E&G

OLYMPIAD EXPLORER

Workbook for

Nationwide Interactive SCIENCE Olympiad & Other National/International Olympiads/Talent Search Exams.

Also useful for Nationwide Biotechnology Olympiad (NBTO)

Based on CBSE, ICSE, GCSE, State Board Syllabus & NCF (NCERT)

100's of Q's with answers

- Chapterwise Practice Q's
- Revision Q's
- Sample Paper

Class 11

EDUHEAL FOUNDATION

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EduHeal Foundation conducts 5 Olympiads annually reaching out to 3,500 + Schools ● 4 Lakh + Students ● 50,000 Coordinating Teachers and having 500 Resource persons in English / Maths / Science / Biotech / Computer & 300 Regional Coordinators.

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Contents

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SYLLABUS GUIDELINES*

Based on CBSE, ICSE & GCSE Syllabus & NCF guidelines devised by NCERT

PHYSICS

Physical World and Measurement

Physics - scope and excitement; nature of physical laws; Physics, technology and society. Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures. Dimensions of physical quantities, dimensional analysis and its applications.

Kinematics

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion (graphical treatment). Elementary concepts of differentiation and integration for describing motion. Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity. Unit vector; Resolution of a vector in a plane - rectangular components. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

Laws of Motion

Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

Work, Energy and Power

Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power. Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: elastic and inelastic collisions in one and two dimensions.

Motion of System of Particles and Rigid Body

Centre of mass of a two-particle system, momentum conversation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod. Vector product of vectors; moment of a force, torque, angular momentum, conservation of angular momentum with some examples. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

Gravitation

Kepler's laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

Properties of Bulk Matter

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity. Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure. Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, application of surface tension ideas to drops, bubbles and capillary rise. Heat, temperature, thermal expansion; specific heat - calorimetry; change of state - latent heat. Heat transfer-conduction, convection and radiation, thermal conductivity, Newton's law of cooling.

Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators.

Behaviour of Perfect Gas and Kinetic Theory

Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases - assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heats of gases; concept of mean free path, Avogadro's number.

Oscillations and Waves

Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a spring–restoring force and force constant; energy in S.H.M.-kinetic and potential energies; simple pendulum–derivation of expression for its time period; free, forced and damped oscillations (qualitative ideas only), resonance.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

CHEMISTRY

Some Basic Concepts of Chemistry

General Introduction: Importance and scope of chemistry. Historical approach to particular nature of matter, laws of chemical combination. Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass: percentage composition, empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

Structure of Atom

Discovery of electron, proton and neutron; atomic number, isotopes and isobars.

Thomson's model and its limitations, Rutherford's model and its limitations. Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, De Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p, and d orbitals, rules for filling electrons in orbitals - Aufuau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Classification of Elements and Periodicity in Properties
Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii. Ionization enthalpy, electron gain enthalpy, electro negativity, valence.

Chemical Bonding and Molecular Structure
Valence electrons, ionic bond, covalent bond: bond parameters. Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital; theory of homo nuclear diatomic molecules (qualitative idea only), hydrogen bond.

States of Matter: gases and liquids
Three states of matter. Intermolecular interactions, type of bonding, melting and boiling points. Role of gas laws in elucidating the concept of the molecule, Boyle's law. Charles law, Gay Lussac's law, Avogadro's law. Ideal behaviour, empirical derivation of gas equation, Avogadro's number. Ideal gas equation. Derivation from ideal behaviour, liquefaction of gases, critical temperature.

Liquid State - Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

Thermodynamics (Energetics)
Concepts Of System, types of systems, surroundings. Work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics - internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH, Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation. Phase transition, ionization, and dilution. Introduction of entropy as a state function, free energy change for spontaneous and nonspontaneous process, equilibrium.

Equilibrium
Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle; ionic equilibrium - ionization of acids and bases, strong and weak electrolytes, degree of ionization, concept of pH. Hydrolysis of salts (elementary idea). Buffer solutions, solubility product, common ion effect (with illustrative examples).

Redox Reactions
Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, applications of redox reactions.

Hydrogen
Position of hydrogen in periodic table, occurrence, isotopes, preparation,

properties and uses of hydrogen; hydrides - ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, reactions and structure; hydrogen as a fuel.

s-Block Elements (Alkali and Alkaline earth metals)

Group 1 and Group 2 elements:
General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.

Preparation and properties of some important compounds:
Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium. CaO, CaCO3 and industrial use of lime and limestone, biological importance of Mg and Ca

Some p-Block Elements

General Introduction to p-Block Elements
Group 13 elements: General introduction, electronic configuration, occurrence. Variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron- physical and chemical properties, some important compounds: borax, boric acids, boron hydrides. Aluminium: uses, reactions with acids and alkalies.

Group 14 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element, Carbon - catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides.

Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites.

Organic Chemistry - Some Basic Principles and Techniques
General introduction, method, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance

and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations,

carbanions; electrophiles and nucleophiles, types of organic reactions

Hydrocarbons

Classification of hydrocarbons
Alkanes - Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism or halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene) geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties.

Methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.

Aromatic hydrocarbons: Introduction, IUPAC nomenclature; Benzene: resonance aromaticity ; chemical properties: mechanism of electrophilic substitution. – nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation: directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

BIOLOGY

Environmental Chemistry

Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming - pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

Diversity in Living World

Diversity of living organisms

Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom). Systematics and binomial System of nomenclature Salient features of animal (non chordates up to phylum level and chordates up to class level) and plant (major groups; Angiosperms up to subclass) classification. Botanical gardens, herbaria, zoological parks and museums.

Structural Organisation in Animals and Plants

Tissues in animals and plants. Morphology, anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit and seed. Morphology, anatomy and functions of different systems of an annelid (earthworm), an insect (cockroach) and an amphibian (frog).

Cell : Structure and Function

Cell: cell wall, cell membrane and cell organelles' (plastids, mitochondria, endoplasmic reticulum, Golgi bodies/dictyosomes, ribosomes, lysosomes, vacuoles, centrioles) and nuclear organization.

Mitosis, meiosis, cell cycle. Basic chemical constituents of living bodies. Structure and functions of carbohydrates, proteins, lipids and nucleic acids. Enzymes: types, properties and function.

