1. Which of the following biological conversions taking place in the cell yields the highest amount of energy in the form of ATP?
   (A) Glucose → pyruvic acid
   (B) Glucose → $CO_2 + H_2O$
   (C) Glucose → lactic acid
   (D) Glucose → ethyl alcohol

2. Which of the following is found only in the prokaryotic cells?
   (A) Cytoplasm containing membrane bound organelles
   (B) Intracellular matrix of proteins called cytoskeleton
   (C) Cell membranes made up of phospholipids and proteins
   (D) Ability to fix atmospheric nitrogen

3. Three test tubes were prepared as given below;
   I.   Glucose solution
   II.  Sucrose solution + dilute HCl
   III. Starch solution + Amylase
   After one hour, Benedict's solution was added to all three test tubes and heated gently in a water bath. A red precipitate was observed in,

   (A) I only.
   (B) II and III only.
   (C) II only.
   (D) I, II, and III.

4. Which of the following cannot be considered as a symbiotic association?
   (A) Association of fungi with roots of higher plants.
   (B) A mango tree and the *Cuscuta* plant growing on it.
   (C) A leguminous plant and nitrogen fixing bacteria found in its root nodule.
   (D) Lichens and the bark of the tree they are growing on.

5. Which of the following statements about photosynthesis is incorrect?
   (A) Photosynthesis can be considered as an energy releasing process.
   (B) Red and blue light are the most effective in photosynthesis.
   (C) Chlorophyll is not the only pigment participating in photosynthesis.
   (D) The oxygen released during photosynthesis originates from water.

6. Clotting of blood at injury is delayed due to the deficiency of
   (A) Vitamin A     (B) Vitamin B     (C) Vitamin C     (D) Vitamin K

7. Which one of the following statements is correct regarding the regulation of body temperature in man?
   (A) Decrease in body temperature produces more sweat.
   (B) Rise in body temperature inhibits the secretion of hormones that increase the metabolic rate.
   (C) Rise in environmental temperature contracts the hair erector muscles in the skin
   (D) Lowering of the environmental temperature dilates the superficial blood vessels in the skin.

8. Which of the following phenomenon is not likely to cause an increase in phenotypic variation among the progeny of a genetic cross?
   (A) Independent segregation
   (B) Linkage
   (C) Crossing Over
   (D) Incomplete dominance

9.  In Pea plants red flower (R) is dominant to white flower (r) and green seed (G) is dominant to yellow seed (g). In order to determine the genotype of a plant which had red flowers and green seeds it was crossed with a plant which had white flowers and yellow seeds. The progeny obtained was of two types, red flowers with green seeds and white flowers with green seeds. The genotype of the tested plant is likely to be
    (A) RRGG        (B) RrGG        (C) RrGg        (D) RRGg

10. Which of the following is incorrect regarding microorganisms and diseases?
    (A) Microorganisms are found also in the intestine of healthy humans.
    (B) Extracellular enzymes produced by some microorganisms are responsible for disease production.
    (C) Endotoxins produced by bacteria are heat labile.
    (D) Human skin prevents the establishment of some pathogenic microorganisms.

11. Which of the following statement is incorrect regarding ATP?
    (A) ATP is a nucleotide.
    (B) ATP is produced during photosynthesis.
    (C) In aerobic respiration most ATP per molecule of glucose is produced during Kreb's cycle.
    (D) ATP is used in muscle contraction.

12. Which of the following could be considered as a passive process?
    (A) Movement of mineral ions from soil solution into vacuoles of root hair cells.
    (B) Movement of sucrose from mesophyll cells into sieve tubes.
    (C) Movement of sucrose from one sieve tube element to the next sieve tube element.
    (D) Movement of $Na^+$ ions from the glomerular filtrate through the wall of proximal convoluted tubule.

13. Which of the following statement is correct regarding the human liver?
    (A) It is the largest organ of the body.
    (B) It lies mainly in the upper left region of the abdomen.
    (C) It synthesizes hemoglobin.
    (D) It plays a role in the digestion of food.

