Physics

1. The earth absorbs 10^{22} J of energy from the sun every day. The percentage increase in the mass of earth every day will be
(mass of earth $= 6 \times 10^{24}$ kg)
(a) $1.82 \times 10^{-10}\%$ (b) $1.85 \times 10^{-15}\%$
(c) $1.85 \times 10^{-17}\%$ (d) $1.85 \times 10^{-18}\%$

2. A crystal has bcc structure and its lattice constant is 3.6 Å. What is the atomic radius?
(a) 3.6 Å (b) 1.8 Å
(c) 1.27 Å (d) 1.56 Å

3. A *p*-type semiconductor has acceptor levels 57 MeV above the valence band. The maximum wavelength of light required to create a hole is
(a) 57 Å (b) 57×10^{-3} Å
(c) 217100 Å (d) 11.61×10^{-33} Å
(Planck's constant $h = 6.6 \times 10^{-34}$ Js)

4. For a transistor, the current amplication factor is 0.8, the transistor is connected in common-emitter configuration. The change in the collector current when the base current changes by 6 mA is
(a) 6 mA (b) 4.8 mA
(c) 24 mA (d) 8 mA

5. A microscope has an objective of focal length 1.5 cm and an eye-piece of focal length 2.5 cm. If the distance between objective and eye-piece is 20.5 cm, what is the magnification produced when the final image is at infinite distance away?
(a) 120 (b) 115
(c) 110 (d) 105

6. The kinetic energy of a projectile at the highest point is half of its initial kinetic energy. The angle of projection is
(a) 30° (b) 45°
(c) 60° (d) None of these

7. An electric current is flowing in a long straight wire. The magnetic field due to this current at a distance of 5 cm from the wire is 10 G. The magnetic field at a distance of 10 cm from the wire is
(a) 2.5 G (b) 5 G
(c) 20 G (d) 40 G

8. A 100μF capacitor is to have an energy content of 50 J in order to operate a flash lamp. The voltage required to charge the capacitor is
(a) 500 V (b) 1000 V
(c) 1500 V (d) 2000 V

9. A body falls from rest. In the last second of its fall it covers half of the total distance. If g is 9.8 m/s^2, then the total time of its fall is (in second)
(a) 2 (b) $2+\sqrt{2}$
(c) $2-\sqrt{2}$ (d) $2 \pm \sqrt{2}$

10. At a place, horizontal component of earth's magnetic field is $\sqrt{3}$ times the vertical component. The angle of dip at that place is
(a) 75° (b) 60°
(c) 45° (d) 30°

11. A convex lens forms a real image 4 cm long on a screen. When the lens is shifted to a new position without disturbing the object or

the screen, again real image is formed on the screen which is 16 cm long. The length of object is

(a) 8 cm (b) 10 cm
(c) 12 cm (d) 6 cm

12. A zener diode when used as a voltage regulator is

(a) connected in series with load
(b) unbiased
(c) in forward biased
(d) in reverse biased

13. An electron revolving in an orbit of radius 0.5 Å in a hydrogen atom executes 10^{16} rev / s. The magnetic moment of electron due to its orbital motion will be

(a) 1256×10^{-26} A-m^2
(b) 6.53×10^{-26} A-m^2
(c) zero
(d) 256×10^{-26} A-m^2

14. A solid cylinder rolls on an inclined plane. It slides down an another frictionless inclined plane of same length and inclination. The ratio of the accelerations in the two cases is

(a) 1 : 1 (b) 2 : 3
(c) 3 : 4 (d) 1 : $\sqrt{2}$

15. The time period of an earth satellite close to the surface of the earth is 83 min. The time period of another earth satellite in an orbit at a distance of three earth radii from its surface will be

(a) 83 min (b) $83\sqrt{8}$ min
(c) 664 min (d) 249 min

16. A plane mirror reflects a beam of light to form a real image. The incident beam is

(a) parallel (b) convergent
(c) divergent (d) None of these

17. The temperature at which the mean KE of the molecules of gas is one-third of the mean KE of its molecules at 180°C is

