

JEE Main Physics Question Bank 2024

Question 1: For a system undergoing an isothermal process, heat energy is supplied to the system. Choose the option showing correct statements

- (a) Internal energy will increase
- (b) Internal energy will decrease
- (c) Work done by system is positive
- (d) Work done by system is negative
- (e) Internal energy remains constant

- (1) (a), (c), (e)
- (2) (b), (d)
- (3) (c), (e)
- (4) (a), (d), (e)

Answer (Option 3)

Question 2: A particle moving in unidirectional motion travels half of the total distance with a constant speed of 15 m/s. Now first half of the journey time it travels at 10 m/s and second half of the remaining journey time it travels at 5 m/s. Average speed of the particle is

- (1) 12 m/s
- (2) 10 m/s
- (3) 7 m/s
- (4) 9 m/s

Answer (Option 2)

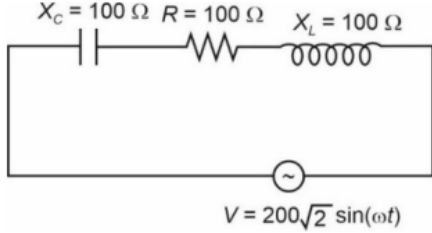
Question 3: Electromagnetic wave beam of power 20 mW is incident on a perfectly absorbing body for 300 ns. The total momentum transferred by the beam to the body is equal to

- (1) 2×10^{-17} Ns
- (2) 1×10^{-17} Ns
- (3) 3×10^{-17} Ns
- (4) 5×10^{-17} Ns

Answer (Option 1)

Question 4:

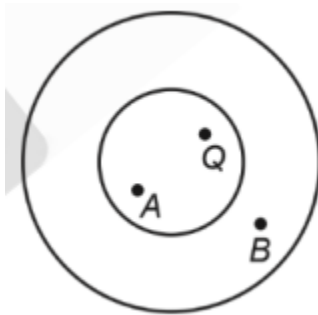
In the AC circuit shown in the figure the value of I_{rms} is equal to



- (1) 2A (2) $2\sqrt{2}A$
 (3) 4A (4) $\sqrt{2}A$

Answer (Option 1)

Question 5: A point charge Q is placed inside the cavity made in a uniform conducting solid sphere as shown. E_A , E_B and E_C are electric field magnitudes at points A, B and C respectively, Then



- (1) $E_A = 0$, $E_B = 0$ and $E_C \neq 0$
 (2) $E_A \neq 0$, $E_B = 0$ and $E_C \neq 0$
 (3) $E_A \neq 0$, $E_B = 0$ and $E_C = 0$
 (4) $E_A \neq 0$, $E_B \neq 0$ and $E_C \neq 0$

Answer (Option 2)

Question 6: A carnot engine working between a source and sink at 200 K has an efficiency of 50%. Another carnot engine working between the same source and another sink with unknown temperature T has an efficiency of 75%. The value of T is equal to

- (1) 400 K
 (2) 300 K
 (3) 200 K
 (4) 100 K

Answer (Option 4)

Question 7:

Two waves of same intensity from sources in phase are made to superimpose at a point. If path difference between these two coherent waves is zero then resultant intensity is I_0 . If this path difference is $\frac{\lambda}{2}$ where λ is wavelength of these waves, then resultant intensity is I_1 , and if the path difference is $\frac{\lambda}{4}$ then resultant intensity is I_2 . Value of $\frac{I_1 + I_2}{I_0}$ is equal to

Answer (00.50)

Question 8: If T is the temperature of a gas then RMS velocity of the gas molecules is proportional to

- (1) $T^{1/2}$
- (2) $T^{-1/2}$
- (3) T
- (4) T^2

Answer (Option 1)

Question 9: Temperature of hot soup in a bowl goes from 98°C to 86°C in 2 minutes. The temperature of surroundings is 22°C . Find the time taken for the temperature of soup to go from 75°C to 69°C . [Assume Newton's law of cooling is valid]

- (1) 1 minute
- (2) 1.4 minute
- (3) 2 minute
- (4) 3.2 minute

Answer (Option 2)

Question 10: Find the ratio of density of oxygen ($M = 32$) to the density of Helium ($M = 4$) at STP.

Answer (08.00)

Question 11: A solenoid of length 2 m, has 1200 turns. The magnetic field inside the solenoid when 2 A current is passed through it is $5 \times 10^{-2} \text{ T}$. Find the value of N . (The diameter of the solenoid is 0.5 m)

Answer (48.00)

Question 12: A metal rod of length 1 m is moving perpendicular to its length with 8 m/s velocity along the positive x-axis. If a magnetic field $B = 2 \text{ T}$ perpendicular to the plane of motion. Find the emf induced between the two ends of the rod.

