

## SAT BIOLOGY SUBJECT TEST PRACTICE PAPER

1. This organ secretes growth hormone (GH).

- A. Thyroid
- B. Pancreas
- C. Parathyroid
- D. Adrenal medulla
- E. Anterior pituitary

2. This organ secretes thyroxine.

- A. Thyroid
- B. Pancreas
- C. Parathyroid
- D. Adrenal medulla
- E. Anterior pituitary

3. This organ secretes the hormone responsible for the flight-or-flight response.

- A. Thyroid
- B. Pancreas
- C. Parathyroid
- D. Adrenal medulla
- E. Anterior pituitary

4. This organ secretes a hormone that causes the liver to break down glycogen.

- A. Thyroid
- B. Pancreas
- C. Parathyroid
- D. Adrenal medulla
- E. Anterior pituitary

5. Crossing over occurs in this phase.

- A. Anaphase I
- B. Prophase I
- C. Anaphase II
- D. Prophase II
- E. Metaphase I

6. Homologous chromosomes separate in this phase.

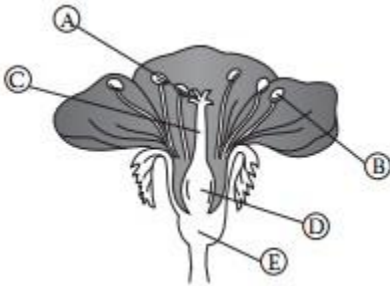
- A. Anaphase I
- B. Prophase I

- C. Anaphase II
- D. Prophase II
- E. Metaphase I

7. Sister chromatids separate in this phase.

- A. Anaphase I
- B. Prophase I
- C. Anaphase II
- D. Prophase II
- E. Metaphase I

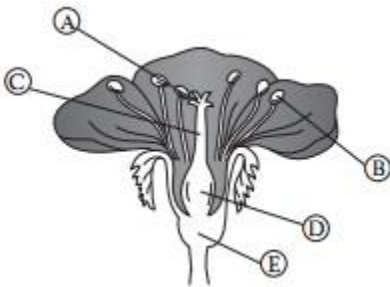
8. Question below refers to the following diagram of floral structures.



The site of fertilization

- A.
- B.
- C.
- D.
- E.

9. Question below refers to the following diagram of floral structures.

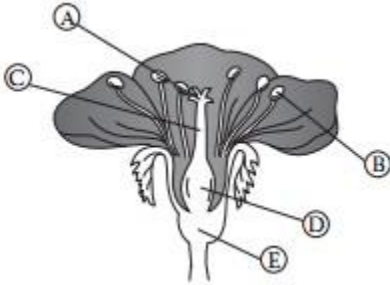


The site of pollen production

- A.
- B.
- C.

- D.
- E.

10. Question below refers to the following diagram of floral structures.



The site of pollen tube development

- A.
- B.
- C.
- D.
- E.

11. Tissue that conducts sugars downward from the leaves

- A. Xylem
- B. Phloem
- C. Cambium
- D. Bark
- E. Pith

12. Tissue that conducts water upward from the roots

- A. Xylem
- B. Phloem
- C. Cambium
- D. Bark
- E. Pith

13. Tissue that gives rise to all vascular tissue

- A. Xylem
- B. Phloem
- C. Cambium
- D. Bark
- E. Pith

14. Ground tissue with no specialized function

- A. Xylem
- B. Phloem
- C. Cambium
- D. Bark
- E. Pith

15. Which tissue, formed during the gastrulation phase of embryonic development, later differentiates to form the nervous system?