(a) −122°C (b) −90°C
(c) 60°C (d) 151°C

18. A cube having each side 80 cm is fixed at the bottom and tangential force is applied to its top. The layer of cube at a distance of 60 cm from the bottom is displaced by 0.6 mm parallel to the force. The shear strain is

(a) 0.0075 rad (b) 0.01 rad
(c) 0.001 rad (d) 0.00075 rad

19. In a potentiometer experiment for measuring the emf of a cell, the null point is at 480 cm when we have a 400 Ω resistor in series with the cell and galvanometer. If the series resistances is reduced to half, the null point will be at

(a) 120 cm (b) 240 cm
(c) 480 cm (d) 600 cm

20. The unit of Stefan's constant is

(a) W/m^{2}K^4 (b) W/m^{2}K
(c) W/m^{2}K^2 (d) None of these

21. The molecular weight of oxygen and hydrogen are 32 and 2 respectively. The rms velocities of hydrogen and oxygen will be in the ratio

(a) 16 : 1 (b) 1 : 4
(c) 2 : 3 (d) 4 : 1

22. Potential energy in a spring when stretched by 2 cm, is U. Its potential energy, when stretched by 10 cm is

(a) $\frac{U}{25}$ (b) $\frac{U}{5}$
(c) $25U$ (d) $5U$

23. An aeroplane moves 400 m towards north, 300 m towards west and then 1200 m vertically upwards. Then, its displacement from the initial position is

(a) 1300 m (b) 1400 m
(c) 1500 m (d) 1600 m

24. A body of mass 2 kg, moving on a horizontal surface with an initial velocity of 4 m/s comes to rest after 2s. If one wants to keep this body moving on same surface with a velocity of 4 m/s, the force required is

(a) 2 N (b) 4 N
(c) 6 N (d) 10 N

25. Penetrating power of X-rays can be increased by

(a) increasing the potential difference between anode and cathode
(b) decreasing the potential difference between anode and cathode
(c) increasing the cathode filament current
(d) decreasing the cathode filament current

Chemistry

1. In coagulating the colloidal solution of As_2S_3 which has the maximum coagulating value?
   (a) NaCl (b) KCl
   (c) $BaCl_2$ (d) $AlCl_3$

2. In the equation

$$4M + 8CN^- + 2H_2O + O_2 \longrightarrow 4[M(CN)_2]^- + 4OH^-$$

   Identify the metal M
   (a) Copper (b) Iron
   (c) Silver (d) Zinc

3. The formula of azurite is
   (a) $CuCO_3 \cdot Cu(OH)_2$ (b) $2CuCO_3 \cdot Cu(OH)_2$
   (c) $CuCO_3 \cdot 2Cu(OH)_2$ (d) $CuSO_4 \cdot Cu(OH)_2$

4. The fresh precipitate can be transformed in colloidal state by
   (a) peptisation (b) coagulation
   (c) diffusion (d) None of these

5. The correct name of the compound $[Cu(NH_3)_4](NO_3)_2$, according to IUPAC system is
   (a) cuprammonium nitrate
   (b) tetrammine copper (II) dinitrate
   (c) tetrammine copper (II) nitrate
   (d) tetrammine copper (II) dinitrite

6. Excess of PCl_5 reacts with conc H_2SO_4 giving
   (a) chlorosulphonic acid
   (b) thionyl chloride
   (c) sulphuryl chloride
   (d) sulphurous acid

7. How many optically active stereomers are possible for butan-2,3-diol?
   (a) 1 (b) 2
   (c) 3 (d) 4

8. For a chemical reaction $A \rightarrow B$, the rate of the reaction is 2×10^{-3} mol $dm^{-3}s^{-1}$, when the initial concentration is 0.05 mol dm^{-3}. The rate of the same reaction is 1.6×10^{-2} mol $dm^{-3}s^{-1}$ when the initial concentration is 0.1 mol dm^{-3}. The order of the reaction is
   (a) 2 (b) 0
   (c) 3 (d) 1

