

# PPSC Lecturer Physics Test 2020

**(Q 1):** Which part of a transistor is doped the heaviest to supply charge carries?

- (A) Emitter (B) Base (C) Collector (D) None of these

Hint: Three parts of a transistor are: Emitter (E), Base (B), Collector (C)

Size: Collector > Emitter > Base

Doping/impurity Concentration: Emitter > Collector > Base

**(Q 2):** In an a.c. circuit, power is:

- (A)  $VI \cos \theta$  (B)  $VI \sin \theta$  (C)  $I^2Z$  (D)  $I^2XL$

Hint: In dot product we take projection of second quantity along the first quantity... with  $\cos \theta$

$$* P = V_{rms} I_{rms} \cos \theta = \frac{1}{2} V_0 I_0 \cos \theta$$

**(Q 3):** If you were to make a very sensitive glass thermometer which of the following liquid would you choose? (A) Mercury (B) Alcohol (C) Gasoline (D) Glycerin

Hint: The coefficient of expansion of the alcohol is greater than the coefficient of expansion mercury, gasoline, and glycerin. Due to this reason, ethyl alcohol is used as fluid to make sensitive glass thermometer.

$$* \alpha = \frac{V_t - V_0}{V_0 \Delta T}$$

**(Q 4):** An object placed between  $f$  and  $2f$  of a convex lens produces an image that is :

- (A) Inverted, real (B) Upright, real (C) Inverted, virtual (D) Upright, virtual

Hint: An object placed between  $F$  and  $2F$  of a convex lens will produce an image which is real, inverted, enlarged

For Convex Lens

- O beyond  $2F$  → I is between  $F$  and  $2F$ , real, inverted, small than O  
 O at  $2F$  → I is at  $2F$ , real, inverted, equal to O  
 O between  $2F$  and  $F$  → I is beyond  $2F$ , real, inverted, larger than O  
 O at  $F$  → I is not formed  
 O between  $F$  and lens → I is behind O, virtual, erect, larger than O (Magnifying glass)

**(Q 5):** Two objects with masses  $M$  and  $m$  ( $m < M$ ) are on a frictionless surface. A force  $F$  accelerates  $m$  with an acceleration  $a$ . If that same force is applied to  $M$  then this mass will :

- (A) Move with a greater acceleration than  $m$  (B) Move with the same acceleration than  $m$   
 (C) Move but with a smaller acceleration than  $m$   
 (D) Move only if the force  $F$  is greater than some minimum value

**(Q 6):** Problem related to the optic nerve is :

- (A) Hyperopia (B) Presbyopia (C) Myopia (D) Glaucoma

**(Q 7):** Bernoulli's Equation is an expression of :

- (A) Conservation of energy (B) Conservative of mass  
 (C) Conservation of momentum (D) Conservation of angular momentum

**(Q 8):** The dot product of vectors  $\vec{A} = 5\hat{i} - 4\hat{j}$  and  $\vec{B} = \hat{i} + \hat{j} + \hat{k}$  where  $\hat{i}$ ,  $\hat{j}$  and  $\hat{k}$  are unit vectors, is:

- (A) 135 (B)  $\sqrt{135}$  (C) 25 (D) 1

**(Q 9):** If a dielectric is placed between the plates of a capacitor, the capacitance :

- (A) Increases (B) Decreases (C) Remain unchanged (D) Capacitor is destroyed

**(Q 10):** The \_\_\_\_\_ will cause least damage to a person exposed to radioactive rays-  $\alpha$ ,  $\beta$ ,  $\gamma$  rays.

- (A)  $\beta$  rays (B)  $\gamma$  rays (C)  $\alpha$  rays (D) All are damaging

Hint: Alpha particles are the least dangerous in terms of external exposure.

Alpha particles are the most harmful internal hazard.

Gamma rays are the most harmful external hazard.

Ionizing Radiations/particles: alpha, beta, neutron particles, gamma, x-rays

Ionizing Power: alpha > beta > gamma ; also dangerous order in terms of internal hazard.

Penetrating Power: gamma > beta > alpha ; also dangerous order in terms of external exposure.

