BASIC SCIENCE AND TECHNOLOGY

(1a) Explain Hydraulic and Pneumatic machines with two examples each.

Hydraulic machines are machines that use the power of liquid or fluid to do work.

Examples are: hydraulic car brake, tipper, excavator, cranes etc.

Pneumatic machines are machines that generate power via or through expansion of compressed air or pressurized gas.

Examples are: pipe organs, air brakes, riveters, vacuum pumps etc.

(b) State 5 differences between hydraulic and pneumatic machine.

	HYDRAULIC MACHINE	PNEUMATIC MACHINE
1	They use liquid or fluid to work.	They use compressed air or gas to work.
2	They are useful in complex and heavy equipment.	They are useful in simple and electric system.
3	They leak oil.	Pneumatic system is clean.
4	Hydraulic energy is costly and dangerous.	Pneumatic energy is less costly, less dangerous and more reliable.
5	Hydraulics use closed system by retaining oil.	Pneumatic use open system for throwing out used air.

(c) List 3 applications of a gear.

(i) It allows cars to reach high speed.

(ii) Gears make vehicles climb steep hills.

(iii) They increase the spinning speed of devices e.g. blender and washing machine

(2a) Explain 5 types of gear.

(1) Internal gear: They are gears with their teeth inside the internal surface of the circular rim. This type of gear is used in bicycles.

(2) External gear: They are gears which have their teeth formed on the outer surface of the circular rim.

(3) Helical gear: This is a cylindrical gear whose teeth are at right angles to the axis of rotation. It appears as a segment of a helix. It transmits energy between parallel or perpendicular axes.

(4) Bevel gear: Bevel gears have teeth that are available in straight, spiral or hypoid shape. It is designed to transmit motion between intersecting axes.

(5) Worm gear: The worm gear is a device consisting of a threaded shaft that mates with a gear wheel.

(2b) State 5 uses of gears.

(i) Power transmission: They transmit power from one part of a machine to another.

(ii) Speed selection: They can increase or decrease the speed of motion in a machine.

(iii) They change direction of motion.

(iv) They change direction of rotational force.

(v) They transmit rotational motion.

(2c) Calculate the gear ratio of a car with 25 teeth driving gear and 15 teeth driving gear.

GR = Gear ratio

GR = $\frac{Number\ of\ teeth\ of\ the\ driven\ gear}{Number\ of\ teeth\ of\ the\ driving\ gear}$

GR = $\frac{T2}{T1}$

GR = $\frac{25}{15}$

GR = $\frac{5}{3}$

GR = 5:3

Gear ratio of the car is ratio 5 to 3 = 5:3