

Scientific Analysis of Nursery Rhymes

Nursery Rhymes · Answer Key · 25 Questions

1. In 'Humpty Dumpty,' the egg-like figure falls from a wall. From a physics perspective, which structural property makes an eggshell highly resistant to pressure when applied to its apex but vulnerable to lateral impact?

- A) The elasticity of the calcium carbonate matrix
- B) The geometric arch structure of the calcium carbonate crystals**
- C) The osmotic pressure of the albumen
- D) The protein-rich membrane elasticity

2. The rhyme 'Jack and Jill' describes fetching a pail of water. In terms of classical mechanics, what is the most significant force acting upon the pair as they ascend a hill, increasing the metabolic energy required per step?

- A) Gravitational potential energy gain**
- B) Centrifugal force
- C) Magnetic torque
- D) Atmospheric pressure variance

3. 'Mary, Mary, quite contrary' mentions 'silver bells and cockle shells.' From a biological taxonomy standpoint, what are 'cockle shells' scientifically classified as?

- A) Crustacean carapaces
- B) Bivalve mollusks**
- C) Echinoderm exoskeletons
- D) Cephalopod cuttlebone

4. In 'Little Miss Muffet,' the subject is frightened by a spider. Arachnophobias are often studied in psychology; what is the specific classification of the typical fear response triggered by a spider's rapid, erratic movement?

- A) Vestibular reflex
- B) Startle response**
- C) Cognitive dissonance
- D) Synesthetic hallucination

5. 'Three Blind Mice' references a loss of vision. Which anatomical structure, if damaged, would most likely result in the total clinical blindness described in the rhyme?

- A) The optic nerve**
- B) The tympanic membrane
- C) The olfactory bulb
- D) The semicircular canals

6. 'Hey Diddle Diddle' mentions a cow jumping over the moon. If an object were to achieve 'escape velocity' from Earth, what approximate speed in kilometers per second would it require to overcome gravitational pull?

- A) 1.1 km/s
- B) 11.2 km/s**
- C) 22.4 km/s
- D) 33.6 km/s

7. 'Twinkle, Twinkle, Little Star' describes a star. Scientifically, what is the primary nuclear fusion process occurring within a main-sequence star that produces its luminosity?

- A) Hydrogen into Helium**
- B) Carbon into Oxygen
- C) Iron into Nickel
- D) Nitrogen into Neon

8. In 'London Bridge is Falling Down,' the bridge faces structural failure. What is the primary cause of 'material fatigue' in historical masonry structures subjected to repetitive environmental stress?

- A) Micro-fracture propagation**
- B) Molecular sublimation
- C) Electrolytic corrosion
- D) Biological oxidation

9. 'Baa, Baa, Black Sheep' describes the wool. What is the protein that constitutes the primary structural component of sheep's wool fibers?

- A) Collagen
- B) Keratin**
- C) Elastin
- D) Myosin

10. 'Peter Piper picked a peck of pickled peppers.' Peppers (Capsicum) produce capsaicin. What is the scientific purpose of capsaicin in the plant's evolutionary strategy?

- A) To attract bees
- B) To deter mammalian herbivory**
- C) To enhance photosynthesis
- D) To increase fruit water retention

11. 'The itsy-bitsy spider' climbs a waterspout. When it rains, the spider faces adhesion issues. Which physical force is most responsible for water clinging to the spider's hydrophobic setae?

A) Surface tension

- B) Magnetic flux
- C) Ionic bonding
- D) Thermal expansion

12. 'Georgie Porgie' involves pudding and pie. In food science, what process causes the thickening of starch-based puddings when heated in liquid?

A) Gelatinization

- B) Fermentation
- C) Sublimation
- D) Oxidation

13. 'One, Two, Buckle My Shoe.' Shoes are typically designed to support the plantar fascia. Where is this ligament located in the human foot?

A) Connecting the heel to the toes

- B) Along the lateral malleolus
- C) Between the tibia and fibula
- D) Within the metatarsophalangeal joint

14. 'Sing a Song of Sixpence' mentions a pocket full of rye. Rye (*Secale cereale*) is a grain often susceptible to which fungus, known to produce alkaloids that can cause ergotism?

A) *Claviceps purpurea*

- B) *Aspergillus niger*
- C) *Penicillium chrysogenum*
- D) *Candida albicans*

15. 'Old King Cole' called for his pipe. Tobacco smoke contains carbon monoxide, which binds to hemoglobin with higher affinity than oxygen. What is this resultant molecule called?

A) Carboxyhemoglobin

- B) Oxyhemoglobin
- C) Deoxyhemoglobin
- D) Methemoglobin

16. 'Rub-a-dub-dub, three men in a tub.' For an object to float, it must displace a weight of fluid equal to its own weight. What is the name of this physical law?

A) Archimedes' Principle

- B) Bernoulli's Principle
- C) Hooke's Law
- D) Newton's Third Law

17. 'Ladybug, Ladybug, fly away home.' Ladybugs (Coccinellidae) often exhibit aposematism. What is the function of this biological trait?

A) Camouflage

B) Warning predators of toxicity

- C) Attracting mates via bioluminescence
- D) Regulating body temperature

18. 'Jack be nimble, Jack be quick, Jack jump over the candlestick.' What is the chemical process of combustion that causes the candle wick to consume paraffin wax?

A) Exothermic oxidation

- B) Endothermic reduction
- C) Catalytic hydrolysis
- D) Polymerization

19. 'Pat-a-cake, pat-a-cake, baker's man.' Bread dough rises due to the release of which gas by *Saccharomyces cerevisiae*?

A) Carbon dioxide

- B) Oxygen
- C) Nitrogen
- D) Argon

20. 'Little Bo Peep has lost her sheep.' Sheep are ruminants. How many compartments are in the complex stomach of a ruminant animal?

- A) One
- B) Two
- C) Three
- D) Four**

21. 'Rock-a-bye baby, on the tree top.' Deciduous trees undergo abscission in autumn. What is the primary hormone responsible for this process?

A) Ethylene

- B) Auxin
- C) Gibberellin
- D) Cytokinin

22. 'Rain, Rain, Go Away.' Rain is caused by the condensation of water vapor around nuclei in the atmosphere. What are these small particles called?

A) Aerosols

B) Photons

C) Neutrinos

D) Quarks

23. 'There was a crooked man, who walked a crooked mile.' What anatomical condition involves an abnormal lateral curvature of the spine?

A) Scoliosis

B) Lordosis

C) Kyphosis

D) Spondylolysis

24. 'The North Wind doth blow.' Wind is primarily generated by differences in what atmospheric factor?

A) Pressure gradients

B) Ocean currents

C) Lunar phases

D) Magnetic declination

25. 'Hickory Dickory Dock, the mouse ran up the clock.' Clocks rely on harmonic motion. What is the period of a pendulum dependent upon?

A) Length and gravity

B) Mass and air resistance

C) Amplitude and color

D) Width and density