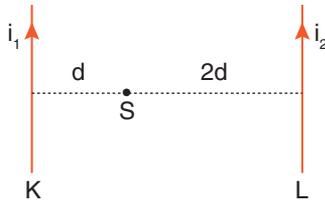


POPULAR SCIENCE - SENIOR GROUPS (Grades 10-11-12)

1.



Currents i_1 and i_2 pass through parallel linear wires K, L shown in the figure.

(The wires are in the same plane)

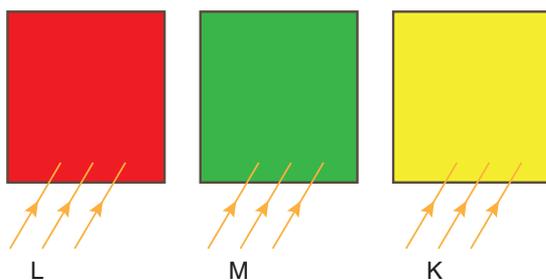
If the resultant magnetic field created by the wires at the S point is zero; which of the following statements are correct?

- I. i_2 current intensity is greater than i_1 .
- II. If the wire L is brought closer to the point S, the direction of the resultant magnetic field is out of page
- III. If the i_1 current intensity is increased, The direction of the resultant magnetic field intensity at point S becomes out of page.

- A) I and II
- B) II and III
- C) I and III
- D) I, II and III

2.

When Marcus illuminates the painted wall with flashlights that emit monochromatic light rays K, L, M, he sees that the colors of the walls are similar to below



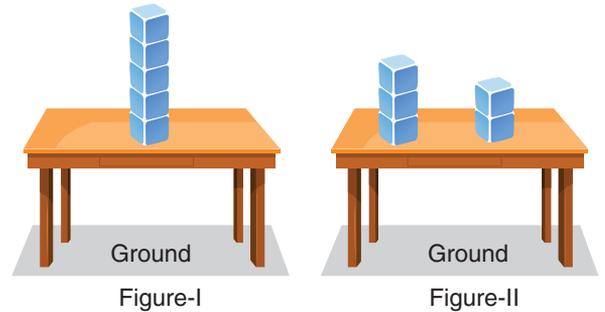
Which of the following statements are correct?

- I. The Wall was painted with yellow paint.
- II. The color of the light emitted from the flashlight L is yellow.
- III. The color of the light emitted from the flashlight M is green.

- A) I and II
- B) II and III
- C) I and III
- D) I, II and III

3.

The surface area where the legs of a 15G table contact the horizontal floor is S. Five identical objects, each weighing G, are placed on the table as shown in the figure.



Two out of five identical objects placed on the table as in figure-II.

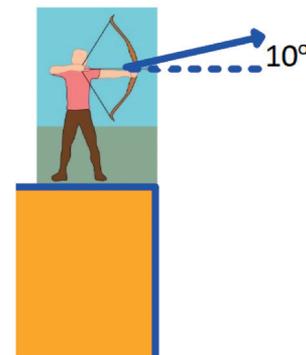
If the surface area of the table is 5S, which of the statement(s) is/are correct?

- I. Pressure on the ground increases.
- II. The pressure force exerted on the surface of the table increases.
- III. The pressure force of the table on the floor does not change.

- A) Only I
- B) Only II
- C) Only III
- D) I and II

4.

An arrow is fired with a 75 m/s speed it has 10° angle to the horizontal. The archer is standing next to a cliff and the horizontal distance between the target and the archer is 222 m. Ignore the effects of friction for this question. What would be the minimum speed of the arrow during the flight? ($\sin 10^\circ = 0.17$, $\cos 10^\circ = 0.98$)



- A) 73.50
- B) 75
- C) 13.02
- D) 26.04

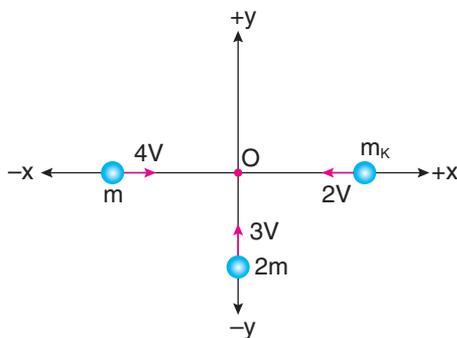
Senior Groups (Grades 10-11-12)

5. A baseball travelling towards west at 30 m/s is hit by a baseball bat which is moving at 10 m/s towards east. Mass of the baseball is 160 g whereas the baseball bat is 1 kg. Immediately after the collision, the bat becomes stationary. What is the average force acting on the ball if the collision takes 20 milliseconds?