Neutron > gamma > x-rays > beta > alpha

**(Q 11):** An ideal gas occupies a volume of  $100 \text{ cm}^3$  at  $20^\circ\text{C}$  and a pressure of  $100 \text{ Pa}$ . Determine the number of moles of gas in the container :

- (A)  $6.01 \times 10^{-3} \text{ mol}$  (B)  $6.01 \times 10^{-5} \text{ mol}$  (C)  $4.11 \times 10^{-4} \text{ mol}$  (D)  $4.11 \times 10^{-6} \text{ mol}$

Hint:  $PV = nRT$ ,  $n = \frac{100 \times 100 \times 10^{-6}}{8.314 \times (20 + 273.15)}$

**(Q 12):** The scattered photon in Compton effect has :

- (A) More energy than the incident photon and smaller frequency  
**(B) Less energy than the incident photon and smaller frequency**  
 (C) Less energy than the incident and greater frequency  
 (D) More energy than the incident photon and greater frequency

**(Q 13):** Which is Not the Unit for mass ?

- (A)  $lb$  (B)  $kg$  (C)  $u$  (D)  $Dyn$

**(Q 14):** The dimension for force  $F$  :

- (A)  $[MLT^{-1}]$  (B)  $[ML^{-1}T^{-2}]$  (C)  $[MLT^{-2}]$  (D)  $[ML^{-2}T^{-2}]$

**(Q 15):** Which of the following determine the acceleration due to gravity ?

- (A) The shape of the earth (B) The density of the earth  
 (C) The rotation of the earth **(D) The shape, density and rotation of the earth**

**(Q 16):** A pendulum has a time period of  $3.0 \text{ s}$  in an inertial frame. What is time period when measured by an observer moving with a speed of  $0.95c$  with respect to the pendulum ?

- (A)  $2.85 \text{ s}$  (B)  $3.32 \text{ s}$  (C)  $6.64 \text{ s}$  (D)  $9.60 \text{ s}$

Hint:  $T = \gamma T_0$ ,  $T = \frac{1}{\sqrt{1 - (0.95c/c)^2}} \times 3$

**(Q 17):** The reactances of a  $52 \text{ mH}$  inductor and a  $76 \mu\text{F}$  capacitor at equal \_\_\_\_\_ frequency .

- (A)  $40 \text{ Hz}$  (B)  $80 \text{ Hz}$  (C)  $125 \text{ Hz}$  (D)  $160 \text{ Hz}$

Hint:  $X_L = X_C$ ,  $f_r = \frac{1}{2\pi\sqrt{LC}}$ ,  $f_r = \frac{1}{2\pi\sqrt{52 \times 10^{-3} \times 76 \times 10^{-6}}}$

**(Q 18):**  $PV$  of an ideal gas is given by :

- (A)  $PV = nRT$**  (B)  $PV = nK_B T$  (C)  $PV = N_A k_B T$  (D)  $PV = N_A RT$

**(Q 19):** The acceleration of gravity on the moon is one-sixth that on earth. The weight of a  $70 \text{ kg}$  man on the moon is \_\_\_\_\_.

- (A)  $70.00 \text{ N}$  (B)  $114.33 \text{ N}$  (C)  $686.00 \text{ N}$  (D) Not enough data to determine

Hint:  $g_m = \frac{1}{6} g_e$ ,  $w = mg_m$ ,  $w = 70 \times 9.8/6$

**(Q 20):** Two coils have a mutual inductance of  $2 \text{ H}$ . As a result of mutual inductance an emf of  $4 \text{ V}$  exits in one cell. It follows that in the other coil :

- (A) A current of  $2 \text{ A}$  flows (B) **A current changing at the rate of  $2 \text{ C/s}$  flows**  
 (C) A charge of  $2 \text{ C}$  passes through it (D) A p.d. of  $2 \text{ V}$  is applied

Hint:  $N_s \phi_s = MI_p$ ,  $\epsilon_s = -M \frac{dI_p}{dt}$ ,  $\frac{dI_p}{dt} = \frac{4}{2} = 2 \text{ A/s}$ , (A current changing at the rate of  $2 \text{ A}$  flows)

**(Q 21):** The inductance required for a  $2000 \Omega$  reactance at  $20 \text{ MHz}$  equals :

- (A)  $1.59 \mu\text{H}$  (B)  **$15.9 \mu\text{H}$**  (C)  $159.0 \mu\text{H}$  (D)  $320.0 \mu\text{H}$

Hint:  $X_L = \omega L = 2\pi fL$ ,  $L = \frac{2000}{2\pi \times 20 \times 10^6}$

**(Q 22):** A lens of focal length  $20 \text{ cm}$  has a power of \_\_\_\_\_.

- (A)  $0.20 \text{ diopters}$  (B)  **$5.00 \text{ diopters}$**  (C)  $10.00 \text{ diopters}$  (D)  $50.00 \text{ diopters}$

Hint:  $P = \frac{1}{f}$ ,  $P = \frac{1}{20 \times 10^{-2}}$

**(Q 23):** What is the nature of binding of  $\text{CH}_4$  ?

- (A) Ionic (B) **Covalent** (C) Metallic (D) Dipole

**(Q 24):** A long solenoid has  $10 \text{ turns/cm}$ . If the current in the solenoid is  $5 \text{ A}$  what will be the magnetic field  $B$  inside the solenoid :

