

**PHYSICS TEST PAPER WITH ANSWER & SOLUTIONS  
FINAL NEET(UG)-2020 (EXAMINATION)**

1. The color code of a resistance is given below



The values of resistance and tolerance, respectively, are :

- (1)  $470 \Omega$ , 5%                          (2)  $470 \text{ k}\Omega$ , 5%  
 (3)  $47 \text{ k}\Omega$ , 10%                        (4)  $4.7 \text{ k}\Omega$ , 5%

**Ans. (1)**

**Sol.**  $R = 47 \times 10^1 \pm 5\%$   
 $R = 470 \Omega$ , 5%

2. Find the torque about the origin when a force of  $3\hat{j}$  N acts on a particle whose position vector is  $2\hat{k}$  m :

- (1)  $6\hat{k}$  Nm                                  (2)  $6\hat{i}$  Nm  
 (3)  $6\hat{j}$  Nm                                      (4)  $-6\hat{i}$  Nm

**Ans. (4)**

**Sol.**  $\vec{F} = 3\hat{j}$  N,  $\vec{r} = 2\hat{k}$

$$\begin{aligned}\vec{\tau} &= \vec{r} \times \vec{F} = 2\hat{k} \times 3\hat{j} = 6(\hat{k} \times \hat{j}) \\ &= 6(-\hat{i})\end{aligned}$$

$$\vec{\tau} = -6\hat{i}$$
 Nm

3. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )  
 (1)  $0.02 \text{ kg/m}^3$                               (2)  $0.5 \text{ kg/m}^3$   
 (3)  $0.2 \text{ kg/m}^3$                                     (4)  $0.1 \text{ kg/m}^3$

**Ans. (3)**

**Sol.** For an ideal gas sample

$$\frac{P}{\rho} = \frac{RT}{M_w}$$

$$\begin{aligned}\rho &= \frac{PM_w}{RT} = \frac{249 \times 10^3 \times 2 \times 10^{-3}}{8.314 \times 300} = 0.199 \\ \rho &= 0.2 \text{ kg/m}^3\end{aligned}$$

4. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

- (1) isobaric                                      (2) isothermal  
 (3) adiabatic                                      (4) isochoric

**Ans. (3)**

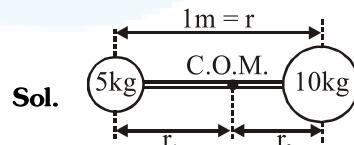
**Sol.** Free expansion i.e. expansion against vacuum is adiabatic in nature for all type of gases. It should be noted that temperature final temperature is equal to initial temperature for ideal gases.

5. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

- (1) 80 cm    (2) 33 cm  
 (3) 50 cm    (4) 67 cm

**Ans. (4)**



$$mr = \text{constant} \Rightarrow r \propto \frac{1}{m}$$

$$\frac{r_1}{r_2} = \frac{m_2}{m_1} = \frac{10}{5} = \frac{2}{1}$$

$$r_1 = \frac{2}{3}r = \frac{2}{3} \times 1 \text{ m} = 67 \text{ cm}$$

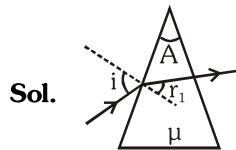
6. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to:

(1)  $\frac{\mu A}{2}$

(2)  $\frac{A}{2\mu}$

(3)  $\frac{2A}{\mu}$

(4)  $\mu A$

**Ans. (4)**


$r_2 = 0$

$r_1 = A$

Apply Snell's law

$\sin i = \mu \sin r_1$

for small angle ( $r_1 = A$ )

$i = \mu A$

7. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

(1) 24 N

(2) 48 N

(3) 32 N

(4) 30 N

**Ans. (3)**

**Sol.**  $W_s = mg_s = 72 \text{ N}$

$$W_h = mgh = \frac{mg_s}{\left(1 + \frac{h}{R}\right)^2} = \frac{72 \text{ N}}{\left(1 + \frac{R/2}{R}\right)^2} = \frac{72}{9/4}$$

$W_h = 32 \text{ N}$

8. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :

$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$

(1)  $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$

(2)  $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$

(3)  $8.0 \times 10^{-5} \text{ T m A}^{-1}$

(4)  $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$

**Ans. (2)**

**Sol.**  $\mu_r = x_m + 1 = 599 + 1 = 600$

$\mu = \mu_0 \mu_r = 4\pi \times 10^{-7} \times 600$

$= 2.4\pi \times 10^{-4} \frac{\text{Tm}}{\text{A}}$

9. For transistor action, which of the following statements is **correct**?

(1) The base region must be very thin and lightly doped.

