PHYSICS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2014

Physics

1. A rifle man, who together with his rifle has a mass of 100 kg, stands on a smooth surface and fires 10 shots horizontally. Each bullet has

a mass 10 g and a muzzle velocity of 800 ms^{-1}. The velocity which the rifle man attains after firing 10 shots is

A. $8ms^{-1}$

B. $0.8ms^{-1}$

C. $0.08ms^{-1}$

D. $-0.8ms^{-1}$

Answer: B

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2. A train accelerating uniormly from rest attains a maximum speed of $40ms^{-1}$ in $20s$. It travels at this speed for $20s$ and is brought to rest with uniform retardation i further $40s$. What is the average velocity during this period?

A. 80 m/s

B. 25 m/s

C. 40m/s

D. 30m/s

Answer: B

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3. A particle is fired with velocity u making angle θ with the horizontal.What is the change in velocity when it is at the highest point?

A. $u\cos\theta$

B. u

C. $u\sin\theta$

D. $u\cos\theta - u$

Answer: C

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4. For the equation $F = A^a v^b d^c$ where F is force, A is area, v si velocity and d is density with the dimensional anaysis gives the following values for the exponents.

A. 1,2,1

B. 2,1,1

C. 1,1,2

D. 0,1,1,

Answer: A

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5. A person with his hands in his pockets is skating on ice at the velocity of $10m/s$ and describes a circle of radius 50 m . What is his inclination with vertical

A. $\tan^{-1}(1/2)$

B. $\tan^{-1}(1/5)$

C. $\tan^{-1}(3/5)$

D. $\tan^{-1}(1/10)$

Answer: B

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6. A small block of mass m is kept on a rough inclined surface of inclination θ fixed in an elevator. The elevator goes up with a uniform velocity v and te block does not slide n te

wedge. The work done by the force of friction on the block in time t will be

A. zero

B. $mgvt\cos^2\theta$

C. $mgvt\sin^2\theta$

D. $mgvt\sin 2\theta$

Answer: C

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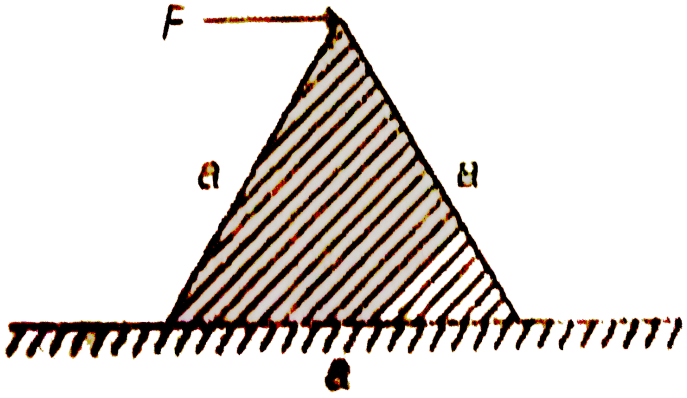
7. An equilateral prism of mass m rests on a rough horizontal surface with cofficent of friction μ. A horizontal force F is applied on the prism as shown in the figure. If the cofficent of the friction is sufficently high so that the prism does not slide before toppling, then the minimum force required to topple the prism is



A. $(mg)\left(\sqrt{3}\right)$

B. $\frac{mg}{4}$

C. $\frac{\mu mg}{\sqrt{3}}$

D. $\frac{\mu mg}{4}$

Answer: A

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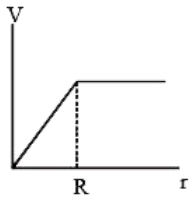
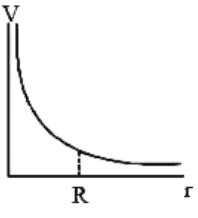
8. A spherically symmetric gravitational system of particles has a mass density

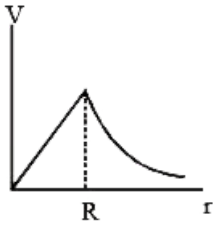
$\rho = \begin{cases} \rho_0 & f \text{ or } r < R \\ 0 & f \text{ or } r > R \end{cases}$ where ρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field of particles. Its speed v as a function of distahce $r(0 < r < OO)$ form the centre of the system is represented by

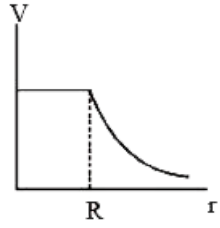
A.