- A) 100 N B) 200 N
C) 500 N D) 1000 N

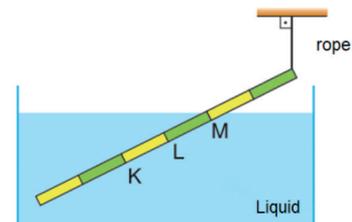
6. The masses m , $2m$ and m_K moving towards the origin will collide and stick together on a frictionless horizontal plane.



After the collision, if the masses start moving along +y axis, what should m_K be in m ?

- A) $2m$ B) $3m$
C) $\frac{1}{2}m$ D) $\frac{1}{4}m$

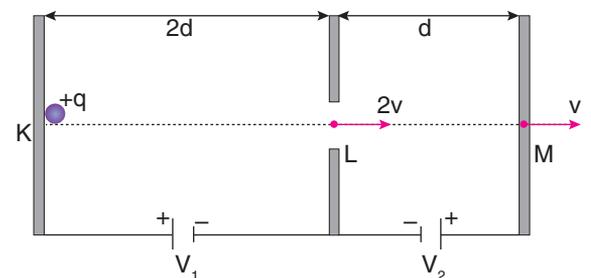
7. The smooth rod is in balance with the rope as shown in the figure, with a portion of it submerged in liquid.



Where is the center of mass of the rod since the tensile force in the rope equals the magnitude of the buoyancy? (The rod is evenly divided)

- A) K B) L
C) M D) Between KL

8. Between the parallel plates, the charged body released from point K passes through point L with a speed of $2v$ and hits point M with velocity of v .



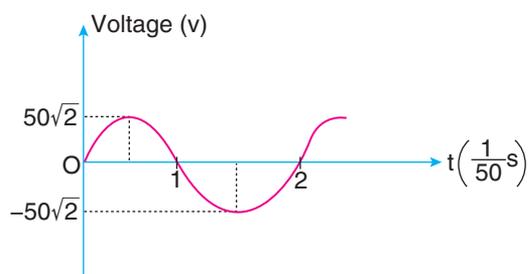
What is the ratio of potential differences $\frac{V_1}{V_2}$? (friction is neglected)

- A) $\frac{3}{2}$ B) $\frac{1}{3}$ C) $\frac{4}{3}$ D) $\frac{3}{4}$



Senior Groups (Grades 10-11-12)

9. The graph of the voltage between the ends of a coil with an inductive reactance of 25Ω versus time is as shown in the figure.



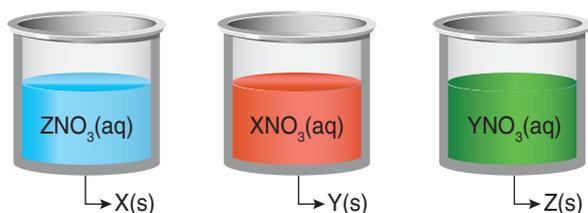
Which of the following statement(s) is/are correct?

- I. Effective value of the current flowing through the coil is 2 amperes.
- II. If the frequency of the source is increased, the resistance of the coil against current decreases.
- III. The coil's coefficient of induction is 25 Henry.

($\pi = 3$)

- A) Only I B) Only II
C) I and II D) I and III

10. Aqueous solutions of their salts are placed in containers made of X, Y and Z metals as shown in the diagrams below.

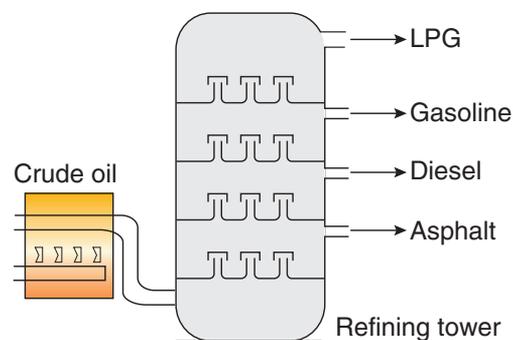


After a while, container Z cracks due to chemical reaction and the solution in it flows out. The other two containers do not crack.