Plant Physiology

Movement of water, food, nutrients and gases, Plants and Water Mineral nutrition, Respiration, Photosynthesis, Plant growth and development.

Human Physiology

Digestion and absorption.

Breathing and respiration.

Body fluids and circulation.

Excretory products and elimination.

Locomotion and movement.

Control and coordination.

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BIOLOGY QUESTION BANK

Q1. Today there are many different breeds of dogs. What mechanism is responsible for most of this variation?

(a) inbreeding (b) genetic drift
(c) natural selection (d) artificial selection

Q2. In the evolution of life on Earth the early primitive cells that were present must have obtained their energy by:

(a) glycolysis and fermentation.
(b) aerobic respiration.
(c) cyclic phosphorylation
(d) noncyclic phosphorylation.

Q3. The excessive use of antibiotics is a concern to the medical community. The concern is that antibiotics will no longer be as effective in treating disease because:

(a) humans are evolving a resistance to some antibiotics
(b) viruses are not killed by antibiotics
(c) some bacteria are evolving resistance to antibiotics
(d) antibiotics are very expensive

Q4. Which of the following "vegetables" is technically a fruit?

(a) potato (b) lettuce
(c) broccoli (d) green bean.

Q5. The concentration of polychlorinated biphenyls (PCB, an organochloride contaminant) in many fish populations has been declining since a ban on their production was instituted in the late 1970s. PCBs remain a potential problem, however, because they are lipophilic and are known to biomagnify. Based on this knowledge, what type of fish is expected to be safest for human consumption (i.e., with the lowest concentration of organochlorides)?

(a) slow-growing fish species.
(b) piscivorous fish species (i.e., which eat other fish).
(c) benthivorous fish species (i.e., which eat invertebrates on the lake bottom).
(d) small (young) fish.

Q6. Which statement about chemical bonds is correct**?**

(a) A covalent bond forms between a sodium ion and a chloride ion.
(b) A hydrogen bond forms between water molecules.

(c) A hydrophobic interaction links an oxygen atom to the hydrogen atoms in a water molecule.
(d) A covalent bond links an iron atom to the protein haemoglobin.

Q7. Which of the following statements about atoms are correct?

i. The atoms which make up an element are usually of the same kind.

ii. An atom is identified by the number of its protons, which is called the atomic number.

iii. Not all atoms of the same element have the same mass number.

iv. Deuterium and tritium are isotopes of hydrogen; all three have the same atomic number, 1.

(a) i and ii (b) i, ii, iii, and iv
(c) i and iii (d) ii and iv

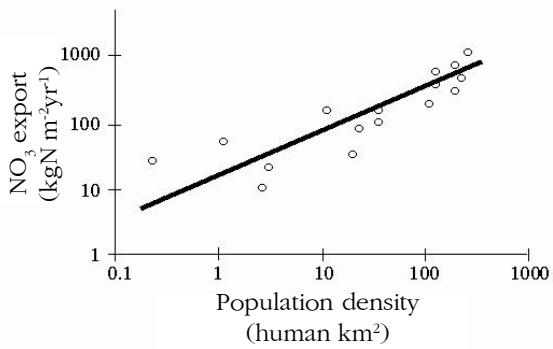
Q8. Thyroid stimulating hormone (TSH), luteinizing hormone (LH), and oxytocin are all:
(a) released from the pituitary gland
(b) tropic hormones (act on other endocrine tissue)
(c) steroid hormones (d) sex hormones

Q9. Why is the global climate change that is predicted to occur in the next 100 years a concern for ecological communities?
(a) Primary production will decline markedly due to decreased atmospheric CO_2 concentrations.
(b) The tundra of northern polar regions will disappear and be replaced by boreal forest.
(c) Species will not be able to migrate quickly enough to follow the change in climate.
(d) Ocean levels will increase substantially and flood a large portion of present continents.

Q10. Gas exchange in animals always involves:
(a) cellular respiration
(b) breathing movements.
(c) active transport of gases
(d) diffusion across membranes.

Q11. The graph shows how much nitrate (NO_3) is exported from the continent towards the ocean by 16 major rivers in the world compared to the density of human populations living in those drainage basins (i.e., along these rivers). Nitrate exported through rivers causes eutrophication

and has been implicated in the development of toxic algal blooms in marine coastal regions. What conclusion drawn from the graph is correct?



(a) Large drainage basins export more NO_3^-
(b) Small drainage basins export more NO_3^-
(c) Drainage basins with higher population densities export more NO_3^-
(d) All rivers export equally large amounts of NO_3^-.

Q12. Which statement about proteins is correct?
(a) The primary structure of a protein is composed of many branched chains.
(b) Proteins always contain an amino group at one end and the amino acid methionine at the other end.
(c) The formation of disulfide bridges between cysteine amino acids can modify a protein's primary structure.
(d) The quaternary structure of proteins is the result of the interactions of two or more independent polypeptide chains.

Q13. One aspect of genetic engineering involves the modification of proteins to improve their function. Which statement would not be a logical goal for researchers in this field?
(a) Increase the hydrophobicity of a protein so that it will function in the aqueous environment of the cell cytoplasm.
(b) Improve the binding of a specific substrate to an enzyme.
(c) Modification of an enzyme active site to increase the rate of catalysis.
(d) Increase the stability of a protein so that it may function at a higher temperature.

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ANSWERS

1. (d) 2. (a) 3. (c) 4. (d) 5. (d) 6. (b) 7. (b)
8. (a) 9. (c) 10. (d) 11. (c) 12. (d) 13. (a)

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CHEMISTRY QUESTION BANK

1. $^{18}_{9}F$ has a half-life of 110 minutes. Calculate the time period over which a sample of this isotope loses 75% of its initial activity.
(a) 110 minutes (b) 165 minutes
(c) 220 minutes (d) 330 minutes

2. Phosphorous-32 ^{32}P, is produced by the irradiation of ^{32}S, a proton being emitted in the process. The bombarding particle must be
(a) an α-particle (b) a deuteron $^{2}_{1}H^{+}$
(c) an electron (d) a neutron

3. The number of waves made by a Bohr electron in an orbit of maximum magnetic quantum number +2 is
(a) 3 (b) 4 (c) 2 (d) 1

4. The electronic configuration, $1s^2$, $2s^2$, $2p^5$, $3s^1$, described which one of the following
(a) an excited state of the fluorine atom
(b) the ground state of neon
(c) an excited state of oxygen anion, O^{2-}
(d) the ground state of fluorine anion F^-

5. Which one of the following species has the same number of electrons as an atom of argon
(a) Mg^{2+} (b) Na^+ (c) Ne (d) S^{2-}

6. Compared to the lightest atom, the heaviest atom weighs
(a) 200 times (b) 238 times (c) 92 times (d) 16 times

7. The radio-isotope sulphur-35 decays by β-emission. Which one of the following symbols correctly represents the isotope produced when an atom of ^{35}S emits a β-particle?
(a) ^{35}Cl (b) ^{31}P (c) ^{34}S (d) ^{31}Si

8. The quantum numbers of last electron in an atom are 4, 0, 0, 1/2. The atomic number of the element could be
(a) 21 (b) 20
(c) 19, 20, 29, 30 (d) 19, 20.