14. Which of the following statement is incorrect regarding animal skeletons?
    (A) Skeletons assist in locomotion.
    (B) Annelids have a hydrostatic skeleton.
    (C) Exoskeletons limit the growth of animals.
    (D) Endoskeletons are confined to vertebrates.

15. Which of the following statements is incorrect regarding viruses?
    (A) Most plant viruses contain DNA.
    (B) Animal viruses contain either DNA or RNA.
    (C) Viruses are used in DNA recombinant technology.
    (D) All viruses are obligate parasites.

16. Atoms or ions with equal number of electrons are isoelectronic .What atom or ion given below is not isoelectronic with others?
    (A) $N^{3-}$        (B) $Na^+$        (C) Neon        (D) Oxygen

17. What is the **incorrect** statement about concentrated hydrochloric acid (HCl) you find in the lab?
    - (A) It has a higher desity than water
    - (B) It contains only pure hydrochloric acid.
    - (C) It forms white fumes when contacted with ammonia gas
    - (D) It is corrasive

18. What is the correct order of abundance of the following elements in the earth crust?
    - (A) O < Si < Al < Fe
    - (B) Fe < Al < Si < O
    - (C) Fe < O < Al < Si
    - (D) O < Al < Si < Fe

19. A container of 3 L volume and 5 atm pressure is connected to a vaccume container of 2.5 L volume. What is the final pressure of the system when the tap is opened? Asume ideal behaviour of neon gas.
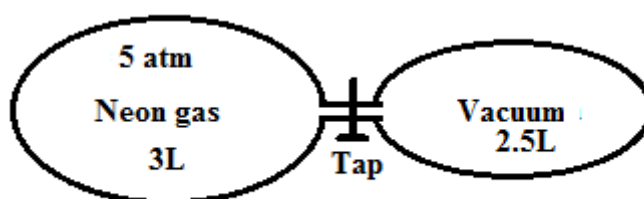


    - (A) 7.5 atm
    - (B) 2 atm
    - (C) 5 atm
    - (D) 2.5 atm

20. What is the **correct** statement about carot 22 gold?
    - (A) It is a heterogenious solid-solid mixture
    - (B) It is a pure compound
    - (C) It is a homogeneous mixture
    - (D) It oxidizes easily when contacted with air

21. What is the most suitable solvent with minimum health risks to remove jack latex on your palm.
    - (A) Hexane
    - (B) Benzene
    - (C) Acetone
    - (D) Liquid ammonia

22. How do you prepare a 8 %w/w aqueous solution of glucose for an experiment?
    - (A) Weigh 8 g of glucose and dissolve in 100 g of water
    - (B) Weigh 8 g of glucose and dissolve in 100 mL of water
    - (C) Weigh 8 g of glucose and dissolve in 1000 mL of water
    - (D) Weigh 8 g of glucose and dissolve in water until the final weight is 100 g

23. A glucose solution was prepared by mixing 250 g of water and 18 g of glucose .What is the weight percentage(w/w) of glucose in the solution?
    - (A) 18 %w/w
    - (B) 7.2 %w/w
    - (C) 9.9 %w/w
    - (D) 6.7 %w/w

24. What is the molar concentration in Mol $L^{-1}$ of glucose in the solution in question 23? (Density of water is 1g $mL^{-1}$ ,Volume of the solution does not change when glucose is dissoved).
    Atomic masses :H =1, O =16, C =12
    - (A) 0.4
    - (B) 0.1
    - (C) 4
    - (D) 1

25. NaCl makes a lattice structure in solid state .When it dissolves in water, the lattice breaks and the resultant $Na^+$ and $Cl^-$ ions dissolve in water. What is the **correct** statement about the process of dissolving NaCl in water?
    (A) Both braking the lattice and disolving of ions absorb energy.
    (B) Energy is absorbed when ions dissolve in water and energy is released when NaCl lattice breaks.
    (C) Energy change during dissolving ions should be higher than the energy change during breaking of lattice.
    (D) Both breaking of lattice and dissolving of ions release energy.