(2) Base, emitter and collector regions should have same doping concentrations.

(3) Base, emitter and collector regions should have same size.

(4) Both emitter junction as well as the collector junction are forward biased.

**Ans. (1)**

**Sol.** Base region is very thin and lightly doped.

10. Light with an average flux of  $20 \text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :

(1)  $48 \times 10^3 \text{ J}$

(2)  $10 \times 10^3 \text{ J}$

(3)  $12 \times 10^3 \text{ J}$

(4)  $24 \times 10^3 \text{ J}$

**Ans. (4)**

**Sol.**  $I = \frac{E}{At}$

$E = IAt$

$= \frac{20}{10^{-4}} \times 20 \times 10^{-4} \times 60$

$= 24 \times 10^3 \text{ J}$

11. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ C m}$ . The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2 / \text{C}^2 \right)$$

(1) zero

(2) 50 V

(3) 200 V

(4) 400 V

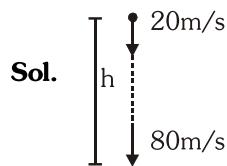
**Ans. (3)**

**Sol.**  $V = \frac{kP \cos \theta}{r^2} = \frac{9 \times 10^9 \times 16 \times 10^{-9}}{(0.6)^2} \times \frac{1}{2}$

$V = 200 \text{ V}$

- 12.** A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ )
- (1) 300 m                          (2) 360 m  
 (3) 340 m                           (4) 320 m

**Ans. (1)**



$$v^2 = u^2 + 2gh$$

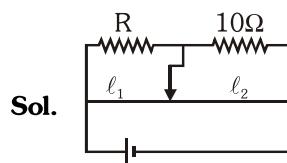
$$80^2 = 20^2 + 2 \times 10h$$

$$h = 300 \text{ m}$$

- 13.** A resistance wire connected in the left gap of a metre bridge balances a  $10\Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1  $\Omega$  of the resistance wire is :

- (1)  $1.5 \times 10^{-2} \text{ m}$                           (2)  $1.0 \times 10^{-2} \text{ m}$   
 (3)  $1.0 \times 10^{-1} \text{ m}$                            (4)  $1.5 \times 10^{-1} \text{ m}$

**Ans. (3)**



$$\frac{R}{10} = \frac{l_1}{l_2}$$

$$\frac{R}{10} = \frac{3}{2}$$

$$R = 15\Omega$$

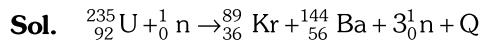
Length of  $15\Omega$  resistance wire is 1.5 m

$$\therefore \text{length of } 1\Omega \text{ resistance wire} = \frac{1.5}{15} = 0.1$$

$$= 1.0 \times 10^{-1} \text{ m}$$

- 14.** When a uranium isotope  $^{235}_{92}\text{U}$  is bombarded with a neutron, it generates  $^{89}_{36}\text{Kr}$ , three neutrons and:
- (1)  $^{103}_{36}\text{Kr}$                                   (2)  $^{144}_{56}\text{Ba}$   
 (3)  $^{91}_{40}\text{Zr}$                                       (4)  $^{101}_{36}\text{Kr}$

**Ans. (2)**



- 15.** A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is : ( $\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$ )
- (1)  $3.14 \times 10^{-5} \text{ T}$                                   (2)  $6.28 \times 10^{-4} \text{ T}$   
 (3)  $3.14 \times 10^{-4} \text{ T}$                                       (4)  $6.28 \times 10^{-5} \text{ T}$

**Ans. (2)**

**Sol.**  $B = \mu_0 \frac{N}{\ell} I$

$$= 4\pi \times 10^{-7} \times \frac{100}{(0.5)} \times 2.5$$

$$= 6.28 \times 10^{-4} \text{ T}$$

- 16.** The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and  $T$ , absolute temperature )