9. The nuclear reaction that results in the emission of neutrons is
(a) $^{241}Am_{96} + {}^{4}He_{2} \rightarrow {}^{244}Bk_{97} + {}^{0}e_{+1}$
(b) $^{30}P_{15} \rightarrow {}^{30}Si_{14} + {}^{0}e_{-1}$
(c) $^{14}C_{6} + {}^{4}He_{2} \rightarrow {}^{18}O_{8}$ (d) $^{9}Be_{4} + {}^{1}H_{1} \rightarrow {}^{8}Be_{4} + {}^{2}H_{1}$

10. In a photoelectric effect experiment, irradiation of a metal with light of frequency 2×10^{16} Hz yields electrons with maximum kinetic energy 7.5×10^{-18} J. Calculate ν_0 for the metal
(a) 8.7×10^{15} Hz (b) 8.7×10^{-15} Hz
(c) 8.7×10^{10} Hz (d) 8.7×10^{-10} Hz

11. What is the electronic configuration of the ground state of the magnesium cation, Mg^{2+}?
(a) $1s^2\ 2s^2\ 2p^6\ 3s^2$ (b) $1s^2\ 2s^2\ 2p^6\ 3s^1$
(c) $1s^2\ 2s^2\ 2p^6$ (d) $1s^2\ 2s^2 2p^4\ 3s^2$

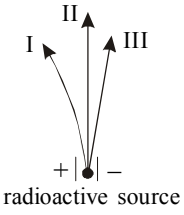
12. Which one of the following symbols correctly represents the radio-isotope formed from phosphorous-31 by neutron capture?
(a) ^{32}P (b) ^{31}S (c) ^{32}S (d) ^{31}Si

13. The isotope $_{92}U^{235}$ decays in a number of steps to an isotope of lead, $_{82}Pb^{207}$. Which one of the following groups of particles could be emitted in this process?
(a) 4α, 7β (b) 6α, 4β (c) 7α, 4β (d) 10α, 8β

14. Which of the following isotopes of uranium does not occur naturally
(a) $_{92}U^{238}$ (b) $_{92}U^{234}$ (c) $_{92}U^{235}$ (d) $_{92}U^{233}$

15. The effect of an electric field on three different types of radiation is shown in the diagram below.
Which one of the following correctly describes the nature of these three types of radiation?

	I	II	III
(a)	α	β	γ
(b)	α	γ	β
(c)	β	α	γ
(d)	β	γ	α



16. When an aluminium atom is bombarded with α-particles, phosphorous may be formed according to the following equation.
$^{27}_{13}Al + {}^{4}_{2}He \longrightarrow {}^{30}_{15}P + X$. In this process the particle X emitted is a
(a) β-particle (b) hydrogen atom
(c) γ-ray (d) neutron

17. In one type of mutual annihilation of the positron and electron, three γ-ray photons are produced. If each photon carries an energy of 0.3407 MeV, what is the mass of the positron? [1 u = 931.5 MeV]
(a) 5.486×10^{-4} u (b) 10.972×10^{-4}u
(c) 7.243×10^{-4} u (d) 6.363×10^{-4} u.

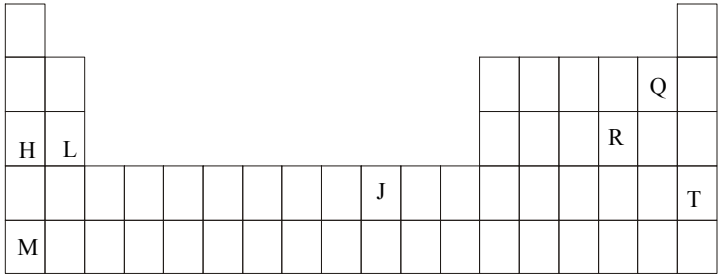
18. A thin sheet of gold foil is bombarded with α-particles, which of the following descriptions most accurately represents the path of the α-particles?

	Undeflected	Number of particles deflected through a small angle	deflected through a large angle
(a)	all	none	none
(b)	most	a few	none
(c)	most	a few	a few
(d)	a few	most	a few

19. The particle with the smallest mass is
(a) positron (b) proton (c) neutron (d) deuteron

20. The unstable isotope $_{82}Pb^{212}$ decays with the emission of a β^- particle to form
(a) an atom with a mass number of 211
(b) an atom with an atomic number of 81
(c) the atom $_{82}X^{213}$
(d) an atom with an atomic number of 83.

21. The diagram below shows part of the skeleton of the Periodic Table in which elements are indicated by letters which are not their usual symbols.