- (A)  $100.00 \text{ mT}$  (B)  $62.80 \text{ mT}$  (C)  $10.00 \text{ mT}$  (D)  **$6.28 \text{ mT}$**

Hint:  $B = \mu_0 nI$ ,  $B = 4\pi \times 10^{-7} \times 10/10^{-2} \times 5$

**(Q 25):** The uncertainty in position is only  $\Delta y = 1.5 \times 10^{-11} \text{ m}$ . Determine the minimum uncertainty in the momentum of the object ( $h = 6.63 \times 10^{-34} \text{ J s}$ ):

- (A)  $1.75 \times 10^{-24} \text{ kg m/s}$  (B)  $0.88 \times 10^{-24} \text{ kg m/s}$  (C)  $3.50 \times 10^{-24} \text{ kg m/s}$  (D)  $7.00 \times 10^{-24} \text{ kg m/s}$

Hint:  $\Delta y \Delta p_y \geq \frac{h}{4\pi}$ ,  $\Delta p_y = \frac{h}{4\pi \Delta y}$ ,  $\Delta p_y = \frac{6.63 \times 10^{-34}}{4\pi \times 1.5 \times 10^{-11}}$

**(Q 26):** Two parallel wires carrying currents in the opposite directions :

- (A) Repel each other (B) Attract each other  
(C) They cancel out their individual magnetic fields (D) Have no effect upon each other

**(Q 27):** A Sphere of radius  $r$  has volume  $V$ . If the radius of a sphere is increased to three times  $r$  what is the volume now : (A)  $V$  (B)  $3V$  (C)  $9V$  (D)  $27V$

Hint:  $V = \frac{4}{3} \pi r^3$ ,  $V' = 27V$

**(Q 28):** A  $200 \text{ kg}$  motorcycle travelling at  $30 \text{ m/s}$  hits a tree and is brought to rest in  $0.10$  seconds. What is the magnitude of the average force acting on the car to bring it to rest?

- (A)  $6 \times 10^2 \text{ N}$  (B)  $6 \times 10^3 \text{ N}$  (C)  $6 \times 10^4 \text{ N}$  (D)  $6 \times 10^5 \text{ N}$

Hint:  $t = F \times t = mv$ ,  $F = \frac{mv}{t}$ ,  $F = \frac{200 \times 30}{0.10}$

**(Q 29):** If the driver in the bus you are travelling in suddenly accelerates :

- (A) You are thrown forward (B) You are pushed backwards  
(C) You remain where you were (D) Insufficient information

**(Q 30):** The mass of oxygen is  $32 \text{ u}$  (atomic mass units). How many molecules of oxygen are in  $32 \text{ g}$  of oxygen ?

- (A)  $1/2 \times (6.022 \times 10^{22})$  molecules (B)  $1 \times (6.022 \times 10^{23})$  molecules  
(C)  $1 \times (6.022 \times 10^{18})$  molecules (D)  $1/2 \times (6.022 \times 10^{23})$  molecules

**(Q 31):** The energy gap in a semi conductor is :

- (A) Equal to that of an insulator (B) Less than that of an insulator  
(C) More than that of an insulator (D) None of these

**(Q 32):** A kilowatt-hours is a unit of :

- (A) Time (B) Energy (C) Power (D) Voltage

Hint:  $1 \text{ kWh} = 3.6 \text{ MJ} = 3.6 \times 10^6 \text{ J}$

**(Q 33):** The work function for silver surface is  $W_0 = 4.73 \text{ eV}$ . Find the minimum frequency that light must have to eject electrons from this surface ( $h = 6.63 \times 10^{-34} \text{ J s}$ ):

- (A)  $7.13 \times 10^{33} \text{ Hz}$  (B)  $1.14 \times 10^{23} \text{ Hz}$  (C)  $1.14 \times 10^{15} \text{ Hz}$  (D)  $7.13 \times 10^{-1} \text{ Hz}$

Hint:  $W_0 = hf_0$ ,  $f_0 = \frac{4.73 \times 1.6022 \times 10^{-19}}{6.63 \times 10^{-34}}$

**(Q 34):** The force of gravity above the Earth's surface is proportional to and inside the Earth it is proportional to :

- (A)  $1/r^2, r^2$  (B)  $1/r^2, r$  (C)  $1/r, r^2$  (D)  $1/r, r$

**(Q 35):** The magnitude of the force of gravity between two identical objects is given by  $F_0$ . If the mass of each object is doubled and the distance between them is doubled, then the new force of gravity between the objects will be :

- (A)  $4F_0$  (B)  $2F_0$  (C)  $F_0$  (D)  $F_0/16$

Hint:  $F = G \frac{m_1 m_2}{r^2}$ ,  $F = F_0$

**(Q 36):** Four resistances  $R_1 = 20 \Omega$ ,  $R_2 = 50 \Omega$  and  $R_3 = 1 \Omega$  are connected in parallel. The equivalent resistance is  $R$  :

- (A)  $R \geq 71 \Omega$  (B)  $50 \Omega < R < 71 \Omega$  (C)  $R \geq 1 \Omega$  (D)  $R < 1 \Omega$

Hint: In parallel combination of resistance, equivalent resistance is less than the minimum of individual resistances.

