PHYSICS

BOOKS - BITSAT GUIDE

SOLVED PAPER 2019 BITSAT

Part I Physics

1. A radioactive sample of half life 23.1 days is disintegrating continuously. The percentage

decay of its in 15th to 16th days will be

[Take $e^{0.03}$ = 1.03]

A. 5%

B. 1%

C. 2.9%

D. 3.5%

Answer: C

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2. Two seperate soap bubbles of radii 3×10^{-3} m and 2×10^{-3} m respectively, formed of same liquid (surface tension 6.5×10^{-2} N/m) come together to form a double bubble. The radius of interface of doubl bubble is

A. 6×10^{-3} m

B. 4×10^{-3} m

C. 1.5×10^{-3} m

D. 0.66×10^{-3} m

Answer: A

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3. An electron revolves in a circular orbit of radius r with angular speed ω . The magnetic field at the centre of electron orbit is

A. $\frac{\mu_0 e\omega}{\pi r}$

B. $\frac{\mu_0 e\omega}{4\pi r}$

C. $\frac{\mu_0 e^2\omega}{4\pi r}$

D. $\frac{\mu_0 e\omega}{2\pi r}$

Answer: B

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4. A steel wire of cross-sectional area 4 cm2 has elastic limit of $2.2 \times 10^8 N/m^2$. The maximum upward acceleration that can be given to a 1000 kg elevator supported by this steel wire if the stress is to exceed one-fourth of the elastic limit is [Take, g = 10 m/s^2]

A. 10 m/s^2

B. $9m / s^2$

C. $11m / s^2$

D. $12m / s^2$

Answer: D

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5. An ideal monoatomic gas at 300K expands adiabatically to twice its volume. What is the final temperature?

A. $300\sqrt{2}$

B. $300\sqrt{3}$

C. $300\left(\frac{1}{2}\right)^{2/3}$

D. $300(2)^{2/3}$

Answer: C

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6. Two sound producing sources A and B are moving towards and away from a stationary observer with same speed respectively. If

frequency of sound produced by both sources are equal as 400 Hz, then speed of sources (approximately) when observer detects 4 beats per second, is [Given, speed of sound =340 m/s]

A. 1.7 m/s

B. 3.4 m/s

C. 2.4 m/s

D. 1 m/s

Answer: A

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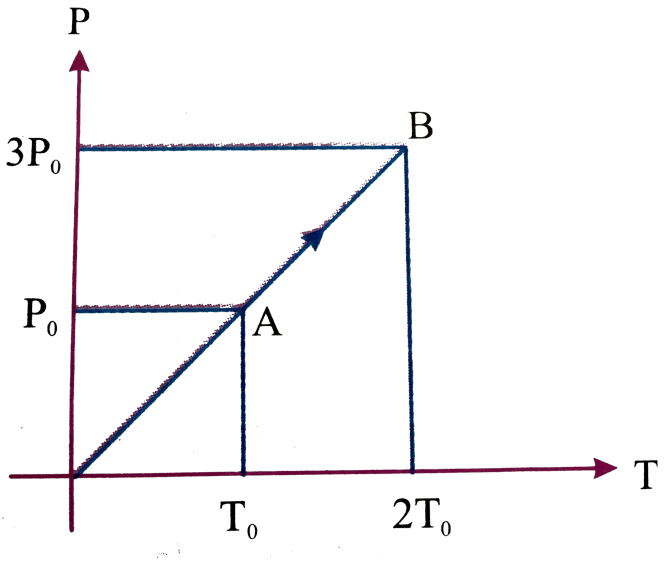
7. Pressure versus temperature graph of an ideal gas is shown in figure. Density of the gas at point A is ρ_0. Density at B will be



A. $2\rho_0$

B. $\frac{2}{3}\rho_0$

C. $\frac{3}{2}\rho_0$

D. $3\rho_0$

Answer: B

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8. A rubber cord has a cross-sectional area $10^{-6}m^2$ and total unstretched length 0.1 m. It is stretched to 0.125 m and then released to project a particle of mass 5.0 g. The velocity of

projection is [Given, Young's modulus of rubber $Y = 5 \times 10^8 N/m^2$]

A. 45 m/s

B. 30 m/s

C. 25 m/s

D. 15 m/s

Answer: A

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9. A body is moving unidirectionally under the influence of a sources of constant power. The square of its displacement in time t is proportional to

