NSO

CLASS 9

Contents

SCIENCE OLYMPIAD FOUNDATION

14th NSO

LEVEL - 2

Year 2011-12

MENTAL ABILITY

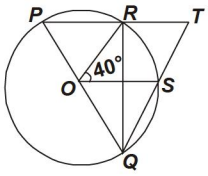
1. If $x + y + z = 1$, $xy + yz + zx = -1$ and $xyz = -1$, then the value of $x^3 + y^3 + z^3$ is ____.

(A) 1 **(B)** –1 **(C)** 0 **(D)** 2

2. *ABCD* is a trapezium with parallel sides *AB* = *a* and *DC* = *b*. If *E* and *F* are mid-points of non-parallel sides *AD* and *BC* respectively, then the ratio of areas of quadrilaterals *ABFE* and *EFCD* is ___.

(A) $a : b$ **(B)** $(a + 3b) : (3a + b)$ **(C)** $(3a + b) : (a + 3b)$ **(D)** $(2a + b) : (3a + b)$

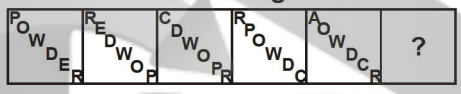
3. *O* is the centre of a circle and *PQ* is a diameter. If $\angle ROS = 40°$, find $\angle RTS$.



(A) 60°
(B) 70°
(C) 50°
(D) 20°

4. Select a figure from the options that would continue the series as established by five problem figures.

Problem Figures

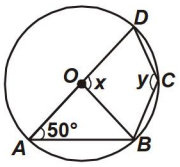


(A)  **(B)**  **(C)**  **(D)** 

5. Aman's present age is three times his son's present age and two-fifth of his father's present age. The average of the present ages of all of them is 46 years. What is the difference between Aman's son's present age and Aman's father's present age?

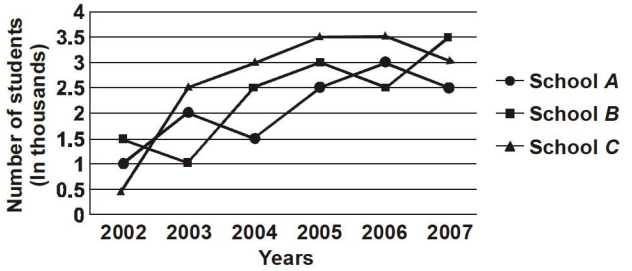
(A) 68 years **(B)** 88 years **(C)** 58 years **(D)** 78 years

6. *O* is the centre of the circle and $\angle DAB = 50°$. Calculate the values of *x* and *y* respectively.



(A) 100°, 130°
(B) 80°, 100°
(C) 70°, 50°
(D) 50°, 130°

7. What was the average number of students in all the schools together in year 2006?



(A) 2000
(B) 5000
(C) 4000
(D) 3000

8. How many such pairs of letters are there in the word PERFORATE each of which has as many letters between them in the word as in the English alphabet?

(A) None **(B)** One **(C)** Two **(D)** Three

9. Find the weight of a lead pipe 3.5 m long, if the external diameter of the pipe is 2.4 cm and the thickness of the lead is 2 mm and 1 cubic cm of lead weighs 11gm.

(A) 4.329 kg **(B)** 5.324 kg **(C)** 2.534 kg **(D)** 3.258 kg

10. Find the value of p, if the mean of the following distribution is 20.

x	15	17	19	$20 + p$	23
f	2	3	4	$5p$	6

(A) 1 **(B)** –1 **(C)** 0 **(D)** Both (A) and (B)

11. If $x^4 + \frac{1}{x^4} = 47$, then the value of $x^3 + \frac{1}{x^3}$ is _____.

(A) 18 **(B)** 27 **(C)** 14 **(D)** 12

12. *P, Q, R, S, T, V, W, Y* and *Z* are sitting around a circle facing the centre. *V* is second to the left of *P* who is third to the left of *Y*. *S* is fourth to the left of *P*. *T* is third to the right of *Q* who is to the immediate right of *V*. *W* is fourth to the right of *Z*. Who is third to the left of *S* ?

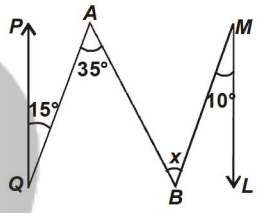
(A) *Y* **(B)** *W* **(C)** *T* **(D)** Data inadequate

13. A bag contains 50 coins and each coin is marked from 51 to 100. One coin is picked at random. The probability that the number on the coin is not a prime number, is ____.

(A) $\frac{1}{5}$ **(B)** $\frac{3}{5}$ **(C)** $\frac{2}{5}$ **(D)** $\frac{4}{5}$

14. In the given figure, *QP* ll *ML* and other angles are shown. Find the value of *x*.

(A) 60°
(B) 35°
(C) 20°
(D) 30°



15. Let p and q be the remainders, when the polynomials $x^3 + 2x^2 - 5ax - 7$ and $x^3 + ax^2 - 12x + 6$ are divided by $(x + 1)$ and $(x - 2)$ respectively. If $2p + q = 6$, then value of a is ____.

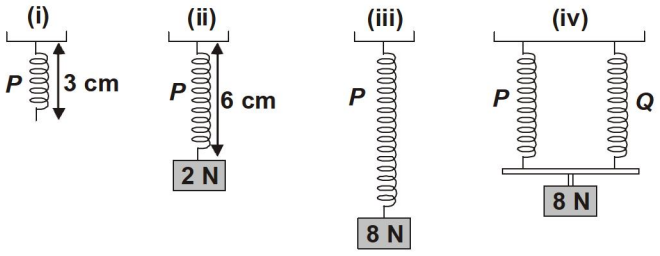
(A) 1 **(B)** 2 **(C)** 4 **(D)** 3

SCIENCE

DIRECTION : Study the diagram given below and answer questions 16 and 17. (The diagrams are not drawn to scale).

16. What is the extension of spring *P* in figure (iii)?

(A) 6 cm **(B)** 9 cm
(C) 12 cm **(D)** 15 cm



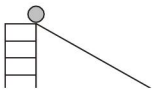
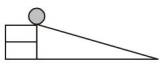
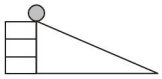
17. Springs *P* and *Q* are similar. What is the length of spring *P* in figure (iv)?

(A) 6 cm **(B)** 9 cm
(C) 12 cm **(D)** 15 cm

18. Which of the following statements is correct?

(A) Kinetic energy of a system can be changed without changing the momentum.
(B) Kinetic energy of a system cannot be changed without changing its momentum.
(C) Momentum of a system cannot be changed without changing its kinetic energy.
(D) A system cannot have energy without having momentum.

19. In which of the following figures, the ball will have the most kinetic energy when each ball is released from the top of the ramp ?

(A)  **(B)**  **(C)**  **(D)** 

20. A microphone is connected to an oscilloscope. The diagram shows the trace on the screen when the microphone receives a pure note.

Which trace can be obtained when a musical instrument produces a note of the same pitch but of a different quality?

(A)  **(B)**  **(C)**  **(D)** 

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21. A barometer is carried from the 1st floor to the 20th floor of a building. Why does the reading on the barometer fall?

(A) Air pressure has increased.
(B) Gravity has decreased.
(C) Temperature has increased.
(D) There is less air above the barometer.

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22. One man takes one minute to raise a box to a height of 1 metre and another man takes 1/2 minute to do so. The energy of the two is _____.

(A) Different
(B) Same
(C) Energy of the first is more
(D) Energy of the second is more

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23. A tennis ball is dropped on to a horizontal surface. As the ball bounces up and down, the height of each bounce gradually decreases. During the motion of the ball ____.

(A) Kinetic energy of the ball is constant
(B) The potential energy of the ball is constant
(C) The sum of the kinetic and potential energies of the ball is constant
(D) The total energy of the ball, ground and air is constant

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24. Match the following and select the correct option.
A boy of mass 55 kg, runs up a flight of 40 stairs, each measuring 0.15 m in 5 s. Column II gives numerical value for quantities described in Column I. Assume units are standard.

Column I	Column II
(a) Force acting on the boy	**(p) 550**
(b) Work done by the boy	**(q) 3300**
(c) Gain of potential energy by the boy	**(r) zero**
(d) Power developed by the boy	**(s) 660**

(A) (a)–(p), (b)–(r), (c)–(q), (d)–(s)
(B) (a)–(s), (b)–(p), (c)–(q), (d)–(r)
(C) (a)–(r), (b)–(s), (c)–(p), (d)–(q)
(D) (a)–(q), (b)–(r), (c)–(s), (d)–(p)

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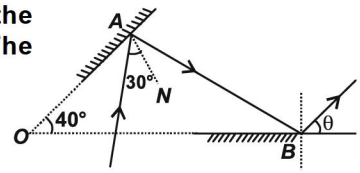
25. Two mirrors are arranged as shown in the figure. Light is incident on the first mirror at an angle of 30° and it reflects towards a second mirror. The value of angle θ is _____.



(A) 15°
(B) 20°
(C) 25°
(D) 30°

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26. The sliding frictional force between 4 kg box and the floor is 15 N. It is pushed across the floor with a constant force such that it accelerates at 0.8 ms^{-2}. What is the force applied to the box ?

(A) 16.6 N **(B)** 18.2 N **(C)** 20 N **(D)** Zero

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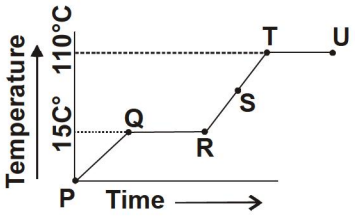
27. Which of these generalizations seems true?

(A) The larger the planet, the longer its day.
(B) The larger the planet, the longer it takes to revolve around the sun.
(C) The farther away the planet from the sun, the longer is its year.
(D) The closer the planet is to the sun, the longer it takes to spin on its axis.

DIRECTION (Q.Nos. 28 & 29) : Look at the given heating curve for a pure substance carefully and answer the following questions :



28. What is the physical state of the substance at point S ?

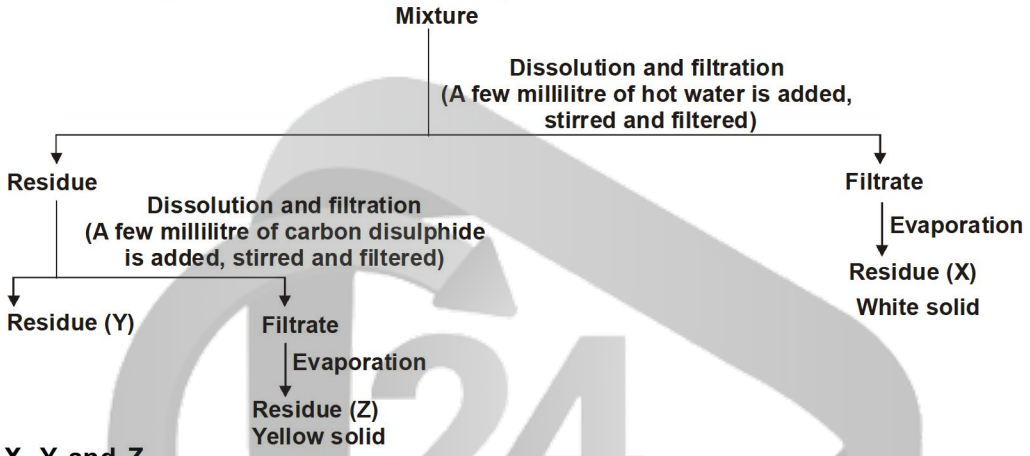
(A) Solid **(B)** Gas

(C) Liquid **(D)** Liquid & gas both

29. Which points on the graph show no change in state?

(A) QR **(B)** RT **(C)** TU **(D)** (A) & (C) both

30. The flow chart of separation of a mixture is given below :



Identify X, Y and Z

(A) X = Nitre, Y = Charcoal, Z = Sulphur **(B)** X = Sulphur, Y = Sand, Z = Iodine

(C) X = Potassium Chloride, Y = Carbon, Z = Sulphur **(D)** Both (A) and (C) are possible

31. State which of the following is not likely to be an element.

I. On heating gives off a gas and leaves a residue.

II. Burns in air to form carbon dioxide and water.

III. Changes into solid at 273 K and to a gas at 373 K.

(A) I **(B)** II and III **(C)** I and III **(D)** I, II, III

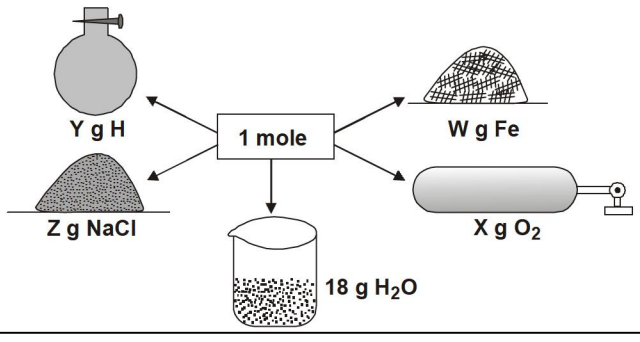
32. Which one of the following is not a property of solution?

(A) Solution is a homogeneous mixture. **(B)** Solution does not scatter light.

(C) Path of light is visible in solution.

(D) Solute particles do not settle down when left undisturbed.

33. Observe the given figure carefully and select the correct option.



(A) W = 55.8, X = 16, Y = 2.016, Z = 58.5

(B) W = 55.8, X = 32, Y = 1.008, Z = 58.5

(C) W = 55.8, X = 16, Y = 1.008, Z = 58.5

(D) W = 55.8, X = 32, Y = 2.016, Z = 58.5

34. A flask P contains 0.5 moles of oxygen gas. Another flask Q contains 0.4 moles of ozone gas. Which flask contains greater number of oxygen atoms?

(A) Flask P **(B)** Flask Q

(C) Both contain same number of atoms **(D)** Incomplete information

35. The composition of three atomic particles is given :

	X	Y	Z
Protons	8	7	7
Neutrons	8	9	9
Electrons	8	8	7

What is the relation between X and Y and between Y and Z ?

(A) X and Y are isotopes, Y and Z are isotopes **(B)** X and Y are isobars, Z is an ion of Y

(C) X and Y are isobars, Y is an ion of Z **(D)** No relation between X and Y, Y and Z are same

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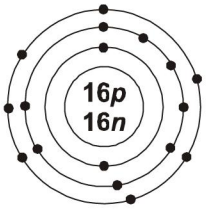
36. The given diagram represents _____.



(A) S

(B) S^-

(C) Cl

(D) Cl^-

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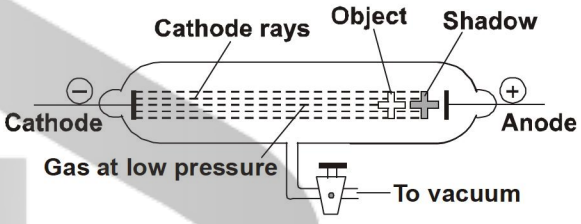
37. The given figure demonstrates _____.



(A) Cathode rays consist of material particles

(B) Cathode rays consist of negatively charged particles

(C) Cathode rays produce fluorescence

(D) Cathode rays travel in straight line

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38. Shefali classified the functions of cell organelles as given in the table below.

Group A	Group B	Group C	Group D
Endocytosis & exocytosis.	Freely permeable. Provides shape and rigidity to the cell.	Storage, modification & packaging of secretory products.	Synthesis and transport of proteins & fats.

Which of the following have the correct headings for the given table ?

	Group A	Group B	Group C	Group D
(A)	Cell wall	Cell membrane	Golgi body	Endoplasmic reticulum
(B)	Cell membrane	Cell wall	Endoplasmic reticulum	Golgi body
(C)	Cell wall	Cell membrane	Endoplasmic reticulum	Golgi body
(D)	Cell membrane	Cell wall	Golgi body	Endoplasmic reticulum

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39. Which of the following statements is/are incorrect ?

(i) Anthrax is a viral disease. **(ii) Pneumonia is caused by virus.**

(iii) Both syphilis and AIDS are sexually transmitted diseases.

(iv) Cancer and hepatitis are non-communicable diseases.

(A) (iv) only **(B)** (i), (ii) & (iv) **(C)** (ii) & (iv) **(D)** (iii) only

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40. Given below are four groups (i-iv), with some examples in each. In each group there is one example that does not fit into it. Identify the odd one in each of these groups and select the correct option.

(i) ***Euplectella, Euspongia, Spongilla, Metridium*** **(ii)** ***Physalia, Antedon, Metridium, Aurelia***

(iii) ***Aphrodite, Asterias, Echinus, Antedon*** **(iv)** ***Chiton, Pila, Euplectella,*** **Mussels**

	(i)	(ii)	(iii)	(iv)
(A)	*Euplectella*	*Antedon*	*Aphrodite*	Mussels
(B)	*Metridium*	*Aurelia*	*Aphrodite*	*Euplectella*
(C)	*Euplectella*	*Metridium*	*Antedon*	Mussels
(D)	*Metridium*	*Antedon*	*Aphrodite*	*Euplectella*

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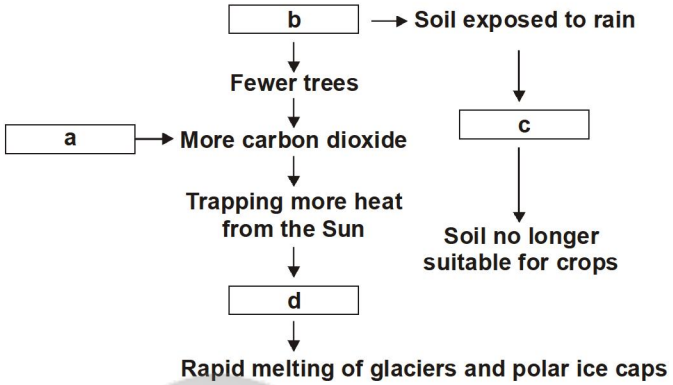
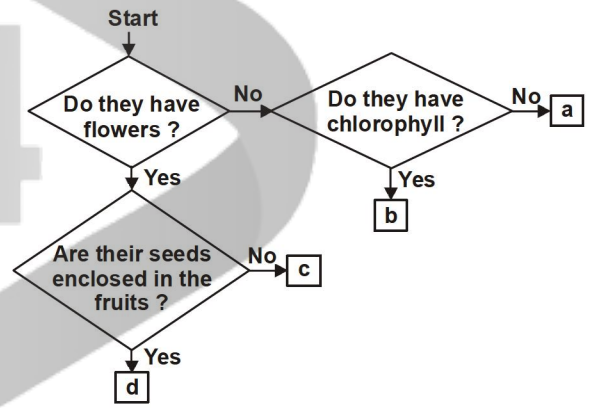
41. The given flow chart is a representation of human activities which can have negative effects on the environment.