9. The standard electrode potential for the half-cell reactions are

$$Zn^{2+} + 2e^- \longrightarrow Zn; \quad E^\circ = -0.76\,V$$

$$Fe^{2+} + 2e^- \longrightarrow Fe; \quad E^\circ = -0.44\,V$$

   The emf of the cell reaction,

$$Fe^{2+} + Zn \longrightarrow Zn^{2+} + Fe \text{ is}$$

   (a) $-0.32\,V$ (b) $-1.20\,V$
   (c) $+1.20\,V$ (d) $+0.32\,V$

10. A 6% solution of urea is isotonic with
    (a) 1 M solution of glucose
    (b) 0.05 M solution of glucose
    (c) 6% solution of glucose
    (d) 25% solution of glucose

11. $CH_3COOH \xrightarrow{LiAlH_4} X \xrightarrow[300°C]{Cu} Y \xrightarrow[NaOH]{Dilute} Z$

    In the above reaction Z is
    (a) butanol (b) aldol
    (c) ketol (d) acetal

12. The reaction involved in the oil of winter green test is

$$\text{salicylic acid} \xrightarrow[\text{Conc. } H_2SO_4]{\Delta} \text{product.}$$

    The product is treated with Na_2CO_3 solution. The missing reagent in the above reaction is
    (a) phenol (b) NaOH
    (c) ethanol (d) methanol

13. The one which has least iodine value is
    (a) sunflower oil (b) ginger oil
    (c) ghee (d) groundnut oil

14. An organic compound on heating with CuO produces CO_2 but no water. The organic compound may be
    (a) carbon tetrachloride
    (b) chloroform
    (c) methane
    (d) ethyl iodide

15. The condensation polymer among the following is
    (a) rubber (b) protein
    (c) PVC (d) polyethene

16. The function of $Fe(OH)_3$ in the contact process is to
(a) remove arsenic impurity
(b) detect colloidal impurity
(c) remove moisture
(d) remove dust particles

17. In the calcium fluoride structure the coordination number of the cation and anions are respectively
(a) 6, 6 (b) 8, 4
(c) 4, 4 (d) 4, 8

18. Which of the following is most volatile?
(a) HF (b) HCl
(c) HBr (d) HI

19. CrO_3 dissolves in aqueous NaOH to give
(a) CrO_4^{2-}
(b) $Cr(OH)_3^-$
(c) $Cr_2O_7^{2-}$
(d) $Cr(OH)_2$

20. Aniline on oxidation with $Na_2Cr_2O_7$ and H_2SO_4 gives
(a) benzoic acid
(b) *m*-amino benzoic acid
(c) Schiff's base
(d) *p*-benzoquinone

21. Which of the following is a double base propellant?
(a) Methyl nitrate and nitromethane
(b) Nitroglycerine and nitrocellulose
(c) Kerosine and alcohol
(d) Acrylic rubber and liquid N_2O_4

22. The standard reduction electrode potentials of the three electrodes *P*, *Q* and *R* are respectively –1.76 V, 0.34 V and 0.8 V, then
(a) metal *Q* will displace the cation of *P* from its aqueous solution and deposit the metal *P*
(b) both metals *Q* and *R* will displace the cation of *P* from its aqueous solution and deposit the metal *P*
(c) metal *R* will displace the cation of *P* from its aqueous solution and deposit the metal *P*
(d) metal *P* will displace the cation of *R* from its aqueous solution and deposit the metal *R*

23. The diffraction of a crystal of barium with X-rays of wavelength 2.29 Å gave a first order reflection at 27°8′. What is the distance between the diffracting planes?
[sin 27°8′ = 0.4561]
(a) 1.46 Å
(b) 1.59 Å
(c) 2.51 Å
(d) 5.46 Å