A. t^3

B. t^2

C. t

D. $\sqrt{t}$

Answer: C

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10. Two electrons are moving with speed of 5×10^5 m/s parallel to each other, then the electrostatic and magnetic force between them is

A. 5×10^5

B. 2.5×10^4

C. 3.6×10^5

D. 4.4×10^3

Answer: D

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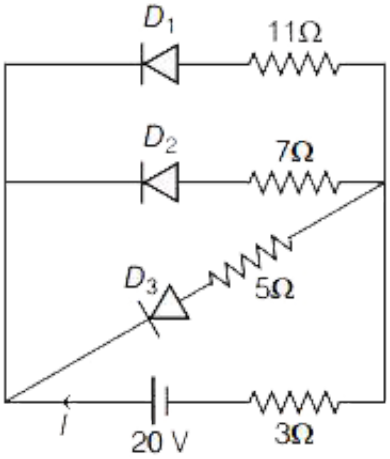
11. In the following circuit diagram, the current through battery is



A. $4A$

B. $3A$

C. $1A$

D. $2A$

Answer: B

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12. A semicircular disc of mass M and radius R is free to rotate about its diameter. The moment of inertia of semicircular disc about a

line perpendicular to its plane through centre is

A. $\frac{3}{4}MR^2$

B. $\frac{MR^2}{2}$

C. $\frac{MR^2}{3}$

D. $\frac{MR^2}{4}$

Answer: B

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13. 12 eV energy is given to electron in third orbit of H-atom, then final energy of electron when it ionise from third orbit, is

A. 5.25 eV

B. 10.49 eV

C. 12 eV

D. 11.15 eV

Answer: A

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14. In Young's double slit experiment, the distance between slits and screen is 2 m and distance between slits is 0.25 mm. A light of wavelength 800 nm is used to find fringes on the screen. If screen moves with a speed of 5 m/s, then first maxima will move with a speed of

A. 16 mm/s

B. 8 mm/s

C. 20 m/s

D. 50 mm/s

Answer: C

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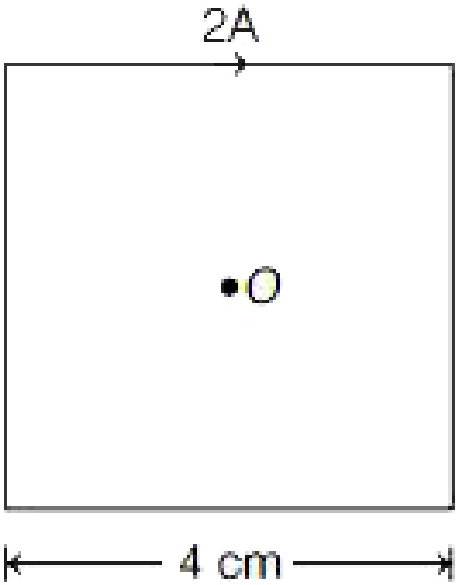
15. The magnetic field at the point O in the following current carrying square loop at the

centre will be



A. 12×10^{-5} T

B. 4×10^{-5} T

C. $4\sqrt{2} \times 10^{-5}$ T

D. $2\sqrt{2} \times 10^{-5}$ T

Answer: C

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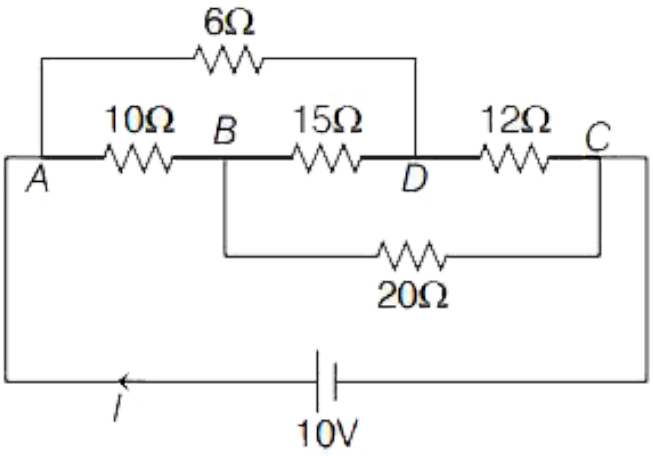
16. The value of current I as shown in the given circuit diagram is



