Some hyperthermophilic organisms that grow in highly acidic (pH 2) habitats belong to the two groups

(a) eubacteria and archaea

(b) cyanobacteria and diatoms

(c) protists and mosses

(d) liverworts and yeasts.

A bite of tse-tse fly may pass to humans

(a) *Leishmania donovani*

(b) *Trypanosoma gambiense*

(c) *Entamoeba histolytica*

(d) *Plasmodium vivax*.

In which of the following would you place the plants having vascular tissue lacking seeds?

(a) Pteridophytes
(b) Gymnosperms
(c) Algae
(d) Bryophytes

Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them?

(a) *Pteropus* and *Ornithorhynchus* - Viviparity

(b) Garden lizard and crocodile - Three chambered heart

(c) *Ascaris* and *Ancylostoma* - Metameric segmentation

(d) Sea horse and flying fish - Cold blooded (poikilothermal)

Select the wrong statement.

(a) The walls of diatoms are easily destructible.

(b) 'Diatomaceous earth' is formed by the cell walls of diatoms.

(c) Diatoms are chief producers in the oceans.

(d) Diatoms are microscopic and float passively in water.

The pathogen *Microsporum* responsible for ringworm disease in humans belongs to the same kingdom of organisms as that of

(a) *Taenia*, a tapeworm

(b) *Wuchereria*, a filarial worm

(c) *Rhizopus*, a mould

(d) *Ascaris*, a round worm.

System of classification used by Linnaeus was

(a) natural system
(b) artificial system
(c) phylogenetic system
(d) asexual system.

In ferns, meiosis takes place at the time of

(a) spore formation

(b) spore germination

(c) gamete formation

(d) antheridia and archegonia formation.

Pheretima and its close relatives derive nourishment from

(a) sugarcane roots

(b) decaying fallen leaves and soil organic matter

(c) soil insects

(d) small pieces of fresh fallen leaves of maize, etc.

Typhlops is

(a) sea snake

(b) glass snake

(c) blind snake

(d) grass snake.

In eubacteria, a cellular component that resembles eukaryotic cell is

(a) plasma membrane (b) nucleus

(c) ribosomes (d) cell wall.

The infective stage of malarial parasite. *Plasmodium* that enters human body is

(a) merozoite
(b) sporozoite
(c) trophozoite
(d) minuta form.

Cycas has two cotyledons but not included in angiosperms because of

(a) naked ovules

(b) seems like monocot

(c) circinate ptyxis

(d) compound leaves.

The characteristics of Class Reptilia are

(a) body covered with moist skin which is devoid of scales, the ear is represented by a tympanum, alimentary canal, urinary and reproductive tracts open into a common cloaca

(b) fresh water animals with bony endoskeleton, air-bladder to regulate buoyancy

(c) marine animals with cartilaginous endoskeleton, body covered with placoid scales

(d) body covered with dry and cornified skin, scales over the body are epidermal, they do not have external ears.

Organ Pipe Coral is

(a) *Tubipora*
(b) *Astraea*
(c) *Helipora*
(d) *Fungia.*

Which one of the following microbes forms symbiotic association with plants and helps them in their nutrition?

(a) *Azotobacter* (b) *Aspergillus*

(c) *Glomus* (d) *Trichoderma*

Amoebiasis is prevented by
(a) eating balanced food
(b) eating plenty of fruits
(c) drinking boiled water
(d) using mosquito nets.

Which of the following is without exception in angiosperms?

(a) Presence of vessels

(b) Double fertilisation

(c) Secondary growth

(d) Autotrophic nutrition

Which of the following features is not present in the Phylum Arthropoda?

(a) Parapodia
(b) Jointed appendages
(c) Chitinous exoskeleton
(d) Metameric segmentation

Which is not a true amphibian animal?

(a) Salamander
(b) Toad
(c) Tortoise
(d) Frog

The cyanobacteria are also referred to as

(a) protists (b) golden algae

(c) slime moulds (d) blue green algae.

African sleeping sickness is due to

(a) *Plasmodium vivax* transmitted by tse-tse fly

(b) *Trypanosoma lewsii* transmitted by bed bug

(c) *Trypanosoma gambiense* transmitted by *Glossina palpalis*

(d) *Entamoeba gingivalis* spread by housefly.

Sexual reproduction in *Spirogyra* is an advanced feature because it shows

(a) different sizes of motile sex organs

(b) same size of motile sex organs

(c) morphologically different sex organs

(d) physiologically differentiated sex organs.

Choose the correct statement.

(a) All mammals are viviparous.

(b) All cyclostomes do not possess jaws and paired fins.

(c) All reptiles have a three-chambered heart.

(d) All pisces have gills covered by an operculum.

Bird vertebrae are

(a) acoelous
(b) heterocoelous
(c) amphicoelous
(d) procoelous.

Which one of the following is true for fungi?

(a) They lack a rigid cell wall.

(b) They are heterotrophs.

(c) They lack nuclear membrane.

(d) They are phagotrophs.

An important criterion for modern day classification is

(a) resemblances in morphology

(b) anatomical and physiological traits

(c) breeding habits

(d) presence or absence of notochord.

Which one of the following pairs of plants are not seed producers ?

(a) Fern and *Funaria*

(b) *Funaria* and *Ficus*

(c) *Ficus* and *Chlamydomonas*

(d) *Funaria* and *Pinus*

Important characteristic that hemichordates share with chordates is

(a) ventral tubular nerve cord
(b) pharynx with gill slits
(c) pharynx without gill slits
(d) absence of notochord.