• In series combination of resistance, equivalent resistance is greater than the maximum of individual resistances.

**(Q 37):** The rate of change of linear momentum  $p$  is equal to the :

- (A) Velocity (B) Force (C) Acceleration (D) Impulse

**(Q 38):** The colour of light emitted by a LED depends on :

- (A) Its forward bias (B) Its reverse bias  
(C) The amount of forward current (D) **The type of semiconductor material used**

**(Q 39):** Doppler's effect is the principle underlying :

- (A) Detection of malignancies (B) **Measuring blood flow speeds** (C) Magnetic Imaging (D) CT scans

**(Q 40):** When silicon is doped with a trivalent impurity it is referred to as :

- (A) Donor atom (B) **Acceptor atoms** (C) Neither (D) Both A & B

**(Q 41):** A floppy disk in a computer rotates from rest up to an angular speed of  $31.4 \text{ rad/s}$  in time  $0.892 \text{ s}$ . What is the angular acceleration of the disk ?

- (A)  $0.028 \text{ rad/s}^2$  (B)  $14.40 \text{ rad/s}^2$  (C)  **$35.20 \text{ rad/s}^2$**  (D)  $70.40 \text{ rad/s}^2$

Hint:  $\alpha = \frac{\omega}{t}$ ,  $\alpha = \frac{31.4}{0.892}$

**(Q 42):** The rest mass energy of an electron is :

- (A)  $0.511 \times 10^9 \text{ eV}$  (B)  **$0.511 \times 10^6 \text{ eV}$**  (C)  $0.511 \text{ keV} \times 10^3 \text{ eV}$  (D)  $0.511 \text{ eV} \times 10^0 \text{ eV}$

Hint: Rest mass energy of an electron is  $0.511 \text{ MeV}$

**(Q 43):** When  $9 \times 10^{13}$  electrons are removed from a body which has charge of  $2.50 \mu\text{C}$ . What is its charge now ?

- (A)  $-14.4 \mu\text{C}$  (B)  $-2.5 \mu\text{C}$  (C)  $+14.4 \mu\text{C}$  (D)  **$+16.9 \mu\text{C}$**

Hint:  $q = -ne = -14.4 \mu\text{C}$ ,  $Q = 14.4 + 2.50$

**(Q 44):** At what temperature will the resistance of a copper wire becomes three times its value at  $0^\circ\text{C}$ ? Temperature coefficient of resistance of copper =  $4 \times 10^{-3} \text{ per } ^\circ\text{C}$ ?

- (A)  $550 ^\circ\text{C}$  (B)  **$500 ^\circ\text{C}$**  (C)  $450 ^\circ\text{C}$  (D)  $400 ^\circ\text{C}$

Hint:  $R_t = R_0(1 + \alpha\Delta t)$ ,  $\Delta t = \frac{R_t - R_0}{\alpha R_0} = \frac{3R_0 - R_0}{\alpha R_0} = \frac{2}{\alpha} = \frac{2}{4 \times 10^{-3}}$

**(Q 45):** A block on the end of a spring is pulled to position  $x = A$  and released. Through what total distance does it travel in one full cycle of its motion ?

- (A)  $A/2$  (B)  $A$  (C)  $2A$  (D)  **$4A$**

**(Q 46):** A car of mass  $1000 \text{ kg}$  was brought to rest on a level road by braking and  $500 \text{ kJ}$  of heat were produced. Find the speed of the vehicle just before the brakes were applied :

- (A)  $22.36 \text{ m/s}$  (B)  **$31.62 \text{ m/s}$**  (C)  $63.24 \text{ m/s}$  (D)  $632.4 \text{ m/s}$

Hint:  $K.E. = \frac{1}{2}mv^2$ ,  $v = \sqrt{\frac{2E}{m}} = \sqrt{\frac{2 \times 500 \times 10^3}{1000}}$

**(Q 47):** A truck of mass  $750 \text{ kg}$  moving at  $30 \text{ km/h}$  hits a stationary dumpster of mass  $1000 \text{ kg}$ . The two vehicles stick and move together after the collision. What is their speed ?