A. 2A

B. $1.5A$

C. $0.9A$

D. $0.2A$

Answer: A

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17. In a uniform magneitc field of induced B a wire in the form of a semicircle of radius r rotates about the diameter of the circle with an angular frequency ω. The axis of rotation is

perpendicular to the field. If the total resistance of the circuit is R, the mean power generated per period of rotation is

A. $\frac{(\pi Br^2\omega)^2}{8R}$

B. $\frac{\pi Br\omega^2}{8R}$

C. $\frac{(\pi Br\omega)^2}{8R}$

D. 0

Answer: B

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18. A convex lens of focal length 25 cm produces images of the same magnification 2, when an object is kept at two positions x_1 and $x_2(x_1 > x_2)$ from the lens. The ratio of x_2 and x_1 is

A. $2:1$

B. $1:3$

C. $1:2$

D. $3:1$

Answer: D

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19. A particle X of massm and initial velocity u collide with another particle Y of mass $\frac{3m}{4}$ which is at rest, The collision is head on and perfectly elastic. The ratio of de-Broglie wavelengths λ_Y and λ_X after the collision is

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20. The dimensional formula of $\sqrt{\frac{\mu_0}{\varepsilon_0}}$ is

A. $\left[ML^2T^{-3}A^2\right]$

B. $\left[M^0LT^{-1}A^0\right]$

C. $\left[ML^2T^{-3}A^{-2}\right]$

D. $\left[M^{-1}L^{-2}T^3A^2\right]$

Answer: A

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21. A body of massm is moving in a straight line with momentum p. Starting at time t = 0, a force F = at acts in the same direction on the

moving particle during time interval of T. So that its momentum changes from p to 2p. The value of T is

A. $\sqrt{\frac{2p}{a}}$

B. $\sqrt{\frac{p}{a}}$

C. $\sqrt{\frac{2p}{a}}$

D. $\frac{2p}{a}$

Answer: D

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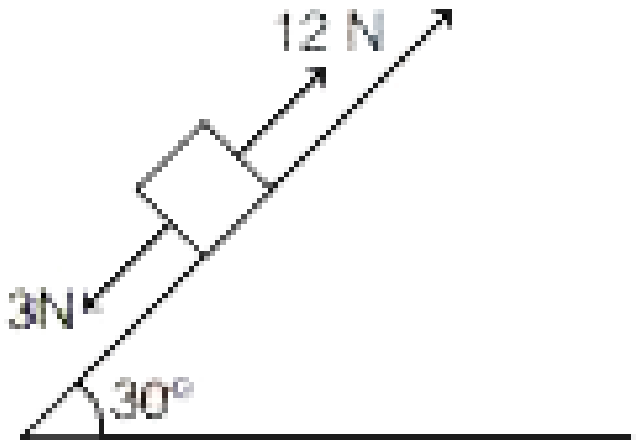
22. When a maximum force of 3 N is applied on a body kept on rough inclined plane of shown in the figure, then body remains stationary. The maximum external force up the inclined plane that does not move the block is 12 N. The coefficient of static friction between the block and the plane is [Take, g = 10 m/s^2]



A. $\frac{\sqrt{3}}{5}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{3\sqrt{3}}{5}$

D. $\frac{5}{3\sqrt{3}}$

Answer: A

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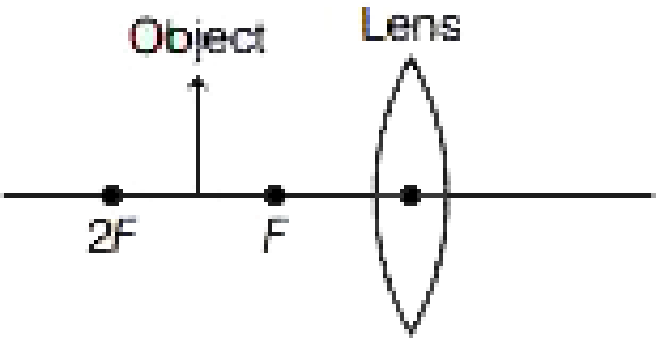
23. In the shown situation, if middle portion of the lens is painted black, then



A. complete image of the object will formwith low intensity

B. complete image of the object will formwith high intensity

C. incomplete image of the object will form with low intensity

D. incomplete image of the object will form with high intensity

Answer: D

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24. If sound travels in air with the speed of 340 m/s, then number of tones present in an open organ pipe of length 2 m and its maximum frequency 1200 Hz, are