Which of the following statements is correct?
(a) the greatest ionic character of compounds formed by reaction of pairs of the listed elements would be exhibited by the compound with the formula, M_2Q.
(b) the J^{2+} ion is coloured and has an electronic configuration of $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^7$.
(c) the carbonate of compound H is insoluble in water

(d) element T is an inert gas with an electronic configuration $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^{10}$, $4s^2$, $4p^6$

22. The molecule that has the highest bond energy is
(a) H_2 (b) F_2 (c) Cl_2 (d) ICl

23. Which of the following do not exhibit both ionic and covalent bond
(a) $BaSO_4$ (b) NH_4Cl (c) $Ca(NO_3)_2$ (d) HCl

24. Which one of the following equations represents the change to which the electron affinity of a halogen X relates?
(a) $X(g) + e^- \rightarrow X^-(g)$ (b) $1/2X_2(g)+e^- \rightarrow X^-(g)$
(c) $1/2X_2(aq)+e^- \rightarrow X^-(aq)$ (d) $X^+(g) + e^- \rightarrow e^- \rightarrow X(g)$

25. Which one of the following processes occurs in the formation of the bonds in magnesium chloride?
(a) sharing of two electrons from the magnesium atom between the magnesium and chlorine atoms
(b) sharing of one electron from the magnesium atom and one electron from a chlorine atom between the magnesium and chlorine atoms
(c) transfer of one electron from each of two chlorine atoms to the magnesium atom
(d) transfer of two electrons from the magnesium atom, one to each of two chlorine atoms

26. Given that aqueous solutions of potassium chromate (VI) and copper (II) sulphate are yellow and blue respectively. What colour is a solution of copper (II) chromate (VI) (in dilute hydrochloric acid) most likely to be?
(a) blue (b) green (c) orange (d) yellow

27. The molecule which has zero dipole moment is
(a) CH_2Cl_2 (b) NF_3 (c) ClO_2 (d) BF_3

28. In the caesium chloride and sodium chloride lattices the numbers of chloride ions surrounding each metal ion are 8 and 6 respectively. The best explanation for this difference is that caesium and sodium have different
(a) densities (b) electronegativities
(c) first ionisation energies (d) ionic radii.

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ANSWERS

1. (c)	2. (d)	3. (a)	4. (c)	5. (d)	6. (b)	7. (a)
8. (c)	9. (a)	10. (a)	11. (c)	12. (a)	13. (c)	14. (d)
15. (d)	16. (d)	17. (a)	18. (c)	19. (a)	20. (d)	21. (d)
22. (a)	23. (d)	24. (a)	25. (d)	26. (b)	27. (d)	28. (d)

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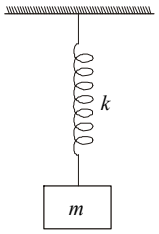
PHYSICS QUESTION BANK

1. If the unit of length, mass and time each be doubled, the unit of work is increased
(a) two times (b) four times (c) six times (d) no change

2. Two masses of 1 g and 4 g are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is
(a) 4 : 1 (b) $\sqrt{2}$: 1 (c) 1 : 2 (d) 1 : 6

3. The time period of the oscillating spring system shown in the figure is T. If another spring of spring constant k_1 is connected in series with the given spring, then the new system will oscillate with a period



(a) more than T (b) less than T
(c) equal to T
(d) more than T if $k_1 < k$ and less than T if $k_1 > k$.

4. The acceleration due to gravity on the surface of the moon is 1/6 that on the surface of Earth and the diameter of the moon is one-fourth that of Earth. The ratio of escape velocities on earth and moon will be
(a) $2\sqrt{6}$ (b) $4\sqrt{2}$ (c) 3 (d) $2\sqrt{3}$

5. A man weighing 60 kg stands on an immobile platform (a disc) with a mass of 100 kg. What are the number of revolutions per minute made by the platform if the man moves along a circle with a radius of 5m around the axis of rotation? Given that the man moves relative to platform with a velocity of 4 km/h. The radius of the platform is 10 m.
(a) 0.25 rpm (b) 0.75 rpm (c) 1 rpm (d) 0.5 rpm

6. A 200 gram mass at the end of a vertical spring describing S.H.M. has maximum velocity of 4 cm/s and maximum acceleration of 5 m/s^2. The spring constant of the spring is
(a) 31.25 N/m (b) 3.125×10^3 N/m
(c) 1.25×10^4 N/m (d) 2.265×10^2 N/m

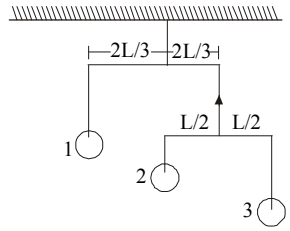
7. A football is kicked of with an initial speed of 19.6 m/sec. at a projection of 45°. A receiver on the goal line 67.4 m away in the direction of the kick starts running to meet the ball at that instant. The speed be, if he is to catch the ball before it hits the ground is
(a) 10 m/sec. (b) 20 m/sec. (c) 15 m/sec. (d) 25 m/sec.

8. A car of mass m is driven with acceleration a along straight level road against constant external resistance R. When the velocity is v, the rate at which the engine is working is
(a) Rv (b) $m.av$ (c) $(R + ma)\, v$ (d) $(R - ma)\, v$

9. A projectile thrown with an initial velocity u and angle of projection 15° to the horizontal has a range of R = 16 m. If the same projectile is thrown at an angle of 45° to the horizontal but with the velocity $2u$, its range will be
(a) 12 R (b) 8 R (c) 3.0 R (d) R/3

10. At a given place where the acceleration due to gravity is g, a sphere of lead of density d is gently released in a column of liquid of density ρ. If $d > \rho$, the acceleration with which the sphere falls is
(a) gd/ρ (b) $\frac{gd-\rho}{d}$ (c) $\frac{g(d-\rho)}{d}$ (d) $\frac{g\rho}{d}$

11. The weights shown in fig. hangs at equilibrium. It consists of objects held by vertical strings. Object 3 weighs 1.4 N while each of the identical uniform horizontal bars weigh 0.50 N. Then the tension in the upper string is



(a) 1.5 N (b) 1.4 N
(c) 5.3 N (d) 6.4 N

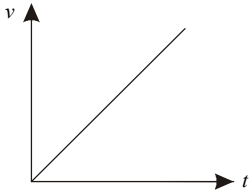
12. A projectile is thrown from a point in a horizontal plane such that its horizontal and vertical velocity components are 9.8 m/s and 19.6 m/s respectively. It will strike the plane after covering a horizontal distance of
(a) 4.9 m (b) 9.8 m (c) 19.6 m (d) 39.2 m

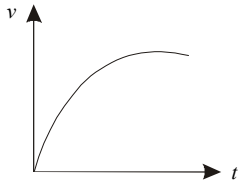
13. A uniform chain of length L and mass M is lying on a smooth table and one third of its length is hanging vertically down over the edge of the table. If g is acceleration due to gravity, the work required to put the hanging part on the table is
(a) MgL (b) $\frac{MgL}{3}$ (c) $\frac{MgL}{6}$ (d) $\frac{MgL}{18}$