Which of the following could be a, b, c and d ?

	a	b	c	d
(A)	Soil erosion	Deforestation	Global warming	Burning fossil fuel
(B)	Deforestation	Global warming	Burning fossil fuel	Soil erosion
(C)	Global warming	Soil erosion	Deforestation	Burning fossil fuel
(D)	Burning fossil fuel	Deforestation	Soil erosion	Global warming

42. Refer the given flow chart and select the correct option.



	a	b	c	d
(A)	*Agaricus*	Algae	*Cycas*	Deodar
(B)	*Fucus*	*Rhizopus*	*Pinus*	Deodar
(C)	*Agaricus*	Algae	*Cycas*	Strawberry
(D)	*Fucus*	*Rhizopus*	*Pinus*	Strawberry

43. Which of the following are correctly paired?

(i)	**Growth**	**–**	**Cambium**	**(ii)**	**Protection**	**–**	**Hypodermis**
(iii)	**Transport of food**	**–**	**Phloem**	**(iv)**	**Support**	**–**	**Collenchyma**

(A) (i), (ii), (iii) & (iv) **(B)** (i), (iii) & (iv) **(C)** (i) & (iii) **(D)** (i), (ii) & (iii)

44. The aim of plant breeding programme is to produce _____.

(A) Disease–free varieties **(B)** High–yielding varieties

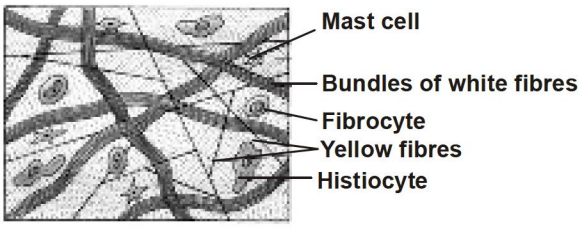
(C) Early–maturing varieties **(D)** All of these

45. SARS is caused by _(i)_ which affects lungs. _(ii)_ is caused by *Leishmania* which lives as intracellular parasite in cells of spleen and bone marrow. Sleeping sickness is caused by *Trypanosoma* and its target organ is _(iii)_.

Select the correct sequence of terms to complete the above paragraph.

	(i)	(ii)	(iii)
(A)	Coronavirus	Kala-azar	Brain
(B)	Ribovirus	Hepatitis	Liver
(C)	Adenovirus	Jaundice	Spleen
(D)	Coronavirus	Filariasis	Brain

46. Which of the following parts in the given figure are labelled incorrectly ?



(A) Mast cell and fibrocyte
(B) Mast cell and histiocyte
(C) White fibres and mast cell
(D) Yellow fibres and fibrocyte

47. Which of the following is an incorrect match ?

(A) Oil spills – Physical water pollutants
(B) Detergents – Particulate matter
(C) Plastics – Non-degradable soil pollutants
(D) Domestic wastes – Degradable soil pollutants

48. Some species of fishes can be cultured in a single fish pond. These fishes do not compete for food as they have different food habits. Select the incorrect pair of fish and its food habit.

(A) *Labeo rohita* – Column feeder
(B) *Catla catla* – Surface feeder
(C) *Cirrhinus mrigala* – Bottom feeder
(D) Common carp – Surface feeder

49. Which of the following statements is/are true and false ?

(i) **The body of *Cladophora* is differentiated into roots, stem and leaves.**
(ii) ***Marsilea* is devoid of specialised vascular tissue and produce seeds.**
(iii) ***Cycas* has differentiated body and produce seeds.**
(iv) **Both *Marsilea* and horse-tails possess vascular tissue and produce seeds.**

(A) (iii) is true; (i), (ii) & (iv) are false
(B) (iii) & (iv) are true; (i) & (ii) are false
(C) (i) & (ii) are true; (iii) & (iv) are false
(D) (iv) is true; (i), (ii) & (iii) are false

50. Which of the following match is incorrect ?

(i) **Diffusion – Movement of substances from higher concentration to lower concentration**
(ii) **Osmosis – Occurs in only one direction**
(iii) **Semi-permeable membrane – Prevents passage of solute molecules**
(iv) **Endosmosis – Withdrawal of water from the vacuole**
(v) **Plasmolysis – Shrinkage of protoplasm when kept in hypotonic solution**

(A) (ii), (iv) & (v)
(B) (iv) & (v)
(C) (i), (iii) & (iv)
(D) (iv) only

SPACE FOR ROUGH WORK

SCIENCE OLYMPIAD FOUNDATION

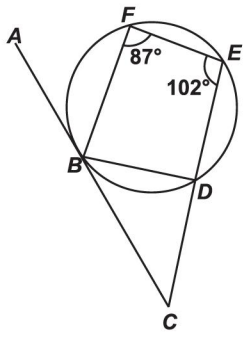
15th NSO

LEVEL - 2

Year 2012-13

MENTAL ABILITY

1. In the diagram, *ABC* and *CDE* are straight lines, $\angle BFE = 87°$ and $\angle FEC = 102°$. Find $\angle DBF$ and $\angle BDC$ respectively.



(A) 78°, 93°

(B) 78°, 87°

(C) 63°, 84°

(D) 87°, 93°

2. There are 2 sets of number cards. The first set contains numbers 1, 2, 3 and 4. The second set contains 5, 6 and 7. A card is randomly drawn from each set. Let *A* be the event that the sum of the 2 cards drawn is a multiple of 3. How many outcomes are there in event *A*?

(A) 4 **(B)** 2 **(C)** 3 **(D)** 5

3. Read the following information carefully and answer the question given below.

Four young men Raj, Sunder, Tarun and Upal are married to Rekha, Sunita, Tara and Uma and the couples live in Rampur, Sanchi, Tirupati and Udhampur.

(i) The first letter of names of men, their wives and cities does not match.

(ii) Sunita is not Raj's wife.

(iii) Sunder does not live in Rampur or Udhampur and is not Rekha's husband.

(iv) Upal and Tara do not live in Sanchi.

Which pair given below is right combination of wife and city for Tarun?

(A) Sunita, Tirupati **(B)** Tara, Sanchi **(C)** Uma, Rampur **(D)** Rekha, Sanchi

4. *ABCD* is a parallelogram, *AD* is produced to *E* so that *DE* = *DC* and *EC* produced meets *AB* produced in *F*. Then *BF* =

(A) *AC* **(B)** *BD* **(C)** *BC* **(D)** All of these

5. From a solid sphere of radius 15 cm, a right circular cylindrical hole of radius 9 cm whose axis passing through the centre is removed. The total surface area of the remaining solid is _____.

(A) 1188 π cm^2 **(B)** 108 π cm^2 **(C)** 1170 π cm^2 **(D)** 144 π cm^2

6. If $x^y = y^x$ and $y = 2x$ then x is equal to _____.

(A) 2 **(B)** -2 **(C)** 1 **(D)** -1

7. If *xAy* means $x + y$, *xSy* means $x - y$, *xMy* means $x \times y$ and *xDy* means $x \div y$, then the value of *4D2S3M6A12* is _____.

(A) -4 **(B)** 18 **(C)** $\frac{-47}{4}$ **(D)** 28

8. The equations of two lines are given below :

$$3x - 2y + 6 = 0 \; ; \; x + 2y - 6 = 0$$

After obtaining the graph of these two lines, the area of triangle formed by the two lines and *x*-axis is _____.

(A) 8 sq. units **(B)** 10 sq. units **(C)** 12 sq. units **(D)** 14 sq. units

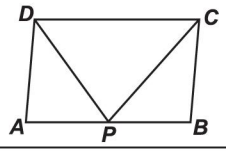
9. Consider the following data.

41, 43, 127, 99, 61, 92, 71, 58, 57

If 58 is replaced by 85, what will be the new median?

(A) 61 **(B)** 71 **(C)** 99 **(D)** 85

10. ***ABCD*** **is a parallelogram. If** ***AB*** **= 2** ***AD*** **and** ***P*** **is the mid-point of** ***AB*****, then** $\angle CPD$ **is equal to _____.**



(A) 100° **(B)** 135°
(C) 45° **(D)** 90°

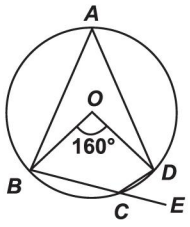
11. **If** $ax^3 + bx^2 + x - 6$ **has** $x + 2$ **as a factor and leaves a remainder 4 when divided by** $(x - 2)$**, find the values of** ***a*** **and** ***b*** **respectively.**

(A) 0, 2 **(B)** 3, 2 **(C)** 1, 5 **(D)** 2, 0

12. **The slant height of a conical tent made of canvas is** $\frac{14}{3}$ **m. The radius of tent is 2.5 m. The width of the canvas is 1.25 m. If the rate of canvas per metre is ₹ 33, then the total cost of the canvas required for the tent (in ₹) is _____.**

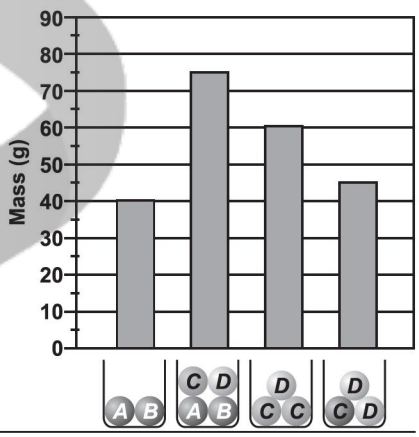
(A) 726 **(B)** 950 **(C)** 960 **(D)** 968

13. **Find the value of** $\angle DCE$ **in the given figure.**



(A) 100°
(B) 80°
(C) 90°
(D) 75°

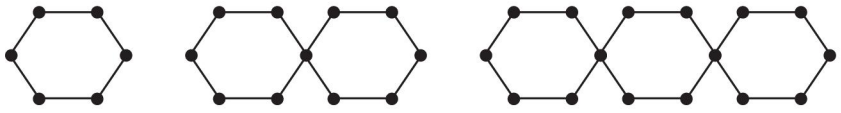
14. **The line graph shows the masses of a container when different marbles are placed in it. What is the mass of marble** ***C*** **and** ***D*** **respectively ?**



(A) 35 grams, 25 grams
(B) 10 grams, 15 grams
(C) 25 grams, 10 grams
(D) 30 grams, 10 grams

15. **Which pattern will have 406 dots?**

(A) 100
(B) 81
(C) 52
(D) 149



Pattern 1 Pattern 2 Pattern 3

SCIENCE

16. **The kinetic energy of a particle continuously increases with time, then _____.**

(A) The resultant force on the particle must be parallel to the velocity at all instant
(B) The resultant force on the particle must be at an angle less than 90° all the time
(C) Its height above the ground level must continuously decrease
(D) The magnitude of its linear momentum is increasing continuously

17. **A rock is thrown downward from an unknown height above the ground with an initial speed of 10 m** s^{-1}**. It strikes the ground 3.0 s later. Find the initial height of the rock above ground.**

(A) 44 m **(B)** 14 m **(C)** 75 m **(D)** 30 m

18. **A 500 kg rocket sled can be accelerated at a constant rate from rest of 1600 km** h^{-1} **in 1.8 s. What is the magnitude of the required net force?**

(A) 1.2×10^5 N **(B)** 1.2×10^4 N **(C)** 2.4×10^5 N **(D)** 2.4×10^4 N

19. **The weight of a balloon is W_1 when empty and W_2 when filled with air. Both are weighed in air by the same sensitive spring balance and under identical condition. Then**

(A) $W_1 = W_2$, as the weight of air in the balloon is offset by the force of buoyancy on it.
(B) $W_2 < W_1$, due to the force of buoyancy acting on the filled balloon
(C) $W_2 > W_1$ as the air inside is of a greater pressure and hence has greater density than the air outside.
(D) $W_2 = W_1$ + weight of the air inside it.

---

20. **An electrically maintained tuning fork vibrates with constant frequency and constant amplitude. If the temperature of the surrounding air increases but pressure remains constant, the sound produced will have _____.**

(A) Larger frequency **(B)** Smaller time period **(C)** Larger velocity **(D)** Smaller wavelength

---

21. **The energy absorbed by a solar panel is used to charge a battery. During the day, the battery stores 1.6 J of energy each second. At night, the battery is used to light a 1.2 W lamp for 18000 s. What is the minimum time for which the battery must be charged during the day?**

(A) 9375 s **(B)** 13500 s **(C)** 24000 s **(D)** 34560 s

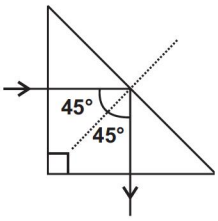
---

22. **A jet plane starts from rest on the runway and accelerates for takeoff at 2.30 m s^{-2}. It has two jet engines, each of which exerts a thrust of 1.40×10^5 N. What is the weight of the plane?**

(A) 1.19×10^6 N **(B)** 2.80×10^5 N **(C)** 2.38×10^6 N **(D)** 4.17×10^5 N

---

23. **The diagram shows a right-angled prism being used to turn a ray of light through 90°. What is the critical angle for the light in the glass?**



(A) Less than 45°
(B) Equal to 45°
(C) Greater than 45°
(D) Equal to 90°

---

24. **The diagram shows a part of a spring that is shaken from side-to-side to produce a wave.**

The distance between successive peaks is 0.60 m and the frequency is 2.5 Hz. How long does it take for a wave to travel 3.0 m along the spring?

(A) 0.20 s **(B)** 0.50 s **(C)** 2.0 s **(D)** 5.0 s

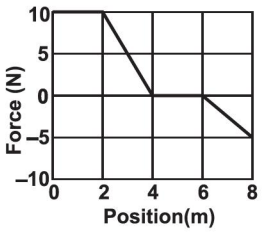
---

25. **Objects *A* and *B* are separated by a distance *r*. The magnitude of the force of gravity on *A* by *B* is given as F_{AB}, and the magnitude of the force of gravity on *B* by *A* is F_{BA}. If the mass of *A* is doubled while that of *B* is unchanged, then _____.**

(A) F_{AB} will double while F_{BA} will remain the same. **(B)** F_{AB} will remain the same while F_{BA} will double.
(C) Both F_{AB} and F_{BA} will double. **(D)** Both F_{AB} and F_{BA} will remain unchanged.

---

26. **A 5.0 kg block moves in a straight line on a horizontal frictionless surface under the influence of a force that varies with position as shown. How much work is done by the force as the block moves from the origin to x = 8.0 m?**



(A) 25 J **(B)** 50 J
(C) 100 J **(D)** 125 J

---

27. **According to the chart, on which planet would a ball fall the fastest?**

Planet	Earth	Jupiter	Neptune	Saturn
Acceleration due to gravity	10	26	14	12

(A) Jupiter **(B)** Saturn **(C)** Neptune **(D)** Earth

28. Suppose that figures 1 and 2 represent the heating curves for substances P and Q respectively.

Figure 1

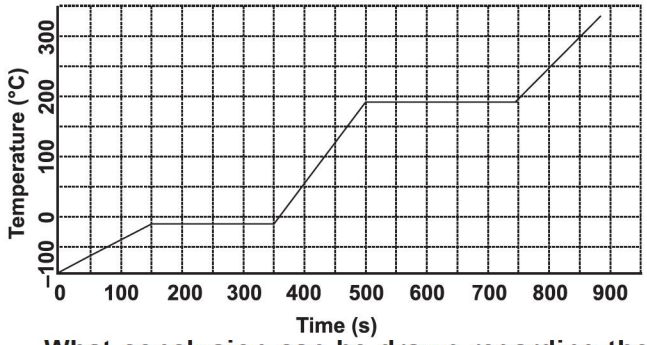
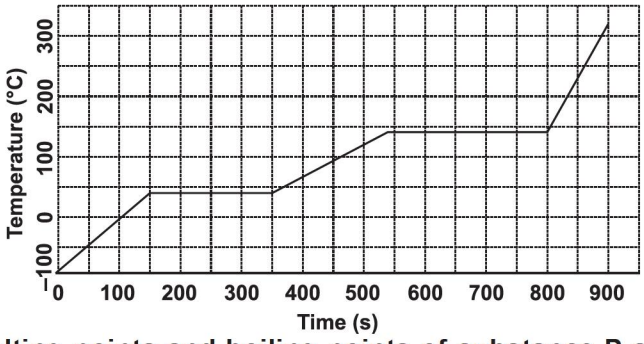


Figure 2



What conclusion can be drawn regarding the melting points and boiling points of substance P and substance Q?

(A) Substance P has a higher melting point and a higher boiling point than substance Q.
(B) Substance Q has a higher melting point and a higher boiling point than substance P.
(C) Substance P has the higher melting point but substance Q has the higher boiling point.
(D) Substance Q has the higher melting point but substance P has the higher boiling point.

---

29. Which of the following pairs has elements with same number of neutrons?

(A) Ne and Na **(B)** Al and Si **(C)** C and F **(D)** Mg and S

---

30. Choose the incorrect statement(s) among the following.

1. The maximum number of electrons present in L and N shells are 8 and 18 respectively.
2. The maximum number of electrons that can be accommodated in the outermost orbit is 8.
3. Shells are filled in a step-wise manner.

(A) 1 **(B)** 2 **(C)** 1 and 2 **(D)** None of these

---

31. Chemical formulae of few compounds are given.

(i) $Zn_3(PO_4)_2$ **(ii)** SFe **(iii)** AlN_3 **(iv)** $Ca(HCO_3)_2$ **(v)** K_2SO_4

The wrong chemical formulae are

(A) (ii) and (iii) **(B)** (i), (iv) and (v) **(C)** (i) and (iv) **(D)** (i), (ii) and (iv)

---

32. The given table contains information about the various fractions obtained when crude oil is fractionally distilled.

The fraction X would be distilled over first and fraction Y will be collected at the bottom of the column. Identify X and Y respectively.

