S3 PHYSICS MAKING GUIDE DISTRICT ASSESSMENT 2024

From a question one up to question four, each sub-question of them has 0.5 marks

1) a) Electric field intensity b) Electric field intensity potential c) Coulomb's force and distance Negative charge
2) a) F b) F c) T d) F e) F
3) a) iii b) iv c) iv d) ii e) iii
4) 1 to E, 2 to B , 3 to D , 4 to A , and 5 to C
5) a) Q stands for Heat energy supplied while W stands for Work done **1pt**
   b) Given W=140 J and Q = 60 J
   Then ΔU=Q+W= -Q-W= -60-140 **0.5pt** ΔU= -200J **0.5pt**
   c) about the working of refrigerator **1pt**
6) a) Elastic collisions occurs When the total kinetic energy is conserved after collision **1pt** while Inelastic Collisions is where the total kinetic energy is not conserved are called inelastic collisions. A completely inelastic collision is one which two bodies stick together after collision 1**pt**
   b) From conservation of linear momentum, $m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$
   u_2= it will be negative because it moves from right to left direction
   then $2kg \times \frac{4m}{s} + 4kg \times -\frac{1m}{s}$ $\boldsymbol{1pt} = 0.8 \times 2 + v_2 \times 4$, $8 - 4 = 1.6 + 4v_2$ **1pt**
   v_2=0.6m/s **1pt**
7) a) acceleration refers to the rate of increasing velocity **1pt while** Deceleration refers to the rate of decreasing velocity **1pt**
   b) $v = \frac{72km}{h} = \frac{72 \times 1000\, m}{60 \times 60\, s} = \frac{20m}{s}$ **1pt**
   c) acceleration $a = \frac{\Delta v}{\Delta t} = \frac{20m/s}{50s} = 0.4ms^{-2}$ **1pt**
8) a) Atmospheric pressure is defined as the pressure resulting from the weight of the air column acting on the earth's surface. **1pt**
   b) The existence of atmospheric pressure atmospheric pressure can be demonstrated by using a wet coin, an inverted glass tumbler, a can and Magdeburg Hemisphere etc….
   c) Mercury; **0.5pt** because it has a high density **0.5pt** and a low melting point **0.5pt**
   d) When the sucker is pressed into place, the air inside is forced out. As a result, the pressure inside the sucker becomes very low . **1pt** The sucker is then held in position by the high atmospheric pressure on the outside surface. **1pt**
9) Below is a simple block diagram showing energy changes in hydro-electric power station each block below has **0.5pt**

Potential energy Of water in dam Or water fall	kinetic energy of water in tunnel	mechanical energy of turbine	mechanical energy in dynamo	Electrical energy

10) a) Heat is a form of energy that flows from a hot to a cold body **1pt while** temperature is the degree of hotness or coldness of a substance. **1pt**
    b) $\frac{T_C - 0}{100} = \frac{T_F - 32}{180} = \frac{T_K - 273}{100}$ By using this formula, help you to get answer
    Then, $T_C = 10^0$C **1pt**
    $T_K = 283k$ **1pt**

C) There so many applications of heat transfer: Vacuum flask **0.5pt**, Windows and ventilators in buildings 0**.5pt**, Natural convection currents over the earth's surface 0**.5pt**, Electrical devices etc…

11) a) coefficient of linear expansion refers to the value of the increase in length per unit rise in temperature for a given material. The SI units of α is K^{-1} **2pt**

b) Increases in length (Linear Expansion) **0.5pt**, Increases in volume (Volume Expansion) **0.5pt**, Increases in area (Surface Expansion). **0.5pt**

c) Given that: $h_0 = 400m, \quad T_0 = -15^0C, \quad T_F = 35^0C\ , \quad \alpha = 0.000004K$

$\alpha = \frac{\Delta h}{l_0 \Delta\theta}$ **0.5pt** $\quad \Delta h = \alpha l_0 \Delta\theta = 0.000004 \times 400 \times [35-(-15)](\mathbf{0.5pt}) = 0.8m$ **0.5pt**

$l = l_0 + \Delta l = 0.8m + 400m = 400.8m$ **1pt**

12) **Matter consists of small particles 0.5pt** The first assumption is that matter consists of a large number of very small particles either individual atoms or molecules **0.5pt**

Large separation between particles0.5pt The second assumption describes the separation of the particles: In a gas, the separation between particles is very large compared to their size, such that there are no attractive or repulsive forces between the molecules. In a liquid, the particles are still far apart, but are close enough that attractive forces confine the material to the shape of its container. In a solid, the particles are so close that the forces of attraction confine the material to a specific shape. **0.5pt**

Particles in constant motion 0.5pt The third assumption is that each particle in matter is in constant motion. Particles of a solid are held very close to each other by strong attractive forces. These forces hold the solid particles in place and gives a solid fixed size and shape. Liquid particles have more energy than solids allowing them to move around more freely, and spread out more than those of a solid and therefore increasing the space between the particles. This is why a liquid will take the shape of its container up to its surface. However, liquids have definite volume. Gas particles have more energy than liquids hence their particles move more freely. **0.5pt**