B.



C. 

D. 

Answer: C

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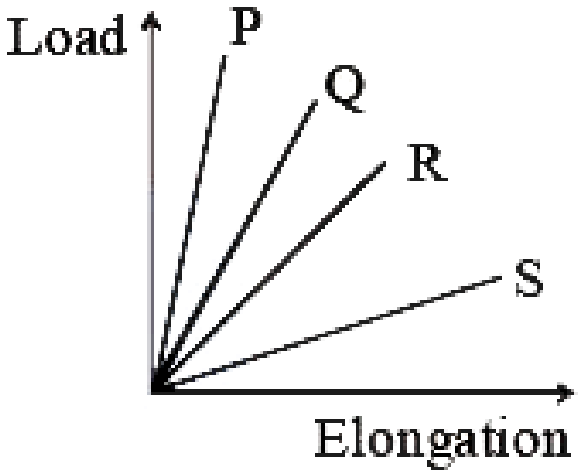
9. The load versus elongation graph for four wires is shown. The thinnest wire is



A. P

B. Q

C. R

D. S

Answer: B

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10. The work done in blowing a soap bubble of surface tension $0.060 Nm^{-1}$ from 2 cm radius to 5 cm radius is

A. 0.004168 J

B. 0.003168 J

C. 0.003158 J

D. 0.004568 J

Answer: D

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11. The wavelength of radiation emitted by a body depends upon

A. The wavelength of radiation emitted by a body depends upon

B. the area of its surface

C. the temperature of its surface

D. All of the above

Answer: D

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12. One mole of O_2 gas having a volume equal to 22.4 litres at $0^\circ C$ and 1 atmospheric pressure is compressed isothermally so that its volume reduces to 11.2 litres. The work done in this process is

A. 1672.5 J

B. 1728 J

C. –1728 J

D. –1572.5 J

Answer: D

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13. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas release $20J$ of heat and $8J$ of work is done on the gas. If initial internal energy of the gas was $30J$, what will be the final internal energy?

A. 2J

B. 42J

C. 18J

D. 58J

Answer: C

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14. In the kinetic theory of gases, which of these statements is/are true ?

(i) The pressure of a gas is proportional to the

mean speed of the molecules. (ii) The root mean square speed of the molecules is proportional to the pressure. (iii) The rate of diffusion is proportional to the mean speed of the molecules. (iv) The mean translational kinetic energy of a gas is proportional to its kelvin temperature.

A. (ii) and (iii) only

B. (i), (ii) and (iv) only

C. (i) and (iii) only

D. (iii) and (iv) only

Answer: D

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15. Two balloons are filled one with pure He gas and the other with air respectively. If the pressure and temperature of these balloons are same, then the number of molecules per unit volume is

A. more in He gas filled balloon

B. same in both balloons

C. more in air filled balloon

D. in the ratio 1 : 4

Answer: B

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16. Two particles P and Q describe S.H.M. of same amplitude a, same frequency f along the same straight line. The maximum distance between the two particles is $a\sqrt{2}$. The initial phase difference between the particle is –

A. zero

B. $\pi / 2$

C. $\pi / 6$

D. $\pi / 3$

Answer: B

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17. A tunnel has been dug through the centre of the earth and a ball is released in it. It executes S.H.M. with time period