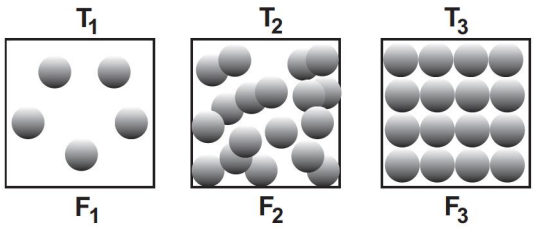
Fraction	Boiling point (°C)
Bitumen	over 359
Fuel gas	below 40
Gasoline	40–100
Heavy gas oil	300–350
Kerosene	160–250
Light gas oil	250–300
Naphtha	75–150

(A) Bitumen, Naphtha **(B)** Bitumen, Fuel gas
(C) Fuel gas, Bitumen **(D)** Gasoline, Heavy gas oil

---

33. The microscopic view of three different substances are shown in the given diagram.

Where T_1, T_2 and T_3 are temperatures and F_1, F_2 and F_3 are the forces of attraction of the particles of the respective states. Choose the correct order among the following.



(A) $T_1 < T_2 < T_3$ and $F_1 < F_2 < F_3$ **(B)** $T_1 > T_2 > T_3$ and $F_1 > F_2 > F_3$
(C) $T_1 < T_2 < T_3$ and $F_1 > F_2 > F_3$ **(D)** $T_1 > T_2 > T_3$ and $F_1 < F_2 < F_3$

34. Which of the following students have the maximum number of atoms?

Raman	**:**	**56 g of Fe;**	**Vijay**	**:**	**18.9 g of HNO_3**
Niharika	**:**	**1 mol of CO_2;**	**Abhinav**	**:**	**8 g of He**

(A) Raman **(B)** Niharika **(C)** Vijay **(D)** Abhinav

---

35. Crystallisation technique is better than simple evaporation technique as _____.

(A) Some solids are evaporated with solvent

(B) Some solids decompose or some may get charred on heating to dryness

(C) Some impurities may remain dissolved in the solution even after filtration, which on evaporation contaminate the solid

(D) Both (B) and (C)

---

36. Shobha dissolved 42 g of sugar in 150 g water. She stirred the solution well and then filtered it. She obtained 12 g of sugar as the residue. Find the solubility of sugar.

(A) 2.4% **(B)** 16.7% **(C)** 21.1% **(D)** 36%

---

37. There are three elements, X, Y and Z.

X : It is the smallest element with zero valency.

Y : It has four neutrons more than that of X.

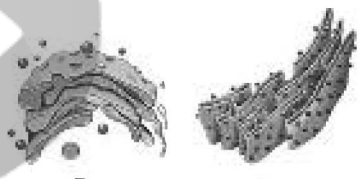
Z : It has one shell and three valence electrons more than that of Y.

By using the given hints, identify elements, X, Y and Z respectively.

(A) H, Cl, Si **(B)** Ne, Al, S **(C)** He, B, S **(D)** H, N, P

---

38. Categorise the following functions respectively associated with the given cell organelles P and Q.



P Q

(i) Works as a seat of protein synthesis.

(ii) Helps in secretion of mucus, enzymes and hormones.

(iii) Helps in storage of secretory products.

(iv) Helps in development of acrosome of sperm.

(v) Helps in membrane biogenesis.

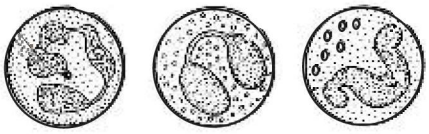
(vi) Forms a continuous transport channel with nuclear membrane.

(A) P - (i), (ii), (v); Q - (iii), (iv), (vi) **(B)** P - (iii), (iv), (v); Q - (i), (ii), (vi)

(C) P - (ii), (iii), (iv); Q - (i), (v), (vi) **(D)** P - (i), (ii), (iii), (iv); Q - (v), (vi)

---

39. Identify the blood cells in the given figure and select the correct option regarding them.



P Q R

(A) P represents basophil which releases histamine and heparin.

(B) Q represents eosinophil whose number increases in asthmatic people.

(C) R represents neutrophil which is phagocytic in nature.

(D) All of these

---

40. The given figure shows four different types of epithelium P, Q, R and S. Select the correct option regarding this.

P Q R S

(A) P is found in organs involved in secretion such as stomach.

(B) R is found in respiratory tract and helps in gaseous exchange.

(C) Q is found in outer skin layer of sole and palms and is protective in function.

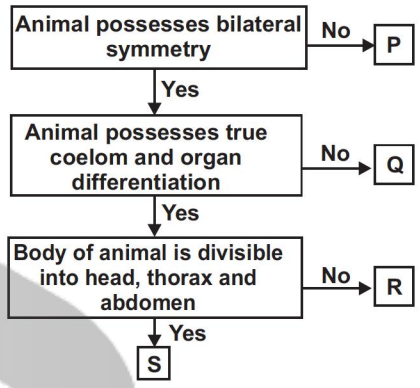
(D) S is ciliated columnar epithelium and is found in inner surface of eyelids.

41. Refer the given table. Which of the following options correctly identifies P, Q, R and S in the table?

	Disease	Causative agent	Vaccine
1.	Tuberculosis	*Mycobacterium tuberculosis*	P
2.	Measles	Q	MMR
3.	R	*Bordetella pertussis*	S

	P	Q	R	S
(A)	DPT	*Flavi virus*	Chicken pox	*Varicella* vaccine
(B)	DPT	*Rubeolla virus*	Whooping cough	BCG
(C)	BCG	*Rubeolla virus*	Whooping cough	DPT
(D)	BCG	*Flavi virus*	Polio	Salk vaccine

42. Study the given chart and select the option which incorrectly identifies any of the animals, P, Q, R and S.



(A) P is *Aurelia* and Q is *Ascaris.*

(B) Q is *Ascaris* and R is *Nereis.*

(C) R is *Pheretima* and S is *Obelia.*

(D) S is *Periplaneta* and P is *Spongilla.*

43. Read the following statements.

(i) W causes peptic ulcers. **(ii) X is a non-heritable, communicable disease.**

(iii) Disease Y is transmitted through a vector in which human RBCs and liver cells are affected.

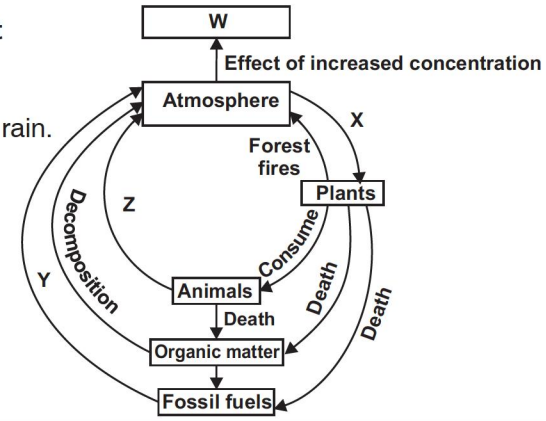
(iv) Z is a disease caused by a protozoan and damages the nervous system.

Which of the following is correct regarding W, X, Y and Z?

(A) W is a protozoan and X is diabetes. **(B)** X is thalassaemia and Y is malaria.

(C) W is a bacterium and Z is kala-azar. **(D)** W is a bacterium and Z is sleeping sickness.

44. Refer the given biogeochemical cycle of 'P' and select the correct option regarding it.



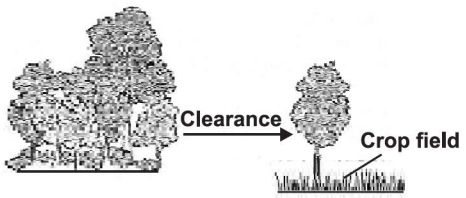
(A) P is carbon dioxide, X is photosynthesis and W is acid rain.

(B) P is nitrogen, Y is combustion and W is acid rain.

(C) P is carbon dioxide, X is photosynthesis and W is global warming.

(D) P is nitrogen, X is photosynthesis and Z is respiration.

45. The given diagram shows a tropical forest before and after the clearance, for agricultural use. Which of the following could be the outcome of this clearance?



(A) Soil will turn saline because minerals present in soil will be used less.

(B) Desertification will occur because all plants are removed.

(C) Soil erosion will speed up because larger trees hold more soil than small plants.

(D) Soil will become waterlogged because crop fields are regularly irrigated.

46. Read the given statements.

(a) ____ are collectively called ____ as all of these are seedless plants and have inconspicuous reproductive organs.

(b) ____ are collectively called ____ as they are seeded plants and possess conspicuous reproductive organs.

(c) The scientific nomenclature of organisms used today, was developed by ____ and consists of ____ and species name.

(d) Class Aves consists of ____ animals while class Reptilia consists of ____ animals.

Select the option which correctly fills the blanks in any two of the above statements.

(A) (a) - Bryophytes and pteridophytes; Cryptogams
(b) - Gymnosperms and angiosperms; Phanerogams

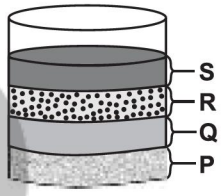
(B) (c) - Bentham; Genus
(d) - Warm blooded; Cold blooded

(C) (b) - Gymnosperms and angiosperms; Cryptogams
(c) - Carolus Linnaeus; Class

(D) (a) - Algae, bryophytes and pteridophytes; Cryptogams.
(d) - Warm blooded; Cold blooded

---

47. Some garden soil is put into a beaker containing water, stirred well and left steady to settle down. After sometime, different layers of soil components, P, Q, R and S can be seen in the beaker. Select the option which correctly identifies different soil components.

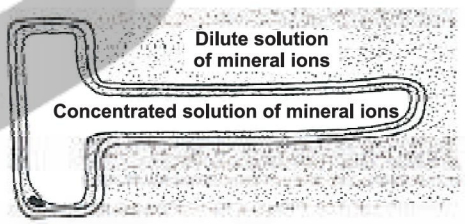


	P	Q	R	S
(A)	Gravel	Sand	Silt	Suspended clay
(B)	Sand	Gravel	Silt	Suspended clay
(C)	Gravel	Silt	Sand	Suspended clay
(D)	Gravel	Silt	Suspended clay	Sand

---

48. Refer the given diagram which shows a root hair cell, surrounded by a dilute solution of mineral ions.

The mineral ions will move _____.



(A) Against the concentration gradient by diffusion or osmosis
(B) Against the concentration gradient by active transport
(C) Along the concentration gradient by diffusion or osmosis
(D) Along the concentration gradient by active transport

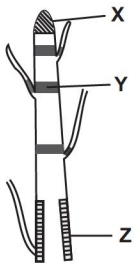
---

49. X = An indigenous milch breed of cow, Y = An exotic milch breed of cow
Z = A high milk–yielding cross-breed of cow. Identify X, Y and Z and select the correct option.

(A) X - Murrah; Y - Ayrshire; Z - Karan-Fries
(B) X - Surti; Y - Jersey; Z - Frieswal
(C) X - Sahiwal; Y - Karan-Swiss; Z - Ayrshire
(D) X - Red Sindhi; Y - Ayrshire; Z - Karan-Fries

---

50. Refer the given figure showing plant meristems and select the incorrect option regarding this.



(A) If part X is removed, side branches will grow well and plant will become short and bushy in appearance.
(B) If part Y is removed, internode elongation will not occur and leaves and flowers will not be produced at all.
(C) If part Z is removed, a mango tree stem will remain as thin as a mustard plant.
(D) Both (A) and (C)

SPACE FOR ROUGH WORK

SCIENCE OLYMPIAD FOUNDATION

16th NSO

LEVEL - 2

Year 2013-14

MENTAL ABILITY

1. The given table shows the birth month of 50 students of class IX.

Jan.	Feb.	March	April	May	June
4	5	2	5	3	4
July	Aug.	Sep.	Oct.	Nov.	Dec.
4	6	4	5	4	4

The probability that the student was born in August is _____.

A. $\frac{6}{40}$

B. $\frac{3}{25}$

C. $\frac{1}{25}$

D. $\frac{7}{25}$

2. If 92 is replaced by 99 and 41 by 43 in the given data, find the new median.

45, 64, 87, 41, 58, 76, 35, 90, 56, 92, 33

A. 58

B. 56

C. 45

D. 64

3. A cylindrical tub of radius 16 cm contains water to a depth of 30 cm. A spherical iron ball is dropped into the tub and thus level of water is raised by 9 cm. What is the radius of the ball?

A. 14 cm

B. 18 cm

C. 12 cm

D. 20 cm

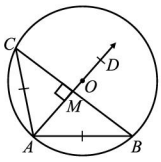
4. In a circle of radius 5 cm, AB and AC are two equal chords such that $AB = AC = 6$ cm. Find the length of the chord BC.

A. 9.8 cm

B. 9.6 cm

C. 9.2 cm

D. 7.3 cm



5. In a row of 29 boys Vikram is at seventeenth position from the left end while Mohit is seventeenth from the right end. How many boys are there between Vikram and Mohit?

A. 5

B. 6

C. 3

D. 4

6. If '20 – 10' means 200; '8 ÷ 4' means 12; '6 × 2' means 4 and 12 + 3 means 4, then

100 – 10 × 1000 ÷ 1000 + 100 × 10 = ?

A. 1090

B. 0

C. 1900

D. 20

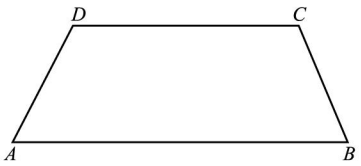
7. Find the area of a trapezium $ABCD$ in which $AB||DC$, $AB = 77$ cm, $BC = 25$ cm, $CD = 60$ cm and $DA = 26$ cm.

A. 1644 cm^2

B. 1964 cm^2

C. 1734 cm^2

D. 1728 cm^2



8. Find the missing character.

A. 3

B. 4

C. 5

D. 6

7	4	5
8	7	6
3	3	?
29	19	31

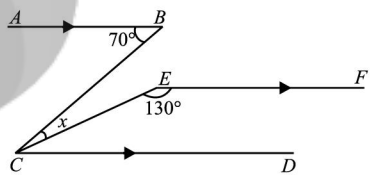
9. In the given figure, $AB||CD||EF$. Find the value of x.

A. 20°

B. 40°

C. 30°

D. 50°



10. 583 is related to 293 in the same way as 488 is related to _____.

A. 291

B. 378

C. 487

D. 581

11. Study the following information carefully and answer the given question.

(i) A, B, C, D, E, F and G are playing cards sitting around a circular table.

(ii) D is not the neighbour of C or E.

(iii) A is the neighbour of B and C.

(iv) G, who is second to the left of D, is the neighbour of E and F.

Which of the following statements is incorrect?

A. E is between G and C.

B. F is between G and D.

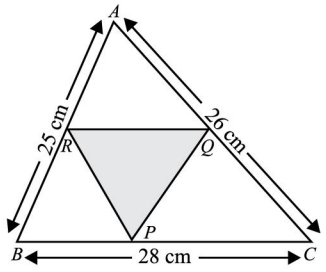
C. B is on the immediate left of D.

D. A is on the immediate right of B.

12. The polynomials $(ax^3 + 3x^2 - 3)$ and $(2x^3 - 5x + a)$ when divided by $(x - 4)$ leave the same remainder. Find the value of a.
A. 1
B. 3
C. 2
D. 4

13. From a wooden cylindrical block, whose diameter is equal to its height, a sphere of maximum possible volume is curved out. What is the ratio of the volume of the utilised wood to that of the wasted wood?
A. 2 : 1
B. 1 : 2
C. 3 : 2
D. 2 : 3

14. Girls are asked to prepare Rangoli in triangular shape in a school. Dimensions of ΔABC are 26 cm, 28 cm, 25 cm. Garland is to be placed along the side of ΔPQR which is formed by joining mid-points of sides of ΔABC. Find the length of garland.



A. 42.3 cm
B. 37 cm
C. 29 cm
D. 39.5 cm

15. How many solutions does the linear equation $2x + 3(y - 1) = 13$ have?
A. 1
B. 3
C. 6
D. Infinitely many

SCIENCE

16. A rubber ball is dropped from a height of 5 m on a plane. On bouncing it rises to 1.8 m. The ball loses its velocity on bouncing by a factor of
A. 3/5
B. 2/5
C. 16/25
D. 9/25

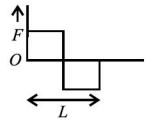
17. A body projected vertically from the earth reaches a height equal to earth's radius before returning to the earth. The power exerted by the gravitational force is greatest
A. At the highest position of the body.
B. At the instant just before the body hits the earth.
C. It remains constant throughout
D. At the instant just after the body is projected.

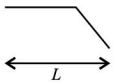
18. Read the given statements and select the correct option.
Statement-1 : The stars twinkle, while the planets do not.
Statement-2 : The stars are much bigger in size than the planets.
A. Both statements-1 and 2 are true and statement-2 is the correct explanation of statement-1.
B. Both statements-1 and 2 are true but statement-2 is not the correct explanation of statement-1.
C. Statement-1 is true and statement-2 is false.
D. Both statements-1 and 2 are false.

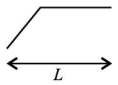
19. Sound waves travel at 350 m s^{-1} through warm air and at 3500 m s^{-1} through brass. The wavelength of a 700 Hz acoustic wave as it enters brass from warm air
A. Decrease by a factor 10.
B. Increase by a factor 20.
C. Increase by a factor 10.
D. Decrease by a factor 20.

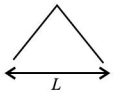
20. Density changes are responsible for which method of thermal energy transfer?
A. Conduction only
B. Convection only
C. Radiation only
D. All of these

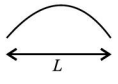
21. A person used force F, shown in figure to move a load with constant velocity on a surface. Identify the correct surface profile.



A. 

B. 

C. 

D. 

