Physics Galaxy
Telegram Test Series

DPYQ JEE Main FULL Test - 2
for
JEE Main & NEET Aspirants

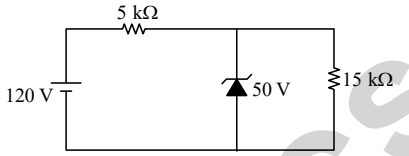
Topic : **Full Syllabus** Time: 75 Min Marking: +4 –1

Section - A : MCQs with Single Option Correct

1. The density of a material in SI units is 96 kg m^{-3}. In certain units in which the unit of length is 25 cm and the unit of mass is 50 g, the numerical value of density of the material is :
[DPYQ From 2019]

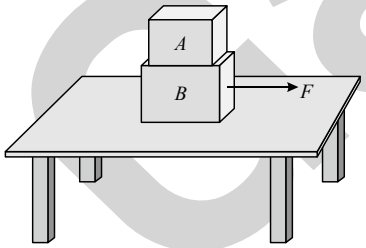
(A) 30 (B) 640
(C) 16 (D) 40

2. For the circuit shown below, the current through the Zener diode is : **[DPYQ From 2019]**



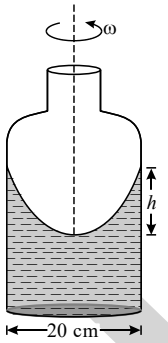
(A) 10.7 mA (B) Zero
(C) 14 mA (D) 9 mA

3. Two blocks A and B of masses $m_A = 1$ kg and $m_B = 3$ kg are kept on the table as shown in figure. The coefficient of friction between A and B is 0.3 and between B and the surface of the table is also 0.3. The maximum force F that can be applied on B horizontally, so that the block A does not slide over the block B is : (Take $g = 10$ m/s^2) : **[DPYQ From 2019]**



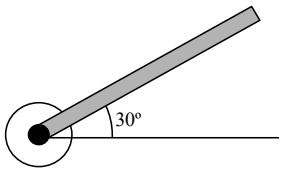
(A) 16 N (B) 40 N
(C) 12 N (D) 24 N

4. A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure. The radius of vessel is 10 cm and the angular speed of rotation is ω rad s^{-1}. The difference in the height, h (in cm) of liquid at the centre of vessel and at the side will be :
[DPYQ From 2020]



(A) $\frac{25\omega^2}{2g}$ (B) $\frac{2\omega^2}{5g}$
(C) $\frac{5\omega^2}{2g}$ (D) $\frac{100\omega^2}{2g}$

5. A rod of length 100 cm is pivoted at one end. It is raised such that it makes an angle of 30° from the horizontal as shown and released from rest. Its angular speed when it passes through the horizontal (in rad s^{-1}) will be ($g = 10$ ms^{-2}) :
[DPYQ From 2019]



(A) $\sqrt{30}$ (B) $\sqrt{\frac{30}{2}}$
(C) $\frac{\sqrt{30}}{2}$ (D) $\frac{\sqrt{20}}{3}$

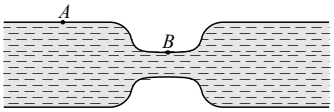
6. Two satellites, A and B, have masses m and $2m$ respectively. A is in a circular orbit of radius R, and B is in a circular orbit of radius $3R$ around the earth. The ratio of their kinetic energies, T_A/T_B, is :
[DPYQ From 2019]

(A) 2 (B) $\sqrt{\frac{1}{2}}$
(C) 1 (D) $\frac{3}{2}$

7. Two steel wires having same length are suspended from a ceiling under the same load. If the ratio of their energy stored per unit volume is 1 : 16, the ratio of their diameters is : **[DPYQ From 2020]**

(A) $1:\sqrt{2}$ (B) $1:2$
(C) $2:1$ (D) $\sqrt{2}:1$

8. Water flows in a horizontal tube (see figure). The pressure of water changes by 700 Nm^{-2} between A and B where the area of cross section are 80 cm^2 and 20 cm^2, respectively. Find the rate of flow of water through the tube. (Density of water = 1000 kgm^{-3}) **[DPYQ From 2020]**



(A) 1810 cm^3/s (B) 3020 cm^3/s
(C) 2720 cm^3/s (D) 2480 cm^3/s

9. Ice at –20°C is added to 100 g of water at 40°C. When the temperature of the mixture reaches 0°C, it is found that 20 g of ice is still unmelted. The amount of ice added to the water was close to **[DPYQ From 2019]**
(Specific heat of water = 4.2 J/g/°C)
Specific heat of Ice = 2.1 J/g/°C
Heat of fusion of water at 0°C = 334 J/g) :

(A) 50 g (B) 40 g
(C) 62.45 g (D) 100 g

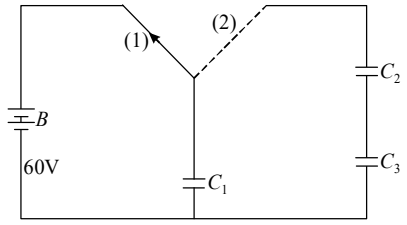
10. An ideal gas is enclosed in a cylinder at pressure of 2 atm and temperature, 100 K. The mean time between two successive collisions is 6×10^{-8} s. If the pressure is increased to 8 times and temperature is increased to 6400 K, the mean time between two successive collisions will be close to : **[DPYQ From 2019]**

