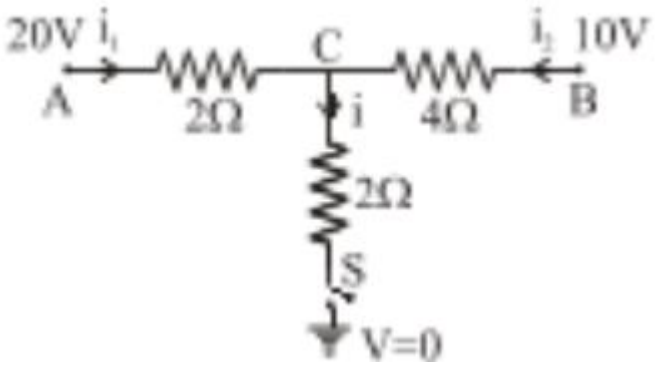
50 Important Questions of Physics for Air Force Group X Exam 2019

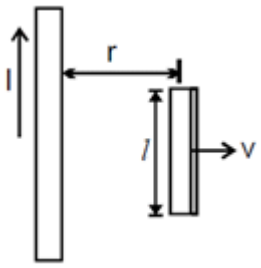
Question Set

1.When the switch S, in the circuit shown, is closed, then the value of current I (in amperes) will be:



2.A conducting circular loop made of a thin wire, has area 3.5×10^{-3} m^2 and resistance 10Ω It is placed perpendicular to a time dependent magnetic field B(t) = (0.4T) sin(50πt). The field is uniform in space. Then the net charge flowing through the loop during t = 0 s and t = 10 ms is close to n x 10^{-5} C ?

3.A conducting rod moves with constant velocity v perpendicular to the long, straight wire carrying a current I as shown. Compute that the emf generated between the ends of the rod.



A. $\frac{\mu_0 v I l}{\pi r}$

B. $\frac{\mu_0 v I l}{2\pi r}$

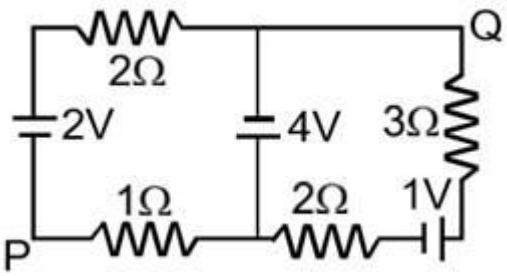
C. $\frac{2\mu_0 v I l}{\pi r}$

D. $\frac{\mu_0 v I l}{4\pi r}$

4.The terminal voltage across a battery of emf E can be

A. 0
B. > E
C. < E
D. all of above

5.In the circuit shown, what is the potential difference V_{PQ}?



A. + 3V
B. + 2V
C. - 2V
D. none

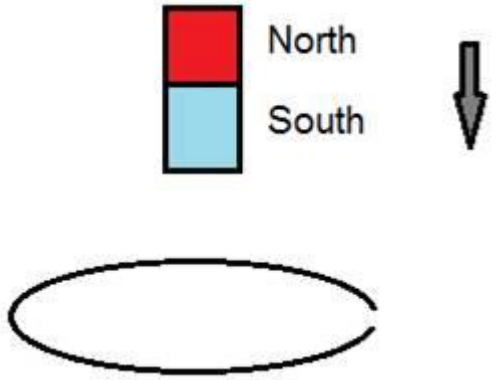
6.The resistance of a wire is R. It is bent at the middle by 180° and both the ends are twisted together to make a shorter wire. The resistance of the new wire is

A. 2R
B. R/2
C. R/4
D. R/8

7.A carbon resistance has a following colour code. What is the value of

A. 530kΩ ± 5%
B. 6.4 MΩ ± 5%
C. 5.3 MΩ ± 5%
D. 64kΩ ± 10%

8.A magnet is falls from height H and it pass through a broken copper ring as shown in figure. The acceleration of the falling magnet while it passes through the ring is