Answer (16.00)

Question 13: A particle of mass 1 kg is moving with a velocity towards a stationary particle of mass 3 kg. After a collision, the lighter particle returns along the same path with a speed of 2 m/s. If the collision was elastic then the speed of 1 kg particle before a collision is _____ m/s.

Answer (04.00)

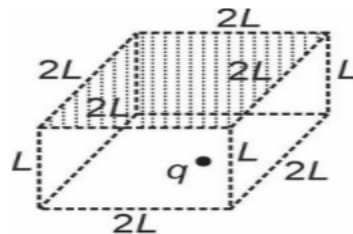
Question 14: Find out the work done in expanding the soap bubble from radius $r_1 = 3.5 \text{ cm}$ to $r_2 = 7.0 \text{ cm}$. (Given surface tension of soap solution, $T = 0.03 \text{ N/m}$)

- (1) 0.14 mJ
- (2) 1.4 mJ
- (3) 0.7 mJ
- (4) 2.8 mJ

Answer (Option 2)

Question 15:

A charge q is placed at the centre of bottom face as shown:



Find the flux through the shaded surface.

- (1) $\frac{2q}{7\epsilon_0}$
- (2) $\frac{q}{12\epsilon_0}$
- (3) $\frac{q}{4\epsilon_0}$
- (4) $\frac{q}{6\epsilon_0}$

Answer (Option 4)

Question 16: Two projectiles are thrown at the angle of projection and with the horizontal. If $\theta + \phi = 90^\circ$ then ratio of the range of two projectiles on the horizontal plane is equal to

- (1) 1 : 1
- (2) 2 : 1
- (3) 1 : 2
- (4) 1 : 3

Answer (Option 1)

Question 17:

Question: The apparent angle of dip in a plane at an angle of 45° with magnetic meridian is 60° find true angle of dip

Options:

- (a) $\tan^{-1} \sqrt{\frac{2}{1}}$
- (b) $\tan^{-1} \sqrt{\frac{5}{2}}$
- (c) $\tan^{-1} \sqrt{\frac{4}{2}}$
- (d) $\tan^{-1} \sqrt{\frac{3}{2}}$

Answer (Option D)

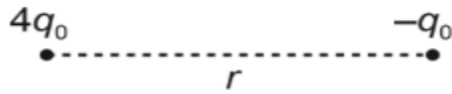
Question 18: In a standard YDSE first minima is obtained in front of a slit for $\lambda = 800$ nm. If the distance between the slit and the screen is 5 m then the separation between the slits is equal to

- (1) 5×10^{-2} m
- (2) 5 mm
- (3) 3 mm
- (4) 2 mm

Answer (Option 4)

Question 19:

Two point charges are arranged as shown:



Find the distance from $4q_0$ where net electric field is zero.

- (1) $4r$ (2) $3r$
(3) $\frac{r}{2}$ (4) $2r$

Answer (Option 4)

Question 20: A car is moving on a circular track of radius 50 cm with coefficient of friction being 0.34. On this horizontal track the maximum safe speed for turning is equal to ($g = 10 \text{ m/s}^2$)

- (1) 1.03
(2) 1.7
(3) 1.3
(4) 1.8

Answer (Option 3)

Question 21: A monoatomic ideal gas expanded isothermally to double its initial volume. It then expanded adiabatically to double the volume again. Find the final pressure if the initial pressure of the gas was $2 \times 10^5 \text{ Pa}$.

- (a) 3.53×10^5
(b) 2.5×10^5
(c) 3.5×10^5
(d) 1.5×10^5

Answer: (Option a)

Question 22: Rod is clamped to wall at one end on other end force is applied radius r , length l , force F , increase in length is 5 cm. Then radius $4r$, length $4l$, force $4F$, increase in length is

- (a) 15 cm
(b) 2 cm
(c) 5 cm

(d) 10 cm

Answer: (Option c)

Question 23: Conduction (RMS) current $6.6 \mu\text{A}$ in a circuit with capacitor connected across 220 V source. Angular frequency is 600 rad/sec. Value of capacitance is?

(a) 50 pF

(b) 20 pF

(c) 40 pF

(d) 10 pF

Answer: (Option a)

Question 24: Two identical capacitors having capacity $40\mu\text{F}$ are connected in series. If dielectric of dielectric constant K is inserted in one of man the net capacity becomes $24\mu\text{F}$.

Find K .

(a) 3.5

(b) 25

(c) 1.5

(d) 5.5

Answer: (Option c)

Question 25: In medium with relative permittivity ϵ and relative permeability μ , the speed of light is

(a) $1.5 * 10^2 * \text{m} / \text{s}$

(b) $4.5 * 10^8 * \text{m} / \text{s}$

(c) $5.5 * 10^8 * \text{m} / \text{s}$

(d) $3.5 * 10^8 \text{m/s}$

Answer: (Option a)

Question 26: Heat produced in a resistance R , carrying current I in time t is given as HI^2Rt . If the percentage error in the measurement of current, resistance and time are 2%, 1%, and 1% respectively, then the error in the measurement of heat would be

(a) 4%

(b) 3%

(c) 6%

(d) 5%

Answer: (Option c)

Question 27: A 9.8kg bag is hanging with a rope then a bullet of 200g moving with 10m/s get embedded in it, find the loss in kinetic energy

(a) 9.8J

(b) 5.81

(c) 7.8 J

(d) 4.8 J

Answer: (Option a)

Question 28: In what condition apparent weight of a man is lesser than actual weight.

