

# SAMPLE PAPER

## 2019 JEE ADVANCED

### PHYSICS

SET-2

Roll No.

--	--	--	--	--	--	--

#### Section 1 (Maximum Marks: 18)

- (i) This section consists of **SIX** questions.
- (ii) Each question has **FOUR** options (a), (b), (c), and (d). **ONLY ONE** of these four options is correct.
- (iii) For each question, darken bubble corresponding to the correct option in the OMR.
- (iv) For each question, marks will be awarded in one of the following categories:  
Full Marks : +3 If only the bubble corresponding to the correct option is darkened.  
Zero Marks : 0 If none of the bubbles is darkened.  
Negative Marks : -1 In all other cases.

1. A cone of radius  $r$  and height  $h$  rests on rough horizontal surface, the coefficient of friction between the cone and the surface being  $\mu$ . A gradually increasing horizontal force  $F$  is applied to the vertex of the cone. The largest value of  $\mu$  for which will slide before it topples is

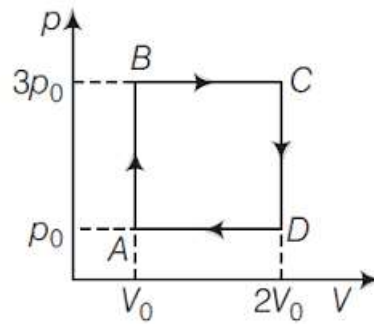
- (a)  $\mu = \frac{r}{2h}$
- (b)  $\mu = \frac{2r}{5h}$
- (c)  $\mu = \frac{r}{h}$
- (d)  $\mu = \sqrt{\frac{r}{h}}$



**MISOSTUDY.COM**

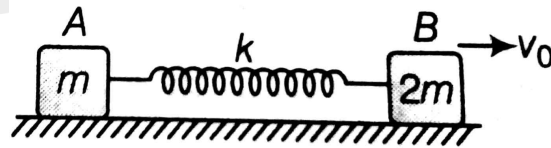
The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

2. An ideal monoatomic gas is carried around the cycle  $ABCD$  as shown in the figure. The efficiency of the gas cycle is



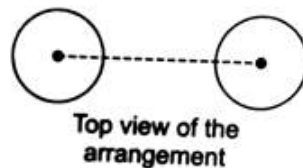
- (a)  $4/21$   
 (b)  $2/21$   
 (c)  $4/31$   
 (d)  $2/31$

3. Two blocks spring system is placed on a smooth horizontal surface as shown in figure. If  $2m$  mass is given, velocity  $v_0$  towards right then find incorrect statement about motion



- (a) Time period of SHM is  $2\pi\sqrt{\frac{2m}{3k}}$   
 (b) Maximum speed of  $A$  w.r.t. ground is  $\frac{5v_0}{3}$   
 (c) Kinetic energy in the frame of CM is  $mv_0^2/6$   
 (d) Maximum speed of  $A$  w.r.t. ground is  $2v_0/3$

4. Two long straight wires with the same cross-section are arranged in air parallel to one another. The distance between the axis of the wire is  $\eta$  times larger than the radius of wires cross-section. The capacitance of the wires per unit length would be [Take,  $\eta \gg 1$ ]



- (a)  $\frac{2\pi\epsilon_0}{\ln \eta}$   
 (b)  $\frac{\pi\epsilon_0}{2 \ln \eta}$   
 (c)  $\frac{\pi\epsilon_0}{\ln \eta}$   
 (d)  $\frac{4\pi\epsilon_0}{6 \ln \eta}$



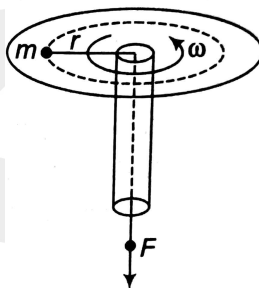
**MISOSTUDY.COM**

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

5. When a thin transparent sheet of refractive index  $\mu = \frac{3}{2}$  is placed near one of the slit in YDSE, the intensity at centre of screen reduces to half of maximum intensity. Then, minimum thickness of sheet should be

