

JEE Main (Phase-II) 2020

Memory Based Questions & Solutions

SUBJECT

PHYSICS

Date: 05 September, 2020 (Shift-1)

Time: 9 PM to 12 PM

HAZRATGANJ

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Shahnajaf Road, Hazratganj,
Lucknow -
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INDIRA NAGAR

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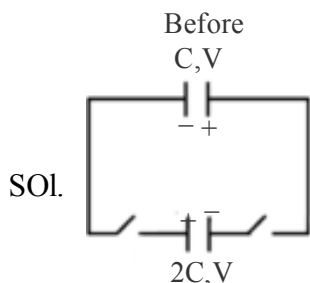
ALIGANJ

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- Q1. Two parallel plate capacitors of capacitance C and $2C$ are charged upto a potential difference V and $2V$ respectively. Now these capacitors are connected in parallel to each other such that positive charged plate of capacitor C is connected to negative charged plate of capacitors $2C$. Find amount of change in potential energy of system.

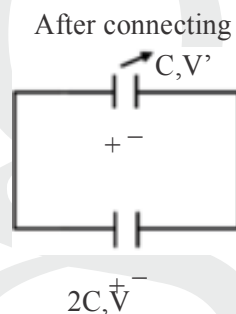
(1) CV^2 (2) $\frac{CV^2}{2}$ (3) $2CV^2$ (4) $3CV^2$

Ans. (4)



Charge on $C = CV$

Charge on $2C = (2C) 2V$



From charge conservation,
Common potential $V' = V$

$$2C(2V) - CV = (C + 2C)V'$$

$$\Delta U = U_{\text{in}} = U_{\text{final}}$$

$$= \left(\frac{1}{2} CV^2 + \frac{1}{2} 2C \times 4V^2 \right) - \left(\frac{1}{2} CV^2 + \frac{1}{2} \times 2CV^2 \right)$$

$$\Delta U = 3CV^2$$

2. A bullet of mass 5g moving with a speed of 210 m/s hit a stationary plank and comes to rest. If half of its kinetic energy is absorbed by bullet itself and remaining half kinetic energy by plank, then find increase in the temperature of bullet in $^{\circ}\text{C}$: (Given specific heat of bullet is $6125\text{ J/g}^{\circ}\text{C}$)
(1) 1 (2) 1.2 (3) 1.6 (4) 1.8

Ans. (4)

Sol. As per given condition

$$\frac{1}{2} \times \frac{1}{2} mv^2 = (ms\Delta T)_{\text{bullet}}$$

$$\frac{1}{2} \times \frac{1}{2} 5 \times 10^{-3} \times (210)^2 = (5 \times 10^{-3})(6125)(\Delta T)$$

$$\Delta T = 1.8^{\circ}\text{C}$$

Q.3 A shell of relative density $\frac{27}{9}$, is just submerged in water. If its inner and outer radius is r and R

respectively, then $\frac{r}{R}$ will be :

(1) $\left(\frac{1}{3}\right)^{1/3}$

(2) $\left(\frac{2}{3}\right)^{1/3}$

(3) $\left(\frac{3}{4}\right)^{1/3}$

(4) $\left(\frac{5}{9}\right)^{1/3}$

Ans. (2)

Sol. In equilibrium

$$mg = F_B$$

$$\frac{4}{3}\pi(R^3 - r^3)\rho_0 g = \frac{4}{3}\pi R^3 \rho_w g$$

$$\left[1 - \left(\frac{r}{R}\right)^3\right] \frac{27}{9} \rho_0 = \rho_w$$

$$1 - \frac{r^3}{R^3} = \frac{9}{27}$$

$$1 - \frac{1}{3} = \frac{r^3}{R^3}$$

$$\frac{2}{3} = \frac{r^3}{R^3}$$

$$\frac{r}{R} = \left(\frac{2}{3}\right)^{1/3}$$

Q.4 Acceleration due to gravity at height $h = \frac{R}{2}$ is equal to acceleration due to gravity at depth d from the surface of earth then find d in terms of R . when R is radius of earth.

