1. Which one of the following characteristics of water is **most** helpful for minimizing temperature variation within organisms?
   (A) Water remains as a liquid within a wide range of temperatures
   (B) Water molecules make hydrogen bonds with many other molecules
   (C) Water molecules are held together by adhesive and cohesive forces
   (D) Water has a high specific heat capacity
2. Which one of the following statements regarding lipids is **incorrect**?
   (A) They are polymers of glycerol and fatty acids
   (B) C, H, O are the only essential elements present in lipids
   (C) Lipids contain more oxygen than carbohydrates
   (D) Lipids have the highest energy among stored food
3. Some events and stages of the mitosis are given below. Select the mismatch pair.
   (A) Condensation of chromosomes - Prophase
   (B) DNA replication - Interphase
   (C) Formation of aster - Metaphase
   (D) Splitting of centromere - Anaphase
4. Which one of the following biological processes **does not** require energy in the form of ATP?
   (A) Conversion of glucose to pyruvic acid in glycolysis.
   (B) Conversion of starch into sugar during seed germination.
   (C) Conversion of carbon dioxide to sugar in photosynthesis.
   (D) Conversion of amino acids into proteins during protein synthesis.
5. Which of the following is **incorrect** regarding photosynthesis?
   (A) The light dependent reaction of photosynthesis provides ATP and NADPH for Calvin cycle.
   (B) The correct sequence of flow of electrons during photosynthesis is H_2O to P680, electron acceptors, P700, electron acceptors, $NADP^+$
   (C) CO_2 fixation during photosynthesis takes place in the thylakoid membrane.
   (D) The red and blue areas of the spectrum are the most effective in photosynthesis.

6. During a field survey, a student observed an animal with scaleless smooth skin and paired limbs in a freshwater pond. This animal is most likely to belong to the Class

(A) Pisces (B). Amphibia (C) Reptilia (D)Mammalia

7. Consider the animal groups given below.

I. *Obelia*, Sea anemone, *Hydra* and Jellyfish

II. Tick, mite, honeybee and scorpion

III. Starfish, sea urchin, sand dollars and brittle star

IV. *Planaria, Fasciola, Taenia* and *Chiton*

V. Earth worm, rag worm, hookworm and leech

Which one of the following groups contain animals belonging to same taxonomic group?

(A) I, II and III (B) I, II and IV (C) II, III and IV (D) III, IV and V

8. Which of the following tissue has the highest number of dead cells

(A) Parenchyma tissue (C) Collenchyma tissue

(B) Xylem tissue (D) Phloem tissue

9. When a piece of leaf epidermis was immersed in distilled water for thirty minutes the cells became fully turgid and attained equilibrium. Which one of the following statements is correct with regard to these cells in equilibrium?

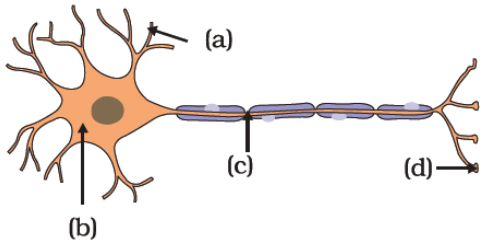
(A) Water potential and solute potential of the cell sap have equal and opposite values.

(B) Water potential and pressure potential of cell sap have equal values.

(C) Solute potential and pressure potential of cell sap have equal and opposite values.

(D) Water potential of cell sap is less than water potential of distilled water.

10. A diagram of a motor neuron is given below. What are the structures labeled as (a), (b), (c) and (d) respectively?



(A) Cell body, dendrites, axon and Axon terminal

(B) Dendrites, cell body, Node of Ranvier, Axon terminal

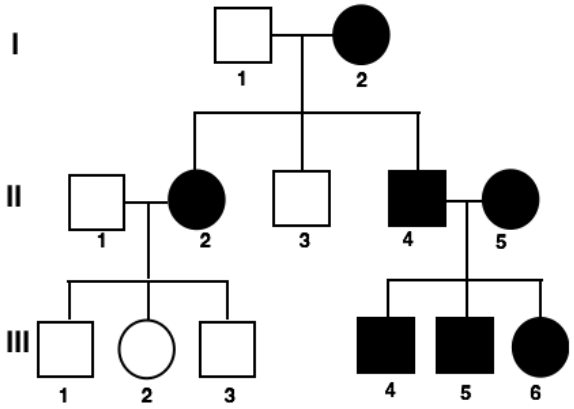
(C) Cell body, axon, dendrites, node of Ranvier, axon terminal