- (1)  $\frac{7}{2}k_B T$     (2)  $\frac{1}{2}k_B T$   
 (3)  $\frac{3}{2}k_B T$     (4)  $\frac{5}{2}k_B T$

**Ans. (3)**

**Sol.** Average thermal energy =  $\frac{3}{2}K_B T$

where 3 is translational degree of freedom  
 For monoatomic gas total degree of freedom  $f = 3$  (translational degree of freedom)

- 17.** A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :

- (1) 20.0 g    (2) 2.5 g  
 (3) 5.0 g    (4) 10.0 g

**Ans. (4)**

**Sol.**  $m \propto r$

$$\frac{m_2}{m_1} = \frac{r_2}{r_1}$$

$$\frac{m_2}{5} = \frac{2r}{r}$$

$$m_2 = 10 \text{ g}$$

- 18.** The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is :

(c = speed of electromagnetic waves)

(1)  $1 : c^2$       (2)  $c : 1$   
 (3)  $1 : 1$       (4)  $1 : c$

**Ans. (3)**

**Sol.** In EMW, electric field and magnetic field have same energy density and same intensities.

- 19.** Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1)  $6.00 \times 10^{-7}$  rad      (2)  $3.66 \times 10^{-7}$  rad  
 (3)  $1.83 \times 10^{-7}$  rad      (4)  $7.32 \times 10^{-7}$  rad

**Ans. (2)**

**Sol.** Limit of resolution =  $\frac{1.22\lambda}{a}$

$$= \frac{1.22 \times 6 \times 10^{-7}}{2}$$

$$= 3.66 \times 10^{-7} \text{ rad}$$

- 20.** A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass M is suspended from its free end. The expression for Young's modulus is :

(1)  $\frac{MgL}{A(L_1 - L)}$       (2)  $\frac{MgL_1}{AL}$   
 (3)  $\frac{Mg(L_1 - L)}{AL}$       (4)  $\frac{MgL}{AL_1}$

**Ans. (1)**

**Sol.**  $Y = \frac{FL}{A\Delta L} = \frac{MgL}{A(L_1 - L)}$

- 21.** The energy required to break one bond in DNA is  $10^{-20}$  J. This value in eV is nearly :

(1) 0.006      (2) 6  
 (3) 0.6      (4) 0.06

**Ans. (4)**

**Sol.**  $E = \frac{10^{-20}}{1.6 \times 10^{-19}} \text{ eV}$   
 $= 0.625 \times 10^{-1}$   
 $= 0.0625 \text{ eV}$

- 22.** In a certain region of space with volume  $0.2 \text{ m}^3$  the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) 5 N/C      (2) Zero  
 (3) 0.5 N/C      (4) 1 N/C

**Ans. (2)**

**Sol.** Potential is constant throughout the volume  
 $\therefore$  Electric field is zero.

- 23.** The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

$$(1) \frac{1}{\sqrt{2} n^2 \pi^2 d^2} \quad (2) \frac{1}{\sqrt{2} n \pi d}$$

$$(3) \frac{1}{\sqrt{2} n \pi d^2} \quad (4) \frac{1}{\sqrt{2} n^2 \pi d^2}$$

**Ans. (3)**

**Sol.** Mean free path for a gas sample

$$\lambda_m = \frac{1}{\sqrt{2} \pi d^2 n}$$

where d is diameter of a gas molecule and n is molecular density

- 24.** An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2}$  nm, the potential difference is :

(1)  $10^4$  V      (2) 10 V  
 (3)  $10^2$  V      (4)  $10^3$  V

**Ans. (1)**

**Sol.**  $\lambda = 1.227 \times 10^{-2} \text{ nm}$

$$= 0.1227 \text{ \AA}$$

$$\lambda = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

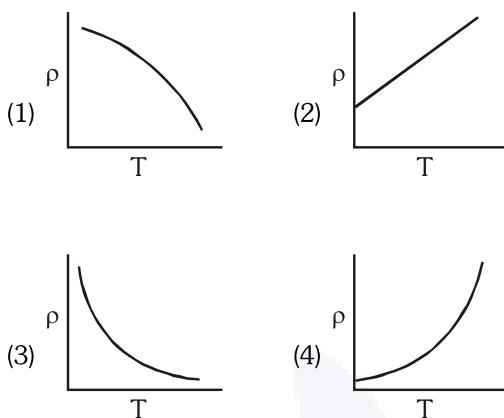
$$0.1227 = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

$$\sqrt{v} = 10^2 \Rightarrow v = 10^4 \text{ volt}$$





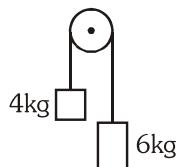
- 38.** Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature (T) for copper ?