26. Isotopes of elements have same number of protons and different numbers of neutrons. Atomic mass of an element with two isotopes is given by the following equation.

$$\frac{M1 \times P1 + M2 \times P2}{2}$$

   M1 = Atomic mass of isotope 1 (amu)      P1 = Mass percentage of isotope 1
   M2 = Atomic mass of isotope 2 (amu)      P2 = Mass percentage of isotope 2
   A mass analysis diagram of two isotopes of the same element is given below.
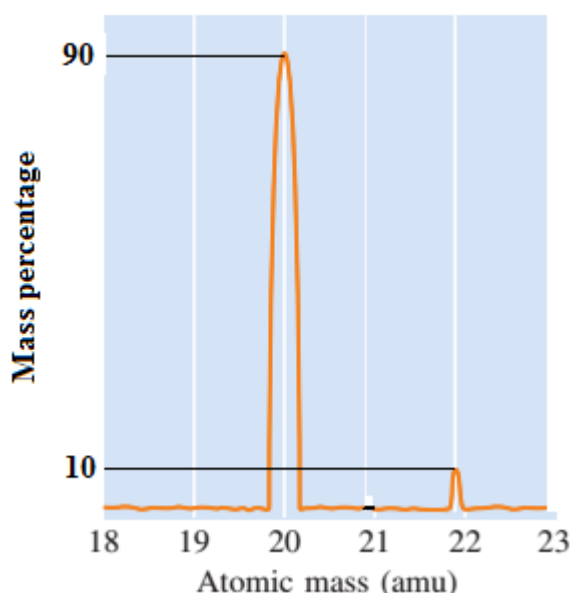


   Based on the above mass analysis diagram, what is the atomic mass (amu) of this element?
   (A) 22          (B) 20.2          (C) 20          (D)   202

27. Consider the following equations.
       Number of moles = mass /molar mass of the compound
       Molar concentration = Number of moles /volume in litres
       What is the mass of NaOH required to make 250 mL of 2 moles per liter (2 Mol $L^{-1}$ ) solution of NaOH .
       Molar mass of NaOH = 40.
       (A) 20 g          (B) 40 g          (C) 10 g          (D) 80 g

28. Sum of the atomic masses of a compound is equal to molar mass. What is the molar mass of glycerol. (Atomic masses : H =1, O =16, C =12)

$$CH_2\text{-}OH$$
$$CH\text{-}OH$$
$$CH_2\text{-}OH$$
Glycerol
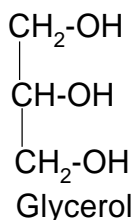
(A) 92        (B) 102        (C) 84        (D) 44

29. Chemical equation for the extraction of ion from $Fe_2O_3$ is given below. How many grams of $Fe_2O_3$ is required to produce 28 kg of Fe according to the equation?

$$Fe_2O_3(s) + 3\,CO(g) \longrightarrow 2\,Fe(s) + 3\,CO_2(g)$$
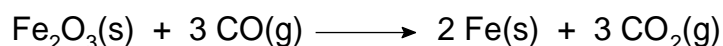
(Atomic masses :Fe =56, O =16, C =12)

(A) 20,000 g        (B) 19,600 g        (C) 40,000 g        (D) 9,800 g

30. What are the sweetest and least sweet sugars respectively among commonly found sugars?
    (A) Fructose and glucose        (C) Glucose and fructose
    (B) Fructose and lactose        (D) Glucose and lactose

31. How much work is done in moving a book with a mass of 2 kg from the floor to the top of a table that is 1 m above the floor? ( $g = 10$ m.s$^{-2}$)
    (A) 2 J        (B) 10 J        (C) 15 J        (D) 20 J

32. A radio station broadcasts at a frequency of 95 MHz. How far will this signal travel in 2.0 ms? Velocity of light is $3.0 \times 10^8$ m.s$^{-1}$.
    (A) 1.95 km        (B) 190 km        (C) 210 km        (D) 600 km