Earthworms are

(a) useful

(b) harmful

(c) more useful than harmful

(d) more harmful.

Which of the following statements is wrong for viroids?

(a) They cause infections.

(b) Their RNA is of high molecular weight.

(c) They lack a protein coat.

(d) They are smaller than viruses.

. The part of life cycle of malarial parasite *Plasmodium vivax*, that is passed in female *Anopheles* is

(a) sexual cycle

(b) pre-erythrocytic schizogony

(c) exoerythrocytic schizogony

(d) post-erythrocytic schizogony.

Angiosperms have dominated the land flora primarily because of their

(a) power of adaptability in diverse habitat

(b) property of producing large number of seeds

(c) nature of self pollination

(d) domestication by man.

In *Pinus*/*Cycas*/gymnosperms, the endosperm is

(a) triploid
(b) haploid
(c) diploid
(d) tetraploid.

Wish bone of birds is from

(a) pelvic girdle

(b) skull

(c) hind limbs

(d) pectoral girdle/clavicles.

The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the

(a) methanogens
(b) eubacteria
(c) halophiles
(d) thermoacidophiles.

Difference in gram positive and gram negative bacteria is due to

(a) cell wall
(b) cell membrane
(c) ribosome
(d) cytoplasm.

Ectophloic siphonostele is found in

(a) *Osmunda* and *Equisetum*

(b) *Marsilea* and *Botrychium*

(c) *Adiantum* and *Cucurbitaceae*

(d) *Dicksonia* and *Maiden hair fern.*

Apophysis in the capsule of *Funaria* is

(a) lower part
(b) upper part
(c) middle part
(d) fertile part.

Kala-azar and Oriental Sore are spread by

(a) housefly
(b) bed bug
(c) sand fly
(d) fruit fly.

DNA replication in bacteria occurs

(a) within nucleolus

(b) prior to fission

(c) just before transcription

(d) during S phase.

Cauliflower mosaic virus contains

(a) ss RNA (b) ds RNA

(c) ds DNA (d) ss DNA.

Peat moss is used as a packing material for sending flowers and live plants to distant places because

(a) it serves as a disinfectant
(b) it is easily available
(c) it is hygroscopic
(d) it reduces transpiration.

Bryophytes are amphibians because

(a) they require a layer of water for carrying out sexual reproduction

(b) they occur in damp places

(c) they are mostly aquatic

(d) all the above.

Bladderworm/cysticercus is the larval stage of

(a) tapeworm
(b) roundworm
(c) pinworm
(d) liver fluke.

Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen?

(a) *Pseudomonas* (b) Mycoplasma

(c) *Nostoc* (d) *Bacillus*

Choose the correct sequence of stages of growth curve for bacteria.

(a) Lag, log, stationary, decline phase
(b) Lag, log, decline, stationary phase
(c) Stationary, lag, log, decline phase
(d) Decline, lag, log phase, stationary

Which one of the following is common to multicellular fungi, filamentous algae and protonema of mosses?

(a) Diplontic life cycle
(b) Members of Kingdom Plantae
(c) Mode of nutrition
(d) Multiplication by fragmentation

In *Pinus*, the pollen grain has 6 chromosomes then in its endosperm will have

(a) 12
(b) 18
(c) 6
(d) 24.

Metamorphosis of insects is regulated through hormone

(a) pheromone
(b) thyroxine
(c) ecdysone
(d) all of these.

Sequence of taxonomic categories is

(a) class–phylum–tribe–order–family–genus–species

(b) division–class–family–tribe–order–genus–species

(c) division–class–order–family–tribe–genus–species.

(d) phylum–order–class–tribe–family–genus–species.

Some bacteria are able to grow in streptomycin containing medium due to

(a) natural selection

(b) induced mutation

(c) reproductive isolation

(d) genetic drift.

Syngamy can occur outside the body of the organism in

(a) mosses
(b) algae
(c) ferns
(d) fungi.

In *Ulothrix/Spirogyra*, reduction division (meiosis) occurs at the time of

(a) gamete formation

(b) zoospore formation

(c) zygospore germination

(d) vegetative reproduction.

Which one occurs i n echinodermata?

(a) Bilateral symmetry (b) Radial symmetry

(c) Porous body (d) Soft skin

The book '*Genera Plantarum*' was written by

(a) Engler and Prantl

(b) Bentham and Hooker

(c) Bessey

(d) Hutchinson.

In five kingdom system, the main basis of classification is

(a) structure of nucleus
(b) mode of nutrition
(c) structure of cell wall
(d) asexual reproduction.

Select the wrong statement.

(a) In Oomycetes, female gamete is smaller and motile, while male gamete is larger and non-motile.

(b) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy.

(c) Isogametes are similar in structure, function and behaviour.

(d) Anisogametes differ either in structure, function or behaviour.

Pinus differs from mango in having

(a) tree habit

(b) green leaves

(c) ovules not enclosed in ovary

(d) wood.

Uricotelism is found in

(a) mammals and birds

(b) fish and fresh water protozoans

(c) birds, land reptiles and insects

(d) frogs and toads.

One of the most important functions of botanical gardens is that

(a) they provide a beautiful area for recreation

(b) one can observe tropical plants there

(c) they allow *ex situ* conservation of germ–plasm

(d) they provide the natural habitat for wild life.