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

6. A small particle of mass  $m$  and its retaining cord are spinning with angular velocity  $\omega$  on the horizontal surface of a smooth disc. As force  $F$  is slightly relaxed,  $r$  increases and  $\omega$  changes. Determine the rate of change of  $\omega$  with respect to  $r$



- (a)  $+\frac{\omega}{r}$   
 (b)  $-\frac{\omega}{r}$   
 (c)  $-\frac{2\omega}{r}$   
 (d)  $+\frac{2\omega}{r}$

### Section 2 (Maximum Marks: 16)

- (i) This section consists of **FOUR** questions.  
 (ii) Each question has **FOUR** options (a), (b), (c), and (d). **ONE OR MORE THAN ONE** of these four options is correct.  
 (iii) For each question, darken bubble corresponding to the correct option in the OMR.  
 (iv) For each question, marks will be awarded in one of the following categories:  
 Full Marks : +4 If only the bubble corresponding to the correct option is darkened.  
 Partial Marks : +1 For darkening a bubble corresponding to **each correct option**, provided **NO** incorrect option is darkened.  
 Zero Marks : 0 If none of the bubbles is darkened.  
 Negative Marks :-2 In all other cases.



**MISOSTUDY.COM**

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

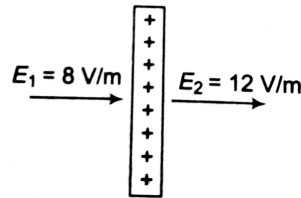
7. Ball  $A$  of mass  $m$  moving with speed  $v$  colliding head on with stationary ball  $B$  of same mass. If  $e$  is coefficient of restitution, which of the following statements are correct?
- Ratio of velocities  $A$  and  $B$  after collision is  $\left(\frac{1+e}{1-e}\right)$
  - Ratio of final and initial velocities of  $A$  is  $\left(\frac{1-e}{2}\right)$
  - Ratio of velocities of balls  $A$  and  $B$  after collision is  $\left(\frac{1-e}{1+e}\right)$
  - Ratio of final and initial velocities of ball  $B$  is  $\left(\frac{1+e}{3}\right)$
8. Two particles  $A$  and  $B$  executing SHM along same straight line, with same amplitude and same mean position.  $A$  starts its motion from mean position and moves towards positive extreme while  $B$  starts from negative extreme position. Angular frequency of  $A$  is  $\omega_A$  and that of  $B$  is  $\omega_B$ , choose the correct statement (s).
- If  $\omega_B = 2\omega_A$ , then when they meet first their velocity will be zero.
  - If  $\omega_B > 2\omega_A$ , then when they meet first their velocity are in same direction.
  - If  $\omega_B < 2\omega_A$ , then when they meet their velocity will be in same direction.
  - Their velocity when they meet does not depend on  $\omega$ .
9. If a circular coil expands radially in a region of magnetic field and no electromagnetic force is produced in the coil. This is because
- the magnetic field is constant
  - the magnetic field is in the same plane as the circular coil it may or may not vary
  - the magnetic field has a perpendicular (to the plane of the coil) component whose magnitude is decreasing suitably
  - there is a constant magnetic field in the perpendicular (to the plane of the coil) direction.
10. A straight conductor carries a current. Assume that all the free electrons in the conductor move with the same drift velocity  $v$ .  $A$  and  $B$  are two observers on a straight line  $XY$  parallel to the conductor.  $A$  is stationary,  $B$  moves along  $XY$  with a velocity  $v$  in the direction of the free electrons.
- $A$  and  $B$  observe the same magnetic field
  - $A$  observes a magnetic field,  $B$  does not
  - $A$  and  $B$  observe magnetic fields of the same magnitude but opposite directions
  - $A$  and  $B$  do not observe any electric field



### Section 3 (Maximum Marks: 6)

- (i) This section consists of **TWO** questions.
- (ii) The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- (iii) For each question, darken bubble corresponding to the correct option in the OMR.
- (iv) For each question, marks will be awarded in one of the following categories:  
Full Marks : +3 If only the bubble corresponding to the correct option is darkened.  
Zero Marks : 0 If none of the bubbles is darkened.