33. In the circuit shown, a potential difference of 4 V is applied across **XY**.
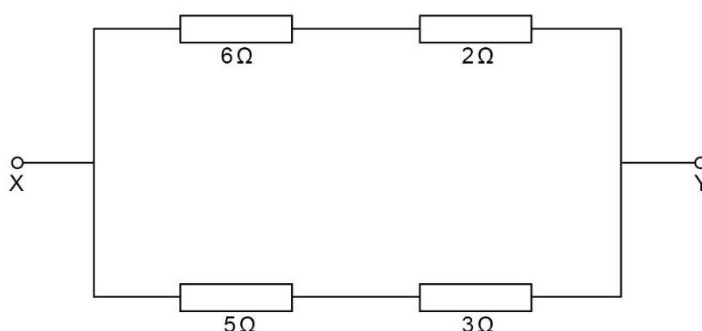


What is the current in the 5 $\Omega$ resistor?

(A) 0.1 A        (B) 0.2 A        (C) 0.5 A        (D) 1 A

34. Velocity ($v$) of a wave traveling in a stretched wire is given by $v = \sqrt{\dfrac{T}{m}}$, v is speed and T is tension. The units of m is

   (A) $kg.m.s^{-1}$        (B) $kg.s^{-1}$        (C) $kg.m^{-1}$        (D) $m.s^{-1}$

35. An air bubble trapped in the deep sea water has a volume of 5 $cm^3$ under pressure 6×10⁵ Pa. What is volume of the air bubble when it reaches to the sea surface? Assume the temperature difference between deep sea and sea surface is negligible and the atmospheric pressure is 1.0 × 10⁵ Pa.

   (A) 2.5 $cm^3$        (B) 10 $cm^3$        (C) 15 $cm^3$        (D) 30 $cm^3$

36. Two spheres, labeled A and B, have identical masses, but are made of different substances. The specific heat capacity of sphere A is 440 J/(kg C°) and that of sphere B is 160 J/(kg C°). The spheres are initially at 21 °C; and the same quantity of heat is supplied to each sphere. If the final temperature of sphere A is 72 °C, what is the final temperature of sphere B?

   (A) 160 °C        (B) 111 °C        (C) 39 °C        (D) 51 °C

37.

38. The graph below shows the velocity – time graphs of two cars.
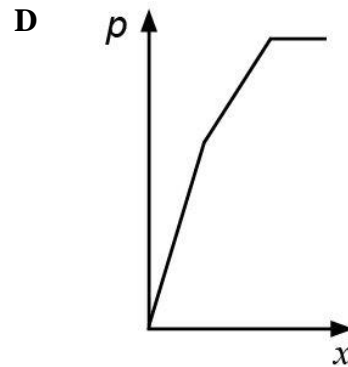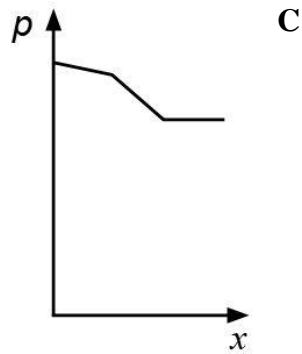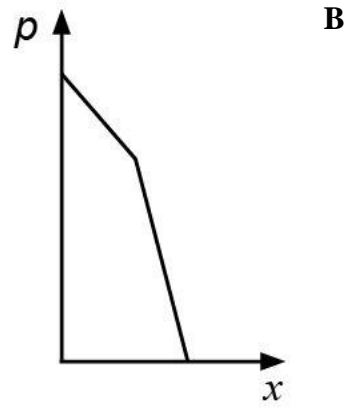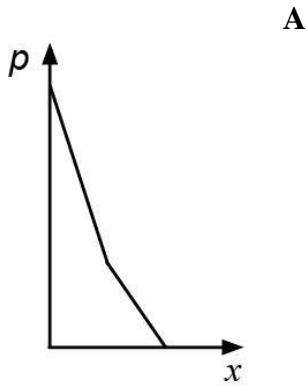


