REPRODUCTION & DEVELOPMENT

I. CHROMOSOMES — rod shaped structures in nucleus
   • consist of genes which contain genetic information (DNA)
   • sex chromosomes – determine sex of an organism
     a. EGGS = X          SPERM = X or Y
     b. FEMALE = XX       MALE = XY

II. CELL DIVISION
   MITOSIS: 1 cell → 2 cells
   • daughter cells have the SAME # OF CHROMOSOMES as parent cell
   • production of ALL body cells EXCEPT sex cells
   MEIOSIS: 2 divisions (1 → 2 → 4)
   • for sexual reproduction
   • 4 new daughter cells with ½ the number of chromosomes as parent cell
   • TO PRODUCE SEX CELLS ONLY (in ovaries & testes)

III. ASEXUAL REPRODUCTION - 1 parent, offspring identical to parent, carried out by mitosis

TYPES OF ASEXUAL REPRODUCTION
1. FISSION – one-celled organism divides into 2 identical cells (ameba and paramecium)
2. BUDDING – unequal division of organism (Yeast)
3. SPORULATION – spores (specialized cells) develop into new organism (mold, mushrooms)
4. VEGETATIVE PROPAGATION – used by plants (NO SEEDS)
   -runners (strawberries), buds/tubers (potatoes), grafting (roses), bulbs (onions)

IV. SEXUAL REPRODUCTION
   • 2 parents, each give sex cell
   • Offspring NOT identical to parents (VARIATIONS OF OFFSPRING)
   • FERTILIZATION = SPERM + EGG → ZYGOTE
   • ZYGOTE DEVELOPS INTO EMBRYO (1st 8 weeks) → FETUS

V. METAMORPHOSIS
   • A change in the form and often habits of an animal during normal development after the embryonic stage.
   • Metamorphosis includes, in insects, the transformation of a maggot into an adult fly and a caterpillar into a butterfly and, in amphibians, the changing of a tadpole into a frog.

A. B. C. D. E.
Fertilization zygote mitosis (cell division) blastula gastrula
1. In a one-celled organism, cell division is responsible for
   (1) growth and maintenance
   (2) sexual reproduction
   (3) asexual reproduction
   (4) production of sex cells

2. A new yeast cell is sometimes produced from a single
   parent by a process called budding. The process of budding
   is best described as
   (1) sexual reproduction, with genetically identical offspring
   (2) sexual reproduction, with genetically different offspring
   (3) asexual reproduction, with genetically identical offspring
   (4) asexual reproduction, with genetically different offspring

3. When do organs begin to develop in humans?
   (1) in the sperm cell before fertilization
   (2) before fertilization and after birth
   (3) in the egg cell after fertilization
   (4) after fertilization and before birth

4. Which process gives rise to a variety of traits within
   a species?
   (1) sexual reproduction
   (2) dynamic equilibrium
   (3) cellular respiration
   (4) internal regulation

5. In sexual reproduction, what fraction of genes does each
   parent contribute to the offspring?
   (1) ¼         (2) 1/3         (3) ½         (4) ¾

6. A male chimpanzee has 48 chromosomes in each of his
   regular body cells. How many chromosomes would be
   found in each of his sperm cells?
   (1) 96       (2) 48       (3) 24       (4) 12

7. Asexually produced offspring are genetically
   (1) identical to the parent
   (2) different from the parent
   (3) different from each other
   (4) formed by two parents

8. Compared to the amount of hereditary information
   in a human body cell, how much hereditary
   information is contained in a human sex cell?
   (1) one-quarter the amount
   (2) one-half the amount
   (3) the same amount
   (4) twice the amount

9. A plant produces tiny plants around the edges of
   its leaves. When these tiny plants fall to the ground,
   they take root and become new plants.
   This process is an example of
   (1) sexual reproduction
   (2) asexual reproduction
   (3) evolution
   (4) extinction

10. Each body cell of a goldfish contains 94
    chromosomes. How many chromosomes are
    contained in a goldfish sex cell?
    (1) 23       (2) 47       (3) 94       (4) 188

11. What advantage does a species that reproduces
    sexually have over a species that reproduces asexually?
    (1) There is greater variation among the offspring.
    (2) The offspring are identical to the parents.
    (3) Only one parent is necessary for reproduction.
    (4) No sex cells are needed for reproduction.
Base your answers to questions 19 and 20 on the diagram below and on your knowledge of science. The diagram shows the life cycle of the common housefly.

19. Which process is shown by this diagram?
   (1) competition       (3) metamorphosis
   (2) metabolism       (4) migration

20. A life cycle is best described as the
   (1) **series of changes in the development of an organism**
   (2) movement of an organism from place to place
   (3) ability of an organism to adapt to its environment
   (4) flow of energy through an organism’s community

21. The diagram below shows the life cycle of a liver fluke.

   ![Liver Fluke Life Cycle Diagram]

   This diagram shows that the liver fluke
   (1) **depends on other organisms for survival**
   (2) completes its life cycle in the snail
   (3) dies when it enters the fish
   (4) survives at very high temperatures

22. The series of diagrams below shows a single-celled organism and its offspring that resulted from cell division over a period of 20 hours.