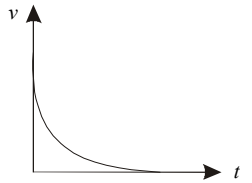
14. For this question make the assumption that water is pushed from the base of a tree to its top by atmospheric pressure, above 100 kPa. If the water column in a tree was supported entirely by atmospheric pressure the maximum possible free height would be about

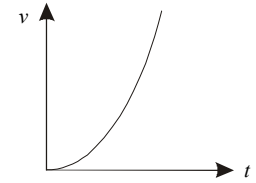
(a) 0.1 m (b) 1 m (c) 10 m (d) 50 m

15. As a small spherical steel ball falls through a viscous column, its velocity change with time according to the graph

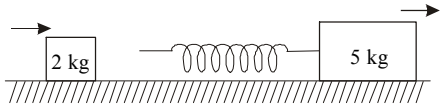
(a) 

(b) 

(c) 

(d) 

16. A block of mass 2 kg slides along a frictionless table with a speed of 10 m/sec. Directly in front of it and moving in the same direction is a block of mass 5 kg moving at 3 m/sec. A massless spring having a spring constant K = 1120 N/m is attached to the backside of 5 kg block as shown in figure. When the blocks collide, the maximum compression in spring will be



(a) 0.33 m (b) 0.25 m (c) 0.4 m (d) 1.12 m

17. A ball hits the floor and rebounds after an inelastic collision. In this case

(a) the mechanical energy of the ball just after the collision is the same as that just before the collision

(b) the mechanical energy of the ball remains the same in the collision

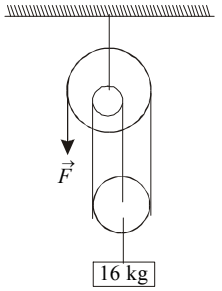
(c) the total momentum of the ball and the earth is conserved

(d) the total energy of the ball and the earth is conserved

18. Two wires of the same material and length but diameters in the ratio 1 : 2 are stretched by the same force. The potential energy per unit volume of the two wires when stretched will be in the ratio

(a) 16 : 1 (b) 4 : 1 (c) 2 : 1 (d) 1 : 1

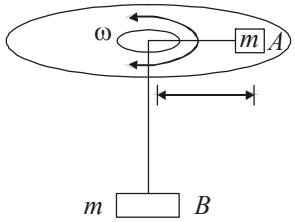
19. In the figure, given the upper pulley is of mass 10 kg and the lower pulley is of mass 5 kg. Both pulleys are smooth and the string wound over them is light. The block suspended is of mass 16 kg. A force $\vec{F}$ (as shown in the figure) keeps the system in equilibrium. Then the magnitude of $\vec{F}$ is



(a) 16 kgf (b) 21 kgf

(c) 31 kgf (d) 7 kgf

20. Two particles *A* and *B*, each of mass *m*, are inter connected by an inextensible such that the particle *B* hangs below a table as shown in the figure and particle *A* is on a rough rotating disc at a distance *r* from the axis of rotation of the disc. If the angular speed of the disc is $w = \sqrt{g/r}$, the frictional force developed at the interface of the particle and the disc is equal to



(a) mg/2 (b) < mg/2 (c) mg/$\sqrt{2}$ (d) zero

21. A body *A* moving with a velocity v_0 collides with a stationary body *B*. The motion of the two bodies is restricted to one-dimension. For *B* to recoil after collision with maximum speed, the ratio of the mass of *B* to the mass of *A* should be

(a) 1 (b) 2 (c) 0.5 (d) None of these

22. A shell is fired from a cannon with a velocity *v* (ms^{-1}) at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon then the speed (in ms^{-1}) of the other piece immediately after the explosion is

(a) 3 *v* cos θ (b) 2 *v* cos θ

(c) $\frac{3}{2}$ *v* cos θ (d) $\sqrt{\frac{3}{2}}$ *v* cos θ

☺☺☺

ANSWERS

1. (a) 2. (c) 3. (a) 4. (a) 5. (d) 6. (b) 7. (a)
8. (c) 9. (b) 10. (b) 11. (c) 12. (d) 13. (d) 14. (c)
15. (b) 16. (b) 17. (c) 18. (a) 19. (b) 20. (d) 21. (a)
22. (a)

☺☺☺

NATIONWIDE INTERACTIVE SCIENCE OLYMPIAD (NISO) SAMPLE PAPER

Total duration : 60 Minutes **Total Marks :** 50

SECTION - A : GENERAL I.Q.

1. Direction : Study the information given below and answer the question that follows :

A, B, C, D, E and F are cousins. No two cousins are of the same age, but all have birthdays on the same date. The youngest is 17 years old and the oldest E is 22. F is somewhere between B and D in age. A is older than B. C is older than D.

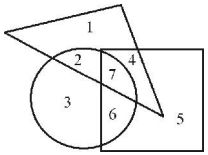
Which of the following is not possible?

(a) D is 20 years old (b) F is 18 years old
(c) F is 19 years old (d) None of these

2. If *cloud* is called *white, white* is called *rain, rain* is called *green, green* is called *air, air* is called *blue* and *blue* is called *water*, where will the birds fly?

(a) Air (b) Cloud
(c) White (d) None of these

3. If Tall is equivalent to circle, Armymen to triangle and Strong to square, indicate which number will represent strong armymen?



(a) 3 (b) 4 (c) 5 (d) None of these

4. If in the word 'DISTURBANCE', the first letter is interchanged with the last letter, the second letter is interchanged with the tenth letter and so on, which letter would come after the letter "T" in the newly formed word?

(a) I (b) N (c) S (d) None of these

5. In the following series, how many such odd numbers are there which are divisible by 3 or 5 and then followed by odd numbers ?

12, 19, 21, 3, 25, 18, 35, 20, 22, 21, 45, 46, 47, 48, 9, 50, 52, 54, 55, 56

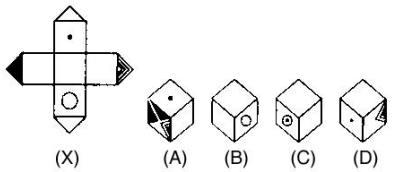
(a) Four (b) One (c) Two (d) None of these

6. Direction : In the question below, you are given a figure (X) followed by four figures (a), (b), (c) and (d) such that (X) is embedded in one of them. Choose the correct alternative.