22. A shell in flight, explodes into four unequal parts. Which of the following is conserved?
A. Potential energy
B. Momentum
C. Kinetic energy
D. Both A and C

23. A cricket ball of mass 150 g moving with a speed of 126 km/h hits at the middle of the bat, held firmly at its position by the batsman. The ball moves straight back to the bowler after hitting the bat. Assuming that collision between ball and bat is completely elastic and the two remain in contact for 0.001 s, the force that the batsman had to apply to hold the bat firmly at its place would be _____.

A. 10.5 N B. 21 N
C. 1.05×10^4 N D. 2.1×10^4 N

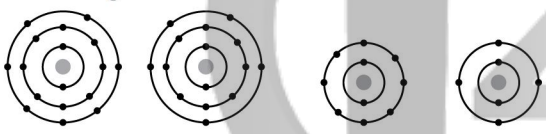
24. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from the same point O along three different frictionless paths. The speeds of the three objects, on reaching the ground, will be in the ratio of _____.

A. $m_1 : m_2 : m_3$ B. $m_1 : 2m_2 : 3m_3$
C. $1/m_1 : 1/m_2 : 1/m_3$ D. 1 : 1 : 1.

25. The speed of a wave in a certain medium is 960 m/s. If 3600 waves pass over a certain point of the medium in 1 minute, the wavelength is _____.

A. 2 m B. 8 m
C. 4 m D. 16 m

26. Schematic atomic structures of the elements I, II, III and IV are given below.



I II III IV

The elements with highest and least valencies respectively are _____.

A. II, I
B. I, III
C. III, IV
D. IV, III

27. Which of the following are correctly matched?

	Material	Hetero-geneous mixture	Homo-geneous mixture	Pure substance
(i)	Rubber	×	×	✓
(ii)	Mercury	×	×	✓
(iii)	Sugar solution	×	✓	×
(iv)	Cheese	×	✓	×
(v)	Sodium chloride	×	×	✓
(vi)	Butter	✓	×	×

A. (iv) only
B. (ii) and (iii) only
C. (i), (v) and (vi) only
D. (ii), (iii), (v) and (vi) only

28. Match Column I with Column II and select the correct option from the codes given below.

	Column I		Column II
(a)	Drying of clothes on a windy day	(i)	Time taken for evaporation increases
(b)	Liquefaction of gases	(ii)	Decreasing pressure and increasing temperature
(c)	Change in state of dry ice from solid to gas	(iii)	Increasing pressure and decreasing temperature
(d)	Less cooling effect of sweating in coastal areas	(iv)	Rate of evaporation increases

A. a - (i), b - (ii), c - (iii), d - (iv)
B. a - (iv), b - (iii), c - (i), d - (ii)
C. a - (iii), b - (iv), c - (ii), d - (i)
D. a - (iv), b - (iii), c - (ii), d - (i)

29. Elements X, Y and Z have valencies 1, 3 and 4 respectively. Formula unit masses of their oxides are 62, 102 and 64 respectively. If atomic mass of Z is divided by the difference in atomic masses of X and Y then value obtained is the atomic number of which of the following elements?

A. Carbon
B. Nitrogen
C. Oxygen
D. Fluorine

30. Read the given observations for four elements ${}^{A_1}_{Z_1}P$, ${}^{A_2}_{Z_2}Q$, ${}^{A_3}_{Z_3}R$ and ${}^{A_4}_{Z_4}S$ carefully. Here Z represents atomic number and A represents mass number.

(i) Elements P and R show similar chemical properties.
(ii) Elements Q and S belong to different groups.
(iii) For elements P and R, $Z_1 = Z_3$ and $A_1 \neq A_3$.
(iv) For elements Q and S, $Z_2 \neq Z_4$ and $A_2 = A_4$.

Which of the following statements is correct?

A. P and R are isobars while Q and S are isotopes.
B. P and S are isobars while Q and R are isotopes.
C. P and Q are isotopes while R and S are isobars.
D. P and R are isotopes while Q and S are isobars.

31. Read the given statements and select the correct option.

Statement 1 : When ice gets converted into water and water into gas, the kinetic energy of the particles increases.

Statement 2 : There is rise in temperature during the melting of ice or boiling of water.

A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true and statement 2 is false.
D. Both statements 1 and 2 are false.

32. A cation M and an anion N have the following composition:

Element	Protons	Neutrons	Electrons	Mass no.
M	12	r	p	25
N	q	17	14	s

M and N form a compound with formula M_3N_2.
p, q, r and s are respectively _____.

A. 11, 12, 13, 28
B. 10, 11, 13, 27
C. 13, 11, 12, 25
D. 10, 11, 13, 28

33. A science teacher allotted the first four fully filled shells K, L, M and N of an atom to four students, Naveen, Meeta, Rahul and Sunita respectively.
Which of the following is correct statement?

A. Meeta and Sunita will be having total of 32 electrons.
B. Sunita has 4 times more electrons than Meeta.
C. Naveen and Rahul differ by 14 electrons.
D. All statements are correct.

34. Anushka, Karuna, Sohan and Krishna have containers with 6 moles of F atoms, 6 moles of F_2 molecules, 12.044×10^{23} number of F atoms and 6.022×10^{23} number of F_2 molecules respectively.
Which among the four will have same amount of F atoms in grams?

A. Karuna and Krishna
B. Sohan and Krishna
C. Anushka and Karuna
D. None of these.

35 A single-celled organism which has contractile vacuole to move water from inside to outside of the cell was studied in an experiment in which the organism was placed in water with different salt concentrations. The rate at which the contractile vacuole contracted to pump out excess water was recorded.

Salt conc.	Rate of contractile vacuole contractions per minute
Very high	2
High	8
Medium	15
Low	22
Very Low	30

Which of the following explains the observed relationship between the rate of contractile vacuole contraction and the salt concentration?

A. When the salt concentration outside the cell is very low, osmosis causes body salts to move outside the cell, increasing water content in body and the contractile vacuole needs to contract rapidly.
B. When the salt concentration outside the cell is very high, diffusion causes water to move outside the cell, and the contractile vacuole does not need to contract as rapidly.
C. When the salt concentration outside the cell is very low, diffusion causes water to move outside the cell, and the contractile vacuole contractions are increased.
D. When the salt concentration outside the cell is very high, osmosis causes water to move outside the cell, and the contractile vacuole does not need to contract as rapidly.

36. Read the following statements regarding green house effect:

P : Intensive plantation can produce large amount of CO_2 which traps heat and produces the green house effect.
Q : Extensive use of fossil fuels and intensive plantation result in the production of large amount of CO_2 and H_2O forming a thick layer that prevents the heat from being re-radiated out from earth.
R : Excessive use of fossil fuels produces heat and CO_2. Heat is absorbed by the CO_2 and water vapour in the atmosphere and causes green house effect.
S : Increasing level of CO_2 tends to warm air in the lower layer of the atmosphere on global scale, resulting in global warming.

Which of the given statements are correct?

A. P and Q
B. Q and R
C. R and S
D. P and S

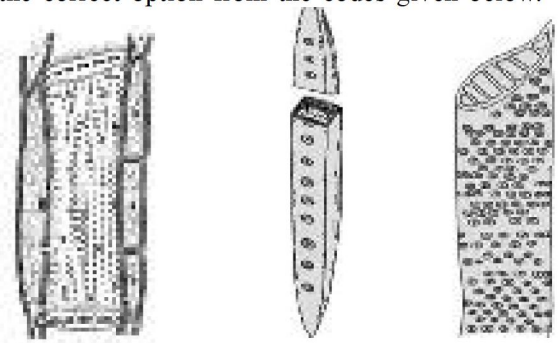
37. Four people W, X, Y and Z were suffering with common cold. X and Y took antibiotics while W and Z did not. An experiment was done and W and Y were subjected to some bacterial infection during cold. Which of the following can be the observation of the experiment?

A. Both X and Z took almost the same time in getting normal because common cold is a viral disease.
B. Y recovered earlier than W because antibiotics taken by Y resisted bacterial infection although antibiotics did not affect cold.
C. Z recovered earlier than W because it was not subjected to bacterial infection.
D. All of these.

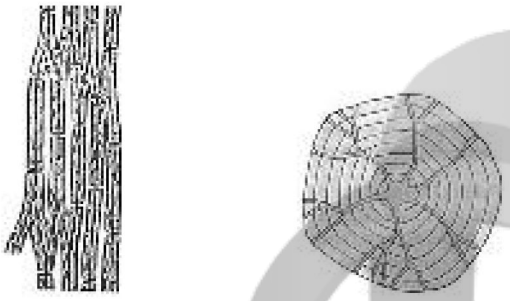
38. Select the incorrect statement regarding the bone or osseous tissue.

A. Matrix of bone is formed by organic matter only.
B. Long bones have a marrow cavity which is filled with a neurovascular tissue called bone marrow.
C. Bone is externally covered by a thick sheath, called periosteum.
D. Matrix of bone is arranged in concentric rings, called Haversian lamellae.

39. Identify the given plant tissues/cells and match them with their respective functions [list (i)-(v)]. Select the correct option from the codes given below.



(a) (b) (c)



(d) (e)

(i) Forms hypodermis of monocot stem.
(ii) Multicellular, long sized and transport water in angiosperms.
(iii) Actively transports sugar from storage organs and leaves to the parts in need.
(iv) It hardens the nut.
(v) Unicellular, small sized and transports water in pteridophytes, gymnosperms and a few angiosperms.

	a	b	c	d	e
A.	(iii)	(ii)	(v)	(i)	(iv)
B.	(i)	(v)	(ii)	(iii)	(iv)
C.	(i)	(ii)	(v)	(iii)	(iv)
D.	(iii)	(v)	(ii)	(i)	(iv)

40. Match Column I with Column II and select the correct option from the codes given below.

Column I	Column II
(a) Green algae	(i) *Porphyra*
(b) Red algae	(ii) *Fucus*
(c) Brown algae	(iii) *Gelidium*
	(iv) *Laminaria*
	(v) *Volvox*
	(vi) *Caulerpa*
	(vii) *Chondrus*

	a	b	c
A.	(i), (iv), (v)	(iii), (vi)	(iv), (vii)
B.	(v), (vi)	(i), (iii), (vii)	(ii), (iv)
C.	(iv), (v)	(i), (iii), (vi)	(iv), (vii)
D.	(v)	(i), (iii), (vii)	(ii), (iv), (vi)

41. Refer the given table illustrating the characteristics of the body plan of some invertebrate embryos.

P	Q	R	S	T
Acoelomate	Acoelo-mate	Pseudo-coelomate	Schizo-coelom	Entero-coelom
Diploblastic	Triploblastic			
Incomplete or blind gut	Complete gut (Tube-within-a-tube)			
Without true segmentation			With segmentation	

Select the correct sequence which corresponds to the phyla represented with P, Q, R, S and T.

	P	Q	R	S	T
A.	Cnidaria	Platyhel-minthes	Nema-toda	Echino-dermata	Annelida
B.	Cnidaria	Nema-toda	Platyhel-minthes	Echino-dermata	Annelida
C.	Platyhel-minthes	Nema-toda	Annelida	Echino-dermata	Chordata
D.	Cnidaria	Platyhel-minthes	Nema-toda	Annelida	Echino-dermata

42. Read the following statements and select the correct option.

Statement 1 : Penicillin is a broad-spectrum antibiotic that inhibits the growth of a number of bacterial pathogens by blocking the metabolic processes that build the cell wall in bacteria.

Statement 2 : The antibiotics such as aureomycin can be used to treat influenza.

A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true and statement 2 is false.
D. Both statements 1 and 2 are false.

43. Study the given table and identify the incorrect matches.

(i)	Malaria-mosquito relationship	Ronald Ross
(ii)	Rickettsial disease	Syphilis, Trichinosis
(iii)	Antibodies	Immunity
(iv)	Anti-retroviral drugs	Azidothymidine, Didanosine
(v)	Analgesics	Gentamicin, Neomycin

A. (i), (iv)
B. (ii), (v)
C. (iii), (iv)
D. (i), (iii)

44. Read the following statements and select the correct option.
Statement 1 : In a mature plant cell, the nucleus and cell organelles are pushed against the cell wall.
Statement 2 : The plant cell have single and large central vacuole which occupies 50-90% of the cell volume.
A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is false and statement 2 is true.
D. Statement 1 is true and statement 2 is false.

45. Which of the following statements are incorrect about thallophyta?
(i) Sex organs are nonjacketed and one celled gametangia.
(ii) Vascular system is well developed.
(iii) An embryo stage is absent.
(iv) Plant body is differentiated into root, stem and leaves.
A (i) and (iii)
B. (i) and (iv)
C. (ii) and (iii)
D. (ii) and (iv)

ACHIEVERS SECTION

DIRECTION : Read the passage given below and answer the questions 46 and 47.
Nitrogen, as a mineral nutrient, has the greatest effect on plant growth. The atmosphere contains nearly 80% N_2, yet plants have to be provided with ammonium salts or nitrates as fertilizers because plants can use nitrogen only in the form of salts. Certain nitrogen fixing bacteria with special enzymes can fix this atmospheric N_2 as shown by given reaction:

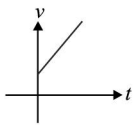
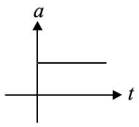
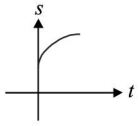
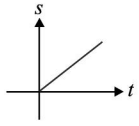
$$N_2 + 8e^- + 8H^+ + 16ATP \rightarrow 2NH_3 + H_2 + 16ADP + 16Pi$$

Such bacteria can be used as biofertilizers. In soil, NH_3 is converted to NO_3^- and then N_2 by the action of nitrifying and denitrifying bacteria respectively.

46. Plants do not themselves fix N_2 because _____.
A. It is easily available from the soil.
B. They lack the nitrogenase enzyme complex.
C. The process has a very high requirement of ATP per mole of N_2 fixed.
D. Hydrogen evolved in the process is deleterious to plants.

47. Select the incorrect statement regarding this.
A. Plants require nitrogen mainly in the form of nitrate, which is exported from roots to shoots, reconverted to ammonium and assimilated as amino acid.
B. Rhizobia, cyanobacteria, nitrifying bacteria, symbiotic fungi, etc are used as biofertilizers.
C. *Rhizobium* bacteria produce N_2 fixing root nodules in leguminous plants and thus help in replenishing nutrients in crop fields.
D. Materials of biological origin which are commonly used to maintain and improve soil fertility are green manures, biofertilizers and bioinsecticides.

48. Match column I with column II and mark the correct option from the codes given below.

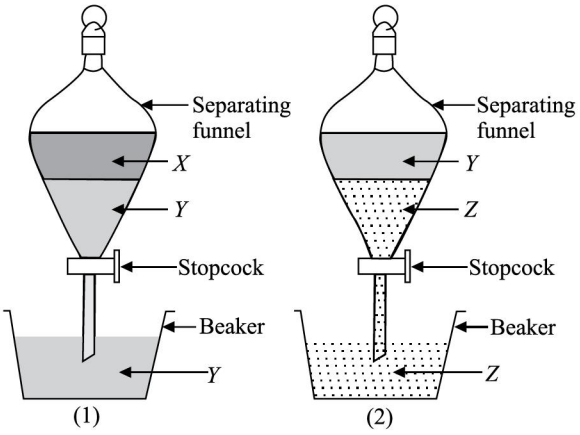
Column I		Column II
(a) Uniform velocity	(i)	
(b) Uniform acceleration	(ii)	
(c) Uniform retardation	(iii)	
(d) Uniform acceleration with initial velocity	(iv)	

A. (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
B. (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
C. (a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)
D. (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

49. Gravitation is a __(i)__ force unless __(ii)__ masses are involved.
The force of gravity__(iii)__ with altitude. It also varies on the surface of earth, __(iv)__ from poles to equator.

	(i)	(ii)	(iii)	(iv)
A.	weak	large	decreases	decreases
B.	strong	large	decreases	decreases
C.	strong	small	decreases	increases
D.	weak	large	increases	increases

50. Observe the given figures carefully.



Which of the following observations are correct?

(i) If X and Z are immiscible liquids then Z will be collected in the beaker.

(ii) Among the three liquids, Y is lightest.

(iii) In experimental set up (1), X and Y are miscible liquids while in (2), Y and Z are immiscible liquids.

(iv) If X, Y and Z all are immiscible liquids then order of density is $X < Y < Z$.

A. (i) and (iv) only
B. (i), (iii) and (iv) only
C. (i), (ii) and (iii) only
D. (ii) and (iii) only

SPACE FOR ROUGH WORK

SCIENCE OLYMPIAD FOUNDATION

18th NSO

LEVEL - 2

Year 2015-16

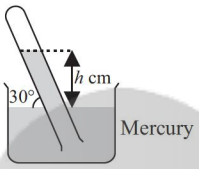
SCIENCE

1. A particle is released from a height h. At a certain height, its kinetic energy is $\left(\frac{2}{5}\right)^{th}$ of its potential energy. The speed of the particle at that instant is

A. $\sqrt{\frac{2gh}{3}}$ B. $2\sqrt{\frac{gh}{3}}$

C. $\sqrt{\frac{2gh}{7}}$ D. $2\sqrt{\frac{gh}{7}}$

2. The given diagram shows a barometer.



If the atmospheric pressure is 76 cm Hg, then what is the value of h?

A. 75 cm Hg B. 76 cm Hg

C. 77 cm Hg D. 80 cm Hg

3. A body of mass m_1 moving with a uniform velocity v collides with another body of mass m_2 at rest and then the two together begin to move with a velocity $\frac{3v}{4}$. The ratio of $[3m_1(m_1 + m_2)]$ to $[4m_2^2]$ is

A. 9 : 1 B. 12 : 1

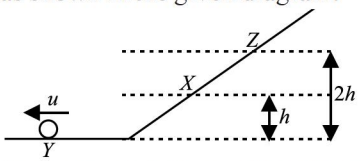
C. 16 : 1 D. Data insufficient

4. Two cylinders of same cross-section and length L but made of two materials of densities ρ_1 and ρ_2 are cemented together to form a cylinder of length $2L$. If the combination floats in water with a length $L/2$ above the surface of water and $\rho_1 < \rho_2$, then

A. $\rho_1 > 1\ g\ cm^{-3}$ B. $\rho_1 > 3/2\ g\ cm^{-3}$

C. $\rho_1 < 8/9\ g\ cm^{-3}$ D. $\rho_1 < 3/4\ g\ cm^{-3}$

5. An object of mass m is released from rest from point X which is at a height h above Y and slides down a frictionless slope. The object passes point Y with a velocity u as shown in the given diagram.