- A. Archenteron
- B. Blastopore
- C. Ectoderm
- D. Endoderm
- E. Mesoderm

16. What is the role of mRNA in protein synthesis?

- A. To make up the structure of the ribosome
- B. To carry amino acids to the ribosome
- C. To catalyze bonds between nucleotides
- D. To serve as a template for the synthesis of DNA
- E. To carry information determining amino acid sequence

17. Oxygen gas ( $O_2$ ) is produced by plants and algae. What is the source of oxygen atoms in these molecules?

- A. Water
- B. Glucose
- C. Carbon dioxide
- D. Atmospheric oxygen
- E. Atmospheric nitrogen

18. Which of the following describes a behavior of organisms of the same species?

- A. Periodical cicadas that emerge the same year
- B. Fish that become fertile during different seasons
- C. Ungulates that mate frequently and yield sterile offspring
- D. Rodents that mate frequently and yield no viable offspring
- E. Tropical birds that court their mates with differing dances or songs

19. A mature gymnosperm will possess all of the following EXCEPT

- A. seeds
- B. leaves
- C. flowers

- D. vascular tissue
- E. woody growth

20. Which of the following patterns of inheritance describes interactions between multiple genes?

- A. Epistasis
- B. Sex linkage
- C. Codominance
- D. Simple dominance
- E. Homozygous recessive

21. Which situation describes an incidence of artificial selection acting upon a single population?

- A. Weak prey animals successfully hunted by predators
- B. Excessive rains providing additional water resources
- C. Males choosing the healthiest females to reproduce with
- D. An early warm front resulting in premature plant blooming
- E. Insecticides eliminating all crop pests except resistant individuals

22. The following change is an example of which type of mutation?

Original DNA sequence: ATGGA-AGC

New DNA sequence: ATTGACAGC

I. Point mutation

II. Deletion

III. Frameshift

- A. I only
- B. II only
- C. III only
- D. I and II
- E. I and III

23. With a limited amount of chemical substrate, all of the following factors could directly affect an enzyme's activity EXCEPT

- A. pH level
- B. inhibitors
- C. temperature
- D. enzyme cofactors
- E. enzyme concentration

24. The loop of Henle is a structure within the urinary tract responsible for reabsorbing water. Compared to a terrestrial species, how might this structure appear in a freshwater aquatic species?

- A. Absent
- B. Longer
- C. Shorter
- D. Withered
- E. Thinner

**25.** The coyote, *Canis latrans*, belongs to each of the taxonomic groups in the answer choices below. Which group's members are most closely related to each other?

- A. Order Carnivora
- B. Class Mammalia
- C. Subfamily Vertebrata
- D. Family Canidae
- E. Phylum Chordata

**26.** Terrestrial snakes and aquatic eels have a similar elongated morphology. However, they are not closely related evolutionarily. Their resemblance is an example of

- A. analogy
- B. homology
- C. speciation
- D. divergent evolution
- E. artificial selection

**27.** Edward's syndrome is the result of an additional 18th chromosome present in a fertilized embryo. Which of the following events could lead to the presence of this additional chromosome in a zygote?

- A. Crossing over in meiosis I
- B. Nondisjunction in meiosis II
- C. A deletion during meiosis II
- D. A deletion during meiosis I
- E. Replication error in meiosis II

**28.** The steps of protein synthesis and modification take place in several different locations throughout the cell. What is the proper order of these locations, from start to finish?

I. Ribosome

II. Nucleus

III. Golgi apparatus

IV. Endoplasmic reticulum

- A. I, II, III, IV
- B. II, I, IV, III
- C. III, II, IV, I

- D. II, I, III, IV
- E. IV, III, II, I

**29.** A somatic cell of the common octopus (*Octopus vulgaris*) has 56 chromosomes. What number of chromosomes will an octopus gamete contain?

- A. 14
- B. 28
- C. 56
- D. 112
- E. 168

**30.** A genetic mutation results in a DNA sequence that continues to synthesize the same protein, at the same rate as a nonmutated sequence. This mutation would be BEST classified as a

- A. deletion
- B. insertion
- C. missense mutation
- D. nonsense mutation
- E. silent mutation

**31.** A unicellular prokaryote belongs to which kingdom?

- A. Animalia
- B. Eubacteria
- C. Fungi
- D. Plantae
- E. Protista

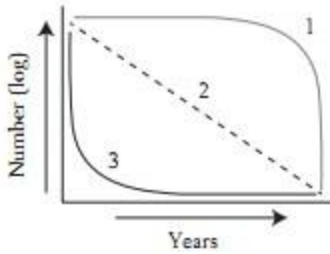
**32.** Which of the following organisms has the highest evolutionary fitness?