(X)

(a)  (b)  (c)  (d) None of these

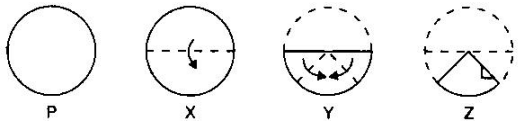
7. Choose from the alternatives, the boxes that will be formed when figure (X) is folded:

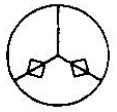


(a) A and B only (b) A, B and C only
(c) A and C only (d) None of these

8. Direction: The question that follows contain a set of three figures X, Y and Z showing a sequence of folding of a piece of paper.

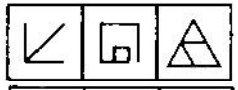
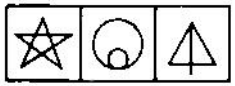
Fig (Z) shows the manner in which the folded paper has been cut. These three figures are followed by four answer figures from which you have to choose a figure which would most closely resemble the unfolded form of fig. (Z)

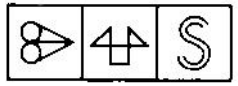


(a)  (b)  (c)  (d) None of these

9. In the following question, choose the set of figures which follows the given rule.

Rule : Any figure can be traced by a single unbroken line without retracing.

(a)  (b) 

(c)  (d) None of these

10. Rustam placed three sheets with two carbons to get two extra copies of the original. Then he decided to get more carbon copies and folded the paper in such a way that the upper half of the sheets were on top of the lower half. Then he typed. How many carbon copies did he get?

(a) 1 (b) 2
(c) 3 (d) None of these

SECTION - B : PHYSICS & CHEMISTRY

11. Which of the following is not an essential condition for interference?
(a) The two interfering waves must propagate in almost the same direction.
(b) The waves must have the same period and wavelength.
(c) The amplitudes of the two waves must be equal.
(d) The two interfering beams of light must originate from the same source.

12. An electron is fired parallel to uniform electric and uniform magnetic fields acting simultaneously and in the same direction. The electron :
(a) Gains energy. (b) Loses energy.
(c) Moves along circular path.
(d) Moves along a parabolic path.

13. A medium is said to be dispersive if
(a) Light of different wavelength propagate at different speeds
(b) Light of different wavelength propagate at same speed but has different frequencies
(c) Light is gradually bent rather than sharply refracted at an interface between the medium and air
(d) Light is never totally reflected internally.

14. Tooth decay starts when pH of the mouth is
(a) > 5.5 (b) < 5.5 (c) < 3.5 (d) > 3.5

15. Which of the following statements about Mg^{2+} are true
I. It symbolizes an ion
II. It symbolizes an atom
III. It has gained two electrons
IV. It has lost two electrons
(a) I and II only (b) I and IV only
(c) II and III only (d) II and IV only

16. Reaction of an ester with a base is termed as
(a) Micelle formation (b) Smelting
(c) Saponification (d) Neutralisation

17. The 'p' in the pH stands for
(a) Potential (b) Power (c) Paper (d) Potenz

18. Which of the following statements regarding the trends when going from left to right across the periods of a periodic table is correct?
(i) The metallic nature increases
(ii) The atomic size increases
(iii) The effective nuclear charge increases
(iv) The electronegativity increases
(a) I and II (b) II and III (c) III and IV (d) I, II, III, IV

19. $KClO_3$ is known as
(a) Potassium chlorate (b) Potassium oxychloride
(c) Potassium chloride (d) Potassium chloroxide

20. Match the options given in Column I with the correct options given in Column II.

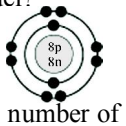
Column I	*Column II*
(i) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy	(p) Double displacement reaction
(ii) $2FeSO_4(s) \xrightarrow{\Delta} Fe_2O_3 + SO_2(g) + SO_3(g)$	(q) Displacement reaction
(iii) $Pb(s) + CuCl_2(aq) \rightarrow PbCl_2(aq) + Cu(s)$	(r) Combination reaction
(iv) $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$	(s) Decomposition reaction

	(i)	(ii)	(iii)	(iv)		(i)	(ii)	(iii)	(iv)
(a)	r	p	q	s	(b)	q	p	r	s
(c)	r	s	q	p	(d)	q	s	r	p

21. Which of the following is used by the terrorists as explosive?
(a) $NaNO_3$ (b) HNO_3 (c) $Ca(NO_3)_2$ (d) NH_4NO_3

22. Which of the following correctly balances the equation?
$Ca(OH)_2 + x\ NH_4Cl \rightarrow CaCl_2 + y\ NH_3 + z\ H_2O$
The x, y and z in the above reactions are:
(a) 3, 2, 1 (b) 2, 4, 3 (c) 2, 2, 2 (d) 3, 2, 2

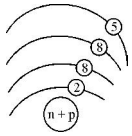
23. Which of the following is represented by the given Bohr model?



(a) An atom of neon (b) An atom of oxygen
(c) A molecule of oxygen (d) A neutral atom of oxygen

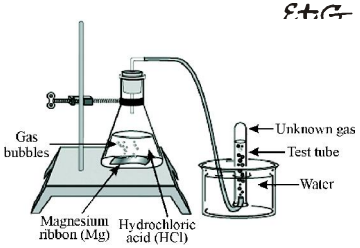
24. Which of the following is the symbol for boron with a mass number of 11?
(a) ${}^{3}_{11}B$ (b) ${}^{5}_{11}B$ (c) ${}^{11}_{3}B$ (d) ${}^{11}_{5}B$

25.



Which of the following element is represented in the above Bohr's orbit?
(a) V (b) Ti (c) Fe (d) Cr

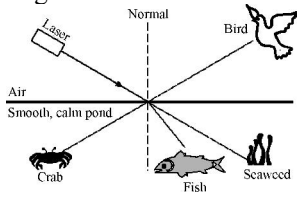
Use the following illustration of a chemical reaction to answer questions 26 and 27.