- (A) Zero  $\text{km/h}$  (B)  $1.20 \text{ km/h}$  (C)  **$12.85 \text{ km/h}$**  (D)  $41.66 \text{ km/h}$

Hint:  $Mv = m_1v_1 + m_2v_2$ ,  $v = \frac{750 \times 30}{750 + 1000}$

**(Q 48):** Equal charges  $q_1$  and  $q_2$  ( $q_1 = q_2$ ) are separated by  $2 \text{ m}$ . The force between them is  $F = 9 \text{ N}$ . What are the charges ?

- (A)  $0.063 \mu\text{C}$  (B)  $0.63 \mu\text{C}$  (C)  $6.30 \mu\text{C}$  (D)  **$63.00 \mu\text{C}$**

Hint:  $F = k \frac{q_1q_2}{r^2}$ ,  $\rightarrow \sqrt{q^2} = \sqrt{\frac{Fr^2}{k}} = \sqrt{\frac{9 \times 2^2}{9 \times 10^9}} = \sqrt{\frac{4}{10^9}}$

**(Q 49):** For coherence two light sources must have :

- (A) Same frequency and same wavelength (B) Same wavelength and be in phase  
(C) Be in phase and have the same wavelength  
(D) **Be in phase, have the same wavelength and same frequency**

Hint: Two light sources are coherent when their phase difference is constant and their frequencies are equal.

- coherent sources must have constant phase difference
- monochromatic = (one color means single frequency)

**(Q 50):** The specific heat of substance  $A$  is greater than that of substance  $B$ . The masses are the same. If equal amount of energy given by heat to both these substances, the one reaching the higher temperature (assuming no melting freezing or evaporation occur) is :

- (A) Substance  $A$  (B) Substance  $B$   
 (C) There will be no difference in the final temperatures (D) Could be either  $A$  or  $B$

Hint:  $c = \frac{\Delta Q}{m\Delta T}$ ,  $\rightarrow \Delta Q$  and  $m$  are same so  $c \propto \frac{1}{\Delta T}$

**(Q 51):** The temperature of a gas of initial volume  $V_1$  in a glass container is increased from  $T_1 = 200\text{ K}$  to  $T_2 = 800\text{ K}$ . The new volume is  $V_2$ . Which equation is correct ?

- (A)  $V_1 = V_2/4$  (B)  $V_1 = V_2/2$  (C)  $V_1 = 2V_2$  (D)  $V_1 = 4V_2$

Hint:  $PV=nRT$ ,  $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ ,  $V_1 = \frac{200}{800} V_2$

**(Q 52):** Pauli's Exclusion Principle states that no two electrons in the same atoms can have the same values for in quantum numbers :

- (A)  $n, l, m_l, m_s$  (B)  $n, l, m_s$  (C)  $n, l, m_l$  (D)  $l, m_s, m_l$

Hint: Pauli's Exclusion Principle states that no two electrons in the same atom can have identical values for all four of their quantum numbers.

**(Q 53):** How many electrons pass a cross section of the wire in time one hour when the current is  $1\text{ A}$  ?

- (A)  $5.00 \times 10^{18}$  (B)  $5.00 \times 10^{20}$  (C)  $2.25 \times 10^{18}$  (D)  $2.25 \times 10^{20}$

Hint:  $I = \frac{q}{t}$ ,  $q = ne$ ,  $n = \frac{I \times t}{e} = \frac{1 \times 3600}{1.602 \times 10^{-19}} = 2.25 \times 10^{22}$

**(Q 54):** The speed of sound in air is affected by changes in ?

- (A) Wavelength (B) Frequency (C) Amplitude (D) Temperature

**(Q 55):** You observe two helium balloons floating next to each other at the ends of strings secured to a table. The facing surfaces of the balloons are separated by  $1\text{-}2\text{ cm}$ . You blow through the opening between the balloons. What happens to the balloons ?

- (A) They move towards each other (B) They move away from each other  
 (C) They are unaffected (D) They move downwards

Hint: In side,  $v$  increases,  $P$  decreases

**(Q 56):** Diamond has :

(A) Four valence electrons (B) Three valence electrons (C) Two valence electrons (D) One valence electron

**(Q 57):** A test car moves at constant speed of  $10\text{ m/s}$  around a circular road of radius  $50\text{ m}$ . Find its acceleration :

- (A)  $0.2\text{ m/s}^2$  (B)  $2.0\text{ m/s}^2$  (C)  $5.0\text{ m/s}^2$  (D)  $50.0\text{ m/s}^2$