(1) $\frac{4}{3}R$

(2) $\frac{4}{9}R$

(3) $\frac{5}{9}R$

(4) $\frac{R}{3}$

Ans. (3)

Sol. Given that

$$g_n = g_d$$

$$\frac{GM}{(R+h)^2} = \frac{GM}{R^3}(R-d)$$

$$\frac{GM}{(R+R/2)^2} = \frac{GM}{R^3}(R-d)$$

$$\frac{4GM}{9R^2} = \frac{GM}{R^3}\left(1 - \frac{d}{R}\right)$$

$$\frac{4}{9} = 1 - \frac{d}{R}$$

$$\frac{d}{R} = 1 - \frac{4}{9} = \frac{5}{9}$$

$$d = \frac{5}{9}R$$

Q.5 Voltage range of Galvanometer of resistance R is 0 to 1V. When it's range increases up to 2V, for this the additional resistance required in series will be :

(1) R

(2) $2R$

(3) $3R$

(4) $4R$

Ans. (1)

Soll. $i_g = \frac{V}{R_g} = \frac{1}{R}$

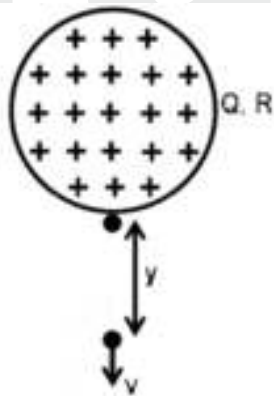
Let the required resistance be r

$$i_g(R+r) = 2$$

$$\frac{R+r}{R} = 2$$

$$r = R$$

Q.6 A uniformly charged sphere of charge Q and radius R is placed at some height from ground surface and sphere is fixed. Now a charged particle of mass m and charge q is released from rest just below to the sphere. What will be speed of particle after travelling y -distance.



(1) $\sqrt{2gy}$

(2) $\sqrt{\frac{2kQq}{m} \frac{y}{R(R+y)}}$

(3) $\sqrt{2gy + \frac{2kQq}{m} \frac{y}{R(R+y)}}$

(4) $\sqrt{gy + \frac{kQq}{m} \frac{y}{R(R+y)}}$

Ans. (3)

Sol. By using total energy conservation

$$\Delta KE + (\Delta PE)_{\text{electro}} + (\Delta PE)_{\text{gravitation}} = 0$$

$$\frac{1}{2}mv^2 + \left(k \frac{Qq}{R+y} - k \frac{Qq}{R} \right) + (-mgy) = 0$$

$$\frac{1}{2}mv^2 = mgy + kQq \left(\frac{1}{R} - \frac{1}{R+y} \right)$$

$$V = \sqrt{2gy + \frac{2kQq}{m} \frac{y}{R(R+y)}}$$

Q.7 In a photoelectric effect experiment potential difference between plates increases keeping incident light on cathode plate remains unchanged which of the following is correct about saturation current :

- (1) Increases (2) Decreases
(3) Remain same (4) First increases then decreases

Ans. (3)

Sol. Saturation current depends only on intensity of incident light.

Q.8 A disc of momentum of inertia I rotating about its own axis with angular speed ω . It is placed on another disc of moment of inertia $3I$ which is at rest. Both disc have common axis of rotation. What will be the loss of kinetic energy when both discs attain common angular velocity.

- (1) $\frac{I\omega^2}{8}$ (2) $\frac{I\omega^2}{4}$ (3) $\frac{3I\omega^2}{8}$ (4) $\frac{5I\omega^2}{8}$

Ans. (3)