26. The above reaction is an example of
(a) Displacement reaction (b) Decomposition reaction
(c) Neutralisation reaction (d) Combination reaction

27. Which gas is collected in the test tube?
(a) O_2 (b) H_2 (c) Cl_2 (d) MgH_2

28. A laser beam is directed at the surface of a smooth, calm pond as represented in the diagram below.



Which organisms could be illuminated by the laser light?
(a) The bird and the fish (b) The crab and the seaweed
(c) The bird and the seaweed (d) The crab and the fish

29. The r.m.s. velecity of hydrogen is $\sqrt{7}$ times the r.m.s. velocity of nitrogen. If T is the temperature of the gas then
(a) $T(H_2) = T(N_2)$ (b) $T(H_2) > T(N_2)$
(c) $T(H_2) < T(N_2)$ (d) $T(H_2) = \sqrt{7}\,T(N_2)$

30. Which of the following explains the difference between the atoms of Cobalt-60 and Cobalt-58?
(a) Cobalt-60 has 2 fewer protons.
(b) Cobalt-60 has 2 more neutrons
(c) Cobalt-60 has 2 more electrons
(d) Cobalt-59 and 60 have the same number of neutrons.

31. The obital angular momentum of an electron in 2s orbital is
(a) $+\frac{1}{2}\frac{h}{2\pi}$ (b) Zero (c) $\frac{h}{2\pi}$ (d) $\sqrt{2}\frac{h}{2\pi}$

32. Use the following information to answer the question that follows:

pH is defined as the negative logarithm of the hydrogen ion concentration in moles per litre. 0.04 mol of HCl is taken. To it enough water was added to make the final volume 4 L.

What is the pH of the solution so formed?
(a) 2 (b) 12 (c) 4 (d) 10

SECTION - C : MATHS

33. If α, β are roots of the equation $x^2 - 2x + 3 = 0$ then the value of $\alpha^3 + \beta^3$ is
(a) 6 (b) –10
(c) 8 (d) None of these

34. If $\tan 4\theta = \cot(\theta - 5°)$, where 4θ and $(\theta - 5°)$ are acute angles, then the value of θ is equal to
(a) 28° (b) 18° (c) 9° (d) 29°

35. The domain of the function $f(x) = \frac{\log_2(x+3)}{x^2+3x+2}$ is
(a) $(-2, \infty)$ (b) $(-3, \infty) - (-1, -2)$
(c) $R - (-1, -2)$ (d) $(-3, \infty)$

36. A bag contains 5 red balls, 8 white balls, 4 green balls and 7 black balls. If one ball is drawn at random, then the probability that it is not green will be
(a) $\frac{5}{6}$ (b) $\frac{2}{3}$ (c) $\frac{1}{6}$ (d) None of these

37. If the fourth term of a G.P. is 5, then the product of its first seven terms will be
(a) 4^7 (b) 5^6 (c) 4^5 (d) 5^7

38. If m^{th}, n^{th} and p^{th} terms of an A.P. are equal to the corresponding term of a G.P. and they are x, y, z then $x^{y-z} \cdot y^{z-x} \cdot z^{x-y}$ equals
(a) 0 (b) 2 (c) 1 (d) –1

39. The number of permutations of m objects, where n objects are of the same kind and rest are all different is equal to
(a) $\frac{n!}{m!}$ (b) $\frac{mn!}{m!}$ (c) $\frac{m!}{n!}$ (d) $\frac{mn!}{n!}$

40. The sum of two natural numbers is 8 and sum of their reciprocals is $\frac{8}{15}$ then the numbers are
(a) (3, 4) (b) (–3, 5) (c) (3, 5) (d) (3, –5)

41. If $\sin^3 \sin 3x = \sum_{m=0}^{n} C_m \cos mx$ is an identity in x, where $C_0, C_1 \ldots C_m$ are constant and $C_n \neq 0$ then n is
(a) 2 (b) 8 (c) 6 (d) 4

42. If A, B are any two sets, then
$(A \cup B')' \cap (A' \cup B)'$ is equal to
(a) ϕ (b) $\cup$ (c) A' (d) B'

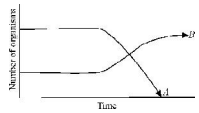
SECTION - C : BIOLOGY

33. Which of the following "vegetable' is technically a fruit?
(a) potato (b) green beas
(c) broccoli (d) none of these

34. The diagram below represents a reproductive process taking place in part of a flower.

The structure labeled *X* is an adaptation for
(a) Producing pollen (b) Internal fertilization
(c) Attracting pollinators (d) Seed dispersal

35. The graph below shows the change in two populations of herbivores in a grassy field.

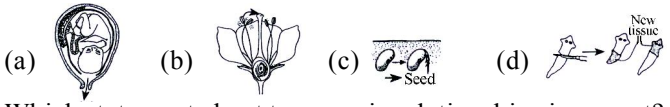


A possible reason for these changes is that
(a) All the plant populations in this habitat decreased
(b) Population B competed more successfully for food than population A did
(c) Population A produced more offspring than population B did
(d) Population A consumed the members of population B

36. Which types of organisms usually develop from an egg containing an amnion?

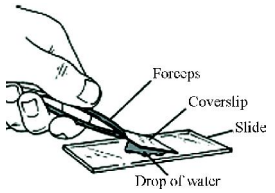
(a) *A* and *B* (b) *B* and *C* (c) *C* and *D* (d) *A* and *D*

37. Which process represented by an arrow in the diagrams below is most similar to cloning?



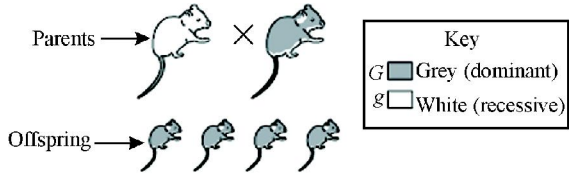
38. Which statement about taxonomic relationships is correct?
(a) A class can contain more than one phylum.
(b) A genus can contain more than one order.
(c) A family can contain more than one class.
(d) An order can contain more than one family.

39. The diagram below shows a student making a wet-mount slide.



Why should the student make sure the edge of the cover slip touches the drop of water before setting the cover slip onto the slide?
(a) To increase evaporation (b) To clean the slide
(c) To reduce air bubbles
(d) To prevent the cover slip from breaking

40. Base your answer to question on the diagram below. The diagram show the offspring of a white mouse and a grey mouse. All of the offspring are grey.