A. Less than gravity
B. More than gravity
C. Equal to gravity
D. depends on the area of the ring and the length of the magnet

9.The working of magnetic braking of trains is based on

A. Alternating current
B. Eddy current
C. Steady current
D. Pulsating current

10.The power factor of a yard choke is

A. nearly zero
B. exactly zero
C. nearly one
D. exactly one

11.A body of mass 5 kg is acted upon by two perpendicular forces 8 N and 6N. The magnitude of acceleration of the body is

A. 1.5 m/s^2
B. 2 m/s^2
C. 3 m/s^2
D. 7 m/s^2

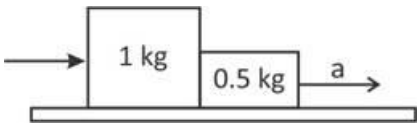
12.Two masses 8 kg and 12 kg are connected at the two ends of a light inextensible string that goes over a frictionless pulley. The tension in the string when the masses are releases is

A. 80 N
B. 92 N
C. 96 N
D. 102 N

13.A monkey of mass 40 k climbs on a hanging rope which can stand a maximum tension of 600 N. In which of the following cases will the rope break. The monkey

A. Climbs up with an acceleration of 6 ms^{-2}
B. Climbs down with an acceleration of 5 ms^{-2}
C. Climbs up with a uniform speed 5 ms^{-1}
D. Falls down the rope nearly freely under gravity

14.A 1 kg block and a 0.5 kg block move together on a horizontal frictionless surface. Each block exerts a force of 6 N on the other. The blocks move with a uniform acceleration of



A. 3 ms^{-2}
B. 6 ms^{-2}
C. 9 ms^{-2}
D. 12 ms^{-2}

15.A batsman hit back a ball straight in the direction of the bowler without changing its initial speed of 12 ms^{-1}. If the mass of the ball is 0.15kg. the impulse imparted to the ball is

A. 2.8 Ns
B. 3.6 Ns
C. 3.9 Ns
D. 4.2 Ns

16.Which of the following case has the highest magnitude of net force acting on the body?

A. a drop of rain falling down with a constant speed
B. a cork of mass 10 g floating on water
C. a car moving with a constant velocity of 30 km/h on a rough road
D. an electron revolving with a constant speed inside a hydrogen atom

17.A rocket is launched normal to the surface of the Earth, away from the Sun, along the line joining the Sun and the Earth. The Sun in 3×10^5 times heavier than the Earth and is at a distance 2.5×10^4 times larger than the radius of the Earth. The escape velocity from Earth's gravitational field is $v_e = 11.2$ km s^{-1}. The minimum initial velocity (v_s) required for the rocket to be able to leave the Sun-Earth system is closest to (Ignore the rotation and revolution of the Earth and the presence of any other planet).

A. $v_s = 62$ km s^{-1}
B. $v_s = 42$ km s^{-1}
C. $v_s = 72$ km s^{-1}
D. $v_s = 22$ km s^{-1}

18.A solid cone of mass (m = 1 kg) is placed on a plank of mass M = 1 kg which is placed on a smooth horizontal plane. The coefficient of friction between cone and the plank is 1/4. If a horizontal force F is applied on the plank, then the maximum value of F for which the cone is in equilibrium with respect to plank is (Given: g = 10 m/s^2 and $\frac{r}{H} = \frac{1}{20}$)

A. 5 N
B. 3 N
C. 4N
D. none of these

19.A satellite revolves around the earth such that its nearest distance from the centre of the earth is R and the farthest distance from the centre of earth is 3R. The speed of satellite at perigee is (neglect air resistance)

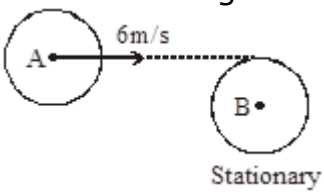
A. $\sqrt{\frac{GM}{R}}$

B. $\sqrt{\frac{GM}{2R}}$

C. $\sqrt{\frac{GM}{6R}}$

D. $\sqrt{\frac{3}{2}\frac{GM}{R}}$

###COMMON###20###22###Two identical smooth spheres undergo a collision for which coefficient of restitution is 0.6. The initial velocities are indicated in figure.