Hint:  $a = \frac{v^2}{r}$ ,  $a = \frac{10^2}{50} = 2$

**(Q 58):** Blood pressure is normally measure with the effect of the Sphygmomanometer around the arm. Suppose that the blood pressure were measured with the cuff around the calf of the leg of a standing person :

- (A) The same as it is for the arm (B) Less than it is for the arm  
 (C) Greater than it is for the arm (D) Cannot be taken

**(Q 59):** The pressure is  $2.5\text{ atmospheres (atm)}$ . What is it in Pascal's ?

- (A)  $2.53 \times 10^4\text{ Pa}$  (B)  $2.53 \times 10^5\text{ Pa}$  (C)  $2.53 \times 10^6\text{ Pa}$  (D)  $2.53 \times 10^7\text{ Pa}$

**(Q 60):** You are a passenger on a hot-air balloon that is rising with constant velocity, and you are carrying a buzzer that emits a sound of frequency  $f$ . If you accidentally drop the buzzer from the balloon, what can you conclude about the sound you hear as it falls to the ground ?

- (A) The frequency and intensity increase (B) The frequency decreases and intensity increases  
 (C) The frequency decreases and intensity decreases  
 (D) The frequency remains the same and the intensity decrease

Hint: when source is moving away from observer, then frequency is given by:  $f_1 = f_0 \frac{(1 - u_o/v)}{(1 + u_s/v)}$

$u_o$  = speed of observer,  $u_s$  = speed of source, Intensity = Power/Area.

$f_1 < f_0$ , and since  $d$  increases, so Power also decreases

**(Q 61):** The area of a sphere of radius 35 cm is :

- (A)  $0.0122 \text{ m}^2$       (B)  $1.22 \text{ m}^2$       (C)  $0.043 \text{ m}^3$       (D)  $0.135 \text{ m}^3$

Hint:  $A = 4\pi r^2$ ,  $A = 4\pi(35 \times 10^{-2})^2 = 1.54 \text{ m}^2$

**(Q 62):** The time period  $T$  and acceleration of gravity  $g$  of a simple pendulum executing SHM, when the amplitude is small, are related by :

- (A)  $T \propto g$       (B)  $T \propto \sqrt{g}$       (C)  $T \propto 1/g$       (D)  $T \propto 1/\sqrt{g}$

**(Q 63):** An object of mass  $m$  moves in a uniform circular motion on a horizontal frictionless table. The radius of the circle is  $r$  and centripetal force  $F$ . If the radius and speed is  $v$  are doubled, what is the centripetal force now ?

- (A)  $F/2$       (B)  $F$       (C)  $2F$       (D)  $4F$

Hint:  $F = \frac{mv^2}{r}$

**(Q 64):** In monitoring body temperature, the \_\_\_\_\_ waves are used .

- (A) Micro waves      (B) Radio waves      (C) Infrared waves      (D) Ultraviolet waves

Hint: Each body emits an electromagnetic radiation from its surface, which is proportional to its intrinsic temperature. A part of this radiation is infrared radiation which is used to measure temperature.

**(Q 65):** All nuclei have roughly the same density. It is :

- (A)  $2.3 \times 10^{10} \text{ kg/m}^3$       (B)  $2.3 \times 10^{17} \text{ kg/m}^3$       (C)  $2.3 \times 10^{16} \text{ kg/m}^3$       (D)  $2.3 \times 10^{15} \text{ kg/m}^3$

Hint: Nuclear density =  $2.3 \times 10^{11} \text{ kg/cm}^3 = 2.3 \times 10^{17} \text{ kg/m}^3$

**(Q 66):** A transformer has 50 in the primary coil and 250 turns in the secondary coil. If the primary voltage is 14 V, what is output voltage :

- (A) 2.80 V      (B) 7.00 V      (C) 28.00 V      (D) 70.00 V

Hint:  $\frac{V_s}{V_p} = \frac{N_s}{N_p}$ ,  $V_s = \frac{250}{50} \times 14$

**(Q 67):** A 50 kg woman stands on a scale in an elevator. What does the scale read if the elevator is moving upwards with an acceleration of  $2 \text{ m/s}^2$  ?

- (A) 50 N      (B) 390 N      (C) 490 N      (D) 590 N

Hint:  $T = w + ma = mg + ma$ ,  $T = 50(9.8 + 2)$ ,  $T = 50 \times 10 + 50 \times 2 = 500 + 100$

**(Q 68):** Which one of the following statements correctly describes the abilities of engines A and B to do work, if Engine A has a greater power rating than engine B ?

