NSO-Style · Original Practice Content

Class 7 | Science Olympiad

40 Questions · With Answer Key
Syllabax Olympiad Series
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Instructions: Each question has one correct answer. Choose the best option (A/B/C/D). Answer key is provided at the end. This paper is for practice only — not an official exam paper. Recommended time: **45 minutes**.

Q1. The Heisenberg Uncertainty Principle states that one cannot simultaneously know a particle's exact:

A. mass and charge
B. position and momentum
C. spin and energy
D. wavelength and frequency

Q2. In a Carnot engine, the efficiency depends only on the:

A. working fluid used
B. temperatures of the hot and cold reservoirs
C. volume of the cylinder
D. speed of the pistons

Q3. Which of the following correctly describes SN2 reactions in organic chemistry?

A. they involve a carbocation intermediate
B. they proceed with retention of configuration
C. they occur in two steps with a stable intermediate
D. they involve backside attack and inversion of configuration

Q4. The human genome contains approximately how many base pairs?

A. 3 million
B. 300 million
C. 3 billion
D. 30 billion

Q5. CRISPR-Cas9 is used for:

A. protein synthesis
B. DNA sequencing
C. gene editing
D. mRNA transcription

Q6. Which force is responsible for holding protons and neutrons together in the nucleus?

A. electromagnetic force
B. weak nuclear force
C. gravitational force
D. strong nuclear force

Q7. In quantum mechanics, a particle in a box has energy levels proportional to:

A. n

B. n^2

C. $\sqrt{n}$

D. $1/n^2$

Q8. The action potential in a neuron involves:

A. potassium flowing in and sodium flowing out

B. rapid influx of Na^+ ions followed by efflux of K^+ ions

C. chloride ions carrying the signal

D. calcium ions triggering the impulse

Q9. Allosteric regulation of an enzyme involves:

A. competitive inhibition at the active site

B. denaturation of the enzyme

C. a molecule binding to a site OTHER than the active site to change enzyme shape

D. permanent inactivation

Q10. The Schwarzschild radius defines the event horizon of a black hole. For Earth, it is approximately:

A. 1 m

B. 9 mm

C. 9 cm

D. 9 km

Q11. In gel electrophoresis of DNA, which band moves FARTHEST from the well?

A. the largest fragment

B. the most negatively charged fragment

C. the fragment with the most base pairs

D. the smallest fragment

Q12. A buffer solution resists pH change because it contains:

A. a strong acid and strong base

B. a weak acid and its conjugate base

C. distilled water only

D. a neutral salt solution

Q13. The Michaelis-Menten equation describes enzyme kinetics. Km is:

A. the maximum reaction rate

B. the activation energy of the enzyme

C. the substrate concentration at which reaction rate is half Vmax

D. the enzyme concentration

Q14. General relativity predicts that light will be bent by:

A. magnetic fields

B. electric fields

C. gravity (curved spacetime)

D. density of the medium

Q15. Which of these correctly describes APOPTOSIS?

A. uncontrolled cell division
B. programmed cell death
C. cellular replication
D. viral infection of cells

Q16. The de Broglie wavelength of a particle is given by $\lambda = h/p$, where h is Planck's constant and p is:

A. pressure
B. potential energy
C. momentum
D. power

Q17. Telomeres protect chromosomes from degradation. They shorten with each cell division, which is associated with:

A. increased cancer risk only
B. ageing and cellular senescence
C. faster cell replication
D. improved DNA repair

Q18. In organic chemistry, a carbonyl group C=O in the middle of a carbon chain identifies the compound as a:

A. carboxylic acid
B. aldehyde
C. ketone
D. alcohol

Q19. Dark energy is thought to be responsible for:

A. holding galaxies together
B. the accelerating expansion of the universe
C. the formation of stars
D. cosmic background radiation

Q20. Which of these correctly describes the Central Dogma of Molecular Biology?

A. protein → mRNA → DNA
B. DNA → protein → RNA
C. RNA → DNA → protein
D. DNA → RNA → protein

Q21. In superconductors, below the critical temperature, electrical resistance becomes:

A. infinite
B. very high
C. equal to normal resistance
D. exactly zero

Q22. The citric acid cycle produces, per turn, which combination?