13) a) **Fleming's right hand rule** states that "If the thumb and first two fingers of the right hand are mutually perpendicular to each other, the First finger pointing in the direction of the Field and the thumb in the direction of Motion of the conductor, then the second finger points in the direction of the induced Current" **2pts**

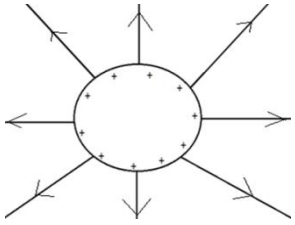
b) Electromagnetic induction is applied in Moving coil microphone and induction coil. **1pt**

14) a) **In a step-up transformer** refers to the number of turns in the secondary coil(Ns) is more than the number of turns in the primary coil (N p) 1**pt** while **in a step-down transformer**, the number of turns in the secondary coil is less than the number of turns in the primary coil **1pt**

b) Resistance of the coils, Eddy currents, Hysteresis loses, Flux or magnet leakage **1pt**

c) Using thick copper wires, Transporting electricity in high voltage.

15) a)



0.5pt

i) To the left **0.5pt** ii) To the right **0.5pt**

b) Given that: Potential difference(V) =70 volts, Charge (Q) = 4.0 $X10^{-6}C$

$V = \frac{W}{Q}$ **1pt** $W = V \times Q = 70 \times 4 \times 10^{-6} = O.00028\,J$ **1pt**

SECTION B

16) a) i. A transformer is an electric device that transfers electrical energy from one circuit to another by electromagnetic induction usually with a change in voltage **1pt**

ii) Radios and Mobile telephone charger, …….**1pt**

iii) Power transformers are essential in minimizing substantial energy losses, due to Joule's effect, in the transmission of large amounts of electrical power over long distances by converting it into high-voltage current then stepping it down to a safer low-voltage current. **1pt**

b) Electricity transmitted at high voltage because the current is then reduced and the heating losses in the cables are small 1**pt**

c) Given data: $V_s = 12\text{V}$, $P_S = 40W$, $N_P = 5000\ turns$, $N_S = 250\ turns$, $\eta = 90\%$

i) $\frac{V_S}{V_P} = \frac{N_S}{N_P}$ $\mathbf{0.5pt}$, $V_P = \frac{N_P \times V_S}{N_S} = \frac{5000 \times 12}{250}$ $\mathbf{0.5pt}$ $V_P = 240V$ **0.5pt**

ii) $P_S = V_S \times I_S$ $\mathbf{0.5pt}$, $I_S = \frac{P_S}{V_S} = \frac{40W}{12V} = 3.33A$ **1pt**

iii) $\eta = \frac{P_{out\ put}}{P_{in\ put}} \times 100\%$ $\mathbf{1pt}$ $\eta = \frac{P_s}{P_i} \times 100\% = \frac{12V}{P_i} \times 100\% = 90\%$, $P_t = 44.4W$ **1pt**

iv) The kind of this transformer is Step-down **1pt**

17) a) Latent heat of fusion of a substance is the quantity of heat energy required to change the substance from the solid to the liquid state without any change in temperature **1pt** **while** Latent heat of vaporization of a substance is the quantity of heat energy required to change 1kg of a substance from liquid state to vapor state without change in temperature **1pt**

b) Heat energy required to:

1. raise the temperature of ice from – 10 °C to 0 °C is given by

$Q_1 = (mc\Delta\theta)$ ice **1pt** $= 1 \times 2\,100 \times 10$ J = 21 000 J **1pt**

2. convert ice at 0 °C to water at 0 °C is given by

$Q_2 = (ml)$ice**0.5pt** $= 1 \times 3.36 \times 10^5$ J = 336 000 J **1pt**

3. raise the temperature of water from 0 °C to 100 °C is given by

$Q_3 = (mc\Delta\theta)$ water **0.5pt** $= 1 \times 4\,200 \times 100$ J = 420 000 J**1pt**

4. convert water at 100 °C to steam at 100 °C is given by

$Q_4 = (ml)$water **0.5pt**$= 1 \times 2.26 \times 10^5$ J = 2 260 000 J**1pt**

Then the Total heat energy required to convert ice into steam is given by

$Q = Q_1 + Q_2 + Q_3 + Q_4$ **0.5pt** = 21 000 + 336 000 + 420 000 + 2 260 000 = 3.04 × 106 J **1pt**