(D) Myelin sheath, dendrites, cell body, node of Ranvier

11. Which of the following types of immunity develops in a person recovering from an infectious disease like chickenpox?
    (A) Naturally acquired active immunity
    (B) Naturally acquired passive immunity
    (C) Artificially acquired active immunity.
    (D) Artificially acquired passive immunity
12. Which one of the following reproductive structures of human male is unpaired?
    (A) seminal vesicle (B) Cowper's gland (C) Ejaculatory duct (D) Prostate gland

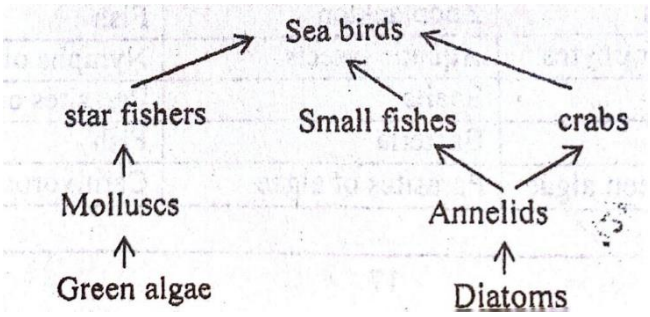
13. The occurrence of dimples in humans is a double recessive Mendelian character. If 2.25% of a certain population exhibits this character, the percentage of that population which is heterogenous for this character is,
    (A) 97.75 (B) 85.00 (C) 74.50 (D) 25.50

14. The pedigree given below follows the inheritance of attached earlobes across generations. Since attached earlobes are an autosomal recessive trait, if individual III-6 marries a man who is homozygous for unattached earlobes, what is the most likely outcome for their children?



    (A) All of their children would have unattached earlobes.
    (B) The children would all have partially attached earlobes.
    (C) All the female children will have unattached earlobes, and all the male children will have attached earlobes.
    (D) All of their children would have attached earlobes.

15. Consider the following food web.



Which one of the following would most probably happen if the population of sea birds decreases?

(A) The small fish and annelids would decrease in number.

(B) The annelids and star fishes would decrease in number.

(C) The crabs and green algae would increase in number.

(D) The mollusks and diatoms would increase in number.

16. Solute Y was dissolved in water (20 cm^{-3}), and its concentration was 0.4 mol dm^{-3}. It was shaken with octane (30 cm^{-3}), and it was found that 0.002 mol was transferred to the organic layer. The distribution coefficient is the ratio of the concentration of Y in the organic phase to the concentration of Y remaining in the aqueous phase. The distribution coefficient of Y in between water and octane is,

(A) 0.34 (B) 0.22 (C) 0.54 (D) 0.44

17. How many nitrogen atoms are there in 0.25 mol of ammonium nitrate?

(A) 1.5×10^{23} (B) 2.4×10^{23} (C) 3.0×10^{23} (D) 6.0×10^{23}

18. 0.39 mol of magnesium chloride is dissolved in water to produce a solution with a volume of 1.5 L. What is the concentration of chloride ions in this solution?

(A) 0.098 mol L^{-1} (B) 0.26 mol L^{-1} (C) 0.39 mol L^{-1} (D) 0.52 mol L^{-1}

19. A 10.00 cm^{-3} portion of Na_2CO_3 base was titrated with 0.1 mol dm^{-3} HCl acid in the presence of phenolphthalein as the indicator. The volume of HCl consumed to reach the end point is 20.00 cm^3. Calculate the concentration of Na_2CO_3.