Which of the following is the order of the activities of the X, Y and Z metals?

- A) $Z > X > Y$
B) $Z > Y > X$
C) $Y > Z > X$
D) $X > Y > Z$

- 11.



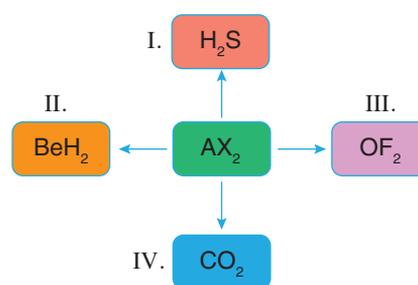
Regarding the operations carried out in the refining process of crude oil;

- I. It is separated into petroleum components by difference in density.
- II. The most volatile component is taken from the top.
- III. Asphalt has the highest boiling point.

which ones of the Information above are correct?

- A) I and II B) I and III
C) II and III D) I, II and III

- 12.



Examples of molecules with VSEPR representation AX_2 in the figure are shown in the diagram above.

Which of the given examples are wrong?

(${}_1\text{H}$, ${}_4\text{Be}$, ${}_6\text{C}$, ${}_8\text{O}$, ${}_9\text{F}$, ${}_{16}\text{S}$)

- A) I and II
B) III and IV
C) I and III
D) II and IV

13.



Iodine is a beneficial element that our body cannot produce and that can be taken with food. It is necessary for the production of thyroid hormone. It is a greyish black solid and sublimates easily by releasing violet vapour.

A 12.7 g iodine sample is completely sublimed in a closed 3.741 dm^3 container and maintained in gas state at a constant temperature and a pressure of $1.00 \times 10^5 \text{ Pa}$.

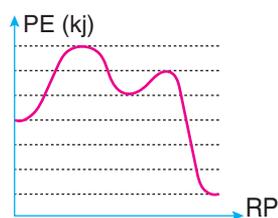
What is the temperature of the iodine vapour?

(Assuming iodine vapour behaves like an ideal gas, $R = 8,31 \text{ J/mol K}$, $I = 127$)

- A) 900 K B) 700 K C) 700 000 K D) 900 000 K

14.

Potential energy (PE) - reaction progress (RP) graph of a mechanised reaction is as shown in the figure.



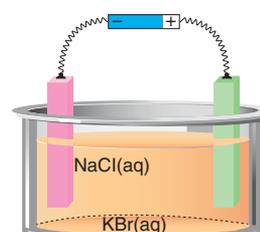
- I. Second step is faster
- II. First step releases heat
- III. The overall reaction is exothermic

Which one(s) of the information given above is/are incorrect?

- A) Only I B) Only II
C) I and III D) II and III

15.

In the electrolysis system shown in the figure, aqueous solutions of NaCl and KBr salts are electrolysed.



Which one of the following is the material to be collected first in the cathode and last in the anode in the system?

	Anode	Cathode
A)	K	Br_2
B)	O_2	K
C)	O_2	H_2
D)	K	O_2

16.

A teacher gives his students the following information: "The number of fully filled s orbitals in the electron configuration of X atom is equal to the number of fully filled p orbitals."

Regarding the element X;

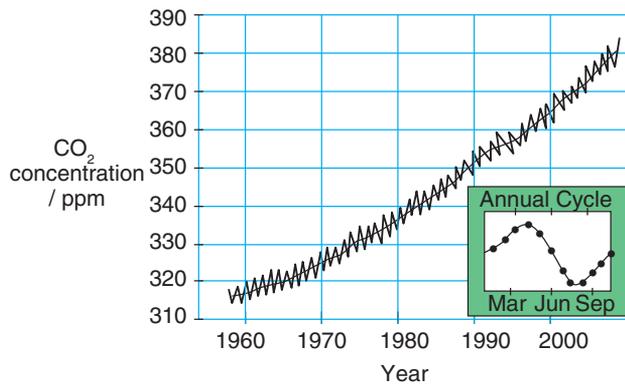
- I. Its nuclear charge can be +14.
- II. It can be found in the 3rd period and 2A group.
- III. It can be an alkaline earth metal in the 4th period.

which statement(s) given above about the element X is/are correct?