Sol. From angular momentum conservation

$$I\omega + 0 = I\omega_c + 3I\omega_c$$

$$\omega_c = \frac{\omega}{4}$$

Loss of kinetic energy

$$= \frac{1}{2}I\omega^2 - \frac{1}{2}(I + 3I)\left(\frac{\omega}{4}\right)^2$$

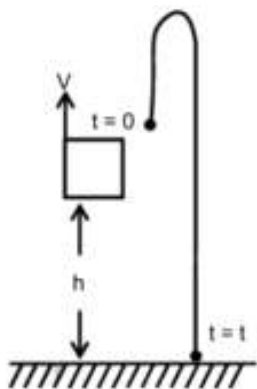
$$= \frac{1}{2}I\omega^2 - \frac{1}{2}I\frac{\omega^2}{4}$$

$$= \frac{3}{8}I\omega^2$$

Q.9 A helicopter is rising up from ground with an acceleration of $g \text{ m/s}^2$ starting from rest. after rising a height h , it attain a velocity of $v \text{ m/s}$. At this instant a particle is now released from helicopter. Take $t=0$ at releasing time calculate the time t when particle reaches to the ground.

- (1) $\sqrt{\frac{2h}{g}}$ (2) $2\sqrt{\frac{2h}{g}}$ (3) $(1+\sqrt{2})\sqrt{\frac{2h}{g}}$ (4) $4\sqrt{\frac{2h}{g}}$

Ans. (3)



Sol.

⇒ For upward motion of helicopter

$$v^2 = u^2 + 2as$$

$$v^2 = 0 + 2gh$$

$$v = \sqrt{2gh}$$

⇒ Now particle will start moving under gravity.

$$s = ut + \frac{1}{2}at^2$$

$$-h = \sqrt{2gh}t - \frac{1}{2}gt^2$$

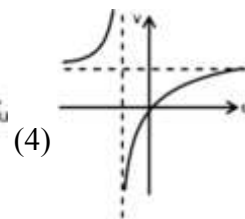
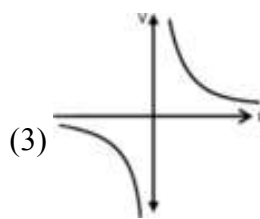
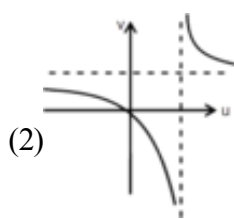
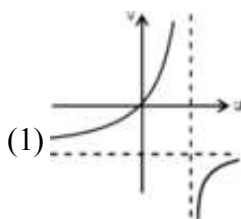
$$\frac{1}{2}gt^2 - \sqrt{2gh}t - h = 0$$

than $t = \frac{\sqrt{2gh} \pm \sqrt{2gh + 4 \times \frac{g}{2} \times h}}{2 \times \frac{g}{2}}$

$$t = \sqrt{\frac{2gh}{g}}(1 + \sqrt{2})$$

$$t = \sqrt{\frac{2h}{g}}(1 + \sqrt{2})$$

10. Which of the following graph represents relation between the image position (v) and object position (u) from the concave lens.



Ans. (1)

Sol. By using relation $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

JEE Main - 2020

Best Result in U.P.



Aditya Pandey
Percentile
99.936
City Topper

Application No. 200310320565
DOB - 23-12-2002

65 Students Above 99 Percentile

145 Students Above 98 Percentile

208 Students Above 97 Percentile

SCHOOL INTEGRATED PROGRAM (SIP)

Tradition of Gravity Continues,
Once Again Historical Result,
100% Students Cracked
JEE Main
(Based on Last Yr Cut off)