Chromosomes in a bacterial cell can be 1 – 3 in number and

(a) are always circular

(b) are always linear

(c) can be either circular or linear, but never both within the same cell

(d) can be circular as well as linear within the same cell.

Which of the following is responsible for peat formation?

(a) *Marchantia* (b) *Riccia*

(c) *Funaria* (d) *Sphagnum*

A well developed archegonium with neck consisting of 4-6 rows and neck canal cells, characterises

(a) gymnosperms and flowering plants
(b) pteridophytes and gymnosperms
(c) gymnosperms only
(d) bryophytes and pteridophytes.

Which of the following unicellular organisms has a macronucleus for trophic function and one or more micronuclei for reproduction?

(a) *Euglena* (b) *Amoeba*

(c) *Paramecium* (d) *Trypanosoma*

ICBN stands for

(a) International Code of Botanical Nomenclature

(b) International Congress of Biological Names

(c) Indian Code of Botanical Nomenclature

(d) Indian Congress of Biological Names.

Phenetic classification of organisms is based on

(a) observable characteristics of existing organisms

(b) the ancestral lineage of existing organisms

(c) dendrogram based on DNA characteristics

(d) sexual characteristics.

Male gametes are flagellated in

(a) *Ectocarpus* (b) *Spirogyra*

(c) *Polysiphonia* (d) *Anabaena.*

A gymnospermic leaf carries 16 chromosomes. The number of chromosomes in its endosperm will be

(a) 12
(b) 8
(c) 16
(d) 24.

In contrast to annelids the platyhelminthes show
(a) absence of body cavity
(b) bilateral symmetry
(c) radial symmetry
(d) presence of pseudocoel.

Which one of the following aspects is an exclusive characteristic of living things?

(a) Isolated metabolic reactions occur *in vitro*

(b) Increase in mass from inside only

(c) Perception of events happening in the environment and their memory.

(d) Increase in mass by accumulation of material both on surface as well as internally.

Viruses that infect bacteria multiply and cause their lysis, are called

(a) lysozymes
(b) lipolytic
(c) lytic
(d) lysogenic.

In bryophytes and pteridophytes, transport of male gametes requires

(a) birds
(b) water
(c) wind
(d) insects.

Multicellular branched rhizoids and leafy gametophytes are the characteristics of

(a) some bryophytes (b) pteridophytes

(c) all bryophytes (d) gymnosperms.

Metameric segmentation is the characteristic of

(a) mollusca and chordata

(b) platyhelminthes and arthropoda

(c) echinodermata and annelida

(d) annelida and arthropoda.

Which one of the following organisms is scientifically correctly named, correctly printed according to the International Rules of Nomenclature and correctly described?

(a) *Musca domestica* - the common house lizard, a reptile

(b) *Plasmodium falciparum* - a protozoan pathogen causing the most serious type of malaria.

(c) *Felis tigris* - the Indian tiger, well protected in Gir forests.

(d) *E.coli* - full name *Entamoeba coli*, a commonly occurring bacterium in human intestine.

Basophilic prokaryotes

(a) grow and multiply in very deep marine sediments

(b) occur in water containing high concentrations of barium hydroxide

(c) readily grow and divide in sea water enriched in any soluble salt of barium

(d) grow slowly in highly alkaline frozen lakes at high altitudes.

Conifers are adapted to tolerate extreme environmental conditions because of

(a) broad hardy leaves
(b) superficial stomata
(c) thick cuticle
(d) presence of vessels.

Heterospory and seed habit are often exhibited by a plant possessing

(a) petiole
(b) ligule
(c) bract
(d) spathe.

Which one of the following pairs of animals comprises 'jawless fishes'?

(a) Mackerals and rohu

(b) Lampreys and hag fishes

(c) Guppies and hag fishes

(d) Lampreys and eels

The common characteristics between tomato and potato will be maximum at the level of their

(a) family (b)order

(c) division (d)genus.

Select the correct combination of the statements (i-iv) regarding the characteristics of certain organisms.

(i) Methanogens are archaebacteria which produce methane in marshy areas.

(ii) *Nostoc* is a filamentous blue-green alga which fixes atmospheric nitrogen.

(iii) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose.

(iv) Mycoplasma lack a cell wall and can survive without oxygen.

The correct statements are

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

Select the mismatch.

(a) *Cycas* — Dioecious

(b) *Salvinia* — Heterosporous

(c) *Equisetum* — Homosporous

(d) *Pinus* — Dioecious

Transfusion tissue is present in the leaves of

(a) *Pinus*
(b) *Dryopteris*
(c) *Cycas*
(d) both (a) and (c).

In which one of the following organisms its excretory organs are correctly stated?

(a) Humans – Kidneys, sebaceous glands and tear glands

(b) Earthworm – Pharyngeal, integumentary and septal nephridia

(c) Cockroach – Malpighian tubules and enteric caeca

(d) Frog – Kidneys, skin and buccal epithelium

Which one of the following is not a correct statement?

(a) A museum has collection of photographs of plants and animals.

(b) Key is a taxonomic aid for identification of specimens.

(c) Herbarium houses dried, pressed and preserved plant specimens.

(d) Botanical gardens have collection of living plants for reference.