- A) Only I B) I and II
C) I and III D) II and III

Senior Groups (Grades 10-11-12)

19. Variation in the concentration of carbon dioxide in the atmosphere above Hawaii is shown in the big graph below. The smaller graph depicts the variations in carbon dioxide over a one year period.



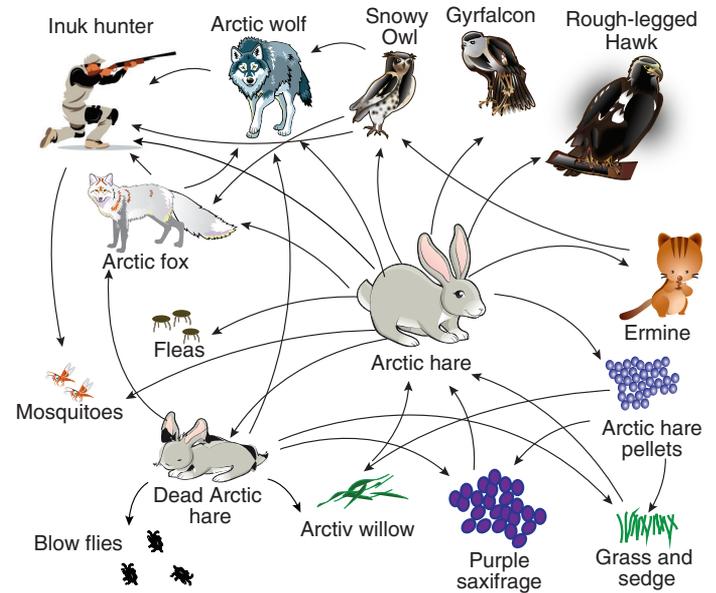
What is the main cause of the increase in carbon dioxide levels from 1960 to 2000?

- A) Depletion of the ozone layer.
- B) Rise in the amount of ultraviolet light penetrating the atmosphere.
- C) Deforestation.
- D) Burning of fossil fuels.

20. Why are antibiotics ineffective against viruses?

- A) Viruses do not contain RN
- B) Viruses have no metabolism
- C) Viruses are protected by a protein shell
- D) Viruses mutate at a high rate

21. An Arctic food web is shown below.



What is the role of the Arctic hare?

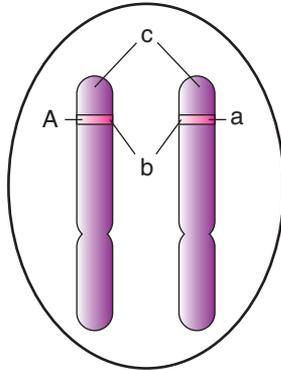
- A) Primary consumer
- B) Secondary consumer
- C) Tertiary consumer
- D) Detritivore

22. Why does shivering occur?

- A) Shivering tells the brain that the body is too cold.
- B) Shivering generates heat and thereby raises body temperature.
- C) Blood is diverted away from the skin and thereby reduces heat loss.
- D) The body loses control over muscles when it becomes cold.

Senior Groups (Grades 10-11-12)

23. The image below shows the hereditary structure of a cell.

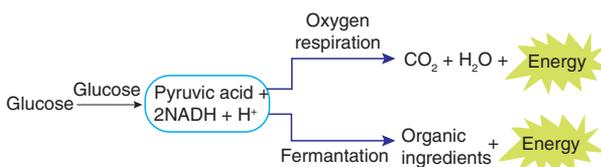


- I. This cell is diploid.
- II. There are two alleles genes responsible for a characteristic.
- III. c refers to homologous chromosomes, and b refers to loci.
- IV. c and b show alleles responsible for the characteristic.
- V. Alleles responsible for a characteristic are located on the same chromosome.

Which of the comments about the image above is wrong?