(A) 0.1 mol dm^{-3} (B) 0.2 mol dm^{-3} (C) 0.05 mol dm^{-3} (D) 0.4 mol dm^{-3}

20. The concentration of a coloured compound can be measured by UV-visible spectrophotometry. The absorbance of the analyte is directly proportional to its concentration. Which of the following is correct.

(A) The absorbance could be increased two times when the concentration of the analyte is increased two times
(B) The absorbance could be increased four times when the concentration of the analyte is increased two times
(C) The absorbance could be increased half of the times when the concentration of the analyte is increased two times
(D) The absorbance could be increased three times when the concentration of the analyte is increased two times

21. Electrode potential is the tendency of an electrode to accept or to lose electrons. Which of the following factors does not affect the electrode potential of an electrode?

(A) Nature of the electrode (metal)
(B) Temperature of the solution
(C) Molarity of the solution
(D) Size of the electrode

22. Solid carbon dioxide, also known as dry ice, sublimes to form gaseous carbon dioxide. What type of bonding is significantly weakened because of this phase change?

(A) Covalent bonding
(B) Hydrogen bonding
(C) Ionic bonding
(D) Intermolecular forces

23. A solution is made by dissolving 358.4 mg of iodine in 0.2500 L of ethanol (the density of ethanol is 0.7893 kg L^{-1}). What is the mass fraction of iodine in this solution in ppm?

(A) 1120 ppm (B) 1422 ppm (C) 1816 ppm (D) 1534 ppm

24. Which of the following solutions is acidic at 25 ^{0}C?

(A) $[OH^-] = 1.0 \times 10^{-10}$ M
(B) $[H^+] < 1.0 \times 10^{-7}$ M
(C) $[OH^-] > 1.0 \times 10^{-7}$ M
(D) $[OH^-] = 1.0 \times 10^{-7}$ M

25. Diet cola drinks have a pH of about 3.0, while milk has a pH of about 7.0. How many times greater is the H^+ concentration in diet cola than in milk?

(A) 10,000 times higher in diet cola than in milk
(B) 0.43 times higher in diet cola than in milk
(C) 2.3 times higher in diet cola than in milk
(D) 1,000 times higher in diet cola than in milk

26. 10.0 cm^3 of this vinegar (CH_3COOH) was diluted with water (1:10 ratio). This solution was neutralized using 14.0 cm^3 of 0.10 mol dm^{-3} NaOH solution. Neutralization reaction is as follows:
$CH_3COOH\ (aq) + NaOH\ (aq) \rightarrow CH_3COONa\ (aq) + H_2O\ (l)$
The original concentration of the acetic acid in the vinegar is

(A) 1.0 mol dm^{-3} (B) 1.4 mol dm^{-3} (C) 0.14 mol dm^{-3} (D) 0.10 mol dm^{-3}

27. Acid-base indicators are compounds that change colour depending on the pH of the medium. Phenolphthalein and methyl orange are 2 acid-base indicators. Colours of the indicators at different pH values are given below:

	pH range	Colour
Methyl orange	0-3	Red
	3-5	Orange
	5-14	Yellow
Phenolphthalein	0-8	Colourless
	8-14	Pink

An acid solution (pH = 2) is added with both indicators methyl orange and phenolphthalein. A base is added to this beaker gradually, until the acid is neutralized and the base (pH =10) remained in the medium. What colours will be observed during the course of the reaction?

(A) Orange, Yellow, Colourless, Pink
(B) Red, Yellow, Colourless, Pink
(C) Red, Orange, Yellow, Pink
(D) Red, Orange, Yellow, Colourless

28. The apatite mineral deposit found in the Eppawela region can be used to produce phosphate fertilizers for agriculture. The main form of apatite in this deposit is fluorapatite ($Ca_5(PO_4)_3F$). What is the percentage of phosphorus found in fluorapatite? (Atomic Mass: O : 16, F : 19, P : 31, Ca : 40)

(A) 11.7 % (B) 18.4 % (C) 12.4 % (D) 20.4 %

29. Using the apatite mineral, superphosphate fertilizers can be produced by reacting it with sulfuric acid. The reaction between apatite ($Ca_5(PO_4)_3F$) and sulfuric acid is represented