Membrane-bound organelles are absent in

(a) *Saccharomyces* (b) *Streptococcus*

(c) *Chlamydomonas* (d) *Plasmodium*.

Lichens indicate SO_2 pollution because they
(a) show association between algae and fungi
(b) grow faster than others
(c) are sensitive to SO_2
(d) flourish in SO_2 rich environment.

Which one of the following statements about *Cycas* is incorrect?

(a) It has circinate vernation.

(b) Its xylem is mainly composed of xylem vessel.

(c) Its roots contain some blue-green algae.

(d) It does not have a well organized female flower.

Which one of the following statements about all the four of *Spongilla*, leech, dolphin and penguin is correct?

(a) Penguin is homoiothermic while the remaining three are poikilothermic.

(b) Leech is a fresh water form while all others are marine.

(c) *Spongilla* has special collared cells called choanocytes, not found in the remaining three.

(d) All are bilaterally symmetrical.

The correct set of four quantum numbers for the valence electron of rubidium atom ($Z = 37$) is

(a) 5, 1, 1, +1/2
(b) 6, 0, 0, +1/2
(c) 5, 0, 0, +1/2
(d) 5, 1, 0, +1/2

The total number of electrons that can be accommodated in all the orbitals having principal quantum number 2 and azimuthal quantum number 1 are

(a) 2 (b) 4

(c) 6 (d) 8

The electronic configuration of four elements are given below. Which elements does not belong to the same family as others?

(a) $[Xe]4f^{14}5d^{10}1s^2$ (b) $[Kr]4d^{10}5s^2$

(c) $[Ne]3s^23p^5$ (d) $[Ar]3d^{10}4s^2$

The value of Planck's constant is 6.63×10^{-34} J s. The speed of light is 3×10^{17} nm s^{-1}. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s^{-1}?

(a) 50
(b) 75
(c) 10
(d) 25

The order of filling of electrons in the orbitals of an atom will be

(a) $3d, 4s, 4p, 4d, 5s$ (b) $4s, 3d, 4p, 5s, 4d$

(c) $5s, 4p, 3d, 4d, 5s$ (d) $3d, 4p, 4s, 4d, 5s$

Which electronic configuration of an element has abnormally high difference between second and third ionization energy?

(a) $1s^2, 2s^2, 2p^6, 3s^1$

(b) $1s^2, 2s^2, 2p^6, 3s^1 3p^1$

(c) $1s^2, 2s^2, 2p^6, 3s^2 3p^2$

(d) $1s^2, 2s^2, 2p^6, 3s^2$

What is the maximum numbers of electrons that can be associated with the following set of quantum numbers?

$n = 3, l = 1$ and $m = -1$

(a) 4 (b) 2

(c) 10 (d) 6

In a given atom no two electrons can have the same values for all the four quantum numbers. This is called

(a) Hund's Rule

(b) Aufbau principle

(c) Uncertainty principle

(d) Pauli's Exclusion principle.

If the atomic number of an element is 33, it will be placed in the periodic table in the

(a) first group (b) third group

(c) fifth group (d) seventh group.

What is the maximum number of orbitals that can be identified with the following quantum numbers?

$n = 3, l = 1, m_l = 0$

(a) 1

(b) 2

(c) 3

(d) 4

Electronic configuration of calcium atom can be written as

(a) [Ne] $4p^2$ (b) [Ar] $4s^2$

(c) [Ne] $4s^2$ (d) [Kr] $4p^2$

Which of the following has the smallest size?

(a) Al^{3+} (b) F^{-}

(c) Na^{+} (d) Mg^{2+}

The number of *d*-electrons in Fe^{2+} ($Z = 26$) is not equal to the number of electrons in which one of the following?

(a) *d*-electrons in Fe ($Z = 26$)

(b) *p*-electrons in Ne ($Z = 10$)

(c) *s*-electrons in Mg ($Z = 12$)

(d) *p*-electrons in Cl ($Z = 17$)

The radius of hydrogen atom in the ground state is 0.53 Å. The radius of Li^{2+} ion (atomic number = 3) in a similar state is

(a) 0.53 Å (b) 1.06 Å

(c) 0.17 Å (d) 0.265 Å

Which of the following elements has the maximum electron affinity?

(a) I (b) Br

(c) Cl (d) F

1 cc N_2O at NTP contains

(a) $\frac{1.8}{224} \times 10^{22}$ atoms

(b) $\frac{6.02}{22400} \times 10^{23}$ molecules

(c) $\frac{1.32}{224} \times 10^{23}$ electrons

(d) All the above.

What will be the longest wavelength line in Balmer series of spectrum?

(a) 546 nm (b) 656 nm

(c) 566 nm (d) 556 nm

Ionic radii are

(a) inversely proportional to effective nuclear charge

(b) inversely proportional to square of effective nuclear charge

(c) directly proportional to effective nuclear charge

(d) directly proportional to square of effective nuclear charge.

The number of oxygen atoms in 4.4 g of CO_2 is

(a) 1.2×10^{23}

(b) 6×10^{22}

(c) 6×10^{23}

(d) 12×10^{23}

The position of both, an electron and a helium atom is known within 1.0 nm. Further the momentum of the electron is known within 5.0×10^{-26} kg m s^{-1}. The minimum uncertainty in the measurement of the momentum of the helium atom is

(a) 8.0×10^{-26} kg m s^{-1}

(b) 80 kg m s^{-1}

(c) 50 kg m s^{-1}

(d) 5.0×10^{-26} kg m s^{-1}

Which one of the following orders is not in accordance with the property stated against it?