18) a) Induced emf is the change in potential difference due to change in the magnetic flux of a coil**1pt while Induced current is the flow of electrons through a conductor in a closed circuit**

b) i) When the switch is closed, the pointer of the galvanometer momentarily deflects to one side **1pt**

ii) Nothing, No deflecting in Galvanometer it means the pointer's Galvanometer is at the center (zero position) **1pt**

iii) When the switch is opened, the pointer momentarily deflects again but in the opposite direction. **1pt**

c) Increase the number of turns of wire in coil **1pt**, Increase the strength of magnetic field **1pt**, By using a strong magnet **1pt**, Increase the rate of the change of magnetic flux etc

c) Given data: Radius(R) =5cm= 0.05m, Magnetic field(B)=0.50T, Time(t)=0.50 sec

Asked? Emf induced $\varepsilon = \frac{\Delta\varphi}{\Delta t} = \frac{B\times A}{\Delta t} = \frac{B\times\pi r^2}{\Delta t}$ **1pt** $= \frac{0.5\times3.14\times(0.05)^2}{0.5} = 0.00785V = 7.85mV$ **1pt**

19) a) Coal, Petroleum(Oil) and Natural gas **1pt**

b) It comes from interior of the earth where Dead animals **1pt** and plants are decayed or decomposed over a long period of time **1pt**

c) Sun **1pt**, wind **1pt**, Hydroelectric power **1pt**, Geothermal energy **1pt**, Biomass, Wave power etc…

d) It is easy to obtain(available) **1pt**

It is cheap **1pt**

It is not polluting the environment through emission of gases which contribute to cause greenhouse effect and Global worming **1pt**

It is renewable etc.

20) a) Switch**0.5pt**, electrical cables**0.5pt**, electrical lamp**0.5pt**, fuse**0.5pt**, circuit breaker etc.

b) i) as we know $P = VI$ **1pt**, $I = \frac{P}{V} = \frac{3}{6} = 0.5A$ **1pt**

ii) Yes **1pt**, Because the total current

iii) As knowing that the total current flow through all components in parallel circuit equals to the current through each component and see in the diagram we have four resistors, each resistor flowed by current of 0.5A.

$I = I_1 + I_2 + I_3 + I_4$ If the $I_1 = I_2 = I_3 = I_4 = 4I_1$

$I = 0.5 + 0.5 + 0.5 + 0.5 = 4 \times O.5 = 2A$ **1pt**

Therefore $P = VI = 6 \times 2 = 12W$ **1pt**

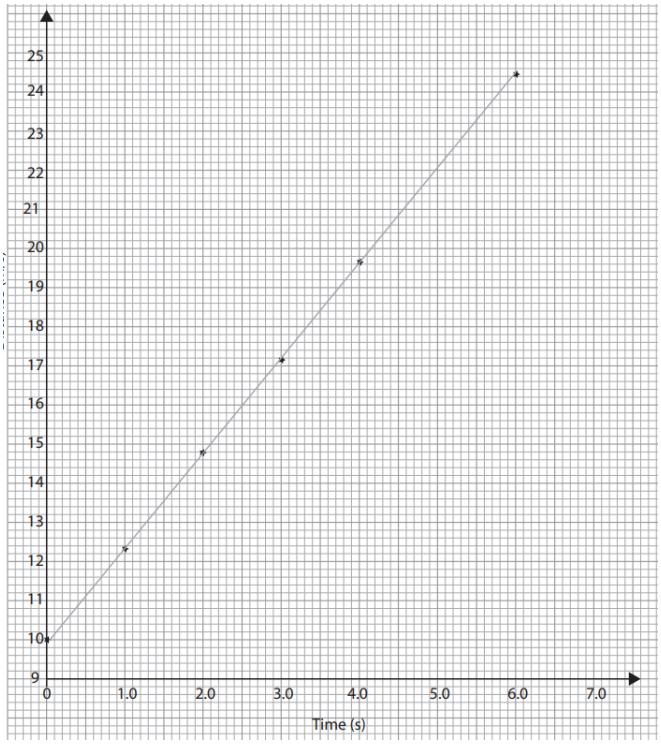
c) If one gets a fault, all the other three can remain working rather (It is used in houses, so if one light goes out others do not get affected by it). **1pt**

- Every unit that is connected in a parallel circuit gets equal amount of voltage. **1pt**

- Parallel circuits are used in cases of multiple loads.

- It becomes easy to connect or disconnect a new element without affecting the working of other elements. For example: the elements that are connected via wall outlets can be switched on or off without hampering the working of the other one running/ or at rest, at the same time

21) a) To join each point (t,v) in suitable way in order to form a best fit line on the graph. Each point has one mark **(1pt)** ie six point=6marks, to plot the coordinate on related axis it means velocity present on vertical line and time on horizontal line has **(1pt)** and both scales on axes have **(1pt).** Then total in (a) is (**8pt)**



b) i) For 2.6 seconds the vehicle is travelling in 16.2m/s**1pt** while
For 4.8 sec vehicle is travelling in 21.6m/s **1pt**

c) Distance(S)=$\Delta v \times \Delta t =$ **1pt** $(21.6 - 16.2)m/s \times (4.8 - 2.6)s = 11.88m$ **1pt**

d) Slope(S)=$\frac{\Delta V}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$ **1pt** $= \frac{24.4-10}{6-0} = \frac{14.4}{6} = 2.40ms^{-2}$ **1pt**