough ground as shown. Co-efficient of friction between blocks and ground is 0.4. If m_1 , m_2 and m_3 are 3 kg, 2 kg and 1 kg respectively, the time after which the blocks start to move is ($g = 10 \text{ ms}^{-2}$)



5. Two blocks, each having a mass M, rest on frictionless surface as shown in the figure. If the pulleys are light and frictionless, and M on the incline is allowed to move down, then the tension in the string will be



- 6. A body of mass m is kept stationary on a rough inclined plane of inclination θ . The magnitude of force acting on the body by the inclined plane is
 - (a) mg (b) mg sin θ (c) mg cos θ (d) mg $\sqrt{1 + \cos^2 \theta}$
- 7. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be:



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8. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet of water at a rate of 1 kgs⁻¹ at a speed of 5 ms⁻¹. The initial acceleration of the block is

(a)
$$\frac{2}{5}$$
ms⁻² (b) $\frac{5}{2}$ ms⁻² (c) 5 ms⁻² (d) $\frac{1}{5}$ ms⁻²

9. A block of mass m is attached to a massless spring of spring constant K. This system is accelerated upward with acceleration a. The elongation in spring will be

(a)
$$\frac{mg}{K}$$
 (b) $\frac{m(g-a)}{K}$ (c) $\frac{m(g+a)}{K}$ (d) $\frac{ma}{K}$

10. The elevator shown in figure is descending with an acceleration of 2 ms⁻². The mass of the block A = 0.5 kg. The force exerted by the block A on the block B is $(g = 10 \text{ ms}^{-2})$



- 11. A man slides down a light rope whose breaking strength is η times his weight ($\eta < 1$). The maximum acceleration of the man so that the rope just breaks is
 - (a) $g(1-\eta)$ (b) $g(1+\eta)$ (c) $g\eta$ (d) $\frac{g}{\eta}$
- 12. A body of mass 1.5 kg is thrown vertically upwards with an initial velocity of 40 m/s reaches its highest point after 3 s. The air resistance acting on the body during the ascent is (assuming air resistance to be uniform, $g = 10 \text{ m/s}^2$)



13. Three blocks of masses 2kg, 4kg and 6kg are connected by string and resting on a frictionless incline of 53° as shown. A force of 120 N is applied upward along the incline to the 6 kg block. If the strings are ideal, the ratio T_1/T_2 will be (g = 10 ms⁻²)



14. A block of mass 20 kg is balanced by three strings A, B & C as shown in figure. Ratio of tensions in string A and B (T_A/T_B) is



15. A block of mass 0.1 kg is held against a wall by applying a horizontal force of 5 N on the block. If the coefficient of friction between the block and the wall is 0.5, the magnitude of the frictional force acting on the block is

| (a) | 2.5 N | (b) | 0.98 N | (c) | 4.9 N | (d) | 0.49 N |
|-----|-------|-----|--------|-----|-------|-----|--------|
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JB 2 MR BATCH CHEMISTRY: DCT Topic: Mole Concept + Periodic Table