(a) $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation energy

(b) $F_2 > Cl_2 > Br_2 > I_2$: Oxidising power

(c) $HI > HBr > HCl > HF$: Acidic property in water

(d) $F_2 > Cl_2 > Br_2 > I_2$: Electronegativity

Ratio of C_p and C_V of a gas 'X' is 1.4. The number of atoms of the gas 'X' present in 11.2 litres of it at NTP will be

(a) 6.02×10^{23}

(b) 1.2×10^{23}

(c) 3.01×10^{23}

(d) 2.01×10^{23}

Who modified Bohr's theory by introducing elliptical orbits for electron path?

(a) Rutherford (b) Thomson

(c) Hund (d) Sommerfield

Among the elements Ca, Mg, P and Cl, the order of increasing atomic radii is

(a) Mg < Ca < Cl < P

(b) Cl < P < Mg < Ca

(c) P < Cl < Ca < Mg

(d) Ca < Mg < P < Cl

The molecular weight of O_2 and SO_2 are 32 and 64 respectively. At 15°C and 150 mmHg pressure, one litre of O_2 contains 'N' molecules. The number of molecules in two litres of SO_2 under the same conditions of temperature and pressure will be

(a) N/2
(b) N
(c) 2 N
(d) 4 N

Isoelectronic species are

(a) CO, CN^-, NO^+, C_2^{2-} (b) CO^-, CN, NO, C_2^-

(c) CO^+, CN^+, NO^-, C_2 (d) CO, CN, NO, C_2

The correct order of the decreasing ionic radii among the following isoelectronic species is

(a) $Ca^{2+} > K^{+} > S^{2-} > Cl^{-}$

(b) $Cl^{-} > S^{2-} > Ca^{2+} > K^{+}$

(c) $S^{2-} > Cl^{-} > K^{+} > Ca^{2+}$

(d) $K^{+} > Ca^{2+} > Cl^{-} > S^{2-}$

The total number of valence electrons in 4.2 g of N_3^- ion is (N_A is the Avogadro's number)

(a) 2.1 N_A (b) 4.2 N_A

(c) 1.6 N_A (d) 3.2 N_A

The following quantum numbers are possible for how many orbitals : $n = 3$, $l = 2$, $m = +2$?

(a) 1 (b) 2

(c) 3 (d) 4

What is the value of electron gain enthalpy of Na^+ if IE_1 of Na = 5.1 eV?

(a) –5.1 eV (b) –10.2 eV

(c) +2.55 eV (d) +10.2 eV

Among the following which one is not paramagnetic? [Atomic numbers; Be = 4, Ne = 10, As = 33, Cl = 17]

(a) Ne^{2+} (b) Be^{+}

(c) Cl^{-} (d) As^{+}

In hydrogen atom, energy of first excited state is –3.4 eV. Then find out KE of same orbit of hydrogen atom

(a) +3.4 eV
(b) +6.8 eV
(c) –13.6 eV
(d) +13.6 eV

Number of atoms in 560 g of Fe

(atomic mass = 56 g mol^{-1}) is

(a) twice that of 70 g N (b) half tha t of 20 g H

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

Oxidation numbers of A, B, C are +2, +5 and –2 respectively. Possible formula of compound is

(a) $A_2(BC_2)_2$ (b) $A_3(BC_4)_2$

(c) $A_2(BC_3)_2$ (d) $A_3(B_2C)_2$

The orientation of an atomic orbital is governed by

(a) principal quantum number
(b) azimuthal quantum number
(c) spin quantum number
(d) magnetic quantum number.

The number of spherical nodes in $3p$ orbitals are/is

(a) one
(b) three
(c) none
(d) two

Specific volume of cylindrical virus particle is 6.02×10^{-2} cc/g whose radius and length are 7 Å and 10 Å respectively. If $N_A = 6.02 \times 10^{23}$, find molecular weight of virus.

(a) 15.4 kg/mol (b) 1.54×10^4 kg/mol

(c) 3.08×10^4 kg/mol (d) 3.08×10^3 kg/mol

The measurement of the electron position is associated with an uncertainty in momentum, which is equal to 1×10^{-18} g cm s^{-1}. The uncertainty in electron velocity is (mass of an electron is 9×10^{-28} g).

(a) 1×10^{5} cm s^{-1} (b) 1×10^{11} cm s^{-1}

(c) 1×10^{9} cm s^{-1} (d) 1×10^{6} cm s^{-1}

The spectrum of He is expected to be similar to that

(a) H
(b) Li^+
(c) Na
(d) He^+

An element, X has the following isotopic composition:

^{200}X : 90% ^{199}X : 8.0% ^{202}X : 2.0%

The weighted average atomic mass of the naturally- occurring element X is closest to

(a) 201 amu (b) 202 amu

(c) 199 amu (d) 200 amu

Which of the following is not permissible arrangement of electrons in an atom?

(a) $n = 5, l = 3, m = 0, s = +1/2$

(b) $n = 3, l = 2, m = -3, s = -1/2$

(c) $n = 3, l = 2, m = -2, s = -1/2$

(d) $n = 4, l = 0, m = 0, s = -1/2$

The maximum number of electrons in a subshell is given by the expression

(a) $4l - 2$ (b) $4l + 2$

(c) $2l + 2$ (d) $2n^2$

What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1 L of propane gas (C_3H_8) measured under the same conditions?