A. 42 minutes

B. 1 day

C. 1 hour

D. 84.6 minutes

Answer: D

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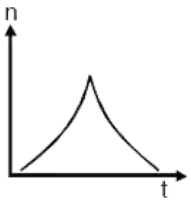
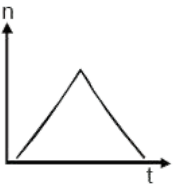
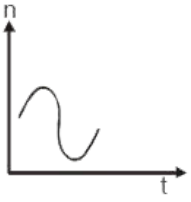
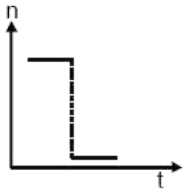
18. A sound source, emitting sound of constant frequency, moves with a constant speed and crosses a stationary observer. The

frequency (n) of sound heard by the observer is plotted against time (t). Which of the following graphs represents the correct variation :-

A. 

B. 

C. 

D. 

Answer: D

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19. When a string is divided into three segments of lengths l_1, l_2 and l_3 the fundamental frequencies of these three segments are v_1, v_2 and v_3

respectively.

The original fundamental frequency (v) of the string is

A. $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$

B. $v = v_1 + v_2 + v_3$

C. $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

D. $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

Answer: C

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20. Two short dipoles $p\hat{k}$ and $\frac{P}{2}\hat{k}$ are located at $(0, 0, 0)$ & $(1m, 0, 2m)$ respectively. The resultant electric field due to the two dipoles at the point $(1m, 0, 0)$ is

A. $\frac{9p}{32\pi \in_0}\hat{k}$

B. $\frac{-7p}{32\pi \in_0}\hat{k}$

C. $\frac{7p}{32\pi \in_0}\hat{k}$

D. none of these

Answer: B

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21. The electric field in a region is given by $\vec{E} = \left(\frac{A}{x^3}\right)\vec{I}$. Write a suitable SI unit for A. Write an experssion for. the potential in the region assuming the potential at. infinity to be zero.

A. $\frac{M}{2x^2}$

B. Mx^2

C. $\frac{M}{3x^4}$

D. $\frac{M}{x^2}$

Answer: A

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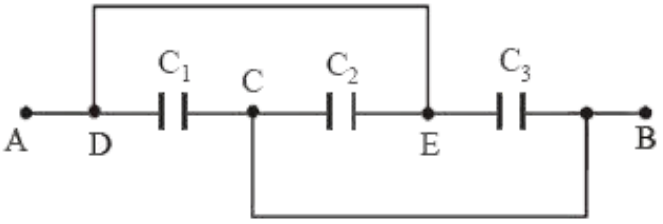
22. Three capacitors $C_1 = 1\mu F, C_2 = 2\mu F$ and $C_3 = 3\mu F$ are connected as shown in figure, then the equivalent capacitance between points A and B is



A. $3\mu F$

B. $4\mu F$

C. $5\mu F$

D. $6\mu F$

Answer: D

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23. Two long coaxial and conducting cylinders of radius a and b are separated by a material of conductivity σ and a constant potential

difference V is maintained between them, by a battery. Then the current, per unit length of the cylinder flowing from one cylinder to the other is

A. $\frac{4\pi\sigma}{\ln(b/a)}V$

B. $\frac{4\pi\sigma}{(b+a)}V$

C. $\frac{2\pi\sigma}{\ln(b/a)}V$

D. $\frac{2\pi\sigma}{(b+a)}V$

Answer: C

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24. A wire X is half the diameter and half the length of a wire Y of similar material. The ratio of resistance of X to that of Y is

A. $8:1$

B. $4:1$

C. $2:1$

D. $1:1$

Answer: C

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25. A narrow beam of protons and deutrons, each having the same momentum, enters a region of uniform magnetic field directed perpendicular to their direction of momentum. The ratio of the radii of the circular paths described by them is