###DONE###

20. The speed of sphere B after collision is

A. 3.17 m/s
B. 4.16 m/s
C. 1.039 m/s
D. 3 m/s.

21.The speed of ball A after collision

A. 3.17 m/s
B. 1.039 m/s
C. 4.16 m/s
D. 3 m/s.

22.The percentage of energy lost in the collision is

A. 10%
B. 18%
C. 24%
D. 30%.

23.A ball hits the floor and rebounds after inelastic collision. In this case

A. The momentum of the ball just after the collision is the same as that just before the collision
B. The mechanical energy of the ball remains the same in the collision
C. The total momentum of the ball and the earth is conserved
D. The total energy of the ball and the earth is conserved

24.Column I

(i) Curie

(ii) Light year

(iii) Dielectric strength

(iv) Atomic weight

(v) Decibel

Column II

A) MLT^{-2}

B) M

C) Dimensionless

D) T

E) ML^2T^{-2}

F) MT^{-3}

G) T^{-1}

H) L

I) $MLT^{-3}I^{-1}$

J) LT^{-1}

Choose the correct match

A. (i) G, (ii) H, (iii) C, (iv) B, (v) C
B. (i) D, (ii) H, (iii) I, (iv) B, (v) G
C. (i) G, (ii) H, (iii) I, (iv) B, (v) G
D. None of the above

###COMMON###25###27###Suppose a nucleus X undergoes α-decay $^{238}_{92}X \rightarrow Y + \alpha$. The emitted α-particle is found to move along a helical path in a uniform magnetic field B = 5 T. Radius and pitch traced by the α-particle are R = 5 cm and P = 7.5p cm respectively.

[Given m(Y) = 221.003 U, m(α) = 4.003 U, m(n) = 1.009 U, m(P) = 1.008 U, 1 U = 931 MeV/c^2].

###DONE###

25.

Speed of the α-particle after the decay is

A. 1.2×10^7 m/s
B. 9×10^6 m/s
C. 1.5×10^7 m/s
D. 8×10^5 m/s

26.Total energy released during an α-decay is around

A. 2.5 MeV
B. 4.7 MeV
C. 9.9 MeV
D. 8 MeV

27.Binding energy per nucleon of nucleus X is around

A. 2.3 MeV
B. 4.7 MeV
C. 6 MeV
D. 7.8 MeV

28.After a time, t has elapsed, 90% of a radioactive sample is undecayed. The percent that will decay in a time 2t is

A. 19%
B. 38%
C. 20%
D. 40%.

29.The time-period of a simple pendulum is 4.0s in a stationary inertial frame of reference. Its period measured by an observer moving at speed 0.4c with respect to the inertial frame of reference will be.

A. 4.7s
B. 3.7s
C. 4.4s
D. 3.4s

30.Neutrino is a particle who is

A. Charged and has spin
B. Chargeless & has no spin
C. Chargeless & has spin
D. same as electron

31.In a Ruby laser, the colour of laser light is due to .....atom.

A. oxygen
B. aluminium
C. xenon
D. chromium

32.A perfectly black body is one where

A. absorptive power is infinity
B. absorption point is 0
C. emissive power is 1
D. absorptive power is 1

33.What will be ratio of their velocities, if the De-Broglie wavelength of a proton and $\alpha - particle$ are equal?