   ![Cell Division Diagram]

   If the organisms continue to reproduce asexually at this same rate, how many organisms will there be after 30 hours?
   (1) 6     (2) 7      (3) 8     (4) 16

23. The diagram below shows changes that a butterfly undergoes as it develops from an egg into an adult.

   ![Butterfly Life Cycle Diagram]

   Which process is illustrated in the diagram?
   (1) mutation       (3) germination
   (2) photosynthesis (4) **metamorphosis**

24. In humans, a fertilized egg contains 46 chromosomes. Which bar graph best represents the number of chromosomes contained in the sperm and egg before they united to make the fertilized egg?

   ![Chromosome Bar Graphs]

   a.   b.   c.   d.
25. The diagram below shows three generations of cell division. How many cells should exist in the fourth generation?

(1) 10  (2) 8  (3) 6  (4) 4

26. The diagram below shows how a frog develops. A fertilized egg hatches into a tadpole with gills. The tadpole develops legs and lungs and becomes an adult frog. What is the term for this series of changes during the life cycle of the frog?

(1) fertilization  (3) mutation  (2) reproduction  (4) metamorphosis

Base your answers to questions 27 and 28 on the diagram below and on your knowledge of science. The diagram shows four stages in the development of a human after fertilization.

27. Between stages A and D, which process must occur?

(1) mutation  (2) sexual reproduction  (3) cell division  (4) extinction

28. Which sequence of development is correct?

(1) fertilized egg → tissues → organ systems → organs  (2) fertilized egg → organ systems → organs → tissues systems  (3) fertilized egg → organs → tissues → organ systems  (4) fertilized egg → tissues → organs → organ

29. The diagram below shows the development of a certain type of insect. This diagram shows the process of

(1) metamorphosis  (3) selective breeding  (2) fertilization  (4) environmental change

30. Base your answers to the questions that follow on the diagram below, which shows a form of reproduction.

a. Which type of reproduction is shown in the diagram?

ASEXUAL

b. What information in the diagram supports this statement?

SHOWING ONLY ONE PARENT

c. How does the genetic material of the daughter cell compare to the genetic material of the parent cell?

EXACTLY THE SAME
31. Base your answers to question 31 on the information below and on your knowledge of science. The diagram below shows the results of a fruit fly activity that took place over a 20-day period. On day 1, four fruit flies were placed in a jar containing food and water. The jar had a cover that allowed enough air exchange for the fruit flies to survive, but would not allow them to escape or other flies to enter. The number of flies observed in the jar during the 20-day period is shown.

a. Identify the process responsible for the population change that occurred from day 1 to day 13.

   REPRODUCTION

b. State one possible reason why many of the fruit flies died from day 13 to day 20.

   NO MORE FOOD OR WATER

32. Base your answers to the following questions on the diagram below and on your knowledge of science. The diagram shows information about the sexual reproduction and development of rabbits.

a. Identify the process occurring at A.  FERTILIZATION

b. Identify the process occurring at B.  MITOSIS

33. Base your answers to the following questions on the diagram below which shows the process of sexual reproduction.

a. Identify the sex cell shown at A.  SPERM

b. Identify the sex cell shown at B.  EGG

c. Identify the reproductive process that is occurring at C.  FERTILIZATION

d. Identify the process that is occurring between E and F.  MITOSIS

34. Base your answers to the following questions on the diagram below and on your knowledge of science. The diagram shows the result of sexual reproduction.

a. Identify the two sex cells that are necessary for sexual reproduction.

   SPERM  EGG

b. In each of the offspring, what percentage of the genetic material comes from the male parent?

   HALF

c. State one advantage that a species that reproduces sexually has over a species that reproduces asexually.

   GENETIC VARIATION
35. The diagrams below show the life cycles of a grasshopper and a butterfly.

Describe one difference in the pattern of development of the grasshopper and the pattern of development of the butterfly shown in the diagrams.

NAME OF STAGES

___________________________________________

36. Base your answers to the following questions on the diagram below and on your knowledge of science.

The diagram shows a model of sexual reproduction. The lines in each cell represent genetic material (chromosomes).

a. Which letter in the diagram represents a female sex cell? __B

b. Which process is occurring at C? FERTILIZATION

c. What evidence in the diagram shows that sexual reproduction occurred? CHROMOSOMES COMBINED

37. The diagrams in the first column of the chart below show various forms of reproduction. In the second column, circle the form of reproduction (asexual or sexual) shown by each of the diagrams.