$2\ Ca_5(PO_4)_3F + x\ H_2SO_4 \rightarrow y\ Ca(H_2PO_4)_2 + 7\ CaSO_4 + z\ HF$

Stoichiometric coefficients x, y, and z respectively are

(A) 5, 2, 2 (B) 7, 3, 2 (C) 7, 3, 4 (D) 5, 3, 2

30. One step in the manufacture of aluminium is the production of aluminium hydroxide by the following process:

$2\ NaAlO_{2(aq)} + 3\ H_2O_{(l)} + CO_{2(g)} \rightarrow 2\ Al(OH)_{3(s)} + Na_2CO_{3(aq)}$

What mass of aluminium hydroxide can be produced from a mixture of 40 g $NaAlO_2(aq)$, 15 g $H_2O(l)$ and 10 g $CO_2(g)$? (Atomic Mass: H : 1, C : 12, O : 16, Na : 20, Al : 23)

(A) 17.7 g (B) 21.6 g (C) 35.4 g (D) 43.3 g

31. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should the position of the object be?

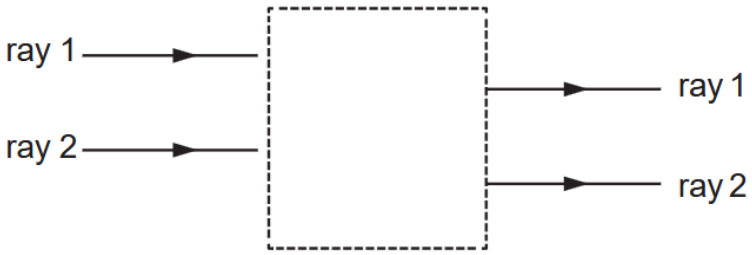
(A) Between the principal focus and the center of curvature

(B) At the centre of curvature

(C) Beyond the centre of curvature

(D) Between the pole of the mirror and its principal focus

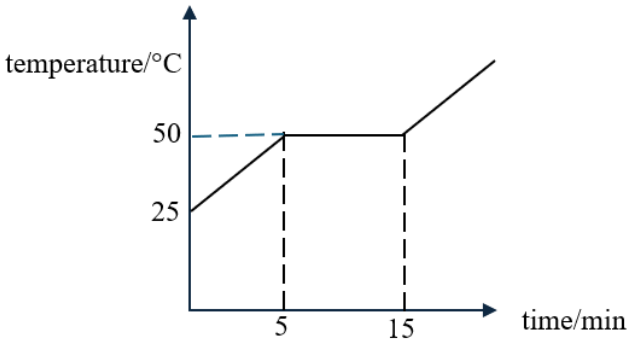
32. Rays of lights enter and leave a box.



What could be inside box to make the rays behave as shown.

(A) A Converging lens (C) Diverging Lense
(B) Rectangular Glass box (D) a triangular prism

33. The graph below shows the variation of the temperature with time of a solid of mass 4.0 kg which is heated by a 400 W electric heater. What is the latent heat of fusion of the solid?



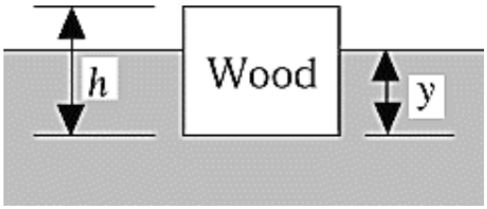
(A) 30 $kJ.kg^{-1}$ (B) 40 $kJ.kg^{-1}$ (C) 60 $kJ.kg^{-1}$ (D) 80 $kJ.kg^{-1}$

34. The diagram shows a image of a clock in a plane mirror. The diagram shows a image of a clock in a plane mirror.

What is the time(hh:mm) in the clock which produces the image?

(A) 2: 25 (B) 2:35 (C) 9:25 (D) 9:35

35. A piece of wood is floating at the surface of some water, as illustrated. The wood has a circular cross section and a height of h = 3.0 cm. The density of the wood is 0.40 g/cm³.