A. 1 ATP, 2 NADH, 1 $FADH_2$
B. 2 ATP, 3 NADH, 1 $FADH_2$
C. 3 NADH, 1 $FADH_2$, 1 GTP (or ATP), 2 CO_2
D. 4 NADH, 2 $FADH_2$, 2 ATP

Q23. An antibody's specificity is determined by its:

A. constant region

B. heavy chain only

C. variable region (which forms the antigen-binding site)

D. light chain only

Q24. The Chandrasekhar limit (~1.4 solar masses) is the maximum mass of a:

A. neutron star

B. white dwarf

C. red giant

D. brown dwarf

Q25. Which of these is a colligative property of a solution?

A. colour

B. density

C. boiling point elevation

D. electrical conductivity

Q26. The concept of 'punctuated equilibrium' in evolution proposes that:

A. evolution occurs at a steady, gradual rate

B. species do not evolve at all

C. evolution occurs in rapid bursts separated by long periods of stasis

D. natural selection does not apply to large populations

Q27. In nuclear magnetic resonance (NMR) spectroscopy, chemically equivalent protons appear as:

A. separate peaks at different chemical shifts

B. a single peak at the same chemical shift

C. multiple peaks depending on coupling

D. no signal at all

Q28. Maxwell's equations describe:

A. quantum mechanical behaviour of atoms

B. the laws of thermodynamics

C. the unified behaviour of electric and magnetic fields

D. the motion of planets

Q29. The lac operon in E. coli is switched ON when:

A. glucose is present and lactose is absent

B. glucose is absent and lactose is present

C. both glucose and lactose are present

D. neither glucose nor lactose is present

Q30. Chirality in molecules refers to:

A. the molecule's ability to rotate polarised light and its non-superimposable mirror image

B. the number of double bonds

C. the presence of a benzene ring

D. reactivity with acids

Q31. The Schrödinger equation is used to calculate:

A. the exact path of an electron

B. the wave function ψ, whose square gives the probability of finding a particle

C. the speed of electrons

D. nuclear binding energy

Q32. In immunology, MHC class I molecules present antigens to:

A. B cells

B. macrophages

C. CD4+ helper T cells

D. CD8+ cytotoxic T cells

Q33. Which of the following describes the Bohr model's limitation?

A. it incorrectly stated that electrons have negative charge

B. it only worked accurately for hydrogen-like (one-electron) atoms

C. it incorrectly described proton-neutron ratios

D. it failed to explain why atoms have a nucleus

Q34. The endosymbiotic theory proposes that mitochondria evolved from:

A. portions of the nucleus breaking off

B. engulfed aerobic bacteria

C. RNA molecules gaining membranes

D. viral infections of early cells

Q35. Lorentz contraction means a moving object appears ___ in the direction of motion.

A. longer

B. heavier

C. shorter

D. brighter

Q36. NADH and $FADH_2$ donate electrons to the electron transport chain, ultimately reducing ___ to produce water.

A. CO_2

B. NAD^+

C. O_2

D. ADP

Q37. The Born-Haber cycle is used to calculate the:

A. enthalpy of combustion

B. lattice enthalpy of ionic compounds

C. entropy of mixing

D. free energy of solvation

Q38. Which of these correctly describes TYPE I and TYPE II errors in a scientific experiment?

A. Type I = missing a real effect; Type II = false positive

B. Type I = false negative; Type II = false positive

C. Type I = false positive (rejecting a true null hypothesis); Type II = false negative

D. Type I = systematic error; Type II = random error

Q39. The discovery of pulsars (rapidly rotating neutron stars) was made by:

A. Edwin Hubble

B. Jocelyn Bell Burnell

C. Carl Sagan

D. Stephen Hawking

Q40. In a chemical equilibrium A ⇌ B, the equilibrium constant Kc > 1 indicates that at equilibrium:

A. reactants are favoured

B. equal amounts of A and B are present

C. products are favoured

D. the reaction proceeds only in the forward direction

Answer Key

Q1: B Q2: B Q3: D Q4: C Q5: C Q6: D Q7: B Q8: B Q9: C Q10: B

Q11: D Q12: B Q13: C Q14: C Q15: B Q16: C Q17: B Q18: C Q19: B

Q20: D Q21: D Q22: C Q23: C Q24: B Q25: C Q26: C Q27: B Q28: C

Q29: B Q30: A Q31: B Q32: D Q33: B Q34: B Q35: C Q36: C Q37: B

Q38: C Q39: B Q40: C