- A. A cheetah that catches the most prey
- B. A fox that successfully avoids predators
- C. A tortoise that has lived for over 100 years
- D. A wolf that recovers quickly from a wound
- E. A gorilla that reproduces several times

**33.** Flowering plants are divided into two subgroups, monocots and dicots. These groups differ significantly in all of the following characteristics EXCEPT

- A. seed structure
- B. floral parts
- C. leaf venation
- D. stomata structure
- E. vascular organization

**34.** An organism produces many offspring each reproductive season, only a few of which survive.



The survivorship curve for this organism can BEST be described as

- A. closely matching curve 1
- B. closely matching curve 2
- C. closely matching curve 3
- D. fitting between curves 1 and 2
- E. fitting between curves 2 and 3

35. An association between two organisms in which one benefits and neither is harmed is called

- A. commensalism
- B. mutualism
- C. parasitism
- D. predation
- E. omnivory

36. Centrifugation is a laboratory technique used to separate materials by their relative masses. More massive substances will sink to the bottom of a test tube while those with less mass will float to the top. A cell culture is centrifuged. Which cellular organelle would be concentrated at the top of the centrifuged mixture?

- A. Nuclei
- B. Endoplasmic reticulum
- C. Mitochondria
- D. Ribosomes
- E. Membrane-bound proteins

37. Which of the following shows the proper order of blood flow through the heart, entering from the vena cava?

- A. Left atrium → left ventricle → right ventricle → right atrium
- B. Left ventricle → left atrium → right atrium → right ventricle
- C. Right atrium → right ventricle → left atrium → left ventricle
- D. Right ventricle → right atrium → left atrium → left ventricle
- E. Right ventricle → right atrium → left ventricle → left atrium

38. What would happen to a blood cell moved from an isotonic solution to a hypertonic solution?



- A. The cell would swell.
- B. The cell would shrivel up.
- C. The cell would immediately lyse.
- D. The cell membrane would be reinforced.
- E. Nothing; the cell would be in equilibrium.

**39.** Triticale is a hybrid of wheat (*Triticum turgidum*) and rye (*Secale cereale*), bred to demonstrate the most desirable characteristics of both species. The resulting hybrid possesses four chromosome sets from the maternal wheat plant and two sets from the paternal rye plant. What is the ploidy of these hybrids?

- A. Diploid (2n)
- B. Triploid (3n)
- C. Tetraploid (4n)
- D. Hexaploid (6n)
- E. Octoploid (8n)

**40.** A group of biologists wishes to isolate an antifreeze gene found in a cold-water species of fish and introduce it into the genome of a different organism. Which of the following techniques must they use?

- A. Cloning
- B. Artificial selection
- C. Selective breeding
- D. Genetic engineering
- E. Sexual recombination

**41.** If the allele for dark-colored hair is dominant over the allele for light-colored hair, which is LEAST likely?

- A. A light-haired couple produces a baby with dark hair.
- B. A dark-haired couple produces a baby with light hair.
- C. A light-haired woman and a dark-haired man produce a light-haired baby.
- D. A dark-haired woman and a light-haired man produce a light-haired baby.
- E. A dark-haired woman and a light-haired man produce a dark-haired baby.

**42.** Which of the following are in order of least complex to most complex, in terms of the amount of genetic information they carry?