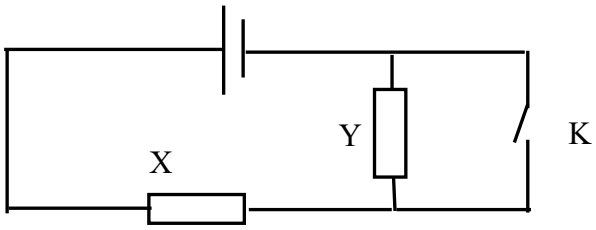
The distance from the surface of the water to the bottom of the wood is:

(A) 0.80 cm (B) 1.2 cm (C) 1.4 cm (D) 2.4 cm

36. Three forces of magnitude P = 3.0 N, Q = 4.0 N and R = 6.0 N act on a body. The body is in equilibrium. The magnitude of the resultant of P and Q is ,

(A) 1 N (B) 5 N (C) 6 N (D) 7 N

37. Two resistors X and Y have the same resistance and are connected in series to a battery of negligible internal resistance. When the key K is opened, the heat is dissipated by X alone is P.



What is the heat dissipation when K is closed?

(A) 0.25 P (B) 0.5 P (C) 2P (D) 4P

38. A student sets up a water flask using a stand and clamp as shown in the diagram below. The teacher tells him that the arrangement will fall easily. To make the arrangement more stable, what should he do?

I. Reduce the distance d.

II. Rotate the clamp so that the water container is above the bottom plate of the support.

III. Lift the clamp with the water container up to the top of the support.

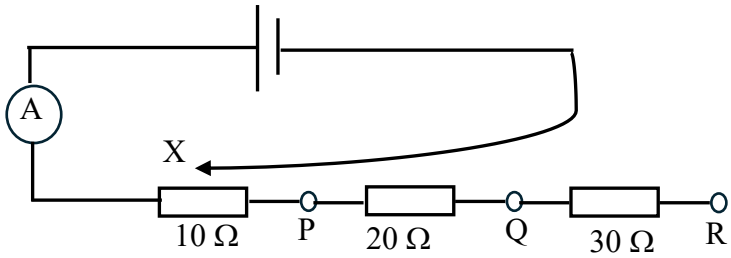
(A) I only

(C) I and II only

(B) II and III only

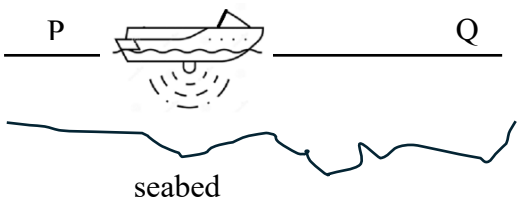
(D) I and III only

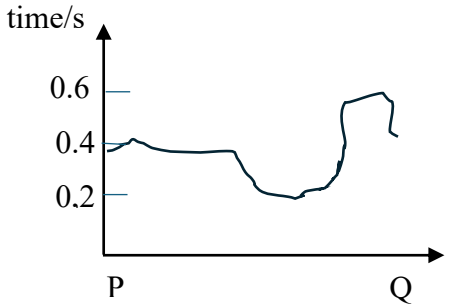
39. A battery is connected to an ammeter and three resistors as shown below. The circuit can be completed by a movable contact X. When X is connected to P, the ammeter reads 0.6 A. X is then connected first to Q and then to R, what are the ammeter readings?



	At Q	At R
A	0.2 A	0.1 A
B	0.3	0.2
C	0.6	0.6
D	1.2	1.8

40. The diagram below shows a ship moving from P to Q. The ship continuously sends ultrasonic waves to the seabed. A computer produced the variation of the time difference between the emitted pulse and its echo from the see-bed along PQ, which is shown in the graph below. What is the distance to the deepest place of the seabed from the water surface? Assume that the ultrasound speed in seawater is 1500 $m.s^{-1}$.



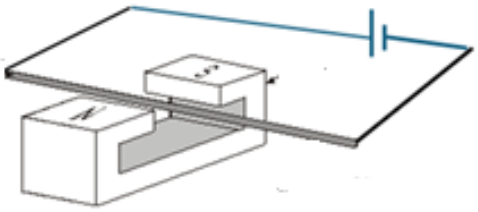


(A) 150 m (B) 300 m (C) 450 m (D) 900 m

41. A horizontal force of 95 N is applied to a 60 kg mass on a rough, level surface. If the mass accelerates at 1.20 m/s^2, what is the magnitude of the force of kinetic friction acting on the mass?

