**Question Bank on Cell Disruption Techniques**

**Multiple Choice Questions (MCQs)**

1. Which method uses glass or ceramic beads to mechanically disrupt cells?

a) Mortar and Pestle

b) Bead Beating

c) Ultrasonication

d) Homogenization

Correct Answer: b) Bead Beating

2. What is the main principle behind ultrasonication for cell disruption?

a) Applying heat

b) High frequency sound waves

c) Electrical discharge

d) Osmotic pressure

Correct Answer: b) High frequency sound waves

3. Which cell disruption method involves using high pressure and shear forces to break cells?

a) Decompression

b) Thermolysis

c) High Pressure Homogenizer (French Press)

d) Osmotic Shock

Correct Answer: c) High Pressure Homogenizer (French Press)

4. What type of cells is the French press particularly effective at disrupting?

a) Red blood cells

b) Bacterial cells

c) Mammalian cells

d) Fungal cells

Correct Answer: b) Bacterial cells

5. What is the primary disadvantage of thermolysis as a cell disruption method?

a) High cost

b) Potential heat damage to biomolecules

c) Requirement for beads

d) Generation of aerosols

Correct Answer: b) Potential heat damage to biomolecules

6. Which method involves the rapid decrease in pressure to lyse cells?

a) Decompression

b) Bead Beating

c) Ultrasonication

d) Chemical Lysis

Correct Answer: a) Decompression

7. What type of shock is used in osmotic shock for cell disruption?

a) Thermal shock

b) Electrical shock

c) Chemical shock

d) Osmotic shock

Correct Answer: d) Osmotic shock

8. Which cell disruption method uses highfrequency sound waves to create cavitation bubbles?

a) Homogenization

b) Ultrasonication

c) Decompression

d) Thermolysis

Correct Answer: b) Ultrasonication

9. What is the main application of osmotic shock in cell disruption?

a) Lysis of red blood cells

b) Disruption of bacterial cells

c) Extraction of chloroplasts

d) Breaking down plant tissues

Correct Answer: a) Lysis of red blood cells

10. Which cell disruption method is particularly suitable for gentle lysis of sensitive cells?

a) Bead Beating

b) Ultrasonication

c) Decompression

d) Thermolysis

Correct Answer: c) Decompression

**Answer in one sentence:**

1. What is the principle behind the bead beating method?

Answer: Bead beating uses mechanical agitation of small beads to disrupt cells.

2. How does ultrasonication disrupt cells?

Answer: Ultrasonication disrupts cells using highfrequency sound waves to create cavitation bubbles.

3. What type of cells are effectively lysed by the French press?

Answer: The French press effectively lyses bacterial cells.

4. What is the major drawback of using thermolysis for cell disruption?

Answer: Thermolysis can cause potential heat damage to biomolecules.

5. What occurs during the decompression method of cell disruption?

Answer: During decompression, cells are lysed by a rapid decrease in pressure.

6. What causes cells to lyse in osmotic shock?

Answer: Cells lyse in osmotic shock due to rapid changes in osmotic pressure causing them to swell and burst.

7. What type of equipment is required for ultrasonication?

Answer: Ultrasonication requires an ultrasonic homogenizer or sonicator.

8. Why is cooling necessary during the ultrasonication process?

Answer: Cooling is necessary to prevent heat damage to heatsensitive biomolecules during ultrasonication.

9. Which method uses high pressure and a narrow orifice to break open cells?

Answer: The high pressure homogenizer (French press) uses high pressure and a narrow orifice.

10. What is the main advantage of using decompression for cell disruption?

Answer: The main advantage of decompression is its gentle lysis of sensitive cells.

**Short Answer Questions:**

1. Explain the bead mill method for cell disruption and its advantages and disadvantages.

Answer: The bead mill method involves using small glass or ceramic beads agitated at high speeds within a vessel to create shear forces and impacts that break open cell walls and membranes. The cell suspension is placed into the bead mill vessel, beads are added, and the vessel is rotated at high speeds. This results in cell lysis and release of intracellular contents.

Advantages: Effective for tough cells like yeast and animal tissues, suitable for smallscale applications, does not produce harmful aerosols, and can operate in batch or continuous modes.

Disadvantages: Generates heat, which can denature heatsensitive materials, limited scalability for large volumes, and requires careful control to prevent overheating.

2. Describe the process and applications of osmotic shock in cell disruption.

Answer: Osmotic shock involves exposing cells to a rapid change in osmotic pressure by transferring them from an isotonic to a hypotonic solution. This causes water influx, leading cells to swell and burst, releasing intracellular contents. The process includes preparing the cell suspension in an isotonic solution, transferring to a hypotonic solution, allowing cells to swell and burst, and collecting the lysed suspension.

Applications: Commonly used for lysing red blood cells in hemoglobin preparation, disrupting mammalian cells for protein and nucleic acid extraction, and in biochemical studies involving membrane proteins. It is gentle on sensitive cells but not suitable for those with robust cell walls