PAPER II

PART I
[20 marks]

Answer **six** questions from this part. **No. 1** and any other **five**.
Question **No. 1** carries **5 marks** while others carry **3 marks** each.

1. (a) List the **two** types of solar collectors.
   (b) Distinguish between a slide projector and a periscope.
   (c) A factory is built on 3 acres of land. Calculate the area of the land in square metres.
   [4047 m^2 = 1 acre]

2. (a) Give **two** instruments used to measure distance.
   (b) State **one** difference between contact and field forces.

3. (a) Mention **one**:
      i. Derived quantity
      ii. Fundamental quantity
   (b) A car moving with a speed of 50 ms^{-1} accelerated for 2 minutes and attained a speed of 120 ms^{-1}. Calculate its acceleration.

4. (a) List **two** examples of third class lever.
   (b) Differentiate first class lever from second class lever.

5. (a) Enumerate the **two** types of collision.
   (b) A ball of mass 0.2 kg moving at a speed of 10 ms^{-1} is suddenly hit by a force of 3 N in the direction of the motion for 0.02 s. Determine the new speed of the ball.

6. (a) Highlight **two** natural sources of light.
   (b) Differentiate sound waves from ultraviolet rays.

7. (a) List **two** ways of reducing echoes in a hall.
   (b) An object is placed 10 cm in front of a concave mirror with a radius of curvature 12 cm. Calculate the image distance.

8. (a) How can a magnet be demagnetised mechanically?
   (b) Contrast angle of declination and angle of dip.

9. (a) Highlight **two** uses of potentiometer.
   (b) A galvanometer of resistance 70 Ω gives a full scale deflection of 5 mA. Calculate the value of the resistance needed to convert it to an ammeter capable of reading 3 A.

10. (a) Give **two** examples of face-centred cubic crystals.
    (b) Distinguish between soft and hard x-rays.

11. (a) Contrast between adhesion and cohesion.
(b) Itemise **two** properties of liquids.

PART II

Answer any four questions from this part
All questions carry equal marks.

12. (a)i. List **two** examples of bodies performing rotational motion.
ii. State **one** difference between random and rotational motion.

(b) Mention **two**:
i. Disadvantages of friction in a machine
ii. Methods of reducing friction

(c) A light beam with supports at X and Y has loads 50 N, 30 N and 40 N hung on it as shown in **Figure 2.1.**

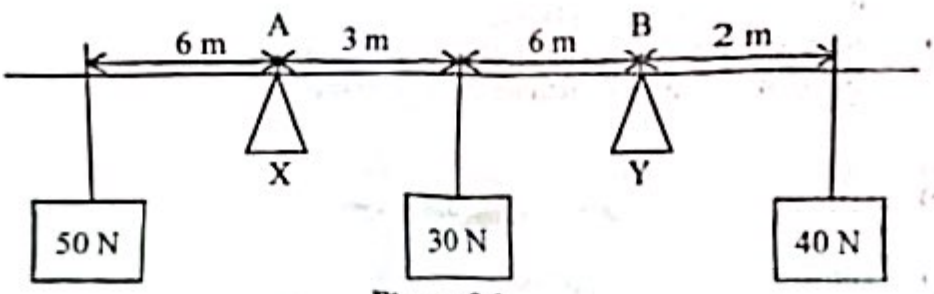

Figure 2.1

Calculate the reactions at A and B.

13. (a)i. Define convection of heat.
ii. Differentiate conduction from radiation.

(b) Mention **two** environmental impacts of using fossil fuel as a source of energy.

(c)i. State **two** factors that affect the rate of evaporation.
ii. An electric heater rated 220 V, 60 W is fixed into a metal block of mass M at 30°C. If the heater is operated for 5 minutes and the temperature of the block rises to 60°C, calculate the:
(i) Heat absorbed by the block
(ii) Value of M

14. (a)i. Enumerate **two** effects of refraction of light.
ii. Draw a ray diagram of the formation of an image of an object placed far away from a short sighted person.

(b) Draw an outline of the wave pattern formed when a plane wave passes through a narrow opening.

(c) Itemise **two** characteristics of sound.

(d) A ray of light experienced a minimum deviation of 37.2° when passing symmetrically through an equilateral triangular glass prism. Calculate the:
i. Angle of refraction of the light in the prism
ii. Refractive index of the glass

15. (a) List **two** components of a
i. d.c. generator.
ii. transformer.

(b) Distinguish between copper wire and dry wood.

(c) How are cathode rays produced in a discharge tube connected to a high voltage source?

(d) A 40 Ω resistor and a capacitor X are connected in series across a 30 V, 50 Hz power source. If the impendence in the circuit is 60 Ω, calculate the:
i. Capacitive reactance of X
ii. Current passing through the circuit

16. (a) Enumerate **two** assumptions of Rutherford's atomic model.

(b) Contrast surface tension and capillarity.

(c) Explain pressure in gas using molecular theory of matter.

(d) A photo emissive surface has a threshold frequency of 3.8×10^{14} Hz. If the surface is illuminated by light of frequency 5.4×10^{15} Hz, calculate the:
i. Work function
ii. Maximum kinetic energy of the emitted photo electrons
[$h = 6.63 \times 10^{-34}$ Js]

17. (a)i. Draw and label a simple continuity tester.
ii. What part of the device indicates continuity in a circuit?

(b)i. Give **two** applications of electrolysis other than electroplating.
ii. List **two** components of a voltameter.

(c) Highlight **two** similarities between an artificial satellite and a rocket.

(d) An astronomical telescope has objective and eyepiece lenses of focal lengths 100 cm and 60 cm respectively. If it is in normal adjustment, calculate the:
i. Distance between the lenses
ii. Magnifying power of the telescope