11. A particle is suspended by a light vertical inelastic string of length ' $l$ ' from a fixed support. At its equilibrium position, it is projected horizontally with a speed  $\sqrt{6gl}$ . What is the ratio of the tension in the string in its horizontal position to that in string when the particle is vertically above the point of support?
12. The electric field on two sides of a charges plate is shown in the figure. If the charge density on the plate is  $n \epsilon_0$ , then  $n$  is



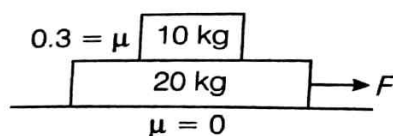
### Section 4 (Maximum Marks: 6)

- (i) This section contains **ONE** paragraph.
- (ii) Based on the paragraph, there are **TWO** questions.
- (iii) Each question has **FOUR** options (a), (b), (c), and (d). **ONLY ONE** of these four options is correct.
- (iv) For each question, darken bubble corresponding to the correct option in the OMR.
- (v) For each question, marks will be awarded in one of the following categories:  
Full Marks : +3 If only the bubble corresponding to the correct option is darkened.  
Zero Marks : 0 If none of the bubbles is darkened.

This section contains 2 multiple choice questions, relating to two paragraph with two questions in each paragraph and two matching type question. Each question has four choices, (a), (b), (c), and (d) out of which only one is correct.

#### Passage

Two blocks are placed as shown in the figure. The friction between 20 kg block and horizontal surface is zero and friction exists between two blocks. A horizontal force is applied on the lower block. Answer the following questions on the basis of given situation.



**MISOSTUDY.COM**

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

13. The range of  $F$  so that 10 kg block do not slip relative to 20 kg block.
- (a) 20 N to 40 N
  - (b) 0 N to 40 N
  - (c) 5 N to 30 N
  - (d) 0 N to 90 N
14. Now if the force  $F$  is applied on the upper block, then choose the correct option.
- (a) If  $F = 30\text{N}$ , then  $(f_s)_{\text{max}}$  will act between two blocks
  - (b) If  $F = 45\text{N}$ , then  $(f_s)_{\text{max}}$  will act between two blocks
  - (c) If  $F = 45\text{N}$ , then  $f_s[< (f_s)_{\text{max}}]$  will act between two blocks
  - (d) None of the above



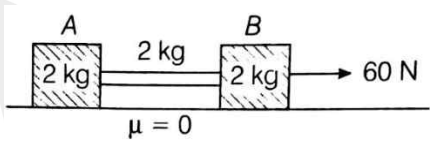
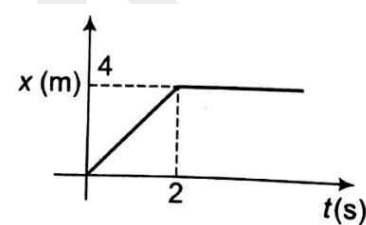
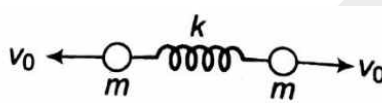
**MISOSTUDY.COM**

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

### Section 5 (Maximum Marks: 9)

- (i) This section consist of **THREE** question of matching type.  
 (ii) For the question, darken bubble corresponding to the correct option in the OMR.  
 (iii) For the question, marks will be awarded in one of the following categories:  
 Full Marks : +3 If only the bubble corresponding to the correct option is darkened.  
 Zero Marks : 0 If none of the bubbles is darkened.  
 Negative Marks : -1 In all other cases.