I. Chromosome

II. Base pair

III. Codon

IV. Gene

- A. I → II → III → IV
- B. II → III → I → IV

- C. III → II → I → IV
- D. II → III → IV → I
- E. II → IV → II → I

43. An organism that demonstrates radial symmetry and an exoskeleton would be classified into which phylum?

- A. Arthropoda
- B. Cnidaria
- C. Echinodermata
- D. Mollusca
- E. Porifera

44. Crabs and lobsters are both members of the suborder Pleocyemata. Both possess a tail; however, in the crab, this structure is very small and not used. This structure can be considered an example of all of the following EXCEPT

- A. convergent evolution
- B. vestigial structure
- C. divergent evolution
- D. genetic fitness
- E. homologous structure

45. A human hereditary disorder that is present only in males is most likely

- A. maternally inherited
- B. a Y-linked trait
- C. an autosomal recessive trait
- D. an X-linked recessive trait
- E. an X-linked dominant trait

46. What prevents ions from crossing the plasma membrane via simple diffusion?

- A. Ions are too large.
- B. Ions carry a charge.
- C. Ions are hydrophobic.
- D. Ions do not produce a concentration difference.
- E. Ions cannot interact with membrane-bound proteins.

47. An ecosystem undergoes a sudden drastic change that now favors organisms with an extreme phenotype. This is an example of

- A. genetic drift
- B. founder effect
- C. artificial selection

- D. disruptive selection
- E. directional selection

48. All of the following organs serve a role in excreting metabolic wastes EXCEPT the

- A. skin
- B. large intestine
- C. lungs
- D. liver
- E. kidney

49. In a system where only two genes are responsible for determining skin pigmentation, a woman is heterozygous for one gene and homozygous for the other. The woman herself only exhibits the homozygous trait. This pattern of expression is known as

- A. epistasis
- B. X-linkage
- C. pleiotropy
- D. codominance
- E. simple dominance

50. A test cross with an organism with a homozygous recessive genotype results in 50% of the offspring exhibiting the recessive trait. What is the genotype of the test-cross parent?

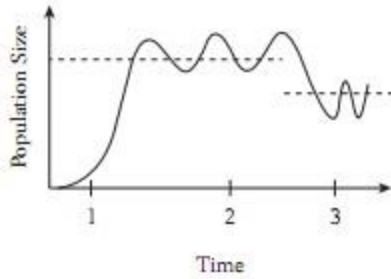
- I. Homozygous recessive
- II. Homozygous dominant
- III. Heterozygous

- A. I only
- B. II only
- C. III only
- D. I or III
- E. II or III

51. Which biological molecule is associated with iron (Fe) ions?

- A. Histone
- B. Catalase
- C. Chlorophyll
- D. Hemoglobin
- E. RNA polymerase

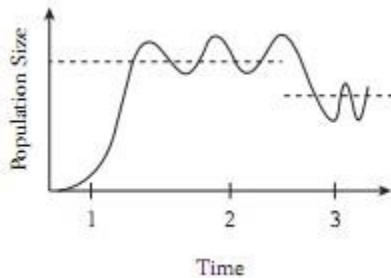
52. The graph depicts the population size of a species over time.



What growth pattern is the population demonstrating at time 1?

- A. Gradual
- B. Declining
- C. Continual
- D. Oscillating
- E. Exponential

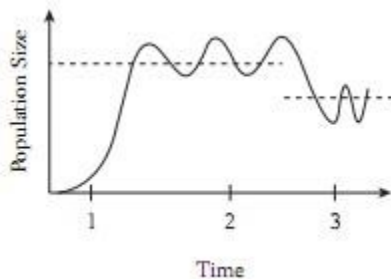
53. The graph depicts the population size of a species over time.



The dashed lines most likely represent

- A. independent climax communities
- B. carrying capacities for different populations
- C. carrying capacities for the same population
- D. similar effects of predation on different populations
- E. similar effects of predation on the same population

54. The graph depicts the population size of a species over time.

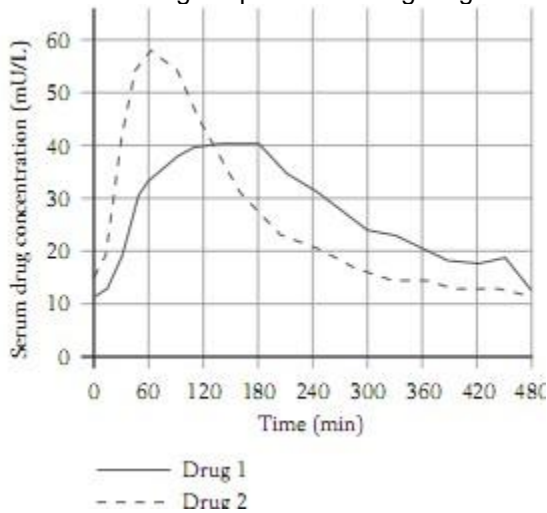


Which of the following could account for the differences in population size between time 2 and time 3?