**Ans. (4)**

**Sol.** For some metals like copper, resistivity is nearly proportional to temperature although a non linear region always exists at very low temperature.

- 39.** Two bodies of mass 4kg and 6kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity ( $g$ ) is :






**Ans. (4)**

**Sol.**  $a = \frac{(m_2 - m_1)g}{m_1 + m_2}$

$$a = \frac{(6-4)g}{6+4} = \frac{2g}{10}$$

$$a = \frac{g}{5}$$

- 40.** A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

- (1) 1.0 mm                          (2) 0.01 mm  
(3) 0.25 mm                          (4) 0.5 mm

**Ans. (4)**

$$\textbf{Sol. L.C.} = \frac{\text{Pitch}}{\text{Number of division on circular scale}}$$

$$\Rightarrow 0.01 \text{ mm} = \frac{\text{Pitch}}{50}$$

$\Rightarrow$  Pitch = 0.5 mm

- 41.** In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

- (1) one-fourth
  - (2) double
  - (3) half
  - (4) four times

**Ans. (4)**

$$\text{Sol. } \beta = \frac{\lambda D}{d}$$

$$\beta' = \frac{\lambda D'}{d'}$$

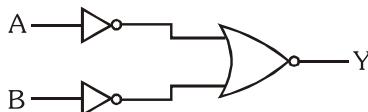
$$D' = 2D, \quad d' = \frac{d}{2}$$

$$\beta' = \frac{\lambda \times 2D}{d/2} = \frac{4\lambda D}{d}$$

$$\beta' = 4\beta$$

Fringe width becomes 4 times

**42.** For the logic circuit shown, the truth table is :



	A	B	Y
(1)	0	0	1
	0	1	0
	1	0	0
	1	1	0
(2)	A	B	Y
	0	0	0
	0	1	0
	1	0	0
	1	1	1
(3)	A	B	Y
	0	0	0
	0	1	1
	1	0	1
	1	1	1
(4)	A	B	Y
	0	0	1
	0	1	1
	1	0	1
	1	1	0

**Ans. (2)**

**Sol.**  $Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}} = A \cdot B = \text{AND gate}$

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

**43.** The energy equivalent of 0.5 g of a substance is:

- (1)  $0.5 \times 10^{13} \text{ J}$
- (2)  $4.5 \times 10^{16} \text{ J}$
- (3)  $4.5 \times 10^{13} \text{ J}$
- (4)  $1.5 \times 10^{13} \text{ J}$

**Ans. (3)**

**Sol.**  $E = mc^2$   
 $= 0.5 \times 10^{-3} \times 9 \times 10^{16}$   
 $= 4.5 \times 10^{13} \text{ J}$

**44.** For which one of the following, Bohr model is **not** valid?

- (1) Singly ionised neon atom ( $\text{Ne}^+$ )
- (2) Hydrogen atom
- (3) Singly ionised helium atom ( $\text{He}^+$ )
- (4) Deuteron atom

**Ans. (1)**

**Sol.** Bohr model is applicable for only single electron species.

**45.** The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio:

- |                   |                    |
|-------------------|--------------------|
| (1) $\frac{5}{3}$ | (2) $\frac{27}{8}$ |
| (3) $\frac{9}{4}$ | (4) $\frac{3}{2}$  |

**Ans. (2)**

**Sol.** Heat supplied  $\Delta Q = Ms\Delta T$   
 For same material 's' same.

$$\Delta Q \propto M \quad \text{and} \quad M = \frac{4}{3}\pi r^3 \rho$$

$$\Delta Q \propto r^3$$

$$\frac{\Delta Q_1}{\Delta Q_2} = \left( \frac{r_1}{r_2} \right)^3 = \left( \frac{1.5}{1} \right)^3 = \frac{27}{8}$$