A second object of mass $0.5m$ is released from rest from point Z which is at a height $2h$ above Y. The velocity with which the second object passes point Y in terms of u is

A. $2u$ B. $\sqrt{2}u$

C. u D. $0.5u$

6. Two identical satellites SI and SII revolve round the earth in circular orbits at distance R and $3R$ respectively from the surface of the earth, where R is the radius of the earth. The ratio of linear momenta of SII to SI is

A. $\sqrt{3}:1$ B. 1 : 3

C. 2 : 1 D. $1:\sqrt{2}$

7. In an experiment to determine the speed of sound, a gun was fired and an observer at a certain distance (x) away measured the time interval (t) between seeing the flash and hearing the shot. Then the speed of sound in air is calculated by x/t.

Which of the following will affect the result?

(i) Temperature of the environment.
(ii) Pitch of the gunshot.
(iii) Wind blowing from the gunner to the observer.
(iv) Loudness of the gunshot.
(v) Wind blowing from the observer to the gunner.
(vi) Quality of sound by gunshot.

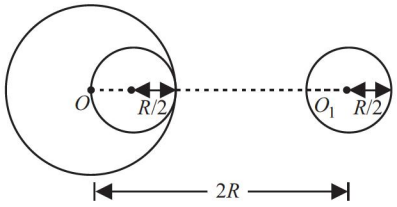
A. (i), (iii) and (iv)
B. (i), (iii) and (v)
C. (i), (ii), (iii) and (vi)
D. (ii), (iv), (v) and (vi)

8. A hollow cylinder of height 1 m whose both cross-sections are closed with a membrane of negligible mass, just floats without sinking in a liquid of density $1.9 \times 10^3\ kg\ m^{-3}$. If the outer diameter and the density of the cylinder are 1 m and $10^4\ kg\ m^{-3}$ respectively, then the inner diameter of the cylinder will be

A. 0.3 m B. 0.5 m

C. 0.8 m D. 0.9 m

9. A cavity of radius $R/2$ is created in a sphere of radius R and mass M at the periphery and this mass is placed at a distance $2R$ from the centre of the sphere as shown in figure. The force between the two is



A. $\frac{GM^2}{225R^2}$ B. $\frac{2GM^2}{243R^2}$

C. $\frac{7GM^2}{288R^2}$ D. $\frac{4GM^2}{243R^2}$

10. A man moves on his motorbike with constant speed of 63 km h^{-1}. After some time, he takes a U turn and continues to move with the same speed. Time elapsed in taking U turn is 10 s. The magnitude of average acceleration during U turn is

A. zero B. 1.75 m s^{-2}

C. 3.50 m s^{-2} D. 6.30 m s^{-2}

11. Read the given statements and select the correct option.

Statement 1 : The acceleration due to gravity on the moon is only one sixth that on the earth. If the earth and moon are assumed to have same density, then the ratio of the radii of moon and earth will be $1:\sqrt{6}$.

Statement 2 : Acceleration due to gravity does not depend upon the density of material.

A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true but statement 2 is false.
D. Both statements 1 and 2 are false.

12. Steady rain, giving 5 mm an hour, turns suddenly into a downpour 20 mm an hour and the speed of rain drops falling vertically on to a flat roof simultaneously doubles. The pressure exerted by the falling rain on the roof rises by a factor of

A. 2 B. $2\sqrt{2}$
C. 4 D. 8

13. Which of the following statements is/are incorrect?

(i) A body moving with varying velocity may have constant speed.
(ii) If velocity of a body is varying, its speed must be varying.
(iii) A body moving with varying speed may have constant velocity if its direction of motion remains constant.
(iv) A body moving with varying speed may have constant velocity if it has zero acceleration.

A. (ii) only
B. (i) and (iii) only
C. (ii), (iii) and (iv) only
D. (i), (ii), (iii) and (iv)

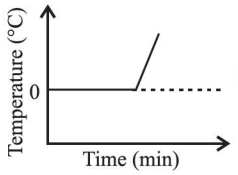
14. The given table shows the speed for a ball bowled by a bowler in an over.

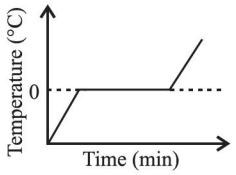
Balls	1	2	3	4	5	6
Bowling speed (m s^{-1})	44	42	46	44	36	38

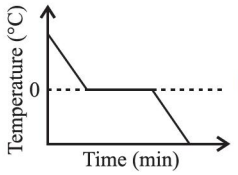
If the cricket pitch is about 20 m long, then the average time taken by the ball to reach batsman after the bowler releases the ball is

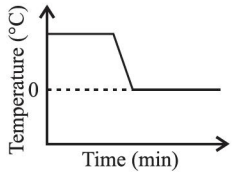
A. 0.46 s B. 0.48 s
C. 0.50 s D. 0.52 s

15. Sakshi put hot water in the ice tray and kept it in the freezer compartment of a refrigerator. If she could measure the temperature of the content of the ice tray as a function of time then, which of the following graphs would correctly represent the result?

A. 

B. 

C. 

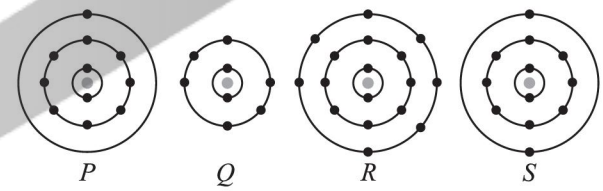
D. 

16. Fill the missing data in the given table.
(Atomic mass of Ca = 40 u, H = 1 u, O = 16 u, Na = 23 u, Cl = 35.5 u, N = 14 u)

Species	Ca atom	H_2O_2	NaCl	NO_2
No. of moles	3	(ii)	2.5	0.5
No. of particles	(i)	12.05×10^{23}	30.115×10^{23}	(iv)
Mass	120 g	68 g	(iii)	23 g

	(i)	(ii)	(iii)	(iv)
A.	36.14×10^{23}	48.184×10^{23}	146.25	3.012×10^{23}
B.	18.07×10^{23}	2	146.25	3.012×10^{23}
C.	18.07×10^{23}	2	46	2.45×10^{23}
D.	1	4	23	92

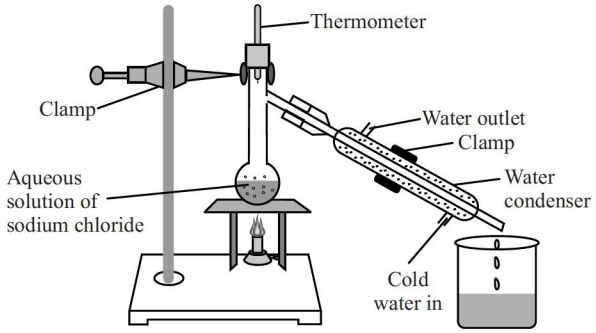
17. The schematic atomic structures of four elements are shown as



These elements can combine with each other to form different compounds. The possible compounds are

A. P_2Q, PR, SQ, SR_2 B. PQ, PR, SQ_2, SR_2
C. P_2Q, PR, SQ_2, SR D. PS, QR, SR_2, RQ_2

18. The given figure shows the distillation of an aqueous solution of sodium chloride :



What is the temperature shown by the thermometer and what is left in the distillation flask?

	Thermometer reading (°C)	Final contents of distillation flask
A.	<100	White residue
B.	85	No residue
C.	100	No residue
D.	>100	White residue

19. Melting and boiling points of some substances are listed in the given table :

Substances	Melting point (°C)	Boiling point (°C)
I	– 190	– 180
II	– 250	– 240
III	– 200	– 190
IV	– 215	– 182

Fill in the blanks by choosing an appropriate option. The substances which are liquid at –185°C are __*p*__ and __*q*__ and the substance which is a liquid over the largest range of temperature is __*r*__.

	p	*q*	*r*
A.	II	III	IV
B.	I	II	III
C.	I	IV	IV
D.	I	IV	I

20. Match the column I with column II and select the correct option from the given codes.

	Column I (To separate)		Column II (Method used)
(p)	Lighter slag from the molten iron in the extraction of iron from its ore	(i)	Chromatography
(q)	Camphor from common salt	(ii)	Fractional distillation
(r)	Drugs from blood	(iii)	Sublimation
(s)	Different gases from air	(iv)	Separating funnel

	(p)	(q)	(r)	(s)
A.	(iii)	(i)	(iv)	(ii)
B.	(iv)	(iii)	(i)	(ii)
C.	(i)	(iv)	(ii)	(iii)
D.	(iv)	(iii)	(ii)	(i)

21. Elements *X*, *Y* and *Z* have valencies 1, 2 and 3 respectively. Formula unit masses of their oxides are 62, 40 and 102 respectively. If atomic mass of *Z* is divided by thrice the difference in atomic masses of *X* and *Y* then value obtained is the atomic number of which of the following elements?

A. Carbon
B. Oxygen
C. Fluorine
D. Neon

22. If 1 g of sulphur dioxide contains *y* molecules then number of molecules in 1 g of methane will be (S = 32 u, O = 16 u, C = 12 u, H = 1 u)

A. $2y$ B. $3y$
C. y D. $4y$

23. When liquid starts boiling, the heat energy further supplied

A. Is lost to the surroundings as such
B. Increases the temperature of the liquid
C. Increases the kinetic energy of the particles in the liquid
D. Is absorbed as latent heat of vaporisation by the liquid.

24. Three students of class 9 performed the following activities in lab to prepare the desired solutions :

Student 1 : Dissolved 2.5 g of NaOH in 35 g of water to form a saturated solution at 298 K.

Student 2 : Dissolved 30 g of NaOH in 100 g of water.

Student 3 : First dissolved 50 g of NaOH in small volume of water, then diluted it to make the total volume of solution 100 mL.

Find the incorrect match.

A. Student 1 : Solubility of NaOH at the given temperature is 3.33 g.
B. Student 2 : *w*/*W* % of solution is 23.07%.
C. Student 3 : *w*/*V* % of solution is 60%.
D. Both A and C

25. Read the given statements and select the correct option.

Statement 1 : Number of gram-molecules of SO_2Cl_2 in 13.5 g of sulphuryl chloride is 0.2.

Statement 2 : Gram molecular mass is equal to one gram molecule of the substance.

(Atomic mass of S = 32 u, O = 16 u and Cl = 35.5 u)

A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true but statement 2 is false.
D. Statement 1 is false but statement 2 is true.

26. Find out isotopes and isobars from the following.

Atom	No. of protons	No. of neutrons
P	9	6
Q	6	6
R	8	9
S	9	9
T	6	7
U	7	10
V	9	8

	Isotopes	Isobars
A.	*U*, *R*, *V*	*P*, *S*, *V* and *Q*, *T*
B.	*P*, *S*, *V* and *Q*, *T*	*U*, *R* and *S* , *Q*
C.	*Q*, *T*, *V*	*P*, *R*, *S*, *U*
D.	*P*, *S*, *V* and *Q*, *T*	*U*, *R*, *V*

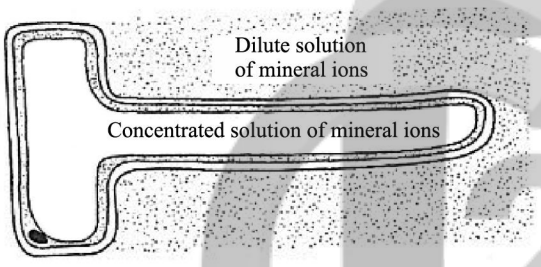
27. Krypton (Kr) is a noble gas. The given table shows four different atoms of krypton and the number of each type of atom.

Atom	Kr-82	Kr-83	Kr-84	Kr-86
Relative number	12	12	63	18

The average mass of one atom of krypton is

A. 82 B. 84
C. 80 D. 48

28. Refer to the given diagram which shows a root hair cell surrounded by a dilute solution of mineral ions.



The mineral ions show

A. Uphill movement by diffusion
B. Uphill movement by active transport
C. Downhill movement by osmosis
D. Downhill movement by active transport.

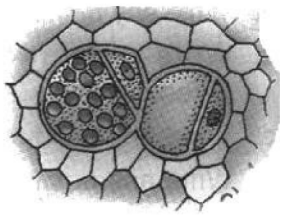
29. Read the following statements.

(i) *P* causes peptic ulcers.
(ii) *Q* is a disease characterised by elevated blood sugar level.
(iii) Disease *R* is transmitted through a vector in which human RBCs and liver cells are affected.
(iv) *S* is a disease caused by a protozoan and damages the nervous system.

Select the correct option regarding *P*, *Q*, *R* and *S*.

A. *P* is a protozoan and *Q* is diabetes which is caused by hypersecretion of insulin.
B. *Q* is thalassaemia and *R* is transmitted by female *Culex* mosquito.
C. *R* is transmitted by a protozoan and *S* is sleeping sickness.
D. *P* is a bacterium and *S* is transmitted by tsetse fly.

30. Given diagram shows the transverse section of a type of plant tissue. Select the option that represents the primary function of this tissue.



A. Transportation of food
B. Food storage
C. Water transportation
D. Protection from injuries

31. Refer to the given table and select the correct option regarding this.

Disease	Causative agent	Vaccine
Tetanus	*Clostridium tetani*	*E*
Measles	*F*	MMR
G	*Bordetella pertussis*	*H*

A. *E* is DPT, *G* is tuberculosis.
B. *F* is Rubeola virus, *H* is DPT.
C. *E* is BCG, *F* is *Flavi* virus.
D. *G* is pertussis, *H* is Salk vaccine.

32. Given below are four animal groups (i-iv). In each group there is one member that does not fit into it.

(i) *Euplectella, Euspongia, Spongilla, Adamsia*
(ii) *Physalia, Antedon, Adamsia, Aurelia*
(iii) *Nereis, Asterias, Echinus, Antedon*
(iv) *Chiton, Pila, Asterias, Loligo*

Which of the following statements is correct regarding these?

A. *Adamsia* is rightly placed in group (i) and is an odd one in group (ii).
B. *Antedon* in group (ii) is a misfit and can be replaced with *Nereis*.
C. *Nereis* is a misfit in group (iii) and can be replaced with *Holothuria*.
D. *Asterias* is rightly placed in group (iv) and is an odd one in group (iii).

33. Identify the different types of white blood cells *X*, *Y* and *Z* shown in the given figure and select the correct option regarding these.

A. *X* releases histamine and heparin.
B. *Y* secretes antibodies to destroy microbes.
C. *Z* is phagocytic in nature.
D. *Y* has granules in its cytoplasm which take basic stains strongly.

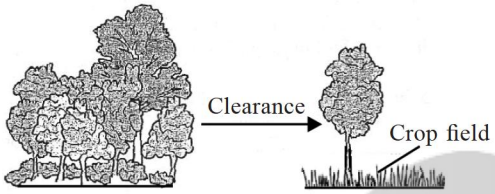
34. Humans affect the environment in the following ways:

(i) Clearing of forest
(ii) Harvesting of marine algae
(iii) Reforestation
(iv) Combustion of fuels
(v) Overuse of pesticides.

Which human activities lead to an increase in the level of carbon dioxide in the earth's atmosphere?

A. (i), (ii) and (iii) only
B. (i), (ii) and (iv) only
C. (ii), (iv) and (v) only
D. All of these

35. The given diagram shows a tropical forest before and after the clearance, for agricultural use. Which of the following could not be the outcome of this clearance?



A. Self-sustaining capacity of the ecosystem will be reduced.
B. Species diversity at the place will decrease.
C. Soil will turn saline because minerals present in soil will be used less.
D. Both A and B.

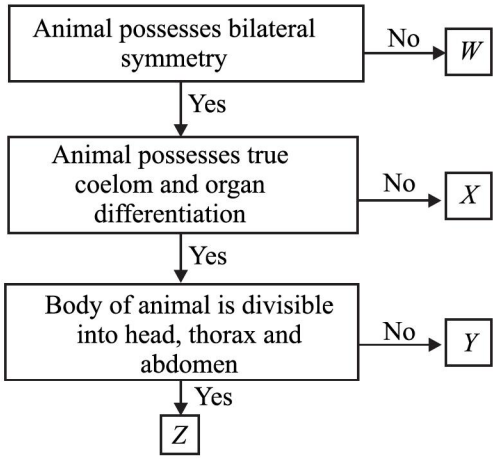
36. Read the given statements and select the correct option.

Statement-1 : Malaria and dengue are communicable (infectious) but non-contagious diseases.

Statement-2 : Malaria and dengue are caused by pathogens which are transmitted from a healthy person to an infected person only through vectors and not by direct contact.

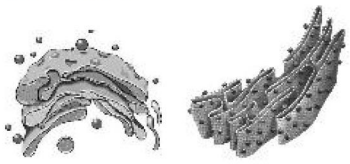
A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true but statement 2 is false.
D. Statement 1 is false but statement 2 is true.

37. Study the given flow chart and select the option which correctly identifies any of the animals, *W*, *X*, *Y* and *Z*.



A. *W* is *Planaria* and *X* is *Ascaris*.
B. *X* is *Ascaris* and *Y* is *Nereis*.
C. *W* is *Sycon* and *Z* is *Fasciola*.
D. *Y* is *Periplaneta* and *Z* is *Unio*.

38. Read the following statements associated with the given cell organelles *X* and *Y*.



X *Y*

(i) *X* works as a seat of protein synthesis.
(ii) *Y* helps in exchange of materials between the cytoplasm and the nucleus.
(iii) *X* helps in storage of secretory products.
(iv) *Y* helps in development of acrosome of sperm.
(v) Both *X* and *Y* help in membrane biogenesis.
(vi) *X* usually forms a continuous transport channel with nuclear membrane.

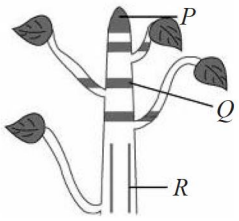
Which of the above statements are correct?