A. 17

B. 11

C. 9

D. 14

Answer: A

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25. A proton is revolving on a circular path of radius 2 mm with frequency 10 Hz. Magnetic dipole moment associated with proton is

A. $2 \times 10^{-24} A - m^2$

B. $4 \times 10^{-24} A - m^2$

C. $3 \times 10^{-20} A - m^2$

D. $6 \times 10^{-20} A - m^2$

Answer: B

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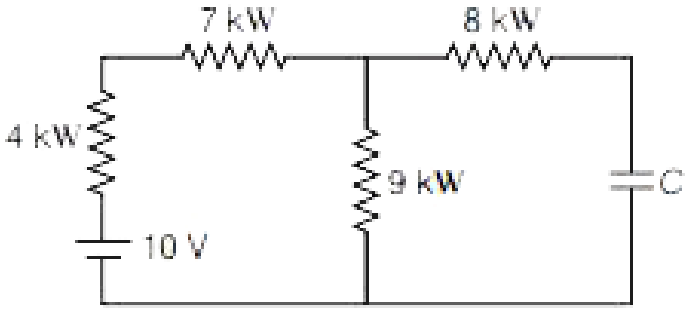
26. When a capacitor is fully charged as shown in the following figure, then current drawn

from the cell is



A. 1 mA

B. 0.5 mA

C. 2 mA

D. 5 mA

Answer: C

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27. A charged capacitor of capacitance C is discharging through a resistor of resistance R. At what time the charge on the capacitor is equal to one half of its initial value?

A. $\frac{RC}{2}$

B. $\frac{RC}{\log_e 2}$

C. RC $\log_e 2$

D. $\frac{1}{RC}\log_e 2$

Answer: D

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28. A body is projected from the surface of the earth with thrice the escape velocity (V_e) from the surface of the earth. What will be its velocity, when it will escape the gravitational pull?

A. V_e

B. $3V_e$

C. $\sqrt{2}V_e$

D. $2\sqrt{2}V_e$

Answer: D

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29. The time period of a bob performing simple harmonic motion in water is 2s. If density of bob is $\frac{4}{3} \times 10^3 kg/m^3$ then time period of bob performing simple harmonic motion in air will be

A. 3 s

B. 4 s

C. 2 s

D. 1 s

Answer: C

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30. A uniform solid cylindrical roller of mass 'm' is being pulled on a horizontal surface with force F parallel to the surface and applied at its centre. If the acceleration of the cylinder is '

a' and it is rolling without slipping, then the value of 'F" is : $-$

A. 2 ma

B. 3 ma

C. $\frac{3ma}{2}$

D. $\frac{5ma}{2}$

Answer: A

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31. A projectile is given an initial velocity of $\left(\hat{i}+\sqrt{3}\hat{j}\right)$ m/s, where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. Then, the equation of the path of projectile is [Take g =10 m/s^2]

A. $y=\sqrt{3x}-5x^2$

B. $y=\sqrt{3}x+5x^2$

C. $x=\sqrt{3}y+5x^2$

D. $x^2=y^2+\sqrt{3}$

Answer: A

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32. The force on a body of mass 1 kg is $\left(20\hat{i}+10\hat{j}\right)$ N. If is starts from rest, then the position of the body at time t = 2 s, is

A. $-20\hat{i}-40\hat{j}$

B. $20\hat{i}-40\hat{j}$

C. $40\hat{i}-20\hat{j}$

D. $40\hat{i}+20\hat{j}$

Answer: B

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33. A cylinder of mass 2 kg is released from rest from the top of an inclined plane of inclination 30° and length 1m. If the cylinder rolls without slipping, then its speed when it reaches the bottom, is [Take, g = 10 m/s^2]

A. $\frac{20}{3}$ m/s

B. $\sqrt{\frac{20}{3}}$ m/s

C. $\frac{10}{3}$ m/s

D. $\sqrt{\frac{10}{3}}$ m/s

Answer: A

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34. Frequency of oscillation of a body is 5 Hz when a force F_1 is applied and 12 Hz when another force F_2 is applied. If both forces F_1 and F_2 are applied together, then frequency of oscillation of the body will be