| 16. | $^{35}_{17}Cl$ and $^{37}_{17}Cl$ are two isotopes of chlorine. If average atomic mass is 35.5 then ratio of these two isotopes is | | | | | | | | | | | |
|--|--|--|---------------------------|--------------------------------------|------------------------|--|-----------------------------------|------------------|--|--|--|--|
| | (a) | 35:37 | (b) | 1:3 | (c) | 3:1 | (d) | 2:1 | | | | |
| 17. | Num | ber of atoms in i | ncreasing or | der in 1.6 g CH ₄ , 1. | .7 g NH ₃ a | nd 1.8 g H ₂ O is | | | | | | |
| | (a) | $H_2O=NH_3\!=\!$ | CH ₄ | | (b) | $H_2O < NH_3 < CH_4$ | 1 | | | | | |
| | (c) | $CH_4 < NH_3 <$ | H_2O | | (d) | $CH_4 = NH_3 < H_2O$ | | | | | | |
| 18. | Whic | Which has maximum number of H-atoms per gram of the substance? | | | | | | | | | | |
| | (a) | CH_4 | (b) | CuSO ₄ .5H ₂ O | (c) | H_2O_2 | (d) | H ₂ O | | | | |
| 19. | If eac | h O-atom has tw | vo equivalen | ts, volume of one e | quivalent | of O ₂ gas at STP is | | | | | | |
| | (a) | 22.4 L | (b) | 11.2 L | (c) | 5.6 L | (d) | 44.8 L | | | | |
| 20. | In a g | as S and O are 5 | 50% by mass | s, hence, their mole | ratio is | | | | | | | |
| | (a) | 1:1 | (b) | 1:2 | (c) | 2:1 | (d) | 3:1 | | | | |
| 21. | The p | bercentage comp | osition of ca | urbon by mole in me | ethane is | | | | | | | |
| | (a) | 75% | (b) | 20% | (c) | 25% | (d) | 80% | | | | |
| 22. | For the | ne following read | ction, the ma | ass of water produce | ed from 44 | 45 g of C ₅₇ H ₁₁₀ O ₆ is | | | | | | |
| | 2C ₅₇ H | $H_{110}O_6(s) + 1630$ | $g_2(g) \rightarrow 1140$ | $CO_2(g) + 110 H_2O(l)$ | .) | | | | | | | |
| | (a) | 490 g | (b) | 495 g | (c) | 445 g | (d) | 890 g | | | | |
| 23. | Al and KClO ₃ react together to form Al ₂ O ₃ according to | | | | | | | | | | | |
| $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ | | | | | | | | | | | | |
| | 4Al + | $-3O_2 \rightarrow 2Al_2O_3$ | | | | | | | | | | |
| | 4 mo | les of KClO ₃ (50 |)% pure) on | reaction with exces | s of Al fo | rm how many moles | of Al ₂ O ₃ | ? | | | | |
| | (a) | 2 mol | (b) | 4 mol | (c) | 6 mol | (d) | 8 mol | | | | |
| | | | | Space for F | Rough Wo | ork | | | | | | |



Learning with the Speed of Mumbai and the Tradition of Kota

| 24. | 36.6 g of the crystal hydrate of barium chloride when roasted lose 5.4 g in mass. Thus, salt is [Ba = 137] | | | | | | | | | | |
|-----|---|---|-----------|--------------------------------------|-----------|--------------------------------------|----------|--------------------------------------|--|--|--|
| | (a) | BaCl ₂ .5H ₂ O | (b) | BaCl ₂ .4H ₂ O | (c) | BaCl ₂ .3H ₂ O | (d) | BaCl ₂ .2H ₂ O | | | |
| 25. | The ato | oms of the elements | belongi | ng to the same group | of the p | eriodic table will have | e | | | | |
| | (a) | the same number of | of protor | 18 | | | | | | | |
| | (b) | (b) the same number of electrons in the valence-shell | | | | | | | | | |
| | (c) | (c) the same number of neutrons | | | | | | | | | |
| | (d) the same number of electrons | | | | | | | | | | |
| 26. | Which will have graded property similar to electronic configuration $1s^22s^22P^63s^23P^64s^1$? | | | | | | | | | | |
| | (a) | $[Ar]3d^{10} 4s^1$ | (b) | $[Kr]4d^{10} 5s^1$ | (c) | [Kr] 5s ¹ | (d) | All of these | | | |
| 27. | Which | has maximum IE? | | | | | | | | | |
| | (a) | Mg | (b) | Mg^+ | (c) | Mg^{2+} | (d) | Equal | | | |
| 28. | Which | of the following wi | ll have t | he most negative elec | tron affi | inity and which the le | ast nega | tive? | | | |
| | (a) | F, Cl | (b) | Cl, F | (c) | Cl, S | (d) | Cl, P | | | |
| 29. | Metalli | ic nature increased r | noving o | down the group becau | ise | | | | | | |
| | (a) | nuclear charge inc | rease | | (b) | shielding increases | | | | | |
| | (c) | Both (a) and (b) | | | (d) | None of the above | | | | | |
| 30. | Three elements X,Y and Z are in the 3^{rd} period of the periodic table. The oxides of X,Y and Z, respectively basic, amphoteric and acidic. The correct order of the atomic number of X,Y and Z is | | | | | | | | | | |
| | (a) | Z < Y < X | (b) | X < Y < Z | (c) | X < Z < Y | (d) | Y < X < Z | | | |

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JB 2 MR BATCH PHYSICS : DCT ANSWER KEY Topic: Relative Motion and NLM

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

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JB 2 MR BATCH CHEMISTRY: DCT ANSWER KEY Topic: Periodic Properties +Moles+ Oxidation

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