- | | |
|-------------|-------------|
| A) Only IV | B) Only III |
| C) I and II | D) IV and V |

24. The amount of energy obtained in two different respiratory reactions is compared below.

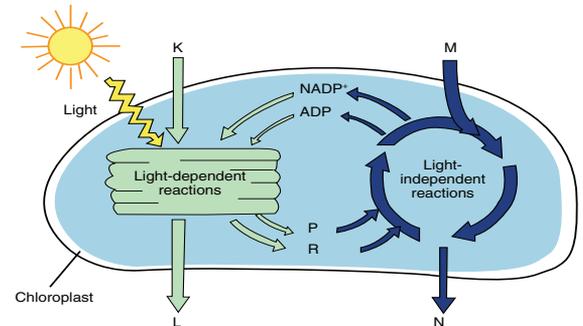


Which of the following are the basis of this difference?

- I. Oxidation of organic monomer to inorganic substances
- II. Use of Electron Transport Chain
- III. The presence and use of oxygen

- | | |
|-------------|------------------|
| A) Only I | B) Only II |
| C) I and II | D) I, II and III |

25. Substances entering and leaving the photosynthesis reactions taking place in the chloroplast are shown below.



- I. K indicates water, and L indicates oxygen.
- II. M symbolizes the organic matter, CO_2 .
- III. P and R substances are ATP and NADPH and are produced under light.

Which of the above comments about the items expressed in letters is correct?

- | | |
|-------------|------------------|
| A) Only I | B) Only II |
| C) I and II | D) I, II and III |

26. Leukemia is a type of cancer that manifests itself with an above-normal proliferation of blood cells, especially white blood cells. One of the methods used in the treatment of leukemia today is stem cell technology.

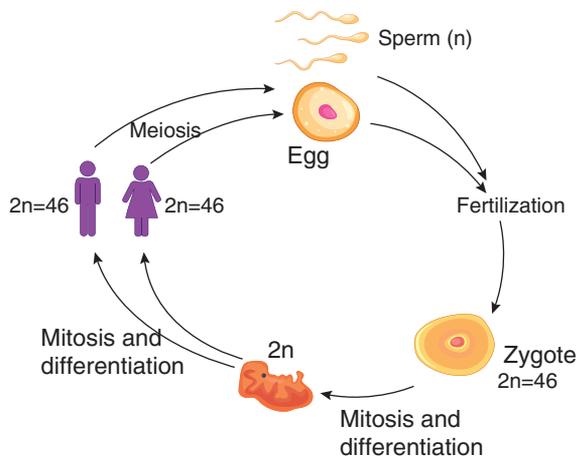
In the treatment of leukemia, the preference of cells obtained from cord blood over bone marrow transplantation is related to which of the following characteristics of the cord blood cells?

- I. high differentiation ability
- II. very low risk of virus transmission
- III. faster reproduction
- IV. being more specialized

- | | |
|------------------|----------------------|
| A) I and II | B) III and IV |
| C) I, II and III | D) I, II, III and IV |

Senior Groups (Grades 10-11-12)

27. The human life cycle is shown in the figure below.

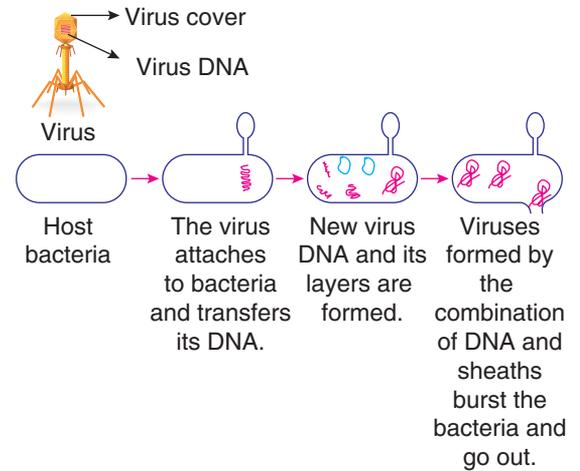


Which of the following ideas about the given life cycle is correct?

- I. During sexual reproduction, a large number of different gametes are formed genetically by meiosis.
- II. In development with mitosis, hereditary diversity increases while chromosome number remains constant.
- III. Each gamete formed as a result of meiosis carries one of the chromosome pairs carried by the ancestral individual.

- A) Only I B) Only II
C) Only III D) I and III

28. The replication of viruses is shown below.



Which of the following explanations about viruses can be made by using this information?

- I. Each virus's host is unique.
- II. Viruses reproduce inside the host cell.
- III. There is one DNA in each virus.
- IV. Viruses live as parasites.

- A) I and II B) I and III
C) II and IV D) I, II and III