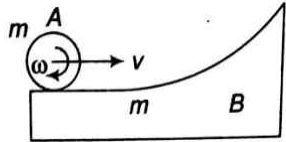
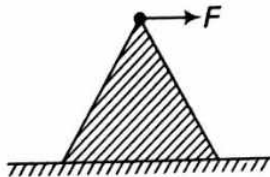
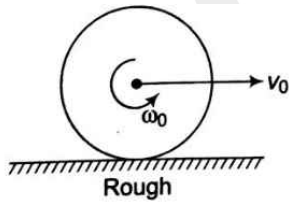
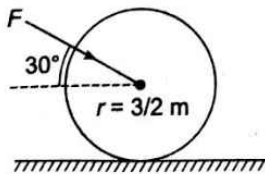
15. Match values of Column I to situation given in Column II.

Column I	Column II
A. 2	i. Two particles of mass 2 kg and 6 kg collide with each other on smooth horizontal surface. If velocity of CM before collision is 10 m/s. Then, the total momentum of system after collision is (kg m/s)
B. 0.2	ii. The mass of string is 2 kg. The tension of point A is <div style="text-align: center;">  </div>
C. 80	iii. Position graph of particle of mass 0.1 kg moving along x-axis. Impulse in kg m/s at $t = 2s$ is <div style="text-align: center;">  </div>
D. 20	iv. A system composed of two small spheres with same mass $m$ . The spring is at natural length and spheres are projected with initial speed $v_0$ , the maximum elastic potential energy is $\frac{N}{2} mv_0^2$ . The value of $N$ is <div style="text-align: center;">  </div>

**Codes**

	A	B	C	D
(a)	i	ii	iii	iv
(b)	iv	iii	i	ii
(c)	iv	ii	i	iii
(d)	iii	ii	iv	i

16. Column I carry some situations and match them with suitable match with Column II.

Column I	Column II
<p>A. A solid cylinder rolls without sliding with velocity <math>v</math> on the horizontal surface of wedge <math>B</math>. All surfaces are smooth and wedge has no initial speed then maximum height of cylinder is <math>\frac{xv^2}{g}</math>. The value of <math>x</math> is</p> 	<p>i. <math>\frac{1}{4}</math></p>
<p>B. A horizontal force is applied at top of a equilateral triangular block having mass <math>m</math> and side length <math>a</math> as given. The coefficient of friction for toppling before slipping.</p> 	<p>ii. <math>\frac{1}{\sqrt{3}}</math></p>
<p>C. A uniform circular disc of radius <math>r</math> is placed on a rough horizontal surface and given a linear velocity <math>v_0</math> and angular velocity <math>\omega_0</math>. If the disc will come to rest, then value of the <math>\frac{v_0}{\omega_0 r}</math></p> 	<p>iii. <math>\frac{4}{50}</math></p>
<p>D. A hollow uniform sphere of mass <math>2 \text{ kg}</math> is kept on a rough horizontal surface. A force of <math>10 \text{ N}</math> is applied at centre of sphere. Minimum value of <math>\mu</math> so that sphere starts pure rolling, then the value of <math>\frac{\mu}{\sqrt{3}}</math> is</p> 	<p>iv. <math>\frac{1}{2}</math></p>

**Codes**

	A	B	C	D
(a)	iv	i	ii	iii
(b)	iii	ii	i	ii
(c)	i	ii	iv	iii
(d)	iii	ii	i	iv



17. Match the Column I with Column II.

Column I	Column II
A. An object is placed at the focus of convex mirror, the image will be at	i. Magnetic
B. The diffraction phenomena is valid only at microscopic level. (T/F)	ii. Electric
C. If the magnetic field through a loop is variable then the force exerted on the free electrons of loop is due to .... force.	iii. Can't form an image
D. If two capacitors are in series and charge on each capacitor is Q then net positive charge supplied by the battery is	iv. Infinity
	v. True
	vi. False
	vii. + Q
	viii. + 2Q

**Codes**

	A	B	C	D
(a)	iii	vi	ii	vii
(b)	iv	v	i	viii
(c)	iv	vi	i	vii
(d)	iii	v	ii	viii



**MISOSTUDY.COM**

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804