Of course. Here is another practice paper with 30 questions from all four chapters, following your specific requirements.

Consolidated Practice Paper

Instructions:

- Answer all questions.
- For numerical questions, show your working clearly.
- Take the gravitational field strength, g, to be $9.8\ N/kg$.

Numerical Questions

1. A stone of mass 2 kg falls from the top of a 20 m high cliff. Assuming all its potential energy is transferred to kinetic energy, calculate its speed just before it hits the ground. [3]
2. A gas in a syringe has a volume of $40\ cm^3$ at a pressure of 1.2×10^5 Pa. The plunger is pushed in until the volume is $10\ cm^3$. Assuming the temperature is constant, what is the new pressure? [2]
3. A box weighs 500 N and its base has an area of $2\ m^2$. Calculate the pressure the box exerts on the ground. [2]
4. A resultant force of 30 N acts on a mass of 5 kg. Calculate the acceleration of the mass. [2]
5. A person pushes a trolley with a force of 80 N over a distance of 10 m. How much work has the person done? [2]
6. The Sankey diagram for a light bulb shows a total energy input of 100 J. 85 J of this is wasted as thermal energy.
   a) How much useful light energy is produced? [1]
   b) What is the efficiency of the light bulb? [2]
7. Calculate the pressure due to the water at a depth of 50 m in a lake. (The density of water is $1000\ kg/m^3$). [2]
8. A force of 12 N stretches a spring by 6 cm. What is the spring constant in N/m? [2]
9. A crane lifts a load, doing 20,000 J of work in 4 seconds. Calculate the power of the crane. [2]
10. In a hydraulic lift, a force of 200 N is applied to a small piston of area $0.1\ m^2$. If the large piston has an area of $2.5\ m^2$, calculate the force exerted by the large piston. [2]

Multiple Choice Questions

1. Which state of matter has particles that are far apart and move randomly at high speed?
   A. Solid
   B. Liquid
   C. Gas
   D. Plasma
2. A book is resting on a table. The resultant force on the book is...
   A. equal to its weight.
   B. equal to the upward force from the table.
   C. zero.
   D. directed downwards.
3. Skis have a large surface area to...
   A. increase the pressure on the snow.
   B. reduce the pressure on the snow.
   C. increase the user's weight.
   D. reduce friction.
4. A stretched elastic band is an example of which energy store?
   A. Kinetic energy
   B. Chemical energy
   C. Gravitational potential energy
   D. Elastic strain energy
5. The random, haphazard motion of smoke particles in the air is known as...
   A. condensation.
   B. evaporation.
   C. Brownian motion.
   D. convection.
6. According to Newton's Second Law, acceleration is...
   A. directly proportional to mass and inversely proportional to force.
   B. directly proportional to both mass and force.
   C. inversely proportional to both mass and force.
   D. directly proportional to force and inversely proportional to mass.
7. The principle of conservation of energy states that...
   A. energy can be created but not destroyed.
   B. energy is mostly lost as heat.
   C. energy cannot be created or destroyed.
   D. energy is only useful when it is kinetic.

8. Pressure within a liquid...
   A. decreases with depth.
   B. is the same at all depths.
   C. increases with depth.
   D. only acts downwards.
9. When a force is applied to a spring, if the extension is directly proportional to the force, the spring is said to obey...
   A. Newton's Law.
   B. Boyle's Law.
   C. Hooke's Law.
   D. The Pressure Law.
10. Which of the following is a non-renewable energy source?
    A. Solar
    B. Hydroelectric
    C. Natural Gas
    D. Wind

Subjective Theory Questions

1. Describe the arrangement and motion of particles in a liquid using the kinetic particle model.
2. State Newton's Second Law of Motion.
3. Explain how a hydraulic system, such as a car's brakes, acts as a force multiplier.
4. Define power and state its SI unit.
5. Using the kinetic particle model, explain how a gas exerts pressure on the walls of its container.
6. Give one everyday example where friction is useful and one where it is a hindrance.
7. What is a Sankey diagram used to represent? What does the width of the arrows in the diagram signify?
8. Explain why a dam wall must be built thicker at the bottom than at the top.
9. State Boyle's Law.
10. Describe the main energy transfers that take place in a power station that burns a fossil fuel like coal.