(A) 4×10^{-8} s (B) 3×10^{-6} s
(C) 2×10^{-7} s (D) 1.5×10^{-8} s

11. T_0 is the time period of a simple pendulum at a place. If the length of the pendulum is reduced to $\frac{1}{9}$ times of its initial value, the modified time period is : **[DPYQ From 2021]**

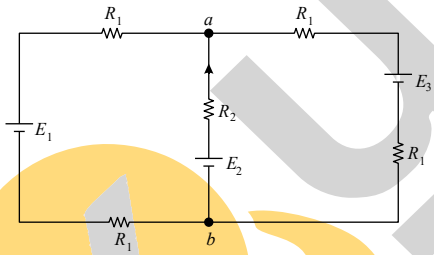
(A) $\frac{T_0}{3}$ (B) $\frac{1}{4}T_0$
(C) $8\pi T_0$ (D) $4T_0$

12. A capacitor $C_1 = 1\ \mu F$ is charged up to a voltage $V = 60$ V by connecting it to battery B through switch (1), Now C_1 is disconnected from battery and connected to a circuit consisting of two uncharged capacitors $C_2 = 3.0\ \mu F$ and $C_3 = 6.0\ \mu F$ through a switch (2) as shown in the figure. The sum of final charges on C_2 and C_3 is : **[DPYQ From 2018]**



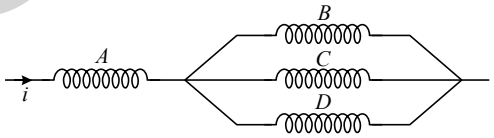
(A) 36 µC (B) 20 µC
(C) 54 µC (D) 40 µC

13. For the circuit shown, with $R_1 = 1.0\ \Omega$, $R_2 = 1\ \Omega$, $E_1 = 2$ V and $E_2 = E_3 = 4$ V, the potential difference between the points 'a' and 'b' is approximately (in V) : **[DPYQ From 2019]**



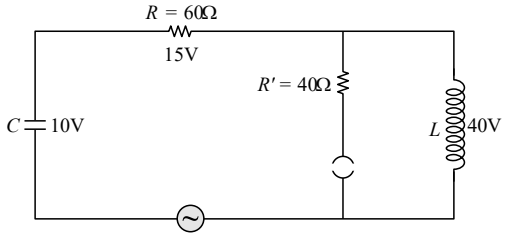
(A) 2.7 (B) 3.3
(C) 2.3 (D) 3.5

14. Four identical long solenoids A, B, C and D are connected to each other as shown in the figure. If the magnetic field at the center of A is 3 T, the field at the center of C would be : (Assume that the magnetic field is confined with in the volume of respective solenoid). **[DPYQ From 2021]**



(A) 12 T (B) 6 T
(C) 9 T (D) 1 T

15. The angular frequency of alternating current in a LCR circuit is 100 rad/s. The components connected are shown in the figure. Find the value of inductance of the coil and capacity of condenser. **[DPYQ From 2021]**



(A) 0.53 H and 250 µF (B) 1.33 H and 150 µF
(C) 0.8 H and 150 µF (D) 0.8 H and 250 µF

16. If the magnetic field in a plane electromagnetic wave is given by $\vec{B} = 3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{j}\ T$, then what will be expression for electric field ? **[DPYQ From 2020]**

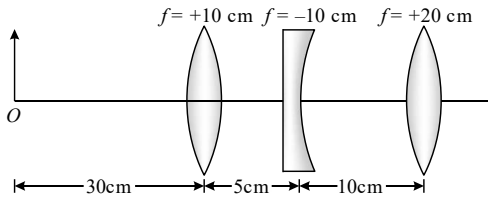
(A) $\vec{E} = (9 \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{k}$ V/m)

(B) $\vec{E} = (3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{i}$ V/m)

(C) $\vec{E} = (60 \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{k}$ V/m)

(D) $\vec{E} = (3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{j}$ V/m)

17. Find the distance of the image from object *O*, formed by the combination of lenses in the figure : **[DPYQ From 2021]**



(A) 65 cm (B) 75 cm
(C) 10 cm (D) Infinity

18. The angular width of the central maximum in a single slit diffraction pattern is 60º. The width of the slit is 1 µm. The slit is illuminated by monochromatic plane waves. If another slit of same width is made near it, Young's fringes can be observed on a screen placed at a distance 50 cm from the slits. If the observed fringe width is 1 cm, what is slit separation distance ? (i.e. distance between the centres of each slit) **[DPYQ From 2018]**

(A) 25 µm (B) 50 µm
(C) 75 µm (D) 100 µm

19. If the de-Broglie wavelength of an electron is equal to 10^{-3} times the wavelength of a photon of frequency 4.12×10^{14} Hz, then the speed of electron is equal to : **[DPYQ From 2019]**
(Speed of light = 3×10^8 m/s
Planck's constant = 6.63×10^{-34} J.s
Mass of electron = 9.1×10^{-31} kg)