24. A compound '*A*' having the molecular formula $C_5H_{12}O$, on oxidation gives a compound '*B*' with molecular formula $C_5H_{10}O$. Compound '*B*' give a 2, 4-dinitrophenylhydrazine derivative but did not answer haloform test or silver mirror test. The structure of compound '*A*' is
(a) $CH_3—CH_2—CH_2—CH_2—CH_2—OH$
(b) $CH_3—CH_2—CH_2\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3$
(c) $CH_3—CH_2—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_2—CH_3$
(d) $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—OH$

25. The vapour pressure of pure water at 26°C is 25.21 torr. What is the vapour pressure of a solution which contains 20.0 *g* glucose, $C_6H_{12}O_6$ in 70 *g* water ?
(a) 2.79 torr
(b) 15.7 torr
(c) 24.5 torr
(d) 32.0 torr

Biology

1. Retroviruses have
   (a) only RNA as genetic material
   (b) only DNA as genetic material
   (c) DNA and RNA as genetic material
   (d) genes on nucleoprotein complexes as genetic material

2. Diphtheria toxin was discovered by
   (a) Paul Ehrlich (b) Roux and Yersin
   (c) Kleb and Loeffier (d) Von-Behring

3. 'Signet ring' stage of *Plasmodium* is found in
   (a) RBC of man (b) RBC of *Anopheles*
   (c) liver of man (d) salivary gland

4. Which of the following is heterothallic fungi?
   (a) *Albugo* (b) *Rhizopus*
   (c) *Claviceps* (d) Yeast

5. In moss capsule, dispersal of spores takes place through
   (a) peristomial teeth (b) annulus
   (c) calyptra (d) operculum

6. Leaf gap in the vascular cylinder in ferns is
   (a) air spaces
   (b) parenchymatous zone
   (c) collenchymatous zone
   (d) area exclusive of phloem

7. The gymnosperm plant nearest to angiosperm is
   (a) *Pinus* (b) *Taxus*
   (c) *Cycas* (d) *Gnetum*

8. The thin layer of epidermis having scattered nuclei and no partition walls below the cuticle of *Ascaris* is known as
   (a) multinucleated epidermis
   (b) aseptate
   (c) coenocytic epidermis
   (d) syncytial epidermis

9. Torsion and detorsion are exceptional to
   (a) Mollusca (b) Echinodermata
   (c) Annelida (d) All of these

10. Ruminants belong to order
    (a) Cetacea (b) Artiodactyla
    (c) Perrisodactyla (d) Rodentia

11. Generally the smaller the cell
    (a) the larger the nuclei
    (b) the smaller the nuclei
    (c) it will be more metabolically active
    (d) it will be less metabolically active

12. Emeiocytosis is another term for
    (a) pinocytosis
    (b) phagocytosis
    (c) reverse endocytosis
    (d) All of the above

13. Most of the hydrolytic enzymes of lysosomes function at
    (a) acidic pH (b) basic pH
    (c) neutral pH (d) any pH

14. Histones associated with the genetic material apart from maintaining its configuration also act as
    (a) modulaters (b) apozymes
    (c) isozymes (d) activators

15. A fruit in which a part, other than that of usual fruit is also edible, is
    (a) nut
    (b) sorosis and syconus
    (c) samara
    (d) drupe

16. Stenson's duct is associated with
    (a) parotid gland (b) sublingual gland
    (c) cardiac gland (d) thyroid gland

17. Which one of the following process shows light deacidification and light acidification?
    (a) CAM cycle (b) C_3 cycle
    (c) C_4 cycle (d) All of these

18. Erythrocytes of adult rabbit and other mammals are formed in
    (a) kidney (b) liver
    (c) spleen (d) bone marrow

19. Trimethylamine is excreted by
    (a) marine teleosts (b) Mollusca
    (c) fresh water fish (d) amphibians

20. Tube feet is the locomotory organ of
    (a) star fish (b) jelly fish
    (c) cray fish (d) silver fish

21. In *Pinus*, the approximate time for the fertilization after pollination is
    (a) only a few hours
    (b) only a few days
    (c) only a few weeks
    (d) about one year

22. In most mammals, the testes are located in scrotal sac for
(a) sex differentiation
(b) spermatogenesis
(c) more space to visceral organs
(d) independent functioning of kidney