A. $1:2$

B. $1:1$

C. $2:1$

D. $1:3$

Answer: B

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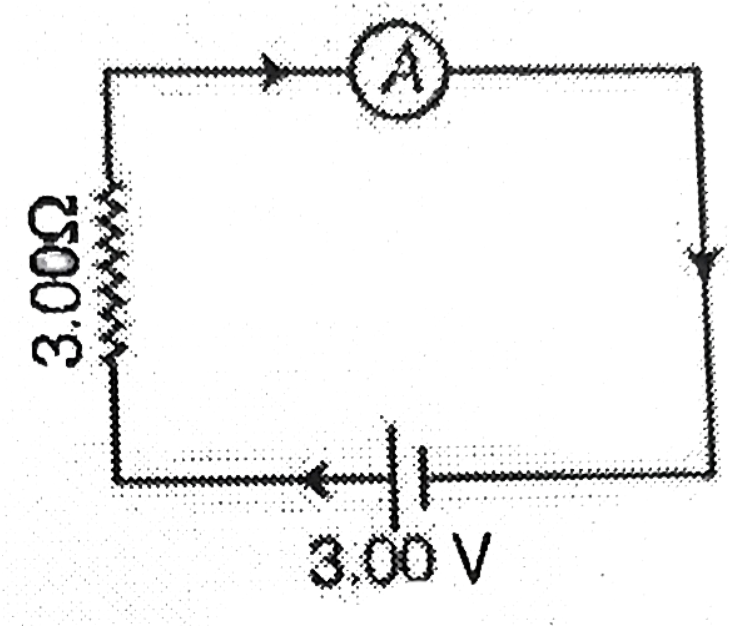
26. For the circuit (figure) the currents is to be measured. The ammeter shown is a galvanometer with a resistance $R_G = 60.00\Omega$ converted to an ammeter by a shunt resistance $r_S = 0.02\Omega$. The value of the

current is



A. 0.79 A

B. 0.29 A

C. 0.99 A

D. 0.8 A

Answer: C

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27. The susceptibility of magnesium at $300K$ is 1.2×10^{-5}. At what temperature will the susceptibility increase to 1.8×10^{-5}?

A. 150K

B. 200K

C. 250K

D. 20K

Answer: B

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28. A coil 10 turns and a resistance of 20Ω is connected in series with B.G. of resistance 30Ω. The coil is placed with its plane perpendicular to the direction of a uniform magnetic field of induction 10^{-2} T. If it is now turned through an angle of 60° about an axis in its plane. Find the charge induced in the coil.(Area of a coil= $10^{-2}\ m^2$

A. 2×10^{-5}C

B. $3.2 \times 10^{-5}C$

C. $1 \times 10^{-5}C$

D. $5.5 \times 10^{-5}C$

Answer: C

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29. Voltage V and current I in AC circuit are given by V =50sin(50 t)volt,I = 50 sin $(50t + \frac{\pi}{3}$

)mA

The power dissipated in the ciruit is

A. 5.0W

B. 2.5W

C. 1.25W

D. zero

Answer: C

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30. Resolving power of a telescope will be more, fi the diameter (a) of the objective is

A. larger

B. smaller

C. it does not depends on diameter

D. None of these

Answer: A

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31. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is $20cm$. The focal lengths of lenses are

A. 18 cm, 2 cm

B. 11 cm, 9 cm

C. 10 cm, 10 cm

D. 15 cm, 5 cm

Answer: A

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32. The angular size of the central maxima due to a single slit diffraction is (a $\rightarrow$ slit width)

A. $\frac{\lambda}{a}$

B. $\frac{2\lambda}{a}$

C. $\frac{3\lambda}{2a}$

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

Answer: B

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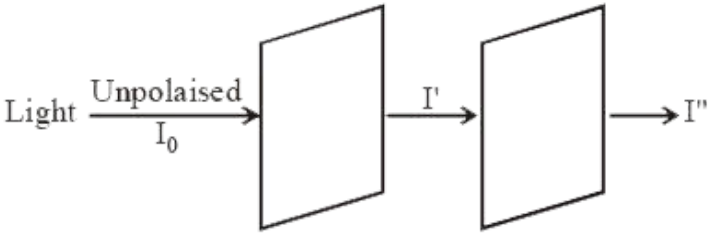
33. Find the final intensity of light (I"), if the angle between the axes of two polaroids is 60°.