**Time /s**
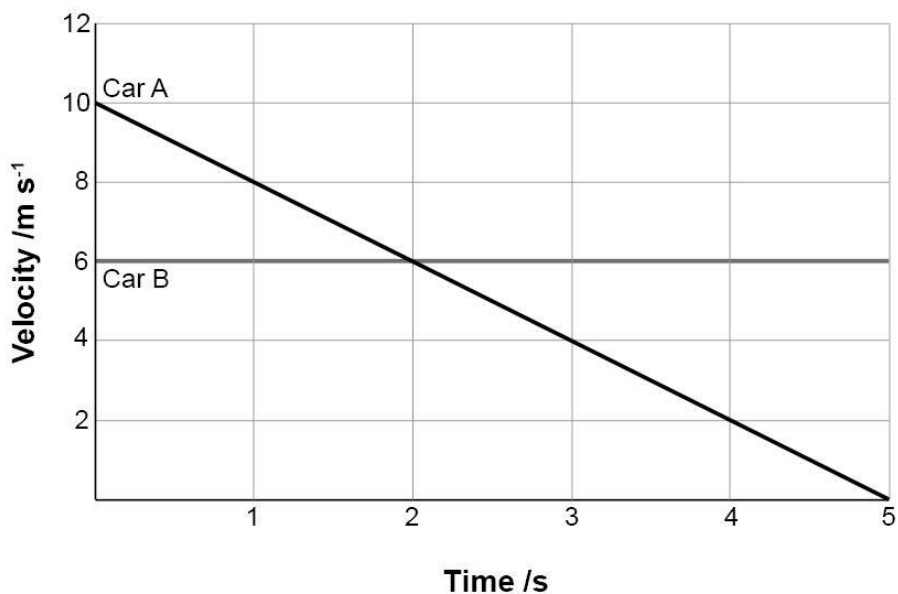
At what time have both cars travelled the same distance since $t = 0$ ?
(A) 1 s           (B) 2 s           (C) 3 s           (D) 4 s

39. A tall container which is open to the atmosphere contains a layer of liquid **L**, floating on liquid **M**, which has a density which is twice that of liquid **L**. Which graph shows how the pressure in the liquid, $p$, at a point varies with its height, $x$, above the base of the container?



7

A



B



C



D
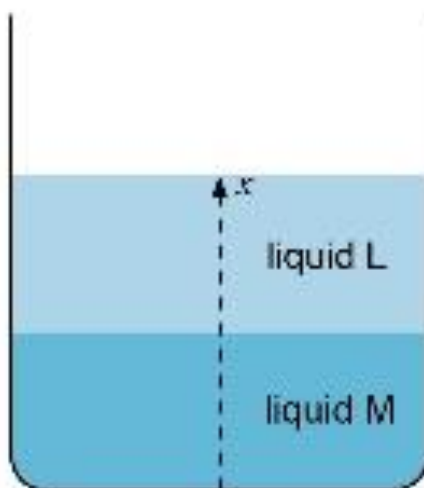
40. Water in a tank is heated by a 5 kW immersion heater for 10 minutes and the temperature raised by 20 °C. Assume that no heat losses and the heat capacity of the water is $1.2\times10^5$ J.K$^{-1}$. What is heat capacity of the tank?

   (A) $1.0\times10^4$ J.K$^{-1}$   (B) $1.4\times10^4$ JK$^{-1}$   (C) $1.5\times10^4$ JK$^{-1}$   (D) $3.0\times10^4$ JK$^{-1}$

41. If an object is placed outside the center of curvature of a convex mirror, what type of image is formed?
   (A) Inverted, miniature, real image          (C) Inverted, magnified, real image
   (B) Upright, miniature, virtual image         (D) Upright, magnified, real image

42. The engine of a train, travelling at 10 ms$^{-1}$, delivers a power of 2 kW. What is the force exerted by the engine?

   (A) 50 N                (B) 100 N                (C) 200 N                (D) 400 N

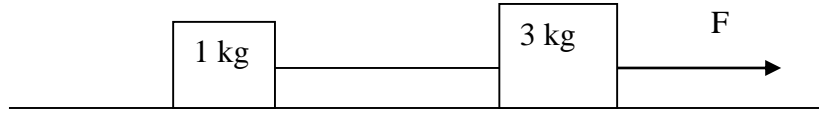43. A ray of light travels parallel to the optical axis of a thin convex lens whose focal point is $f$.



