Name: _____ **Date:** _____

Section: _____

IVF Simulator Activity

Exploring Assisted Reproductive Technology

Phase 1: ENGAGE (5 minutes)

Getting Started: Open peebedu.com and navigate to IVF Simulator

Read the introduction to learn about the IVF process.

What is IVF?

In Vitro Fertilization = '`In Glass`' Fertilization

- Eggs and sperm combine outside the body
- Embryos develop in laboratory conditions
- Healthy embryos transferred to uterus

Initial Questions: Why might couples need IVF? _____ What genetic information is important? _____ How do doctors select the best embryos? _____

Your Role: You're an embryologist helping couples have healthy babies!

Phase 2: EXPLORE (18 minutes)

Step 1: Egg Retrieval

Examine available eggs and their genetic profiles.

Egg Analysis Table:

Patterns Observed (list 3): _____ _____ _____

Step 2: Sperm Selection

Analyze sperm samples for quality.

Sperm Parameters:

- Motility (movement): _____%

- Concentration: _____ million/mL

Best sample based on: _____

Step 3: Fertilization

Combine selected gametes and observe.

Fertilization Attempts:

Success rate: _____%

Step 4: Embryo Development

Monitor embryo growth over 5 days.

Development Checklist:

How many reached blastocyst? _____

Phase 3: EXPLAIN (15 minutes)

Understanding the Science

Genetic Inheritance: Each parent contributes half the DNA.

Example trait: Eye color (B = brown, b = blue)

- Mother: Bb
- Father: Bb

Complete the Punnett square: _____

“‘ B b B __ __ b __ __ “‘

Probability of brown eyes: _____ Probability of blue eyes: _____

Why Multiple Eggs?

Not all eggs will:

- Fertilize successfully
- Develop normally
- Implant in uterus
- Result in live birth

If each step is 50% successful: _____ Overall success = _____%

Factors Affecting Success: Rank by importance (1-5): ___ Maternal age ___ Egg quality ___ Sperm quality ___ Laboratory conditions ___ Number of embryos

Genetic Screening Benefits:

- Detect chromosome abnormalities
- Identify genetic diseases
- Improve success rates
- Reduce miscarriage risk

Example from your simulation: _____

Phase 4: ELABORATE (10 minutes)

Real-World Applications

Success Rate Analysis: National averages by age: _____ “‘ Age Success Rate ¡35 40% 35-37 31% 38-40 22% 41-42 12% ¿42 4% “‘

Graph these data points. Trend observed: _____ Biological explanation: _____

Cost Considerations:

- Average IVF cycle: $12,000
- Medication: $3,000-$5,000
- Genetic testing: $3,000

If success rate is 33%, expected attempts needed: _____ Total expected cost: _____

Ethical Scenarios:

Scenario A: Extra embryos remain after successful pregnancy. Options:

- Donate to research
- Donate to other couples
- Keep frozen
- Discard

Your recommendation: _____ Why? _____

Scenario B: Genetic testing reveals high disease risk. Considerations: _____

Design Challenge:

Improve IVF success rates by 10%. Your innovation: _____ Scientific basis: _____ Potential challenges: _____

Phase 5: EVALUATE (7 minutes)

Assessment Questions

Process Understanding: Order the IVF steps (1-6): ___ Embryo transfer ___ Egg retrieval ___ Pregnancy test ___ Sperm collection ___ Fertilization ___ Embryo culture

Data Interpretation: From 12 eggs retrieved:

- 10 fertilized
- 7 reached day 3
- 4 became blastocysts
- 2 were genetically normal

Calculate percentages:

- Fertilization rate: _____%

- Normal embryo rate: _____%

Genetic Predictions:

Parents both carry sickle cell trait (Ss). For each embryo:

- P(SS) = _____

- P(ss) = _____

Which would you transfer? _____

Critical Thinking: Why is IVF success lower with older eggs? _____

Explain the biology: _____

Model Evaluation: Two strengths of this simulation:

1. _____

Two limitations:

1. _____

Reflection: How has this simulation changed your understanding of:

- Human reproduction: _____
- Medical technology: _____

Future Questions: One thing you want to research further: _____

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Key Vocabulary:

- **Gamete:** Sex cell (egg or sperm)
- **Zygote:** Fertilized egg
- **Blastocyst:** 5-day embryo ready for transfer
- **Implantation:** Embryo attaching to uterus
- **PGT:** Preimplantation Genetic Testing