Answer Key

Numerical Questions: Solutions

1. **Principle**: Potential Energy Lost = Kinetic Energy Gained ($\Delta E_p = E_k$)
   Formula: $mg\Delta h = \frac{1}{2}mv^2$
   Solution: The mass `m` cancels from both sides. $g\Delta h = \frac{1}{2}v^2 \implies v = \sqrt{2g\Delta h}$.
   $v = \sqrt{2 \times 9.8\ N/kg \times 20\ m} = \sqrt{392} = \mathbf{19.8\ m/s}$
2. **Formula**: $p_1V_1 = p_2V_2$
   Solution: $(1.2 \times 10^5\ Pa) \times (40\ cm^3) = p_2 \times (10\ cm^3) \implies p_2 = \frac{1.2 \times 10^5 \times 40}{10} = \mathbf{4.8 \times 10^5\ Pa}$
3. **Formula**: $p = F/A$
   Solution: $p = 500\ N / 2\ m^2 = \mathbf{250\ Pa}$
4. **Formula**: $a = F/m$
   Solution: $a = 30\ N / 5\ kg = \mathbf{6\ m/s^2}$
5. **Formula**: $W = Fd$
   Solution: $W = 80\ N \times 10\ m = \mathbf{800\ J}$
6. a) **Solution**: Useful Energy = Total Input - Wasted Energy = $100\ J - 85\ J = \mathbf{15\ J}$
   b) **Formula**: $efficiency = \frac{\text{useful energy output}}{\text{total energy input}} \times 100\%$
   Solution: ParseError: KaTeX parse error: Unexpected end of input in a macro argument, expected '}' at end of input: ... = \textbf{15%}
7. **Formula**: $\Delta p = \rho g \Delta h$
   Solution: $\Delta p = 1000\ kg/m^3 \times 9.8\ N/kg \times 50\ m = \mathbf{490{,}000\ Pa}$ (or 490 kPa)
8. **Formula**: $k = F/x$
   Solution: First, convert extension to meters: $6\ cm = 0.06\ m$.
   $k = 12\ N / 0.06\ m = \mathbf{200\ N/m}$
9. **Formula**: $P = W/t$
   Solution: $P = 20{,}000\ J / 4\ s = \mathbf{5000\ W}$ (or 5 kW)
10. **Formula**: $F = f \times (A/a)$
    Solution: $F = 200\ N \times (2.5\ m^2 / 0.1\ m^2) = 200\ N \times 25 = \mathbf{5000\ N}$

Multiple Choice Questions: Answers

1. **C**. Gas particles are far apart and move randomly at high speed.
2. **C**. An object at rest has balanced forces, so the resultant force is zero.
3. **B**. The large area reduces the pressure ($p = F/A$), preventing sinking.
4. **D**. A stretched object stores elastic strain energy.

5. **C**. Brownian motion is the random movement of microscopic particles caused by collisions with fluid molecules.
6. **D**. Rearranging $F = ma$ gives $a = F/m$.
7. **C**. Energy cannot be created or destroyed, only transferred from one store to another.
8. **C**. Pressure in a liquid increases with depth ($p = \rho gh$).
9. **C**. Hooke's Law describes the direct proportionality between force and extension for an elastic object.
10. **C**. Natural gas is a fossil fuel and is non-renewable.

Subjective Theory Questions: Answers

1. In a liquid, the particles are close together but are not in fixed positions. They are arranged randomly and can slide past one another, which allows the liquid to flow.
2. Newton's Second Law states that the acceleration of an object is directly proportional to the resultant force acting on it and inversely proportional to its mass ($F = ma$).
3. A hydraulic system uses an incompressible liquid to transmit pressure. A small force applied to a small area creates a pressure ($p = f/a$), which is transmitted throughout the liquid. This pressure then acts on a larger area, producing a much larger output force ($F = p \times A$).
4. Power is the rate at which work is done or the rate at which energy is transferred. Its SI unit is the **watt (W)**.
5. Gas particles are in constant, rapid, and random motion. They repeatedly collide with the walls of their container. The force of these countless collisions over the area of the walls creates pressure.
6. **Useful**: Friction between car tyres and the road allows the car to accelerate and brake.
   Hindrance: Friction in the moving parts of an engine wastes energy and causes wear.
7. A Sankey diagram is used to represent energy transfers. The width of each arrow is proportional to the amount of energy it represents, clearly showing how the total input energy is split into useful and wasted energy outputs.
8. The pressure in a liquid increases with depth ($p = \rho gh$). A dam must be thicker at its base to withstand the much greater force exerted by the water at the bottom of the reservoir.
9. Boyle's Law states that for a fixed mass of gas at a constant temperature, the pressure is inversely proportional to its volume ($pV = \text{constant}$).
10. **Chemical energy** in the coal is released as **thermal energy** through burning. This thermal energy heats water into high-pressure **steam**. The thermal energy of the steam is converted to **kinetic energy** as it rushes past and turns a turbine. The kinetic energy of the turbine is transferred to a generator, which produces **electrical energy**.