8
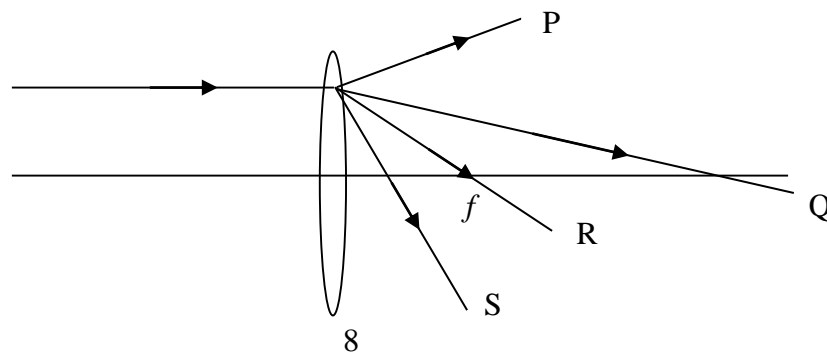
Immerging ray is represented by,
(A)  P                (B)  Q                          (C)  R                        (D)  S

44. Two masses 1 kg and 3 kg connected by a string, are moving on smooth horizontal plane under the F= 20 N force.



What is the tension of the string? (g = $10 m.s^{-2}$).

(A) 2 N                (B) 3 N                (C)  5 N                (D) 6 N

45. Area of the base of a four- leg table is 20 $cm^2$.  When a mass of 100 kg is at the center of the table top, what is the pressure acting on the ground by a table leg? ( g = 10 $m.s^{-2}$)

(A) $10.0 \times 10^4$ Pa        (B) $2.5 \times 10^4$ Pa        (C) $12.5 \times 10^4$ Pa        (D) $5.0 \times 10^4$ Pa

46. A current of 3.0 μA flows through a resistor in 1.5 minutes. How much charge flows through the resistor in this time? Charge of an electron is $1.6 \times 10^{-19}$ C.

(A) $5.0 \times 10^{14}$                (B) $1.8 \times 10^{15}$                (C)  $1.8 \times 10^{20}$                (D) $2.0 \times 10^{20}$

47. A mass hanged by a spring scale that reads 5 N.  A water rest on a electronic balance that reads 10 N. The stone is lowered into the water and the spring scale then reads 2N.
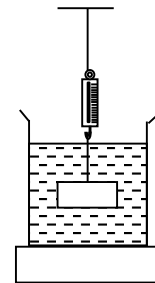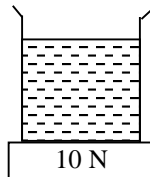


What is the reading of the electric balance?

(A) 7  N                (B) 10 N                (C) 13 N                (D)  15 N

48. A mass $m$ is released from rest at height R above a horizontal surface. The mass slides along the inside of the semi-circular hoop with a radius R. Acceleration of gravity is g.
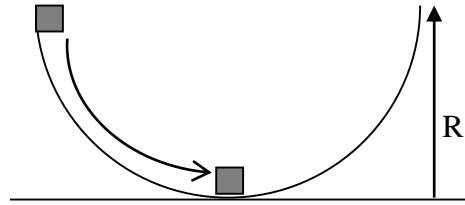


Which one of the following expressions gives the speed of the mass at the bottom of the hoop?

(A) $v = \frac{g}{R}$

(B) $v = \sqrt{2gR}$

(C) $v = mgR$

(D) $v = \frac{mg}{2R}$

49.

50. If $T = 2\pi \sqrt{\frac{l}{g+a}}$ , then $g$ is

(A) $g = \frac{T}{2\pi} l - a$

(B) $g = \left(\frac{2\pi}{T}\right)^2 l - a$

(C) $g = \left(\frac{2\pi}{T}\right)^2 (l + a)$

(D) $g = \left(\frac{T}{2\pi}\right)^2 (l + a)$

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*