A. (i), (ii), (iii) and (v) only
B. (i), (iv) and (vi) only
C. (ii), (iii) and (v) only
D. (iii), (iv), (v) and (vi) only

39. Select the mismatched pair out of the following.

A. *Aspergillus* – Absorbs soluble food material from the surrounding organic matter
B. *Euglena* – Cellulosic cell wall
C. *Marchantia* – Main plant body is gametophyte
D. *Marsilea* – Body is differentiated into root, stem and leaves

40. Which of the following statements is not true regarding the plant meristems (*P*, *Q* and *R*) shown in the given figure?



A. If meristem *P* is removed, plant will become short and bushy in appearance.
B. Meristem *Q* is responsible for internode elongation.
C. If meristem *R* is removed, transportation of water and minerals will not take place.
D. Meristem *P* is present at the growing tips of roots.

41. Refer to the given table and select the correct option regarding it.

Milch breeds of cattle		
Indigenous pure breed	Exotic pure breed	Hybrid breed
(i)	**(ii)**	**(iii)**

A. (i)-Murrah, (ii)-Gir
B. (ii)-Jersey, (iii)-Surti
C. (i)-Sahiwal, (iii)-Frieswal
D. (i)-Karan Fries, (ii)-Ayrshire

42. Match column I with column II and select the correct option.

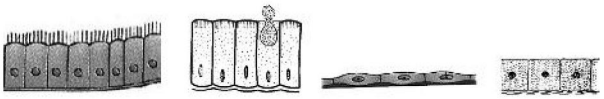
	Column I		**Column II**
(a)	Feeding in the surface zone	(i)	Catla, Silver carp
(b)	Feeding in the middle zone	(ii)	Rohu, Grass carp
(c)	Feeding in the bottom zone	(iii)	Mrigal, Common carp

A. (a) - (i), (b) - (ii), (c) - (iii)
B. (a) - (ii), (b) - (iii), (c) - (i)
C. (a) - (iii), (b) - (i), (c) - (ii)
D. (a) - (iii), (b) - (ii), (c) - (i)

43. Study the following pattern and select the correct option for (i), (ii) and (iii).
(a) Global warming : CO_2 :: Acid rain : (i)
(b) Ammonia: *Nitrosomonas* :: Nitrites to nitrates : (ii)
(c) DDT : Biomagnification :: Nitrates and phosphates : (iii)

	(i)	**(ii)**	**(iii)**
A.	NO_x and SO_2	*Nitrocystis*	Eutrophication
B.	NO_x and SO_2	*Nitrosococcus*	Biomagnification
C.	Chlorofluoro-carbons	*Nitrobacter*	Ozone depletion
D.	Greenhouse gases	*Pseudomonas*	Eutrophication

44. Refer to the given figure showing four different types of epithelial tissues (*P*, *Q*, *R* and *S*) and select the incorrect option regarding these.



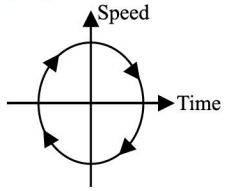
P *Q* *R* *S*

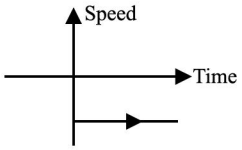
A. *P* is found in Fallopian tubes and respiratory tract.
B. *Q* is found in organs involved in secretion such as stomach.
C. *R* is found in respiratory tract and helps in gaseous exchange.
D. *S* forms the outermost skin layer of soles and palms and is protective in function.

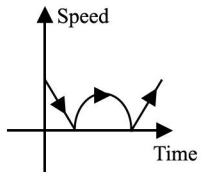
45. Which of the following statements is correct?
A. Fertilisers add a great amount of organic matter in the form of humus in the soil.
B. Inter-cropping is growing two or more crops simultaneously on the same field in a definite pattern.
C. Both abiotic and biotic factors are responsible for causing damage to harvested grains during storage.
D. Both B and C

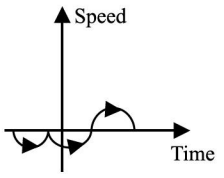
ACHIEVERS SECTION

46. Which of the following graphs is a possible speed-time graph?

A. 

B. 

C. 

D. 

47. Fill in the blanks by choosing an appropriate option.
A tuning fork produces sound of single frequency. It consists of two prongs and one stem. On striking, one of the prongs against a rubber pad, the prongs execute (i) vibrations and the stem executes (ii) vibrations of same frequency. When the prong moves outwards, the air molecules are pushed and a (iii) is created. When the prong moves inwards, it pulls the air molecules and a (iv) is created.

	(i)	**(ii)**	**(iii)**	**(iv)**
A.	Longitudinal	Transverse	Rarefaction	Compression
B.	Transverse	Transverse	Rarefaction	Compression
C.	Longitudinal	Longitudinal	Compression	Rarefaction
D.	Transverse	Longitudinal	Compression	Rarefaction

48. The melting and boiling points of a few substances are given as

Substance	**Melting point (°C)**	**Boiling point (°C)**
I	180	381
II	64	759
III	0	100
IV	– 117	78

Following diagrams show three different states of matter at different temperatures.

at 85°C *X* | at 110°C *Y* | at 35°C *Z*

Out of the given substances which would exist as *X*, *Y* and *Z*?

	X	***Y***	***Z***
A.	IV	II	III
B.	III	I	IV
C.	II	IV	I
D.	IV	II	I and II

Direction : Refer to the given dichotomous key regarding cell organelles and answer the questions 49 and 50.

49. (I) (a) Surrounded by a double unit membrane. ..... Go to (II)
    (b) Not surrounded by a double unit membrane. ..... Go to (IV)
    (II) (a) Membrane with definite pores. [*P*]
    (b) Membrane with no definite pores ..... Go to (III)
    (III) (a) Inner membrane with stalked particles. [*Q*]
    (b) Inner membrane folded into thylakoids. [*R*]
    (IV) (a) Contains digestive enzymes. [*S*]
    (b) Composed of one large subunit and one small subunit. [*T*]

Identify the cell organelles *P*, *Q*, *R*, *S* and *T* and select the correct option regarding these.

A. *P* can be ER and *Q* can be Golgi apparatus.
B. *R* can be chloroplasts and *S* can be ribosomes.
C. *P* can be nucleus and *T* can be ribosomes.
D. *R* can be mitochondria and *S* can be lysosomes.

50. Select the incorrect option regarding the given dichotomous key.

A. The organelles *Q* and *R* are present but poorly developed in prokaryotes.
B. The organelles *Q* and *R* possess their own genetic material.
C. The organelle *T* is present in both prokaryotic and eukaryotic cells.
D. The organelle *S* plays an important role at the time of fertilisation in human beings.

SPACE FOR ROUGH WORK

SCIENCE OLYMPIAD FOUNDATION

19th NSO

LEVEL - 2

Year 2016-17

SCIENCE

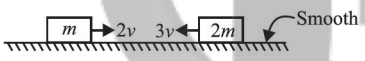
1. Two satellites S_1 and S_2 revolve around a planet in coplanar circular orbits in the same sense. Their periods of revolution are 1 h and 8 h respectively. The radius of the orbit of S_1 is 10^4 km. When S_2 is closest to S_1, then the speed of S_2 relative to S_1 will be

A. $\pi \times 10^4$ km h^{-1} B. $2\pi \times 10^4$ km h^{-1}
C. 1×10^4 km h^{-1} D. 2×10^4 km h^{-1}

2. A ball of mass m falls freely from rest. When it has reached a speed v, it strikes a vertical spring. The spring is compressed by distance y before the ball moves upwards again. Assume that all the energy the ball loses becomes elastic potential energy in the spring. What is the average force exerted by the spring during its compression?

A. $\frac{mv^2}{2y}$ B. $\frac{m}{2y}(v^2 - 2gy)$
C. $\frac{mv^2}{y}$ D. $\frac{m}{2y}(v^2 + 2gy)$

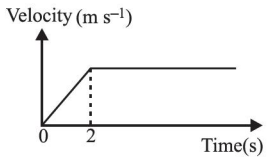
3. An object of mass m travelling to the right with velocity $2v$ collides with another object of mass $2m$ travelling to the left with velocity $3v$ as shown in the figure. After the collision, the objects stick together.



Which of the following options is correct regarding the total momentum (magnitude) and total kinetic energy of the two objects?

	Momentum	Kinetic energy
A.	0	0
B.	6 mv	(1/2) mv^2
C.	4 mv	(8/3) mv^2
D.	4 mv	(4/3) mv^2

4. The velocity-time graph shows the motion of a particle moving in a straight line. What may be deduced about the resultant force acting on the particle during the first 2 s and after 2 s?



	First 2 s	After 2 s
A.	Constant	Zero
B.	Increasing at a constant rate	Constant
C.	Constant	Increasing at a constant rate
D.	Increasing at a constant rate	Zero

5. Which of the following waves does not travel in vacuum?

A. Seismic waves B. X-rays
C. Light D. Radio waves

6. On a straight road, a car starts from rest and accelerates at uniform rate of 6 m s^{-2} for some time, then moves with constant speed for some time and retards at the same uniform rate and comes to rest. Total time for the journey is 24 s and average speed for journey is 20 m s^{-1}. How long does the car move with constant speed?

A. 4 s B. 8 s
C. 12 s D. 16 s

7. A cruise ship is sailing straight towards an island at a speed of 30 m s^{-1}. It sounds the horn when it is 600 m away from the island. Calculate the time taken for the ship crew to hear the echo. (Take the speed of sound in air to be 300 m s^{-1}.)

A. 1.82 s B. 2.22 s
C. 3.64 s D. 4.00 s

8. A cork of mass 10 g is floating on water. The net force acting on the cork is

A. 10 N B. 10^{-3} N
C. 10^{-2} N D. Zero.

9. Read the given statements and select the correct option.

Statement 1 : If a body is thrown vertically upward from ground and air resistance is taken in account, then the time of ascent is less than the time of descent.

Statement 2 : Air resistance opposes the motion of the body.

A. Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statement 1 and statement 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true but statement 2 is false.
D. Statement 1 is false but statement 2 is true.

10. A ball is thrown horizontally from a point 100 m above the ground with a speed of 20 m s^{-1}. Which of the following statements is incorrect regarding the ball just before reaching the ground?

A. Horizontal distance covered by the ball is 90.35 m.
B. Time taken by the ball is 4.5 s.
C. Speed of the ball is 49 m s^{-1}
D. Displacement of the ball $110\sqrt{2}$ m.

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

(i) A car accelerates on a horizontal straight road due to the force exerted by the road.
(ii) All conservation laws such as conservation of momentum, energy, charge etc are considered to be a fundamental laws in physics.

(iii) A passenger in a decelerating train on a straight track tosses a coin which falls behind him.

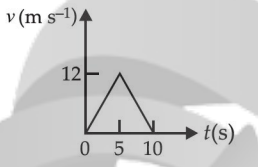
A. (i) only B. (ii) and (iii) only
C. (i) and (ii) only D. (i), (ii) and (iii)

12. From a tower of height h a particle is thrown vertically upwards with a speed v. The time taken by the particle, to hit the ground is n times that taken by it to reach the highest point of its path. Then speed(u) of the particle is equal to

A. $\sqrt{\frac{gH}{(n-2)}}$ B. $\frac{\sqrt{2gH}}{n}$

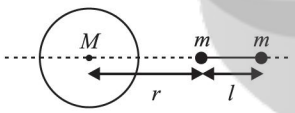
C. $\frac{\sqrt{2gH}}{(n-2)}$ D. $\sqrt{\frac{2gH}{(n-2)n}}$.

13. The speed-time graph of a particle moving along a fixed direction as shown in the figure. The distance traversed by the particle between $t = 0$ s to $t = 10$ s is



A. 20 m B. 40 m
C. 60 m D. 80 m.

14. A large spherical mass M is fixed at one position and two identical point masses m are kept on a line passing through the centre of M (see figure). The point masses are connected by a rigid massless rod of length l and this assembly is free to move along the line connecting them. All three masses interact only through their mutual gravitational interaction. When the point mass nearer to M is at a distance $r = 3l$ from M and tension in the rod is zero then the acceleration of point mass will be



A. $\frac{GM}{9l^2}$ B. $\frac{GM}{16l^2}$

C. $\frac{25}{288}\frac{GM}{l^2}$ D. $\frac{7}{144}\frac{Gm}{l^2}$

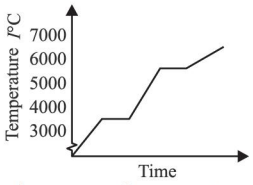
15. The pressure at depth h below the surface of a liquid of density ρ open to the atmosphere is

A. Greater than the atmospheric pressure by ρgh
B. Less than the atmospheric pressure by ρgh
C. Equal to the atmospheric pressure
D. Increases exponentially with depth.

16. An element X has the 4^{th} shell as the valence shell. If the difference in the number of electrons between K and N shells and between L and M shells is zero, then the atomic number of the element X will be

A. 12 B. 10
C. 2 D. 20

17. The wire filaments in light bulbs are usually made of the element 'tungsten'. When electricity passes through tungsten, it glows only when it is a solid.



The given graph shows the heating curve for tungsten. Around which of the following temperatures, we can see the tungsten wire glowing?

A. 3300°C B. 5600°C
C. 4700°C D. 6100°C

18. A sample of hydrated sodium phosphate has a mass of 190 g. Of this, 108 g is the mass of water of crystallisation. What is the molar mass of the hydrated sodium phosphate?

(Atomic mass of Na = 23 u, P = 31 u, O = 16 u, H = 1 u)

A. 380 g/mol B. 420 g/mol
C. 480 g/mol D. 520 g/mol

19. Melting and boiling points of elements W, X, Y and Z are given in the table.

Element	Melting point (°C)	Boiling point (°C)
W	–189	–186
X	–219	–183
Y	–7	58
Z	20	222

Which of the following statements is/are correct?

I. Elements Y and Z are liquids at room temperature.
II. Element W exists as a liquid while element X exists as a gas at room temperature.
III. When element Y is cooled from 70°C to –10°C, its particles get closely packed.

A. I and II only B. I only
C. I and III only D. III only

20. Ms. Prabha a science teacher, prepared a mixture of water, potassium nitrate, sodium chloride and carbon tetrachloride. She divided the class into four groups and asked students to separate individual components. Different groups tried different methods in the given sequence.

Group I : Separating funnel, fractional distillation, sedimentation and then decantation.

Group II : Separating funnel, fractional distillation, and then distillation.

Group III : Fractional distillation, distillation and then fractional crystallisation.

Group IV : Separating funnel, fractional crystallisation and then evaporation.

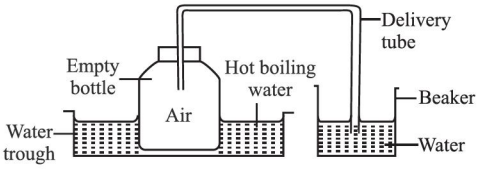
Which group adopted the appropriate methods in the most appropriate sequence to separate individual components of the mixture?

A. Group I B. Group II
C. Group III D. Group IV

21. Element X with mass number 24 has 12 neutrons while element Y with mass number 19 has 10 neutrons. What is the chemical formula of compound formed when X combines with Y?

A. X_2Y B. XY_2
C. X_3Y_2 D. X_2Y_3

22. Study the given experimental set-up carefully and choose the correct observation.

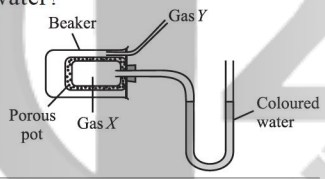


I. Bubbles are produced in the beaker.
II. Air in the empty bottle contracts.
III. Water from the beaker moves up the delivery tube.

A. I only
B. III only
C. II and III only
D. None of the observations is correct.

23. The given apparatus can be used to show the diffusion of gases. Which pair of gases X and Y would cause no movement of the water?

	X	Y
A.	C_2H_4	C_2H_6
B.	C_2H_4	N_2
C.	CO_2	C_2H_6
D.	CO	NO_2

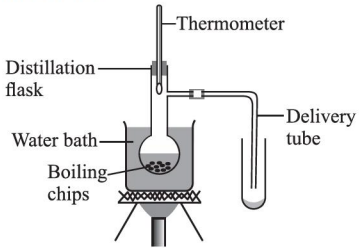


24. Match column I with column II and choose the correct answer from the given codes. (Atomic mass of Na = 23 u, S = 32 u, O = 16 u, H = 1 u)

	Column I		Column II
P.	10 mol of sodium sulphite	(i)	0.375 mol
Q.	12 g of oxygen gas	(ii)	9 g
R.	0.5 mol of water	(iii)	3.76×10^{22} molecules
S.	16 g of solid sulphur	(iv)	1.26 kg

A. P – (iv); Q – (iii); R – (ii); S – (i)
B. P – (ii); Q – (iii); R – (iv); S – (i)
C. P – (ii); Q – (i); R – (iii); S – (iv)
D. P – (iv); Q – (i); R – (ii); S – (iii)

25. Melting and boiling points of four substances are given in the table.



	Melting point (°C)	Boiling point (°C)
P	–130	30
Q	–120	75
R	0	110
S	41	182

Which of the substances can be distilled using the given apparatus?

A. P and R only B. Q and S only
C. P only D. All of these.

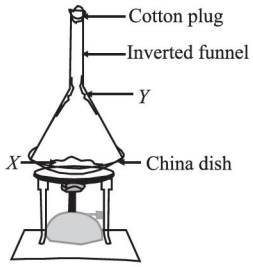
26. Chemical formulae of few compounds are given as :
Zinc phosphate - $Zn_3(PO_4)_2$
Lead bromide - $PbBr_2$
Magnesium nitride - Mg_3N_2
Aluminium nitride - AlN
Based on the formulae, the valencies or charges on the ions are given. Mark the incorrect option.

A. Phosphate ion : 3^- B. Bromide ion : 2^-
C. Nitride ion : 3^- D. Aluminium ion : 3^+

27. Which of the following statements does not form part of Bohr's model of hydrogen atom?

A. Energy of the electrons in the orbit is quantized.
B. The electron in the orbit nearest to the nucleus has the lowest energy.
C. Electrons revolve in different orbits around the nucleus.
D. The position and velocity of the electron in the orbit cannot be determined simultaneously.

