## Second Term Physics Model question Paper II

## STD : X

## Answer Key

### Section A (1 mark each)

1. c) Electric Motor
2. c) North pole
3. c) High resistivity
4. c) Kilowatt hour (kWh)

### Section B (2 marks each)

5. **A.** The magnetic field produced by a coil exists only as long as current flows through it. When the current is switched off, the magnetic field disappears. Hence the magnetic force obtained from a coil of wire is temporary.
   **OR**
   **B.** Any two:
   - Magnitude of current
   - Number of turns in the coil
   - Presence of soft iron core
6. a) Electrical energy → Mechanical energy (sound energy) b) The voice coil vibrates back and forth according to the varying audio current. This vibration pushes the cone (diaphragm) of the loudspeaker, which produces sound waves in air.
7. When a current-carrying conductor is placed in a magnetic field, it experiences a force. Example: Electric fan / Mixer grinder / Washing machine / Juicer (any one)
8. a) Solenoid b) Insert a soft iron core inside the coil
9. $I^2$ (square of current), R (resistance), t (time)
10. The phenomenon of production of induced emf in a conductor/coil due to the change in magnetic flux linked with it is called electromagnetic induction. Discovered experimentally by Michael Faraday.
11. **A.** a) Right-hand thumb rule b) Magnetic field lines are circular around the conductor. If the thumb of the right hand points in the direction of current, the curled fingers give the direction of the magnetic field.
    **OR**
    **B.** a) Motor principle (or Fleming's Left-Hand Rule) b) Reverse the direction of the magnetic field (i.e., reverse the poles of the magnet / turn the horseshoe magnet)

### Section C (3 marks each)

12. a) Electric motor: Electrical energy → Mechanical energy Generator: Mechanical energy → Electrical energy b) To reverse the direction of current in the armature coil after every half rotation so that the torque (couple) always acts in the same direction and the coil rotates continuously in one direction.

13. **A.**
    a) Power of the appliance (529 W means it consumes 529 joules of energy in 1 second)
    b) $R = V^2/P = 230^2 / 529 = 52900 / 529 = 100\ \Omega$
    c) $H = Pt = 529 \times (10 \times 60) = 529 \times 600 = 317400$ J
    **OR**
    **B.** Any three:
    - High resistivity
    - High melting point
    - Does not oxidise (or burn) easily at high temperature
    - Can be drawn into thin wires (ductile)

14. **A.** a) AC generator → Slip rings and brushes
    DC generator → Split-ring commutator and brushes
    b) Cell: ——————————— (straight horizontal line)
    AC Generator: sinusoidal wave (~~~~)
    **OR**
    **B.** a) Any two: – Use LED/CFL bulbs instead of incandescent bulbs – Switch off fans and lights when not required – Use 5-star rated appliances – Use solar water heater b) Carbon footprint is the total amount of greenhouse gases (mainly $CO_2$) released into the atmosphere due to our daily activities.

15. a) Hold the forefinger, middle finger and thumb of the left hand mutually perpendicular. Forefinger → direction of magnetic field Middle finger → direction of current Thumb → direction of force/motion
    b) Current in sides AB and CD is in opposite directions. By Fleming's left-hand rule, the force on AB is in one direction and on CD in the opposite direction. These two equal and opposite forces form a couple and produce rotation.

16. a) Total power = 600 + 500 = 1100 W
    Time = 2 × 3600 = 7200 s
    $E = Pt = 1100 \times 7200 = 7\ 920\ 000$ J (or $7.92 \times 10^6$ J)
    b) Energy consumed = 1100 × 2 = 2200 Wh = 2.2 kWh

17. a) Vs/Vp = Ns/Np = 4000/400 = 10
    b) Vs = 10 × 230 = 2300 V
    c) High voltage reduces the current for the same power. Low current reduces $I^2R$ loss (heating loss) in transmission lines, so electricity can be transmitted over long distances with minimum loss.

**Section D (4 marks – Answer any one)**

18. **A.** a) Magnetic field is produced around a current-carrying conductor (Oersted's experiment / Magnetic effect of electric current)

b) Fig. 1 → Circular magnetic field around a straight conductor
Fig. 2 → Uniform and strong magnetic field inside the solenoid, very weak outside. Strength can be increased by increasing current, number of turns or inserting soft iron core.
c) Soft iron core gets magnetised and greatly increases the strength of the magnetic field. This produces a much larger torque, making rotation powerful and continuous.
d) Split-ring commutator reverses the direction of current in the armature coil after every half rotation so that the direction of the couple remains the same and the armature rotates continuously in one direction.

**OR**

**B.**

a) Electromagnetic induction
b) Thermal Power Station: Chemical energy in coal → Heat energy → Kinetic energy in steam → Mechanical energy in turbine → Electrical energy
Hydroelectric: Potential energy of water → Kinetic energy → Mechanical energy in turbine → Electrical energy
c) During peak hours demand is very high. If everyone uses high-power appliances together, more power stations have to run → more fuel burnt → higher cost and pollution increase. TOD (Time of Day) billing charges higher rates in peak hours to encourage people to shift usage to off-peak hours and reduce the energy crisis.
d) Rooftop solar panels produce electricity without emitting $CO_2$ / greenhouse gases / air pollution (whereas thermal power stations release large amounts of $CO_2$ and other pollutants