(a) 5 L
(b) 10 L
(c) 7 L
(d) 6 L

The energies E_1 and E_2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths *i.e.*, λ_1 and λ_2 will be

(a) $\lambda_1 = \lambda_2$

(b) $\lambda_1 = 2\lambda_2$

(c) $\lambda_1 = 4\lambda_2$

(d) $\lambda_1 = \frac{1}{2}\lambda_2$

Which of the following statements do not form a part of Bohr's model of hydrogen atom?

(a) Energy of the electrons in the orbits are quantized.

(b) The electron in the orbit nearest the nucleus has the lowest energy.

(c) Electrons revolve in different orbits around the nucleus.

(d) The position and velocity of the electrons in the orbit cannot be determined simultaneously.

A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is

(a) $\sqrt{v_u v_d}$

(b) $\frac{v_d v_u}{v_d + v_u}$

(c) $\frac{v_u + v_d}{2}$

(d) $\frac{2 v_d v_u}{v_d + v_u}$.

Three blocks A, B and C, of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is

(a) 8 N
(b) 18 N
(c) 2 N
(d) 6 N

A smooth block is released at rest on a 45° incline and then slides a distance d. The time taken to slide is n times as much to slide on rough incline than on a smooth incline. The coefficient of friction is

(a) $\mu_k = 1 - \frac{1}{n^2}$

(b) $\mu_k = \sqrt{1 - \frac{1}{n^2}}$

(c) $\mu_s = 1 - \frac{1}{n^2}$

(d) $\mu_s = \sqrt{1 - \frac{1}{n^2}}$

A particle moves in a straight line with a constant acceleration. It changes its velocity from 10 ms^{-1} to 20 ms^{-1} while passing through a distance 135 m in t second. The value of t is

(a) 12 (b) 9

(c) 10 (d) 1.8

Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and the lighter one in radius r. The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is

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

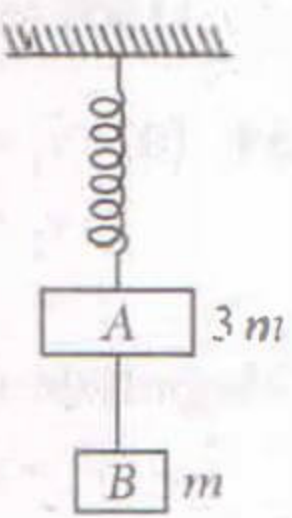
Consider a car moving on a straight road with a speed of 100 ms^{-1}. The distance at which car can be stopped, is [$\mu_k = 0.5$]

(a) 800 m
(b) 1000 m
(c) 100 m
(d) 400 m

A ball is dropped from a high rise platform at $t = 0$ starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18$ s. What is the value of v?
(Take $g = 10\ m/s^2$)

(a) 75 m/s
(b) 55 m/s
(c) 40 m/s
(d) 60 m/s

Two blocks A and B of masses $3m$ and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively



(a) $\frac{g}{3}, g$ (b) g, g (c) $\frac{g}{3}, \frac{g}{3}$ (d) $g, \frac{g}{3}$

A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s. If the catching process is completed in 0.1 s, the force of the blow exerted by the ball on the hand of the player is equal to

(a) 150 N
(b) 3 N
(c) 30 N
(d) 300 N

A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is

(a) $\frac{v_1 + v_2}{2}$

(b) $\frac{v_1 v_2}{v_1 + v_2}$

(c) $\frac{2v_1 v_2}{v_1 + v_2}$

(d) $\frac{v_1^2 v_2^2}{v_1^2 + v_2^2}$

If a unit vector is represented by $0.5\hat{i} - 0.8\hat{j} + c\hat{k}$ then the value of c is

(a) $\sqrt{0.01}$ (b) $\sqrt{0.11}$

(c) 1 (d) $\sqrt{0.39}$

A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m while applying the force and the ball goes upto 2 m height further, find the magnitude of the force.

Consider $g = 10\ \text{m/s}^2$.

(a) 4 N (b) 16 N (c) 20 N (d) 22 N

A boy standing at the top of a tower of 20 m height drops a stone. Assuming $g = 10\ m\ s^{-2}$, the velocity with which it hits the ground is

(a) 10.0 m/s (b) 20.0 m/s

(c) 40.0 m/s (d)5.0 m/s

A man is slipping on a frictionless inclined plane and a bag falls down from the same height. Then the velocity of both is related as

(a) $v_B > v_m$

(b) $v_B < v_m$

(c) $v_B = v_m$

(d) v_B and v_m can't be related.

A monkey is decending from the branch of a tree with constant acceleration. If the breaking strength is 75% of the weight of the monkey, the minimum acceleration with which monkey can slide down without branch is

(a) g

(b) $\frac{3g}{4}$

(c) $\frac{g}{4}$

(d) $\frac{g}{2}$

The displacement 'x' (in meter) of a particle of mass 'm' (in kg) moving in one dimension under the action of a force, is related to time 't' (in sec) by $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero, will be

(a) 4 m
(b) 0 m (zero)
(c) 6 m
(d) 2 m

Two particles having mass M and m are moving in a circular path having radius R and r. If their time period are same then the ratio of angular velocity will be

(a) $\frac{r}{R}$

(b) $\frac{R}{r}$

(c) 1

(d) $\sqrt{\frac{R}{r}}$.