(A) 16 N (B) 23 N (C) 33 N (D) 45 N

42. A thin metal wire is held between the poles of a strong magnet, as shown below.



When a current is passed through the wire, as shown, in which direction does the wire deflect?

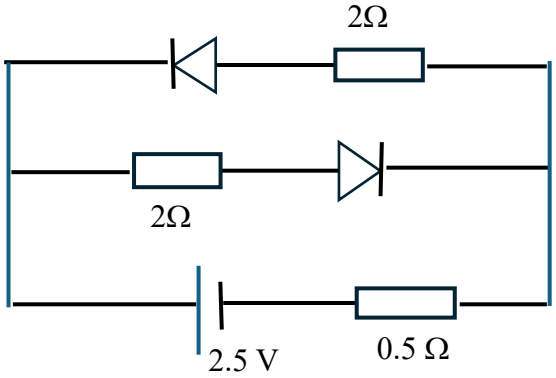
(A) Vertically downwards (C) Towards the North pole of the magnet

(B) Vertically upwards (D) Towards the South of the magnet

43. When a certain gas under a pressure of 5.0 × 10^6 Pa at 27.0°C is allowed to expand to 3 times of its original volume, its final pressure is 1.0 × 10^6 Pa. What is its final ttemperature after expansion?

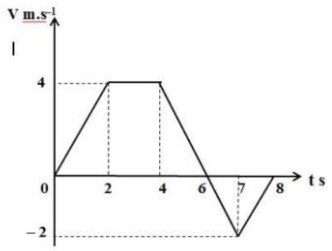
(A) 140 K (B) 160 K (C) 180 K (D) 210 K

44. In the circuit shown in Figure, find the current flowing through the 0.5 Ω resistor. Assume that the diodes are ideal diodes.



(A) 0.5 A (B) 1 A (C) 1.5 A (D) 2.0 A

45. The graph below shows the velocity-time graph of an object starting from rest at the point A, moving on a straight line and coming to rest 8 s later, at the point B.



What is the distance between A and B?

(A) 10 m (B) 12 m (C) 13 m (D) 14m

46. What is the equation of the line parallel to the line whose equation is y = 5x + 3 and whose y-intercept is 4?

(A) $y = 6x + 4$ (C) $y = 3x + 1$

(B) $2y = 10x + 8$ (D) $y = 4x + 4$

47. If $2^{4x+2} = 2^{3x+1} \times 4$ then x is

(A) 0 (B) 1 (C) 2 (D) 3

48. Which equation is **NOT** true?

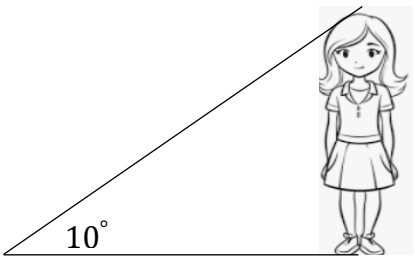
(A) $\log(XY) = \log X + \log Y$ (C) $(x^3)^2 = x^5$

(B) $\log 2^4 = 4 \log 2$ (D) $\log X - \log Y = log \frac{X}{Y}$

49. A standing girl casts a shadow that is 6 m long. If the angle of elevation from the tip of the shadow to the head is 10°, how tall is the girl?

(A) 6 sin 10° (C) 6 cos 10°

(B) 6 tan 10° (D) 6 cos 80°



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

(A) $g = \frac{T}{2\pi} l - \frac{QE}{m}$ (C) $g = \left(\frac{2\pi}{T}\right)^2 (l + \frac{QE}{m})$

(B) $g = \left(\frac{2\pi}{T}\right)^2 l - \frac{QE}{m}$ (D) $g = \left(\frac{T}{2\pi}\right)^2 (l + \frac{QE}{m})$

**********8