A. 13 Hz

B. 169 Hz

C. 62 Hz

D. 52 Hz

Answer: C

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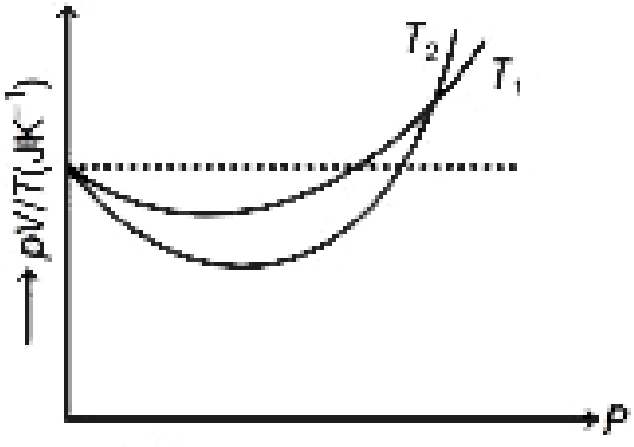
35. The figure shows the graph of $\frac{pV}{T}$ versus p for 2×10^{-4} kg of hydrogen gas at two different temperatures, where p,V andT represents pressure, volume and temperature respectively. Then, the value of $\frac{pV}{T}$ where the

curve meet on the vertical axis, is



A. $\frac{R}{5}$

B. $\frac{2R}{3}$

C. $\frac{R}{10}$

D. $\frac{R}{15}$

Answer: A

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36. An ammeter of resistance 1.5 Ω can measure currents upto 1 A. The value of shunt resistance to measure current upto 4 A is

A. 0.5Ω

B. 1Ω

C. 1.5Ω

D. 0.2Ω

Answer: C

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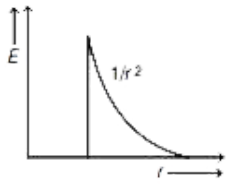
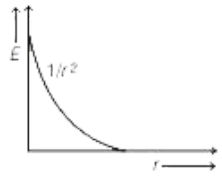
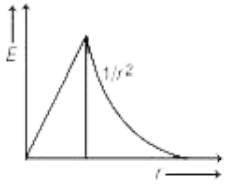
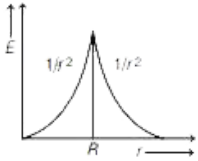
37. An isolated non-conducting solid sphere of radius R is given an electric charge. The charge is uniformly distributed in the volume of sphere. The graph which shows the correct variation of magnitude of electric field with distance from the centre of the sphere is

A. 

B. 

C. 

D. 

Answer: A

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38. A carbon resistor of $(56 \pm 5.6)\ k\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be

A. green, blue, orange, silver

B. blue, yellow, orange, silver

C. green, red, orange, silver

D. red, green, blue, gold

Answer: C

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39. When two waves with same frequency and constant phase differenc interfere,

A. there is a gain of energy

B. there is a loss of energy

C. the energy is redistributed and the distribution remains constant in time

D. the energy is redistributed and the distribution changes with time

Answer: D

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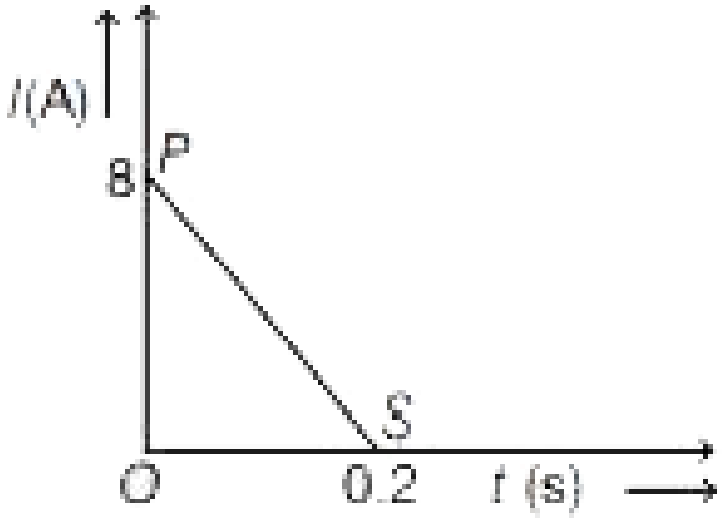
40. In a coil of resistance 50 W, the induced current developed by changing magnetic flux through it, is shown in figure as a function of time. The magnitude of change in flux through

the coil is



A. 10 Wb

B. 20 Wb

C. 32 Wb

D. 40 Wb

Answer: A

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