28. Identify X and Y in the given figure.



A. X = Mixture of naphthalene and anthracene
Y = Solid naphthalene
B. X = Mixture of NaCl and water
Y = Solid NaCl
C. X = Mixture of NaCl and anthracene
Y = Solid anthracene
D. X = Mixture of sugar and NaCl
Y = Solid sugar

29. Read the given statements and select the option which correctly identifies X, Y and Z.

(i) Crop X is grown from March to June.
(ii) Crop Y is grown from October/November to April.
(iii) Crop Z is grown from June to October.

A. *X* could be cucumber and *Z* could be paddy.
B. *Y* could be maize and *Z* could be wheat.
C. *X* could be wheat and *Y* could be cotton.
D. *X* could be pea and *Y* could be soybean.

30. Read the statements given in the box regarding a particular type of animal tissue "*X*".

(i)	Cells of *X* are as tall as wide.
(ii)	It helps in gamete formation.
(iii)	It lines sweat glands and salivary glands.

Identify *X* and select the correct statement regarding it.

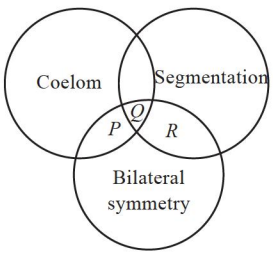
A. *X* could be squamous epithelial tissue which is present in blood capillaries for exchange of materials between body cells and blood.
B. *X* could be cuboidal epithelial tissue which is also present in nephrons of kidney.
C. *X* could be columnar epithelial tissue present in Fallopian tube which helps in movement of ovum/zygote.
D. *X* could be compound epithelial tissue present in skin which protects from mechanical wear and tear.

31. Refer to the given dichotomous key and select the correct option regarding *P, Q, R, S* and *T*.

I. (a) It is a part of endomembrane system. – Go to II
   (b) It is not a part of endomembrane system. – Go to IV
II. (a) Acts as supporting skeletal framework of the cell. – Go to III
   (b) Provides nourishment during starvation by rapidly hydrolysing food stored in cell. – [*P*]
III. (a) Synthesises serum and membrane proteins. – [*Q*]
   (b) Takes part in detoxification with the help of cytochrome P_{450}. – [*R*]
IV. (a) Helps in oxidation of food stuff. – [*S*]
   (b) Stores reserve food material. – [*T*]

A. *Q* is abundant in exocrine pancreatic cells whereas *R* is abundant in liver cells.
B. *P* also helps in removing old and useless cell organelles whereas *Q* is the site of photosynthesis.
C. Matrix of *S* contains proteins and lipids whereas that of *T* contains respiratory enzymes.
D. *P* is also involved in hydrolysis of foreign particles whereas *T* also takes part in cell division.

32. Refer to the given Venn diagram and select the correct option regarding *P, Q* and *R*.



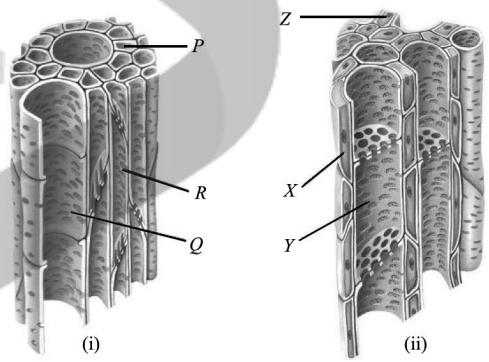
A. *P* could be *Nereis* having incomplete alimentary canal.
B. *Q* could be *Aplysia* which respires through gills called ctenidia.
C. *R* could be *Taenia* in which flame cells are the excretory structures.
D. *P* could be *Dugesia*, *Q* could be *Ophiothrix* and *R* could be *Holothuria*.

33. Match column I with column II and select the correct option from the given codes.

	Column I		**Column II**
(a)	Draught breed of cow	(i)	Jafarabadi
(b)	Exotic poultry breed	(ii)	Salmon
(c)	Buffalo breed	(iii)	White Leghorn
(d)	Marine fish	(iv)	Nageri
(e)	Freshwater fish	(v)	Singhara
(f)	Indigenous poultry breed	(vi)	Ghagus

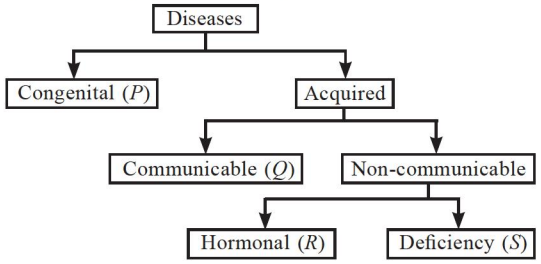
A. (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii), (e)-(v), f-(vi)
B. (a)-(iv), (b)-(vi), (c)-(i), (d)-(ii), (e)-(v), f-(iii)
C. (a)-(iv), (b)-(iii), (c)-(i), (d)-(v), (e)-(ii), f-(vi)
D. (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii), (e)-(v), f-(vi)

34. Refer to the given figures (i and ii) and select the incorrect statement regarding them.



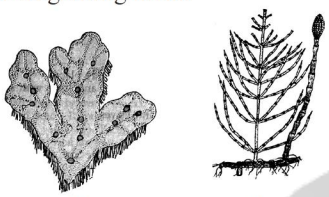
A. Both *P* and *Z* help in storage of food.
B. *Q* and *R* are together called as tracheary elements.
C. Both *R* and *Y* are dead cells having lignified cell walls.
D. *P* helps in lateral conduction of water or sap whereas *X* controls functioning of *Y*.

35. Refer to the given flow chart and select the option that correctly identifies *P, Q, R* and *S*.



	P	*Q*	*R*	*S*
A.	Night-blindness	Malaria	Cheilosis	Scurvy
B.	Down's syndrome	Polio-myelitis	Kwashiorkor	Epilepsy
C.	Sickle cell anaemia	Allergy	Grave's disease	Myxoedema
D.	Haemophilia	Measles	Myxoedema	Night blindness

36. Refer to the given figures *X* and *Y* and read the given statements regarding them.



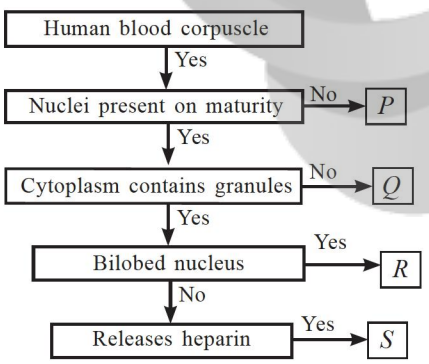
X *Y*

(i) Vascular tissues are completely absent in *X*.
(ii) Main plant body of *Y* is gametophyte.
(iii) Plant body of *X* is fixed to substratum by true roots.
(iv) Sex organs in *Y* are multicellular and jacketed.
(v) In plant *X*, sporophyte is parasitic over gameto-phyte.
(vi) In plant *Y*, seeds are naked and not enclosed inside fruits.

Which of the above statements are incorrect?

A. i, iv and v only B. i, ii, and iii only
C. ii, iii and vi only D. ii, iv and vi only

37. Study the given flow chart carefully and select the incorrect statement regarding it.



A. *P* contains enzyme that regulates transportation of CO_2.
B. *Q* secretes antibodies to destroy pathogenic microbes.
C. *R* decreases during allergy and often changes into macrophages.
D. *S* also releases a chemical that increases permeability of capillaries.

38. Layer *X*, present about 18-50 km over earth's surface, is depleting due to presence of chlorofluorocarbons in the environment. Which of the following options are the results of its depletion?

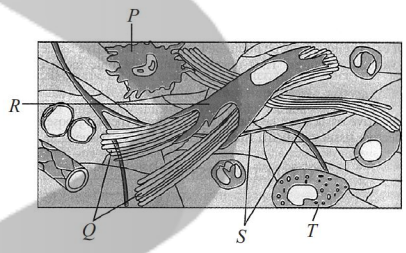
(i) Skin cancer, (ii) Decrease in global temperature,
(iii) Immune disorders, (iv) Melting of polar ice caps,
(v) Triple fold increase in rate of photosynthesis,
(vi) Decreased embryonic mortality, (vii) Increased death rate of seedling

A. (i), (iii), (iv) and (vii) only
B. (i), (ii), (iii) and (v) only
C. (i), (ii), (iv), (vi) and (vii) only
D. (ii), (iii), (v) and (vi) only

39. Which of the following is the correct option?

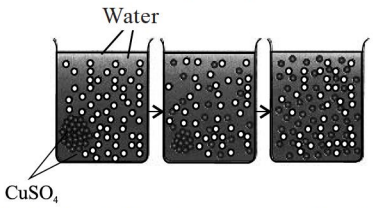
A. Deficiency of vitamin B_1 causes pellagra whereas that of vitamin C causes scurvy.
B. Hypersecretion of thyroid causes Grave's disease whereas that of aldosterone causes Addison's disease.
C. Dengue is a viral disease whereas typhoid is a bacterial disease.
D. Yellow fever is caused by *Aedes* mosquito whereas sleeping sickness is caused by tse-tse fly.

40. Refer to the given diagram of a type of connective tissue and select the incorrect option regarding it.



A. *P* acts as phagocyte whereas *T* plays an important role during allergic reactions.
B. *Q* provide only elasticity whereas *S* provides only strength.
C. *R* secretes extracellular matrix whereas *T* produces a substance that checks clotting of blood inside the blood vessels.
D. *Q* is made up of collagen protein whereas *S* is made up of elastin protein.

41. Refer to the given figure showing a process and select the correct statement regarding it.



Which of the following events also involve this process?

(i) Exchange of respiratory gases
(ii) Opening and closing of stomata
(iii) Swelling of dried raisins when soaked in water
(iv) Spreading of aroma of flowers
(v) Seismonastic movements in plants

A. (i) and (iv) only
B. (i) and (iii) only
C. (i), (ii) and (iv) only
D. (ii), (iii) and (v) only

42. The list given below shows some diseases caused by microorganisms/infectious agents. How many of these diseases are caused by virus?

Elephantiasis, Tetanus, Hepatitis-B, Ringworm, Kala-azar, Influenza, Mumps, Typhoid, Dengue, Sleeping sickness

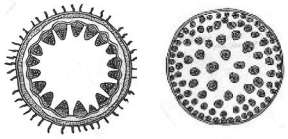
A. 3 B. 4
C. 6 D. 5

43. Refer to the given dichotomous key and identify organisms *P*, *Q*, *R* and *S*.

(I) (a) Cellular level of body organisation is present. – Go to V (a)
(b) Tissue/organ level of body organisation is present. – Go to II
(II) (a) Radial symmetry is present. – Go to V (b)
(b) Bilateral symmetry is present. – Go to III (a)
(III) (a) It is acoelomate. – Go to IV (a)
(b) It is true coelomate. – Go to IV (b)
(IV) (a) It is triploblastic and parasitic. – [*P*]
(b) It is segmented and sanguivorous. – [*Q*]
(V) (a) It is found in deep sea waters and is a costly wedding gift in Japan. – [*R*]
(b) It is a freshwater polyp. – [*S*]

	P	*Q*	*R*	*S*
A.	*Fasciola*	*Hirudinaria*	*Euplectella*	*Hydra*
B.	*Euspongia*	*Wuchereria*	*Limax*	*Palaemon*
C.	*Loligo*	*Asterias*	*Tubifex*	*Ascaris*
D.	*Nereis*	*Scolopendra*	*Adamsia*	*Sepia*

44. Refer to the given figures and select the correct option.



X *Y*

A. *X* is dicot root whereas *Y* is dicot stem.
B. *X* is monocot root whereas *Y* is monocot stem.
C. *X* is dicot stem whereas *Y* is monocot stem.
D. *X* is monocot stem whereas *Y* is dicot stem.

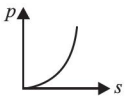
45. Which of the following is an incorrect match of phylum, type of coelom present in it and a characteristic feature?

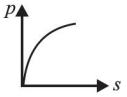
	Phylum	**Coelom**	**Feature**
(i)	Chordata	Coelomate	Dorsal hollow nerve cord
(ii)	Echinodermata	Pseudo-coelomate	Water vascular system
(iii)	Arthropoda	Coelomate	Chitinous exoskeleton
(iv)	Platyhelminthes	Acoelomate	Flame cells

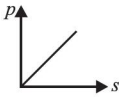
A. (ii) only
B. (iv) only
C. (i) and (iii) only
D. (ii), (iii) and (iv) only

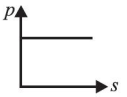
ACHIEVERS SECTION

46. A body of mass *m* is accelerated by a constant force. Which graph best shows the variation of momentum (*p*) of the body with the displacement(*s*). The body starts from rest ?

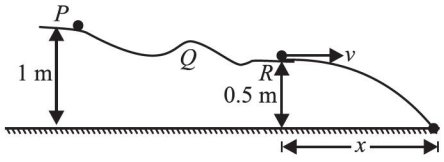
A. 

B. 

C. 

D. 

47. Figure shows a particle of mass 0.5 kg starts sliding from rest on a frictionless track which terminates in a straight horizontal section. As the particle starts sliding then it is going to hit the ground finally.



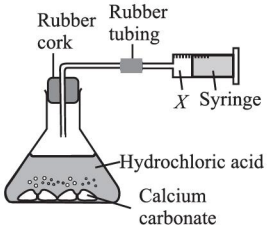
Total mechanical energy and speed of the particle at point *R* is (i) and (ii) respectively. The value of *x* is (iii) and time taken to cover the distance *x* is (iv). (Take $g = 10\ m\ s^{-2}$)

	(i)	**(ii)**	**(iii)**	**(iv)**
A.	5 J	10 m s^{-1}	1 m	$\sqrt{0.1}$ s
B.	10 J	$\sqrt{10}$ m s^{-1}	2 m	1.0 s
C.	5 J	$\sqrt{10}$ m s^{-1}	1 m	$\sqrt{0.1}$ s
D.	10 J	10 m s^{-1}	2 m	2.12 s

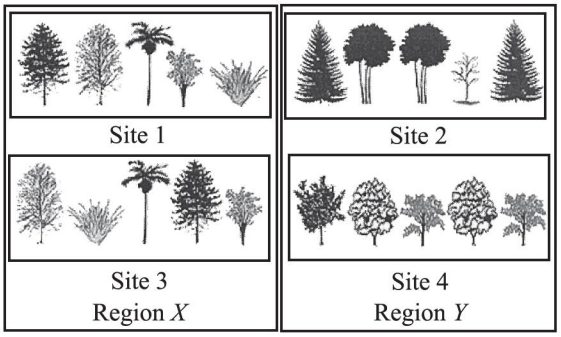
48. In an experiment, hydrochloric acid was reacted with calcium carbonate at room temperature and pressure.

If 80 cm^3 of gas *X* was produced then, the number of molecules and mass of gas *X* given off are respectively

A. 3.33×10^{-3}, 0.5 g
B. 2.15×10^{21}, 0.157 g
C. 6×10^{23}, 7.5 g
D. 4×10^{21}, 1.5 g

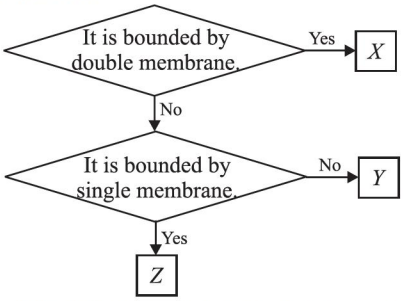


49. Refer to the given figure and select incorrect statement regarding it.



A. Site 1 has higher alpha diversity than site 2.
B. Region *Y* has higher beta diversity than region *X*.
C. Region *X* has high alpha diversity, lower beta diversity but higher gamma diversity than region *Y*.
D. Region *Y* has lower alpha diversity, higher beta diversity and higher gamma diversity than region *X*.

50. Study the given flow chart regarding some cell organelles present in a cell.



Which of the following options is incorrect regarding *X*, *Y* and *Z*?

A. Organelle *X* can transform solar energy into chemical energy of carbohydrates.
B. Enzymes of organelle *Y* are present in the acrosome of human sperm cell which digest the limiting membrane of ovum during fertilisation.
C. On starvation, organelle *Z* digests stored food contents and other cellular components; this process is called as autophagy.
D. Organelle *X* can bring about stepwise oxidation of carbohydrates to produce CO_2 and water.

SPACE FOR ROUGH WORK

CLASS24

ANSWER KEYS

14th NSO

1.	(A)	**2.**	(C)	**3.**	(B)	**4.**	(D)	**5.**	(D)	**6.**	(A)	**7.**	(D)
8.	(C)	**9.**	(B)	**10.**	(A)	**11.**	(A)	**12.**	(C)	**13.**	(D)	**14.**	(D)
15.	(B)	**16.**	(C)	**17.**	(A)	**18.**	(A)	**19.**	(A)	**20.**	(B)	**21.**	(D)
22.	(B)	**23.**	(D)	**24.**	(A)	**25.**	(B)	**26.**	(B)	**27.**	(C)	**28.**	(C)
29.	(B)	**30.**	(D)	**31.**	(D)	**32.**	(C)	**33.**	(B)	**34.**	(B)	**35.**	(C)
36.	(B)	**37.**	(D)	**38.**	(D)	**39.**	(B)	**40.**	(D)	**41.**	(D)	**42.**	(C)
43.	(A)	**44.**	(D)	**45.**	(A)	**46.**	(A)	**47.**	(B)	**48.**	(D)	**49.**	(A)
50.	(B)												

15th NSO

1.	(B)	**2.**	(A)	**3.**	(D)	**4.**	(C)	**5.**	(C)	**6.**	(A)	**7.**	(A)
8.	(C)	**9.**	(B)	**10.**	(D)	**11.**	(A)	**12.**	(D)	**13.**	(B)	**14.**	(C)
15.	(B)	**16.**	(D)	**17.**	(C)	**18.**	(A)	**19.**	(C)	**20.**	(C)	**21.**	(B)
22.	(B)	**23.**	(A)	**24.**	(C)	**25.**	(C)	**26.**	(A)	**27.**	(A)	**28.**	(D)
29.	(B)	**30.**	(A)	**31.**	(A)	**32.**	(C)	**33.**	(D)	**34.**	(B)	**35.**	(D)
36.	(B)	**37.**	(C)	**38.**	(B)	**39.**	(B)	**40.**	(A)	**41.**	(C)	**42.**	(C)
43.	(D)	**44.**	(C)	**45.**	(C)	**46.**	(D)	**47.**	(A)	**48.**	(B)	**49.**	(D)
50.	(B)												

16th NSO

1.	(B)	**2.**	(A)	**3.**	(C)	**4.**	(B)	**5.**	(C)	**6.**	(B)	**7.**	(A)
8.	(C)	**9.**	(A)	**10.**	(B)	**11.**	(C)	**12.**	(A)	**13.**	(A)	**14.**	(D)
15.	(D)	**16.**	(B)	**17.**	(B)	**18.**	(B)	**19.**	(C)	**20.**	(B)	**21.**	(C)
22.	(B)	**23.**	(C)	**24.**	(D)	**25.**	(D)	**26.**	(D)	**27.**	(D)	**28.**	(D)
29.	(C)	**30.**	(D)	**31.**	(C)	**32.**	(D)	**33.**	(B)	**34.**	(B)	**35.**	(D)
36.	(C)	**37.**	(D)	**38.**	(A)	**39.**	(D)	**40.**	(B)	**41.**	(D)	**42.**	(C)
43.	(B)	**44.**	(A)	**45.**	(D)	**46.**	(B)	**47.**	(D)	**48.**	(C)	**49.**	(A)
50.	(A)												

17th NSO-Level 2 was an online exam. Hence, paper cannot be included in the booklet.