A. $\frac{3I_0}{2}$

B. $\frac{I_0}{2}$

C. $\frac{I_0}{4}$

D. $\frac{I_0}{8}$

Answer: D

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34. The threshold wavelength of tungsten is 2300 Å. If ultra voilet light of wavelength 1800 Å is incident on it, then the maximum kinetic energy of photoelectrons would be

A. 1.49 eV

B. 2.2 eV

C. 3.0 eV

D. 5.0 eV

Answer: A

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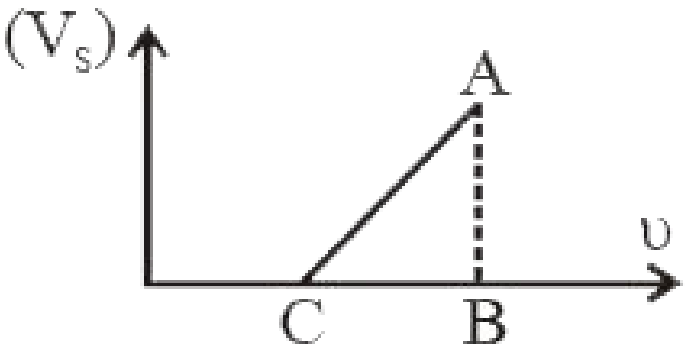
35. Graph betwen stopping potential for most energetic emitted photoelectrons (V_s) with frequency (v) of incident radiation on metal is given below. Value of AB/BC, in graph is [where

h = plank's constant, e = electronic charge]



A. h

B. e

C. h/e

D. e/h

Answer: C

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36. In hydrogen atom, an electron jumps from bigger orbit to smaller orbit, so that radius of smaller orbit is one-fourth of radius of bigger orbit. If speed of electron in bigger orbit was v,then speed in smaller orbit is

A. v/4

B. v/2

C. v

D. 2v

Answer: D

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37. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then :

A. the helium nucleus has less momentum than the thorium nucleus

B. the helium nucleus has more momentum than the thorium nucleus

C. the helium nucleus has less kinetic energy than the thorium nucleus

D. the helium nucleus has more kinetic energy than the thorium nucleus

Answer: D

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38. Let binding energy per nucleon of nucleus is denoted by $\underset{bn}{E}$ and radius is denoted as r. If

mass number of nuclei A,B are 64 and 125 respectively , then

A. $r_A < r_B, E_{bnA} < E_{bnB}$

B. $r_A > r_B. E_{bnA} > E_{bnB}$

C. $r_A = \frac{4}{5} r_B, E_{bnA} < E_{bnB}$

D. $r_A < r_B. E_{bnA} > E_{bnB}$

Answer: D

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39. For a CE transistor amplifier the audio signal voltage across the collector resistance of 2.0 $k\omega$ is 2.0 V suppose the current amplification factor of the transistor is 100 what should be the value of R_B in series with V_{BB} 10 times the signal current also calculate the DC drop across the collector resistance

A. $14k\Omega$

B. $18k\Omega$

C. $10k\Omega$

D. $5k\Omega$

Answer: A

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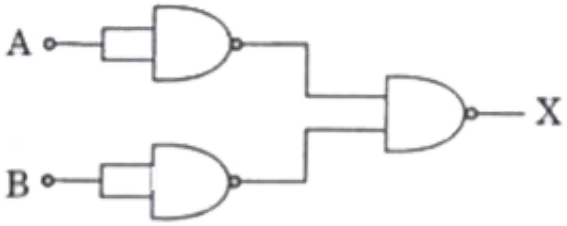
40. The combination of gates shown below yields



A. OR gate

B. NOT gate

C. XOR gate

D. NAND gate

Answer: A

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