- A. Decline in populations of parasitic species
- B. Decline in predator population size

- C. Decline in interspecies competition
- D. Decline in intraspecies competition
- E. Decline in available food resources

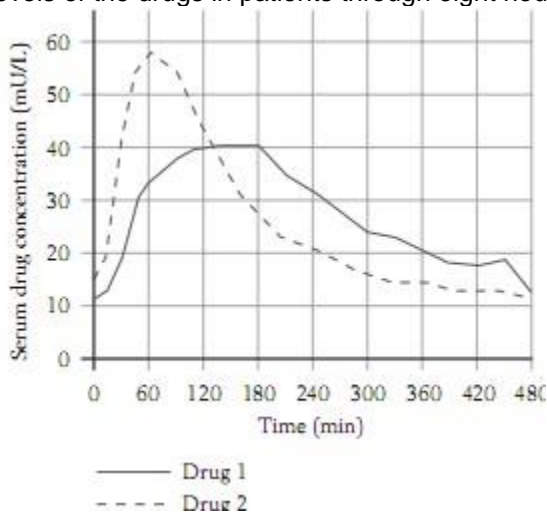
55. Medical researchers tested two different medications for treating type I diabetes. Both Drug 1 and Drug 2 mimic the effects of insulin on muscle, brain, and liver cells. The graph depicts the serum (blood) levels of the drugs in patients through eight hours after injection.



Which of the following can be inferred from these data?

- A. The effects of Drug 2 are longer lasting.
- B. Drug 1 is faster acting than Drug 2.
- C. Drug 1 is at its highest concentration upon injection.
- D. Drug 1 and Drug 2 have about equal concentrations after four hours.
- E. Drug 2 is most highly concentrated within two hours of injection.

56. Medical researchers tested two different medications for treating type I diabetes. Both Drug 1 and Drug 2 mimic the effects of insulin on muscle, brain, and liver cells. The graph depicts the serum (blood) levels of the drugs in patients through eight hours after injection.

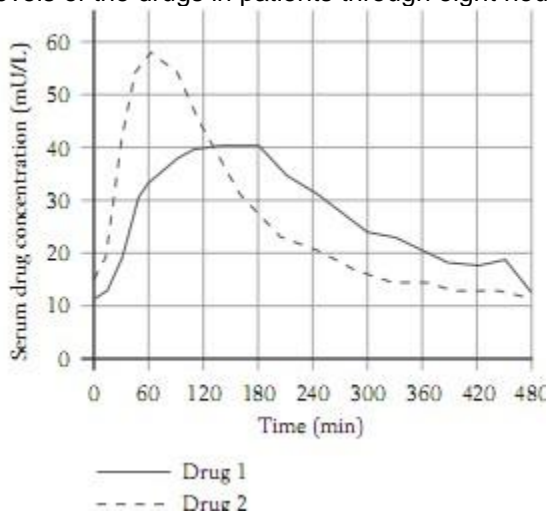


A patient with type I diabetes eats a large meal and then takes a dose of Drug 2. If the drug is effective, what changes will occur in the patient?

- I. The amount of glucose in the blood will increase.
- II. The amount of glucose in muscle cells will increase.
- III. The amount of glucose stored in the liver will decrease.