(A) 1.45×10^6 m/s (B) 1.7×10^6 m/s
(C) 1.8×10^6 m/s (D) 1.0×10^6 m/s

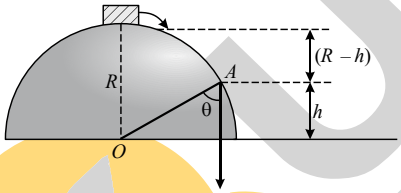
20. In a Frank-Hertz experiment, an electron of energy 5.7 eV passes through mercury vapour and emerges with an energy 0.7 eV. The minimum wavelength of photons emitted by mercury atoms is close to : **[DPYQ From 2019]**

(A) 2020 nm (B) 220 nm
(C) 230 nm (D) 248 nm

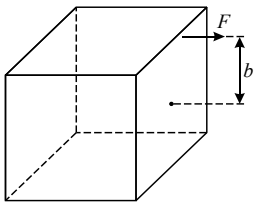
Section- B: INTEGER Answer Type Questions

1. A swimmer can swim with velocity of 12 km/h in still water. Water flowing in a river has velocity $6\sqrt{3}$ km/h. The direction with respect to the direction of flow of river water he should swim in order to reach the point on the other bank just opposite to his starting point is _____º. (Round off to the Nearest Integer) (find the angle in degree) **[DPYQ From 2021]**

2. A small block slides down from the top of hemisphere of radius $R = 6$ m as shown in the figure. The height *h* at which the block will lose contact with the surface of the sphere is _____ (Assume there is no friction between the block and the hemisphere) : **[DPYQ From 2021]**



3. Consider a uniform cubical box of side *a* on a rough floor that is to be moved by applying minimum possible force *F* at a point *b* above its centre of mass (see figure). If the coefficient of friction is $\mu = 0.5$, the maximum possible value of $100 \times \frac{b}{a}$ for a box not to topple before moving is _____. **[DPYQ From 2020]**



4. The change in the magnitude of the volume of an ideal gas when a small additional pressure ΔP is applied at a constant temperature, is the same as the change when the temperature is reduced by a small quantity ΔT at constant pressure. The initial temperature and pressure of the gas were 300 K and 5 atm respectively. If $|\Delta T| = C|\Delta P|$ then value of *C* in (K/atm) is _____. **[DPYQ From 2020]**

5. A 5 metre long (both ends open) organ pipe is kept in a gas that has double the density of air at STP. Assuming the speed of sound in air at STP is 300 m/s, the frequency difference between the fundamental and second harmonic of this pipe is _____ Hz. **[DPYQ From 2020]**

6. The electric field in a region is given by $\vec{E} = \frac{2}{3}E_0\hat{i} + \frac{3}{5}E_0\hat{j}$ with $E_0 = 4.0 \times 10^3 \frac{N}{C}$. The flux of this field through a rectangular surface area 0.3 m^2 parallel to the $Y-Z$ plane is _____ Nm^2C^{-1}. **[DPYQ From 2021]**

7. A galvanometer coil has 1000 turns and each turn has an average area of 3×10^{-4} m^2. If a torque of 1.5 Nm is required to keep this coil parallel to magnetic field when a current of 0.5 A is flowing through it, the strength of the field (in T) is_____: **[DPYQ From 2020]**

8. A coil in the shape of an equilateral triangle of side 10 cm lies in a vertical place between the pole pieces of permanent magnet producing a horizontal magnetic field 40 mT. The torque acting on the coil when a current of 0.4 A is passed through it and its plane becomes parallel to the magnetic field will be $\sqrt{x} \times 10^5$ Nm. The value of x is _____. **[DPYQ From 2021]**

9. A ray of light passing through a prism ($\mu = \sqrt{3}$) suffers minimum deviation. It is found that the angle of incidence is double the angle of refraction within the prism. Then, the angle of prism is _____ (in degree). **[DPYQ From 2021]**

10. From the given data, the amount of energy required to break the nucleus of aluminium $^{27}_{13}Al$ is _____ $x \times 10^{-3}$ J. Mass of neutron = 1.00866 u Mass of proton = 1.00726 u Mass of Aluminium nucleus = 27.18846 u (Assume 1u corresponds to x J of energy) (Round off to the nearest integer) **[DPYQ From 2021]**

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ANSWER KEY

Section - A : MCQs with Single Option Correct

1. (A)	**2.** (A)	**3.** (D)	**4.** (D)
5. (B)	**6.** (D)	**7.** (C)	**8.** (D)
9. (C)	**10.** (D)	**11.** (A)	**12.** (D)
13. (D)	**14.** (D)	**15.** (A)	**16.** (A)
17. (A)	**18.** (A)	**19.** (D)	**20.** (D)

Section- B: INTEGER Answer Type Questions

1. (150)	**2.** (4)	**3.** (50)	**4.** (60)
5. (21.21)	**6.** (800)	**7.** (2)	**8.** (48)
9. (60)	**10.** (27)		