Options:

(a) $N = Mg$

(b) $N < Mg$

(c) $N > Mg$

(d) $N = Mg$

Answer: (Option b)

Question 29: A ball is thrown vertically upward. At the maximum height. Which of the following is zero?

- (a) Momentum
- (b) P.E
- (c) Acceleration
- (d) Force

Answer: (Option a)

Question 30:

Question: Find ratio of maximum torque on dipole placed in electric field.

Given $\frac{P_1}{P_2} = 2$

$E_1 = 4.5 \times 10^{-24} \text{ N/C}$ and $E_2 = 1.5 \times 10^{-24} \text{ N/C}$

Options:

- (a) 2
- (b) 5
- (c) 8
- (d) 6

10

Answer: (Option D)

Question 31:

Question: Force required to stretch a wire of cross-section area 1 cm^2 to double its length shall be: (Given Young's modulus of wire 2×10^{11} Pascal. (Assuming no significant change in area)

Options:

- (a) 10M pascal
- (b) 20M Pascal
- (c) 30M Pascal
- (d) 40M Pascal

Answer: (Option B)

Question 32: If the projection of vector $\vec{a} = 2\mathbf{i} + 4\mathbf{j} - 2\mathbf{k}$ on overline $B = \mathbf{i} + 2\mathbf{j} + a\mathbf{i}$ is equal to zero. Find the value of 'a'.

- (a) $a = 5$
- (b) $a = 4$
- (c) $a = 6$
- (d) $a = 2$

Answer: (Option a)

Question 33: A Carnot engine has efficiency 50%. If the temperature of sink is reduced by 40°C its efficiency increases by 30% the temperature of source is?

- (a) 166.67 K
- (b) 466.67 K
- (c) 266.67°K
- (d) 366.67 K

Answer: (Option c)

Question 34: A carnot engine has efficiency 50%. If the temperature of sink is reduced by 40°C its efficiency increases by 30% the temperature of source is?

- (a) 166.67 K
- (b) 466.67 K
- (c) 266.67°K
- (d) 366.67 K

Answer: (option c)

Question 35:

Question: A ladder rest slantly with its base 3 m from the floor The wall is frictionless. Length of ladder is $\sqrt{34}$ m Mass of ladder is 10kg. Find the ratio of reaction force by wall to reaction force by floor on ladder

Options:

- (a) 3/10
- (b) 9/10
- (c) 5/10
- (d) 7/10

Answer: (a)

Question 36:

Question: Particle moves along the straight line such that it moves $1/3^{\text{rd}}$ distance with speed v_1 the next $1/3^{\text{rd}}$ distance with speed v_2 and remaining $1/3^{\text{rd}}$ distance with speed v_3 . Then its average speed throughout motion is

Options:

- (a) $\frac{v_1 v_2 + v_2 v_3 + v_3 v_1}{v_1 + v_2 + v_3}$
- (b) $\frac{v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$
- (c) $\frac{v_1 + v_2 + v_3}{3}$
- (d) $\frac{3v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$

Answer: (d)



Question 37: If all the oxygen molecules dissociate into atoms and temperature is doubled then V_{rms} becomes times the original

- (a) 4
- (b) 3
- (c) 2
- (d) None of these

Answer: (option c)

Question 38: In YDSE slab of thickness t and RI 1.5 is inserted in front of one of the slits. As a result intensity at the central maxima remains the same. What is the minimum value of thickness required?

- (a) 22
- (b) 42
- (c) 82
- (d) None of these

Answer: (option a)

Question 39:

In a cuboid of dimension $2L \times 2L \times L$, a charge q is placed at the center of the surface 'S' having area of $4L^2$. The flux through the opposite surface to 'S' is given by

1. $\frac{q}{6\epsilon_0}$

2. $\frac{q}{12\epsilon_0}$

3. $\frac{q}{3\epsilon_0}$

4. $\frac{q}{2\epsilon_0}$

Answer: (Option 2)

Question 40:

The threshold wavelength for photoelectric emission from a material is 5500 \AA . Photoelectrons will be emitted, when this material is illuminated with monochromatic radiation from a

- A. 75 W infra-red lamp
- B. 10 W infra-red lamp
- C. 75 W ultra-violet lamp
- D. 10 W ultra-violet lamp

Choose the correct answer from the options given below:

- 1. B and C only
- 2. C only
- 3. A and D only
- 4. C and D only

Answer: (2)