- (A) Engine B can do more work than engine A in the same amount of time  
 (B) Engine A can do more work than engine B in the same amount of time  
 (C) Engine A and B can do the same amount of work in the amount of time  
 (D) Engine A and B can do the same amount of work, but engine A can do it faster

Hint:  $P = \frac{W}{t} \rightarrow P_A > P_B$  so,  $W_A > W_B$  OR  $t_A < t_B$

**(Q 69):** The electron-volt is a unit of :

- (A) Potential      (B) Mass      (C) Energy      (D) Charge

Hint:  $1\text{eV} = 1.602 \times 10^{-19} \text{ J}$

**(Q 70):** There are  $3 \times 10^7$  radon atoms ( $T_{1/2} = 3.83 \text{ days or } 3.3 \times 10^5 \text{ s}$ ) trapped in a basement. How many radon atoms remain after 31 days ? Use  $N = N_0 e^{-\lambda t}$  :

- (A)  $1.1 \times 10^1$  radon atoms      (B)  $1.1 \times 10^3$  radon atoms  
 (C)  $1.1 \times 10^5$  radon atoms      (D)  $1.1 \times 10^7$  radon atoms

Hint1:  $\lambda T_{1/2} = \ln 2$ ,  $N = N_0 e^{-\lambda t}$ ,  $\rightarrow N = 3 \times 10^7 e^{-31 \ln 2 / 3.83} = 1.098 \times 10^5$

Hint2:  $n = t/T_{1/2}$ , No. of remaining atoms after  $n$  half lives,  $N = \frac{1}{2^n} N_0$

$\rightarrow n = t/T_{1/2} = 31/3.83 = 8.094 \approx 8$ ,  $N = \frac{1}{2^8} N_0 = 1.17 \times 10^5$

**(Q 71):** The Uncertainty Principle is :

- (A)  $\Delta P_x \approx h/4\pi \Delta x$       (B)  $\Delta P_x \approx h/2\pi \Delta x$       (C)  $\Delta P_x \geq h/4\pi \Delta x$       (D)  $\Delta P_x \leq h/2\pi \Delta x$

Hint:  $\Delta P_x \Delta x \geq h/2$

- (Q 72):** The Lorentz transformation equations reduce to Galilean transformation equations when :  
 (A) Velocity is very large (B) **Velocity is very low** (C) Reduction is velocity independent (D) None of these
- (Q 73):** The Intensity of sound unit is :  
 (A) Kelvin (B) Slug (C) Candela (D) **Decibel**
- (Q 74):** Work done will be Zero when angle between Force  $F$  and displacement  $d$  is :  
 (A)  $180^\circ$  (B)  **$90^\circ$**  (C)  $60^\circ$  (D)  $0^\circ$
- (Q 75):** Which one or more of the following would lead to an increase in the maximum kinetic energy of the ejected photoelectrons from a metal surface on which light is shining ?  
 (A) Using photons whose frequency  $f_0$  is less than  $W_0/h$ , where  $W_0$  is the work function of the metal and  $h$  is Planck's constant  
 (B) Increasing the number of photons per second striking the surface  
 (C) **Increasing the frequency of the incident light**  
 (D) Selecting a metal that has a greater work function  
 Hint:  $K.E_{max} = hf - W_0 = hf - hf_0$ . As  $f$  increases,  $K.E_{max}$  also
- (Q 76):** A uniform wire of length  $L$  and diameter  $d$  has a resistance  $R$ . Another wire of the same material has length  $2L$  and diameter  $2d$ . Its resistance will be :  
 (A)  $R/2$  (B)  $R$  (C)  $2R$  (D)  $4R$   
 Hint:  $R = \rho \frac{L}{A} = \rho \frac{L}{\pi r^2} = \rho \frac{4L}{\pi d^2}$
- (Q 77):** Integrated circuits are critical for high-speed computers. The fast response is due to :  
 (A) Miniaturization (B) Close packing of components  
 (C) **Miniaturization and close packing of components** (D) None of these
- (Q 78):** Frequency is adjusted by :  
 (A) Filtering (B) **Tuning** (C) Rectification (D) Demodulation
- (Q 79):** Krypton (atomic number 36) has how many electrons in its next to outermost shell ?  
 (A) **8** (B) 18 (C) 32 (D) 50  
 Hint: K, L, M, N=2, 8, 18, 8  
 Electronic Configuration:  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6$
- (Q 80):** A box is at rest on a frictionless surface. Three forces are exerted on the box such that the box remains at rest. One is a force of  $100\text{ N}$  towards the East. Another is a force of  $100\text{ N}$  towards the North. What is the third force ?  
 (A)  $141.42\text{ N}$  towards the Northeast (B)  **$141.42\text{ N}$  towards the Southwest**  
 (C)  $0\text{ N}$  towards the Northeast (D)  $0\text{ N}$  towards the Southwest  
 Hint:  $F_1 = 100\text{ N}$ ,  $F_2 = 100\text{ E}$ , So, the third force  $F_3$  (equal and opposite to the resultant force of  $F_1$  and  $F_2$ ) should be in direction of SW and its magnitude should be equal to the resultant magnitude of first two.  
 $F = \sqrt{F_1^2 + F_2^2}$
- (Q 81):** Mig 21 destroyed by Pakistani air force on 27 April was manufactured by:  
 (A) India (B) France (C) **USSR** (D) Italy  
 Hint: On 27 February, 2019, PAF destroyed MIG 21 of India, manufactured by USSR (Union of Soviet Socialist Republics) ---Russia
- (Q 82):** Total number of bones in a normal adult human body is:  
 (A) 198 (B) **206** (C) 202 (D) 300  
 Hint: An adult has 206 bones, but a newborn baby has nearly 300 bones in her body. This is because babies have more flexible cartilage (a firm tissue softer than bone) in the body. As the child grows, some of the cartilage hardens and turns to bone, and some bones fuse together.