A force vector applied on a mass is represented as $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and accelerates with 1 m/s².

What will be the mass of the body?

(a) 10 kg

(b) 20 kg

(c) $10\sqrt{2}$ kg

(d) $2\sqrt{10}$ kg.

Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = (at + bt^2)$ and $x_Q(t) = (ft - t^2)$. At what time do the cars have the same velocity?

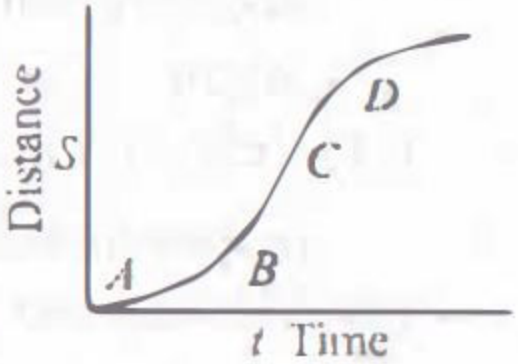
(a) $\frac{a-f}{1+b}$

(b) $\frac{a+f}{2(b-1)}$

(c) $\frac{a+f}{2(1+b)}$

(d) $\frac{f-a}{2(1+b)}$

A particle shows distance - time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point



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

A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m s^{-1}. To give an initial upward acceleration of 20 m s^{-2}, the amount of gas ejected per second to supply the needed thrust will be (g = 10 m s^{-2})

(a) 185.5 kg s^{-1} (b) 187.5 kg s^{-1}

(c) 127.5 kg s^{-1} (d) 137.5 kg s^{-1}

Which of the following has the dimensions pressure?

(a) $[MLT^{-2}]$ (b) $[ML^{-1}T^{-2}]$

(c) $[ML^{-2}T^{-2}]$ (d) $[M^{-1}L^{-1}]$.

The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is

(a) 60° (b) 15° (c) 30° (d) 45°

A bullet is fired from a gun. The force on the bullet is given by

$$F = 600 - 2 \times 10^5 t$$

where, F is in newton and t in seconds. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

(a) 9 N-s
(b) zero
(c) 1.8 N-s
(d) 0.9 N-s

Percentage errors in the measurement of mass and speed are 2% and 3% respectively. The error in the estimate of kinetic energy obtained by measuring mass and speed will be

(a) 8% (b) 2% (c) 12% (d) 10%.

A particle has initial velocity $(3\hat{i}+4\hat{j})$ and has acceleration $(0.4\hat{i}+0.3\hat{j})$. Its speed after 10 s is

(a) 7 units

(b) $7\sqrt{2}$ units

(c) 8.5 units

(d) 10 units

A cricketer catches a ball of mass 150 gm in 0.1 sec moving with speed 20 m/s, then he experiences force of

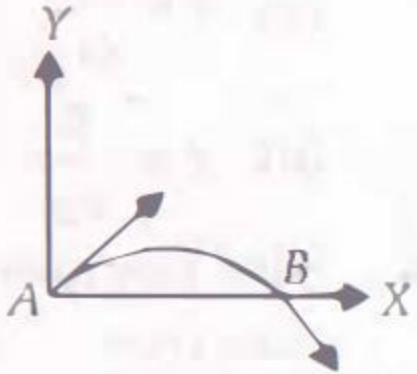
(a) 300 N (b) 30 N

(c) 3 N (d) 0.3 N.

Which of the following dimensions will be the same as that of time?

(a) $\frac{L}{R}$ (b) $\frac{C}{L}$ (c) LC (d) $\frac{R}{L}$.

The velocity of a projectile at the initial point A is $(2\hat{i}+3\hat{j})$ m/s. It's velocity (in m/s) at point B is



(a) $2\hat{i}-3\hat{j}$

(b) $2\hat{i}+3\hat{j}$

(c) $-2\hat{i}-3\hat{j}$

(d) $-2\hat{i}+3\hat{j}$

A block of mass 10 kg placed on rough horizontal surface having coefficient of friction m = 0.5, if a horizontal force of 100 N acting on it then acceleration of the block will be

(a) 10 m/s²
(b) 5 m/s²
(c) 15 m/s²
(d) 0.5 m/s².

The unit of permittivity of free space, ε_0, is

(a) coulomb/newton-metre

(b) newton-metre^2/coulomb^2

(c) coulomb^2/newton-metre^2

(d) coulomb^2/(newton-metre)^2

What will be the ratio of the distance moved by a freely falling body from rest in 4^{th} and 5^{th} seconds of journey ?

(a) 4 : 5 (b) 7 : 9

(c) 16 : 25 (d) 1 : 1.