Which is a correct gene combination for the parents shown in the diagram?
(a) $GG \times GG$ (b) $gg \times gg$ (c) $gg \times GG$ (d) $Gg \times Gg$

41. The region of the brain that integrates visceral activities, body temperature and heart beat is the:
(a) Medulla oblongata (b) Cerebrum
(c) Hypothalamus (d) Cerebellum

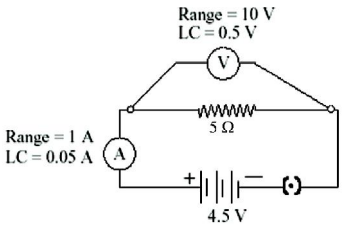
42. Fertilizers can enable farmers to grow the same crop in a field for several years in a row. Farmers who use less fertilizer often rotate their crops by planting the crop one year and legumes, such as beans and clover, the following year.

Fertilizer use and crop rotation with legumes both increase the availability of which of the following nutrients in soil?
(a) Nitrogen (b) Calcium (c) Oxygen (d) Protein

SECTION - D : INTERACTIVE SECTION

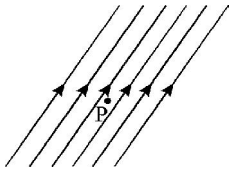
These questions are designed that they can be performed in the class / lab and can be used by the Coordinator Teacher to enhance understanding of basic science concepts.

43. The voltmeter, ammeter and resistance in the circuit shown have been checked to be correct. On plugging the key, the ammeter reads 0.9 A, but the voltmeter reads zero. This could be because

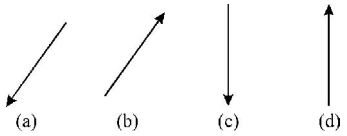


(a) The range of the voltmeter is more than the twice of the battery voltage.
(b) The least count of the voltmeter is too high.
(c) The wires joined to the voltmeter terminals are loose.
(d) The voltmeter is incorrectly placed in the circuit.

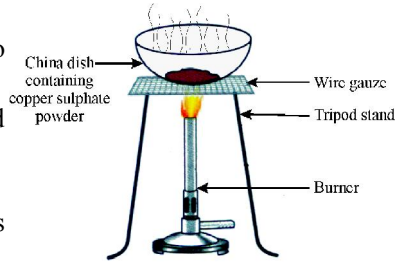
44. The diagram below represents the magnetic field near point *P*.



If a compass is placed at point *P* in the same plane as the magnetic field, which arrow represents the direction of the north end of the compass needle will point?



45. Read the extract below and answer the question that follows:
Solid copper sulphate was taken in a china dish and heated.
What will you observe?



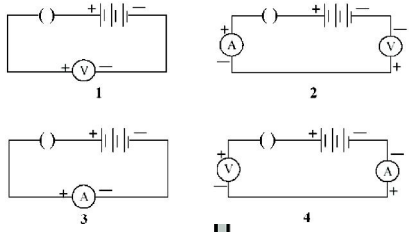
(a) The blue colour changes to black
(b) The blue colour fades and becomes colourless
(c) No change at all.
(d) The copper sulphate gets converted to liquid

46. In an experiment to study dependence of current *I* on the potential difference across a given resistor, students kept the plug key in the circuit closed for time t_1 and then open for time t_2. The times t_1 and t_2 for students *P*, *Q*, *R* and *S* are given in the table below.

Student	*Closed Time* t_1 *Seconds*	*Open Time* t_2 *Seconds*
P	30	60
Q	60	30
R	60	15
S	45	15

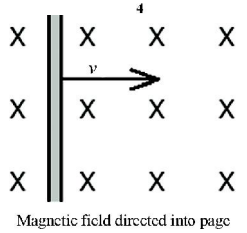
The best choice of open and closed times is that of student
(a) *P* (b) *Q* (c) *R* (d) *S*

47. On plugging the key, the voltmeter/ ammeter is likely to be damaged in the circuit shown in figure



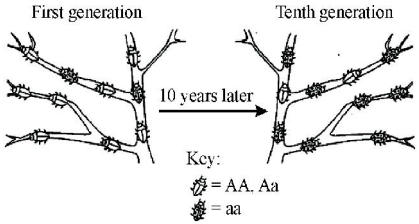
(a) 1 (b) 2
(c) 3 (d) 4

48. The diagram shows a wire moving to the right at speed *v* through a uniform magnetic field that is directed into the page.



As the speed of the wire is increased, the induced potential difference will
(a) Decrease (b) Increase
(c) Remain the same
(d) None of these

49. The diagram below illustrates the change that occurred in the frequency of phenotypes in an insect population over 10 generations.



A probable explanation for this change would be that over time there was
(a) A decrease in the adaptive value of gene *a*
(b) An increase in the adaptive value of gene *a*
(c) An increase in the population of this insect
(d) A decrease in the mutation rate of gene *A*.

50. A cat hiding in bushes near Robin's nest observed the mother Robin encouraging her off-spring to make their first flight. The first young bird flew straight from the next to a nearby tree. The next three were able to fly to the tree, although they took more time. The last young bird moved its wings too slowly and fell onto the ground, where the cat swiftly captured it. This situation illustrates part of the theory of evolution proposed by
(a) Lamarck (b) Weismann (c) Darwin (d) Miller

☺ END OF THE EXAM ☺

ANSWERS

1.	(a)	**2.**	(d)	**3.**	(b)	**4.**	(c)	**5.**	(c)
6.	(c)	**7.**	(a)	**8.**	(b,d)	**9.**	(a)	**10.**	(b)
11.	(c)	**12.**	(b)	**13.**	(a)	**14.**	(b)	**15.**	(b)
16.	(c)	**17.**	(d)	**18.**	(c)	**19.**	(a)	**20.**	(c)
21.	(d)	**22.**	(c)	**23.**	(b)	**24.**	(d)	**25.**	(a)
26.	(a)	**27.**	(b)	**28.**	(a)	**29.**	(c)	**30.**	(b)
31.	(b)	**32.**	(a)	**33.**	(b)	**34.**	(b)	**35.**	(b)
36.	(a)	**37.**	(d)	**38.**	(c)	**39.**	(c)	**40.**	(c)
41.	(c)	**42.**	(a)	**43.**	(c)	**44.**	(b)	**45.**	(b)
46.	(a)	**47.**	(c)	**48.**	(b)	**49.**	(b)	**50.**	(c)

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