A. 4:1
B. 1:4
C. 1:2
D. 2:1

34.A photon of wavelength 6630 Å is incident on a totally reflecting surface. The momentum delivered by the photon is equal to

A. 6.63×10^{-27} kgm/s
B. 2×10^{-27} kgm/s
C. 10^{-27} kgm/s
D. None of these

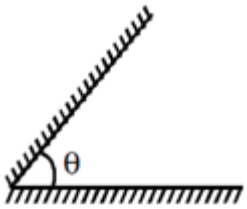
35.The ratio of de-Broglie wavelength of molecules of hydrogen and helium in two gas jars kept separately at temperature 27°C and 127^0C respectively is

A. $\frac{2}{\sqrt{3}}$
B. 2:3
C. $\frac{\sqrt{3}}{4}$
D. $\sqrt{\frac{8}{3}}$

36.An electron and photon possess the same de-Broglie wavelength. If the velocity of electron is 35% of the velocity of photon, then find $\frac{E_e}{E_{ph}}$

A. $\frac{7}{40}$
B. $\frac{8}{11}$
C. $\frac{3}{7}$
D. $\frac{11}{15}$

37.Two mirrors are inclined at an angle q as shown in the figure. Light ray is incident parallel to one of the mirrors. The ray will start retracing its path after third reflection if :



A. θ = 45°
B. θ = 30°
C. θ = 60°
D. all three

38.A ray of light is incident at an angle of 60° on one face of a prism which has an angle of 30°. The ray emerging out of the prism makes an angle of 30° with incident ray. If the refractive index of the material of prism is $\mu = \sqrt{a}$, then find the value of 'a'.

39.A watch glass has uniform thickness and the average radius of curvature of its two surfaces is much larger than its thickness. It is placed in the path of a beam of parallel light, the beam will

A. Converge slightly
B. diverge slightly
C. be completely unaffected
D. Converge or diverge slightly depending on whether the beam is incident from the concave or the convex side

40.A printed page is pressed by a glass of water. The refractive index of the glass and water is 1.5 and 1.33, respectively. If the thickness of the bottom of glass is 1 cm and depth of water is 5 cm, how much the page will appear to be shifted if viewed from the top?

A. 1.033 cm
B. 3.581 cm
C. 1.5 cm
D. 1.90 cm

41.Which of these is incorrect for defects of eye?

A. Myopia is shortsightedness
B. Hypermetropia is farsightedness
C. In myopia image is formed in front of retina
D. In hypermetropia image is formed in front of retina

42.Crystalline lens in the human eye

A. Helps to form an inverted image on the retina.
B. Helps to form an erect image on the retina.

C. Helps the light to enter the eye.
D. Helps to control the amount of light entering the eye.

43.The polarizing angle of glass is 57 º. A ray of light which is incident at this angle will have an angle of refraction as

A. 33 º
B. 38 º
C. 25 º
D. 43 º

44.The ratio of average translational kinetic energy to rotational kinetic energy of a diatomic molecule at temperature T is

A. 3
B. 7/5
C. 5/3
D. 3/2

45.When an ideal gas is compressed isothermally then its pressure increases because :

A. its potential energy increases
B. its kinetic energy increases and molecules move apart
C. its number of colisions per unit area with walls of container increases
D. molecular energy increases

46.A gas behaves more closely as an ideal gas at

A. low pressure and low temperatue
B. low pressure and high temperature
C. high pressure and low temperature
D. high pressure and high temperature.

47.A vessel contains a mixture of one mole of oxygen and two moles of nitrogen at 300 K. The ratio of the average rotational kinetic energy per O_2 molecule to that per N_2 molecule is :

A. 1 : 1
B. 1 : 2
C. 2 : 1
D. depends on the moments of inertia of the two molecules

48.100 g of oxygen performs motion due to increase in temperature find the energy associated with its motion at 30° C.

A. 1.965 X 10^3 J
B. 1.965 X 10^4J
C. 1.965 X 10^2 J
D. 1.965 X 10^5 J

49.The ratio of two specific heats $\frac{C_P}{C_V}$ of CO is

A. 1.33
B. 1.40
C. 1.29
D. 1.66

50.The mean energy of a molecule of an ideal gas is

A. 2 KT
B. $\frac{3}{2}$KT
C. KT
D. $\frac{1}{2}$KT