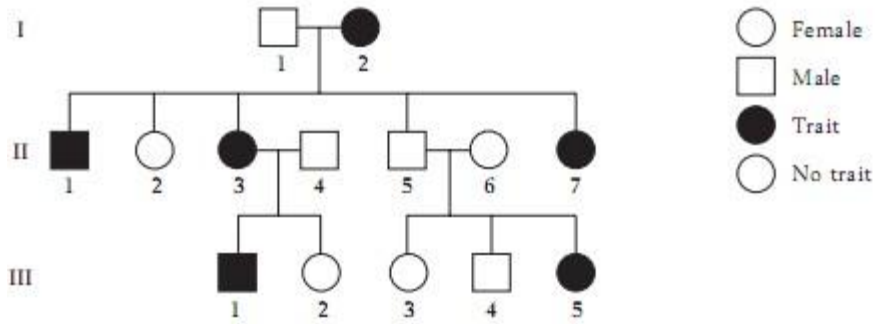
- A. I only
- B. II only
- C. III only
- D. I and II
- E. II and III

57. Medical researchers tested two different medications for treating type I diabetes. Both Drug 1 and Drug 2 mimic the effects of insulin on muscle, brain, and liver cells. The graph depicts the serum (blood) levels of the drugs in patients through eight hours after injection.



How will the two drugs most likely differ in their effects on a diabetic patient's blood glucose level?

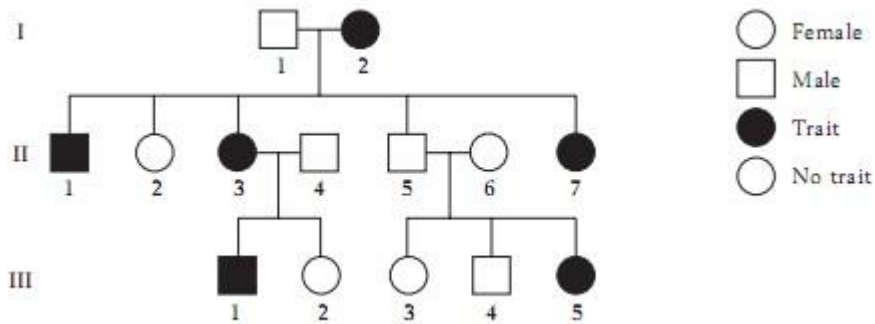
- A. Drug 2 is more likely to cause blood glucose to drop too low.
- B. Drug 2 is more likely to cause blood glucose to rise too high.
- C. Drug 1 is more likely to cause blood glucose to remain high after a meal.
- D. Drug 1 is more likely to cause the liver to break down glycogen.
- E. Drug 2 is more likely to cause the liver to break down glycogen.



58.

According to the pedigree, what is the most likely genotype of individual III-5?

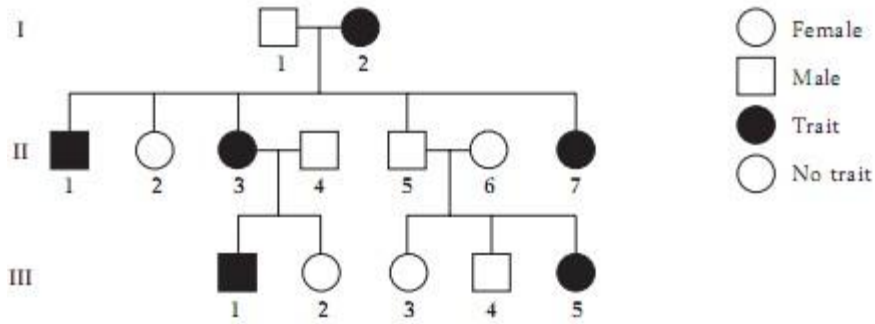
- A. Carrier
- B. Unaffected
- C. Homozygous recessive
- D. Homozygous dominant
- E. Heterozygous



59.

Which individual is most likely to be a carrier of the trait in question?

- A. II-2
- B. II-4
- C. III-2
- D. III-3
- E. III-4



60.

Considering the phenotypes of generations II and II, what is the most likely genotype of the man in generation I?

- A. Autozygous
- B. Hemizygous
- C. Heterozygous
- D. Homozygous recessive
- E. Homozygous dominant