23. Cleidoic eggs are found in
(a) fishes (b) amphibians
(c) few reptiles (d) None of these

24. On the basis of utility, Nagpuri buffaloes are categorized as
(a) milkers (b) dual purpose
(c) drought cattle (d) grazers

25. Vascular grafts are made up of
(a) rubber tubes
(b) dacron or teflon
(c) fibre glass
(d) plastic

English

1. Which Indian ruler is known as 'Napoleon of India?
(a) Chandragupta Maurya
(b) Skandagupta
(c) Ashoka
(d) Samudragupta

2. Where was the capital of Shivaji?
(a) Sinhgarh (b) Poona
(c) Sindhudurg (d) Raigarh

3. At present how many states have bicameral legislatures?
(a) 6 (b) 12
(c) 8 (d) 10

4. Which of the following events prompted Ravindra Nath Tagore to return his 'Knighthood'?
(a) Jalianwala Bagh Massacre
(b) Press Act of 1910
(c) Partition of Bengal
(d) Rowlett Act

5. President can neither return nor withhold his assent to a
(a) Railway Budget
(b) Money Bill
(c) Law Bill
(d) Financial Account Committee Bill

6. Ozone layer is formed in
(a) stratosphere (b) troposphere
(c) mesosphere (d) ionosphere

7. Golden Handshake Scheme is associated with
(a) voluntary retirement
(b) inviting foreign companies
(c) establishing joint enterprises
(d) None of the above

8. Under the NREGA number of days per year for which employment is guaranteed is
(a) 90 (b) 100
(c) 150 (d) 160

9. Which of the following is/are called the king makers in India?
(a) Ahmad Shah Abdali
(b) Safdar Jung
(c) Nizam of Hyderabad
(d) Syed Brothers

10. In which temple can we find the famous Trimurti of Brahma, Vishnu and Shiva?
(a) Kanheri
(b) Ajanta
(c) Sopara
(d) Elephanta

11. What is the Quorum to constitute meeting of either of the Houses of Parliament?
(a) $\frac{1}{5}$th of the total number of members of that House
(b) $\frac{1}{4}$th of the total number of members of that House
(c) $\frac{1}{10}$th of the total number of members of that House
(d) one-half of the total number of members of that House

12. AADHAAR is a unique identification number which the unique Identification Authority of India (UIDAI) will issue for all residents in India. How many digits does this number consist of?
(a) 8 (b) 10
(c) 12 (d) 14

13. Former FIFA presidential canditate Mohammed Bin Hammam has been banned from football for life after being found guilty of
(a) match fixing
(b) attempted bribery for election
(c) dopin scandal
(d) None of the above

14. What is the National Floor Level Minimum Wage in India at present?
(a) ₹ 100 (b) ₹ 110
(c) ₹ 115 (d) ₹ 120

15. Which of the following steel companies will become the country's largest steel maker with the commissioning of 3.2 million tons blast furnace at its Vijayanagar plant in Karnataka?
(a) SAIL (b) Tata Steel
(c) Essar Steel (d) JSW Steel

16. Which among the following companies has received the prestigious Golden Peacock Environment Management Award for the year 2011?
(a) BHEL (b) ONGC
(c) NTPC (d) SAIL

17. A lighted candle gets extinguished when covered with a tumbler because of
(a) adequate supply of air
(b) inadequate supply of air
(c) presence of non-luminous matter
(d) None of the above

18. Which acid is produced when milk gets sour?
(a) Acetic acid (b) Tartaric acid
(c) Lactic acid (d) Butyric acid

19. Which one of the following fertilizers has more nitrogen content?
(a) Urea
(b) Ammonium nitrate
(c) Potassium nitrate
(d) Ammonium phosphate

20. Given below are names of four oceans
I. Atlantic II. Arctic
III. Indian IV. Pacific
(a) II, III, I, IV
(b) III, IV, I, II
(c) I, II, III, IV
(d) IV, I, III, II