**(Q 83):** Which is the largest planet in the solar system?

- (A) Mercury (B) **Jupiter** (C) Venus (D) Mars

Hint: The eight planets orbiting around our star (Sun) are:

Distance: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

The inner, rocky planets are Mercury, Venus, Earth and Mars. The outer planets are gas giants Jupiter and Saturn and ice giants Uranus and Neptune.

Size: Mercury, Mars, Venus, Earth, Neptune, Uranus, Saturn, Jupiter.

Venus spins slowly in the opposite direction from most planets.

Neptune was the first planet discovered through mathematical calculations, rather than observation.

**(Q 84):** 'Iron Cross' was the highest military award of:

- (A) Britain (B) **Germany** (C) France (D) None of these

Highest military awards:

Pakistan: Order of the Lion (Nishan-e-Haider)

China: Order of August First

India: Param Vir Chakra

France: Legion of Honour

Germany: Cross of Honour for Valour (Current)

UK, Canada, New Zealand: Victoria Cross

USA: Medal of Honour

Russia: Hero of the Russian Federation & Order of Saint George

**(Q 85):** Which leader of the then NWFP was also known as the Frontier Gandhi?

- (A) **Abdul Ghaffar Khan** (B) Abdul Jabbar Khan (C) Abdul Ghani Khan (D) None of these

Hint: Abdul Ghaffar Khan (Bacha Khan) (Father of Abdul Wali Khan)

Abdul Jabbar Khan (Dr Khan Sahib, Brother of Abdul Ghaffar Khan)

- Founded the Khudai Khidmatgar movement in 1929. (سرخ پوش)

**(Q 86):** Who was the first Chairman of the Higher Education Commission (HEC) of Pakistan?

- (A) Dr. Javaid Leghari (B) **Dr. Atta-ur-Rahman** (C) Dr. Salim-uz-Zaman Siddiqui (D) Dr. Mukhtar Ahmed

- Dr. Atta-ur-Rahman (in 2002), Tariq Banuri (Current Chairman)

**(Q 87):** The hadith in which the steps of Narration are less in number is:

- (A) **Aali** (B) Nazil (C) Mudraj al-Isnad (D) Mudtarab al-sanad

Aali (العلى) (One that has the least possible number of narrators (راوى))

Nazil (one involving many narrators)

Mudraj al-Isnad (when a narrator adds his comments to the content of the hadith)

Mudtarab al-sanad (When it is narrated in two ways)

**(Q 88):** The capital of the Umayyad dynasty was:

- (A) Baghdad (B) Cairo (C) Madina (D) **None of these**

Hint: Damascus (دمشق) (Capital of Syria(شام), Umayyad dynasty (اميه خاندان))

Hazrat Ali (R.A.) shift Capital from Madina to Kufa

Baghdad (Abbasi)

**(Q 89):** Fill in the blanks so as to make the sentence complete and meaningful.

His comments were almost irrelevant \_\_\_\_\_ the topic of the evening.

- (A) For (B) About (C) **To** (D) On

**(Q 90):** Fill in the blanks so as to make the sentence complete and meaningful.

His face is not familiar \_\_\_\_\_ me.

- (A) **To** (B) With (C) Of (D) About

**(Q 91):** \_\_\_\_\_ controls, co-ordinates and directs all the operations performed by the computer.

- (A) ALU (Arithmetic and Logic Unit) (B) **CU (Control Unit)** (C) AU (Arithmetic Unit) (D) LU (Logic Unit)

**(Q 92):** The code of a web page is written using which of the following language:

- (A) HTTP (B) C++ (C) PERL (D) **HTML**

Hints: HTML (Hyper Text Markup Language)