A man weighs 80 kg. He stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of 5 m/s^2. What would be the reading on the scale ? (g = 10 m/s^2)

(a) zero
(b) 400 N
(c) 800 N
(d) 1200 N

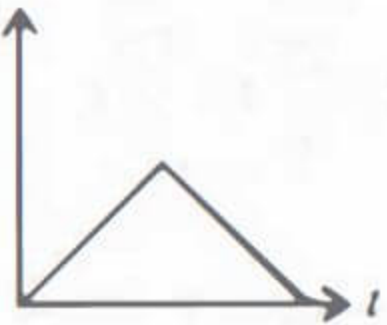
Dimensions of resistance in an electrical circuit, in terms of dimension of mass M, of length L, of time T and of current I, would be

(a) $[ML^2T^{-2}]$ (b) $[ML^2T^{-1}I^{-1}]$

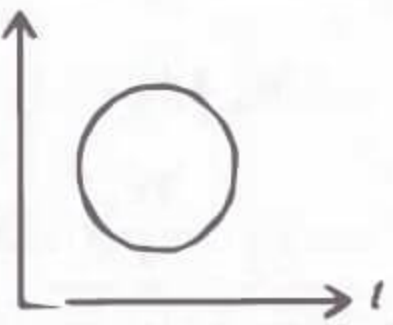
(c) $[ML^2T^{-3}I^{-2}]$ (d) $[ML^2T^{-3}I^{-1}]$.

Which of the following curve does not represent motion in one dimension ?

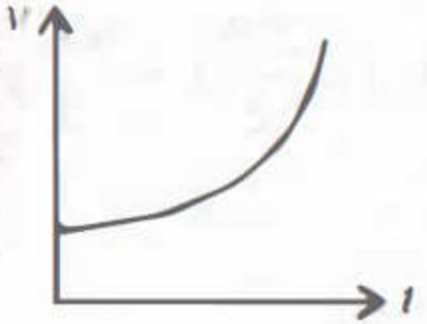
(a)



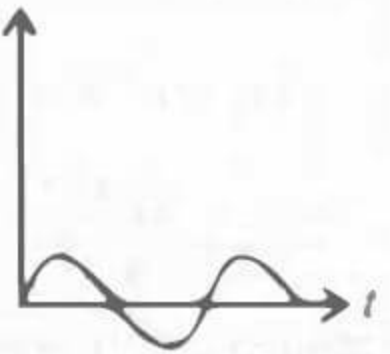
(b)



(c)



(d)



A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block will be (g is acceleration due to gravity)

(a) $mg \cos \theta$ (b) $mg \sin \theta$

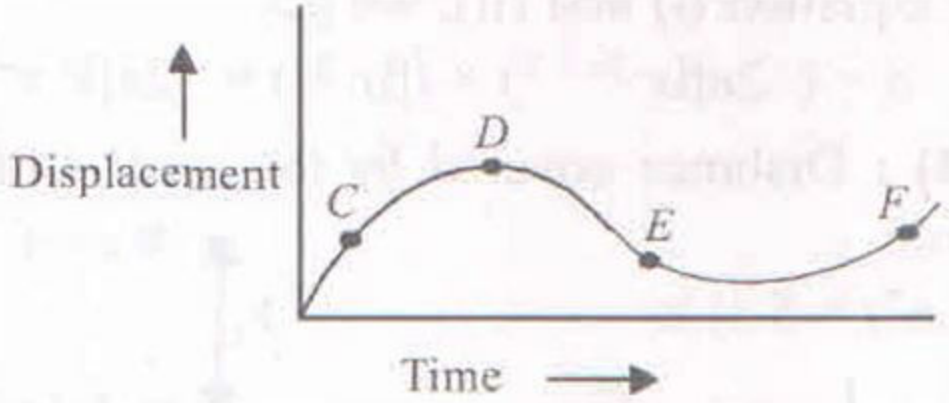
(c) mg (d) $mg/\cos \theta$

A student measures the distance traversed in free fall of a body, initially at rest, in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is

(a) $e_2 - e_1$ (b) $e_1 + 2e_2$

(c) $e_1 + e_2$ (d) $e_1 - 2e$

The displacement-time graph of a moving particle is shown below. The instantaneous velocity of the particle is negative at the point



(a) E (b) F (c) C (d) D

The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by

(a) $\mu = 2\tan\theta$ (b) $\mu = \tan\theta$

(c) $\mu = \frac{1}{\tan\theta}$ (d) $\mu = \frac{2}{\tan\theta}$

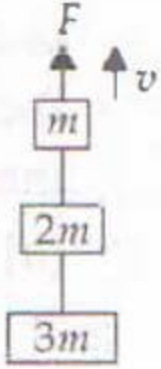
The density of a material in CGS system of units is 4 g cm $^{-3}$. In a system of units in which unit of length is 10 cm and unit of mass is 100 g, the value of density of material will be

(a) 0.04 (b) 0.4 (c) 40 (d) 400

A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metres) of the particle from O is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest?

(a) 16 m
(b) 24 m
(c) 40 m
(d) 56 m.

Three blocks with masses m, $2m$ and $3m$ are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass $2m$? (g is the acceleration due to gravity)



(a) $3mg$

(b) $6mg$

(c) zero

(d) $2mg$

The dimensions of $(\mu_0\varepsilon_0)^{-1/2}$ are

(a) $[L^{1/2}T^{-1/2}]$ (b) $[L^{-1}T]$

(c) $[LT^{-1}]$ (d) $[L^{1/2}T^{1/2}]$

A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 seconds for every circular lap. The average velocity and average speed for each circular lap respectively is

(a) 10 m/s, 0 (b) 0, 0

(c) 0, 10 m/s (d) 10 m/s, 10 m/s.

A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is (Assume $m_1 = m_2 = m_3 = m$)

(a) $\frac{g(1-g\mu)}{9}$

(b) $\frac{2g\mu}{3}$

(c) $\frac{g(1-2\mu)}{3}$

(d) $\frac{g(1-2\mu)}{2}$