2020

80 Out of 80
Cracked JEE Main
We had three Batches
of 55, 15 and 10.
Many Top Ranks are
from these Batches

2019

79 Out of 80 | **50 Out of 79**
in | **in**
JEE Main | **JEE Adv.**

2018

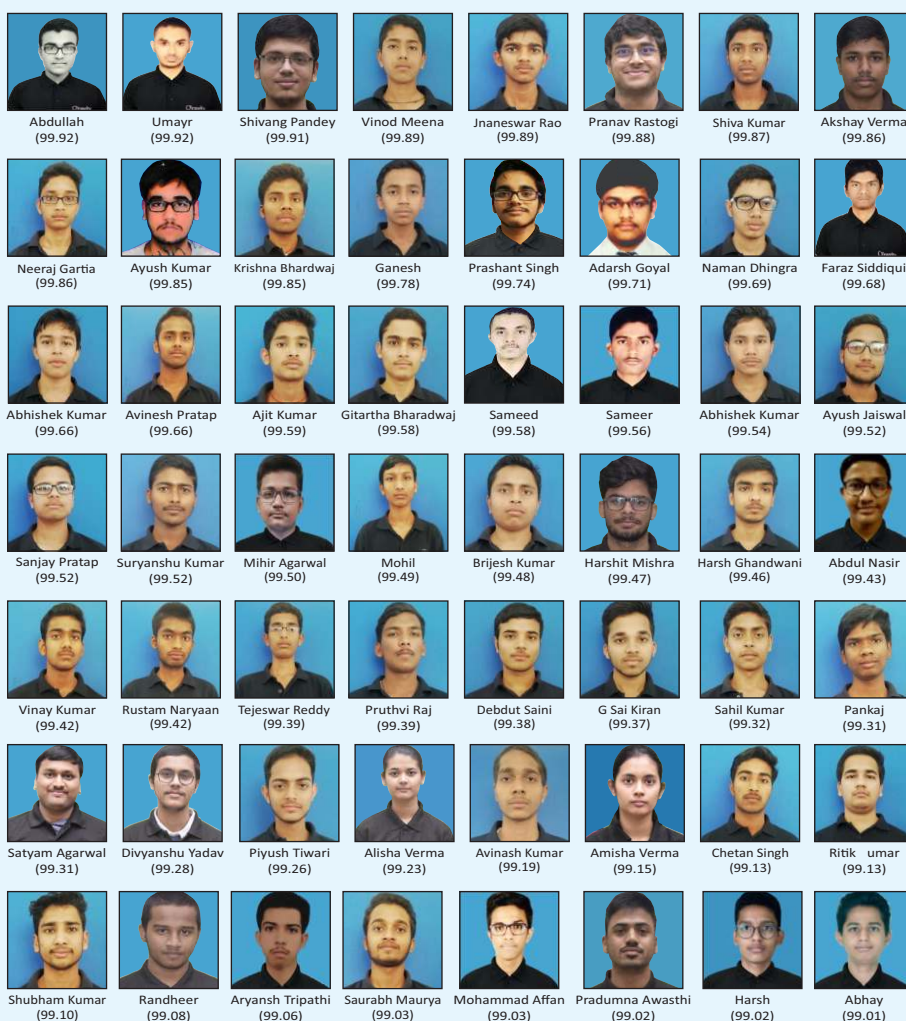
83 Out of 85 | **62 Out of 83**
in | **in**
JEE Main | **JEE Adv.**

2017

80 Out of 85 | **63 Out of 80**
in | **in**
JEE Main | **JEE Adv.**

2016

39 Out of 40 | **31 Out of 39**
in | **in**
JEE Main | **JEE Adv.**





Tarun

194
AIR
(General)



Aniket Agarwal

337
AIR
(General)



Shubh Sahu

494
AIR
(General)



Shlok Nemani

497
AIR
(General)

50 out of 79 Cracked JEE Advanced from SIP (School Integrated Program)

4 Ranks under 500 (General Category) | 2 Ranks under 10 (Reserved Category)

126 Selections in JEE Advanced | 61 Students above 99 Percentile in JEE Main 2019



Sanjana

AIR - 3*



Akash

AIR - 4*



Priyanka

AIR - 68*



Bibek Lakra

AIR - 150*



Neha Raj

AIR - 177*



Arindam

AIR - 809
(General EWS)



Priyam

AIR - 1378
(General)



Mihir Chawla

AIR - 2237
(General)



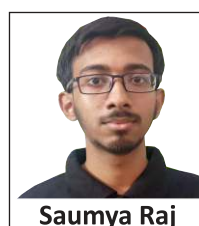
Madhur Kumar

AIR - 2382
(General)



Manish Kumar

AIR - 2388
(General)



Saumya Raj

AIR - 2656
(General)



Raghav

AIR - 2659
(General)



Ritveek

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Aryan Rastogi

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Devansh

AIR - 3600
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Abhisht Bose

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