18th NSO

1.	(D)	**9.**	(C)	**17.**	(A)	**25.**	(D)	**33.**	(D)	**41.**	(C)	**49.**	(C)
2.	(B)	**10.**	(C)	**18.**	(D)	**26.**	(D)	**34.**	(B)	**42.**	(A)	**50.**	(A)
3.	(A)	**11.**	(D)	**19.**	(C)	**27.**	(B)	**35.**	(C)	**43.**	(A)		
4.	(D)	**12.**	(D)	**20.**	(B)	**28.**	(B)	**36.**	(A)	**44.**	(D)		
5.	(B)	**13.**	(C)	**21.**	(C)	**29.**	(D)	**37.**	(B)	**45.**	(D)		
6.	(D)	**14.**	(B)	**22.**	(D)	**30.**	(A)	**38.**	(C)	**46.**	(C)		
7.	(B)	**15.**	(C)	**23.**	(D)	**31.**	(B)	**39.**	(B)	**47.**	(D)		
8.	(D)	**16.**	(B)	**24.**	(D)	**32.**	(C)	**40.**	(C)	**48.**	(D)		

CLASS24

19th NSO

1.	(A)	**2.**	(D)	**3.**	(C)	**4.**	(A)	**5.**	(A)	**6.**	(D)	**7.**	(C)
8.	(D)	**9.**	(A)	**10.**	(D)	**11.**	(C)	**12.**	(D)	**13.**	(C)	**14.**	(C)
15.	(A)	**16.**	(D)	**17.**	(A)	**18.**	(A)	**19.**	(C)	**20.**	(D)	**21.**	(B)
22.	(A)	**23.**	(B)	**24.**	(D)	**25.**	(C)	**26.**	(B)	**27.**	(D)	**28.**	(C)
29.	(A)	**30.**	(B)	**31.**	(A)	**32.**	(C)	**33.**	(D)	**34.**	(C)	**35.**	(D)
36.	(C)	**37.**	(C)	**38.**	(A)	**39.**	(C)	**40.**	(B)	**41.**	(A)	**42.**	(B)
43.	(A)	**44.**	(C)	**45.**	(A)	**46.**	(B)	**47.**	(C)	**48.**	(B)	**49.**	(C)
50.	(B)												

CLASS 9

LEVEL 2

QUESTION PAPER SET B

Techfest IIT Bombay

NSO

SOF NATIONAL SCIENCE OLYMPIAD 2018-19

DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Total Questions: 50 | Time: 1 hr.

Guidelines for the Candidate

1. You will get additional ten minutes to fill up information about yourself on the OMR Sheet, before the start of the exam.
2. Write your **Name, School Code, Class, Section** and **Roll No.** clearly on the **OMR Sheet** and do not forget to sign it.
3. In the school code column in the OMR Sheet, please fill in code allocated to your school and not the exam center code.
4. The Question Paper comprises two sections : **Science** Section (45 Questions) and **Achievers Section** (5 Questions).
   Each question in Achievers Section carries 3 marks, whereas all other questions carry one mark each.
5. All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
6. There is only ONE correct answer. Choose only ONE option for an answer.
7. To mark your choice of answers by darkening the circles on the OMR Sheet, use **HB Pencil** or **Blue / Black ball point pen** only. E.g.

Q.16: In the water cycle, condensation is the process of

A. Water vapour cooling down and turning into a liquid

B. Ice warming up and turning into a liquid

C. Liquid cooling down and turning into ice

D. Liquid warming up and turning into water vapour

As the correct answer is option A, you must darken the circle corresponding to option A on the OMR Sheet.

16. ● Ⓑ Ⓒ Ⓓ

8. Rough work should be done in the blank space provided in this booklet.
9. Please fill in your personal details in the space provided on this page before attempting the paper.
10. **RETURN THE OMR SHEET AND QUESTION PAPER TO THE INVIGILATOR AT THE END OF THE EXAM.**

SOF
SCIENCE OLYMPIAD FOUNDATION
Inspiring Young Minds Through Knowledge Olympiads

Name:.....

Section:..... SOF Olympiad Roll No.:..... Contact No.:.....

1. Two cars X and Y start from two points separated by 75 m. Y which is ahead of X, starts from rest with acceleration of 10 m/s^2 and X starts with uniform velocity of 40 m/s. They meet each other twice in their journey. Find the time gap between their meetings.

   A. 3.5 s B. 2.0 s
   C. 4.5 s D. 1.0 s

2. Read the given statements and select the correct option.

   Statements 1 : Astronauts in a satellite moving around the earth are in a weightless condition.

   Statements 2 : Gravitational force between the earth and the moon is responsible for the motion of moon around the earth.

   A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
   B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
   C. Statement 1 is true and statement 2 is false.
   D. Statement 1 is false and statement 2 is true.

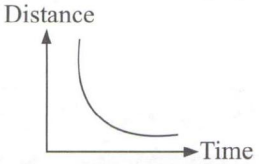
3. A bullet of mass 0.012 kg and horizontal speed 70 m s^{-1} strikes a block of wood of mass 0.4 kg and instantly comes to rest with respect to the block. The block is suspended from the ceiling by means of a thin wire. Find the height to which the block rises. Neglect the air friction.

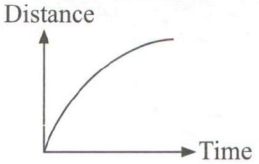
   A. 14.5 cm B. 21.2 cm
   C. 4.07 cm D. 10.3 cm

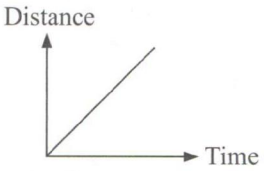
4. From the top of a building, a student throw three identical rocks each with the same speed. One is thrown vertically upwards, one horizontally and one vertically downwards. Which rock will hit the ground with the greatest speed? (Ignore air resistance)

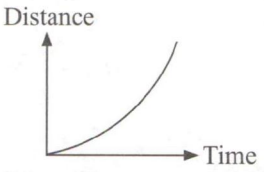
   A. The one thrown vertically upwards.
   B. The one thrown horizontally.
   C. The one thrown vertically downwards.
   D. All will hit with the same speed.

5. A body at rest starts falling from a height under free fall. The distance time graph will be

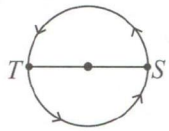
   A. 

   B. 

   C. 

   D. 

6. A particle moves on a circular path of radius 7 m with uniform speed of 11 m/s. If it reaches point T from point S, a diametrically opposite point, then during this interval

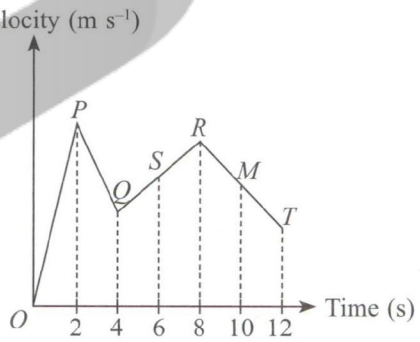


   (i) The average acceleration is zero.
   (ii) The average velocity is zero.
   (iii) The average acceleration is 11 m/s^2.
   (iv) The average velocity is 7 m/s.

   Which of the following options is correct?

   A. (i) and (ii) only B. (ii) and (iii) only
   C. (iii) and (iv) only D. (i) and (iv) only

7. The velocity-time graph of an object is shown in the figure. Identify the correct statement(s) regarding this graph.



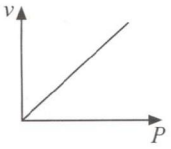
   (i) This is a non uniform velocity-time graph of the object.
   (ii) The velocity of the object is increasing at the same rate during OP and QR.
   (iii) The velocity of the object is decreasing at same rate during PQ and RT.

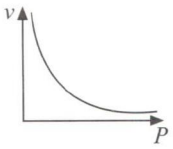
   A. (i) only B. (ii) only
   C. (iii) only D. (i), (ii) and (iii)

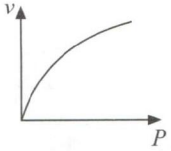
8. If the ratio of momentum and kinetic energy of a particle is inversely proportional to the time, then this is the case of a

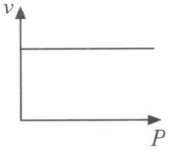
   A. Uniformly accelerated motion
   B. Uniform motion
   C. Non-uniformly accelerated motion
   D. Simple harmonic motion.

9. A student plotted the following four graphs representing the variation of velocity v of sound in a gas with the pressure P for a given temperature. Which one is correct?

A. 

B. 

C. 

D. 

10. A cricket ball of mass 150 g moving with a speed of 126 km/h hits at the middle of the bat, held firmly at its position by the batsman. The ball moves straight back to the bowler after hitting the bat. Assume that the ball rebounds with same speed and they remain in contact for 0.001 s, the force that the batsman had to apply to hold the bat firmly at its place would be

A. 10.5×10^{-4} N B. 2.1×10^{3} N
C. 1.05×10^{4} N D. 2.1×10^{4} N

11. A boy throws a cricket ball from the boundary to the wicket-keeper. If the frictional force due to air cannot be ignored, the forces acting on the ball at the position X are represented by

A.  B. 

C.  D. 

12. Jaya is on a small boat which is situated at the centre of a circular pond. The radius of pond is 30 m. She wants to reach the shore and for that she throws a stone of mass 0.5 kg lying on her boat with velocity 50 m/s. If mass of Jaya, boat and stone together is 50.5 kg, how much time will she take to reach the shore? Assume there is no friction between water and boat.

A. 60 seconds B. 30 seconds
C. 40 seconds D. 50 seconds

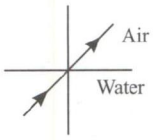
13. A body is dropped from a height h and touches the ground at a speed of $1.2\sqrt{gh}$. The work done by air friction is

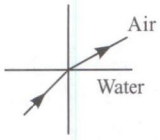
A. mgh B. $0.72\ mgh$
C. $0.28\ mgh$ D. $-0.28\ mgh$

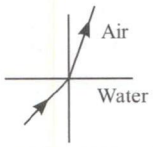
14. A truck accelerates from speed v to $2v$. Work done during this is

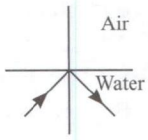
A. Three times as the work done in accelerating it from rest to v.
B. Same as the work done in accelerating it from rest to v.
C. Four times as the work done in accelerating it from rest to v.
D. Less than the work done in accelerating it from rest to v.

15. Which of the following figures is correct regarding the propagation of sound wave from water to air?

A. 

B. 

C. 

D. 

16. Melting and boiling points of a few substances are given in the table.

Substance	M. pt. (°C)	B. pt. (°C)
P	–220	–180
Q	–40	350
R	–20	75
S	–15	180
T	115	440

Which of the following is/are correct regarding these substances?

I. Substance P will have least ordered arrangement of particles at room temperature.
II. Substances Q, R and T will have fixed volumes at room temperature but no fixed shape.
III. The order of strength of interparticle forces in these substances is $P > R > Q > T$.
IV. Substance T exists in solid state while substance R exists in gaseous state at 100°C.

A. I and IV only B. II and IV only
C. III only D. IV only

17. Talcum powder is widely used in cosmetic products. The powder is made from talc, a mineral having formula $Mg_3Si_4O_{10}(OH)_2$. What is the charge on Si_4O_{10} ion in this molecule?

A. –1 B. –2
C. –3 D. –4

18. Iron is extracted from its ore 'magnetite' having formula Fe_3O_4. If during a process, 6 moles of iron are extracted from the ore, then the mass of ore used in the extraction is [Given : Atomic mass of Fe = 56 u, O = 16 u]

A. 152 g B. 464 g
C. 220 g D. 52 g

19. The properties of four different components of a mixture are shown in the table.

Substance	Soluble in water	Soluble in ethanol	Soluble in nitric acid
P	×	✓	×
Q	✓	×	×
R	✓	×	×
S	×	×	Dissolves to form nitrate

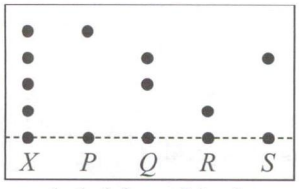
If *S* can be recovered from its nitrate by heating, then which of the following represents the correct sequence of methods that should be employed to obtain pure and dry sample of *S* from the mixture?

A. Dissolve the mixture in water → Add dilute nitric acid to filtrate → Heat to dryness
B. Dissolve the mixture in ethanol → Heat the filtrate to dryness
C. Dissolve the mixture in ethanol → Dissolve the residue in nitric acid → Heat the filtrate to dryness
D. Dissolve the mixture in nitric acid → Add ethanol to filtrate → Heat the filtrate to dryness

20. Ryma was given a mixture of two substances *P* and *Q*. To separate these components, she first dissolved the mixture in ether in a test tube and filtered it through a filter paper. Component *Q* was obtained as residue and component *P* was obtained by evaporation of the filtrate. *P* and *Q* could be respectively

A. Sodium chloride and ammonium chloride
B. Camphor and naphthalene
C. Naphthalene and ammonium chloride
D. Ammonium chloride and naphthalene.

21. Food manufacturers often prefer food dyes over natural food colours because they produce a more vibrant colour. One method to check the presence of artificial dyes in a food item is chromatography. The chromatogram of food item *X* and four dyes *P*, *Q*, *R* and *S* is shown in the figure.



What can be concluded from this chromatogram?

A. *X* contains only three dyes, *P*, *R* and *S*.
B. Dye *Q* consists of only one component.
C. *P*, *R* and *S* are pure dyes.
D. *X* contains only dye *P*.

22. The ratio of atomic number of element *P* to that of element *Q* is 3 : 2. If *P* is an inert gas with octet configuration in *M* shell, then which of the following is correct about *Q*?

A. *Q* is also a noble gas.
B. *Q* forms a stable dipositive ion.
C. *Q* forms a trinegative ion.
D. The stable ion of *Q* has octet configuration in *M* shell.

23. A few hypothetical atoms are listed as:

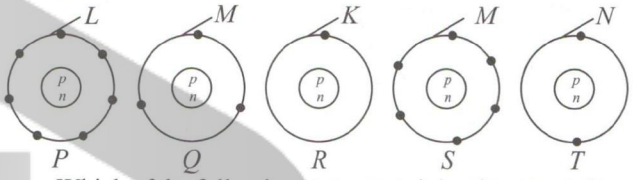
$^{35}_{17}X$, $^{40}_{19}Y$, $^{3}_{1}Z$, $^{4}_{2}V$, $^{18}_{8}W$, $^{3}_{2}U$, $^{40}_{20}T$, and $^{37}_{17}S$

Now, read the given passage and fill in the blanks by selecting an appropriate option.

There are __(i)__ pairs of isotopes and __(ii)__ pairs of isobars in the given list of atoms. Atoms __(iii)__ and __(iv)__ will form divalent cation and divalent anion respectively.

	(i)	(ii)	(iii)	(iv)
A.	3	2	*U*	*V*
B.	2	3	*S*	*T*
C.	2	2	*T*	*W*
D.	2	2	*T*	*S*

24. Outer shell configurations of five atoms (*P*–*T*) are given as:

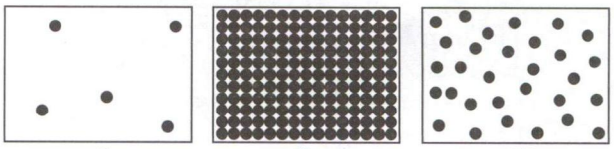


Which of the following statements is/are incorrect about these atoms?

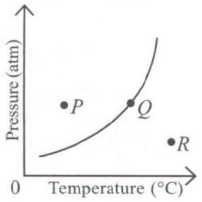
I. Elements *S* and *T* have same valency.
II. Elements *Q* and *T* will form a compound of formula Q_2T_3.
III. Proton number of *T* is 12.
IV. *R* can form a cation as well as an anion.

A. II and III only
B. I only
C. III and IV only
D. I, II and IV

25. Figures I, II and III show how the particles of a substance are arranged in three different states.



If the given graph represents the variation of boiling point of water with pressure, then which of the following is the correct match for the states represented by points *P*, *Q* and *R*?



A. *P*-II; *Q*-I, II; *R*-II, III
B. *P*-II, III; *Q*-I; *R*-II
C. *P*-III; *Q*-I, III; *R*-I
D. *P*-III; *Q*-III; *R*-II, III

26. Read the given statements and mark the correct option.

Statement 1 : Bohr's orbits are called stationary orbits.
Statement 2 : Electrons remain stationary in these orbits for some time.

A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
C. Statement 1 is true and statement 2 is false.
D. Both statements 1 and 2 are false.

27. Three invisible radiations X, Y and Z are passed through an electric field.

X was found to be undeviated, Y deviated towards positive end and Z deviated towards negative end of the electric field. Which of the following is true about X, Y and Z?

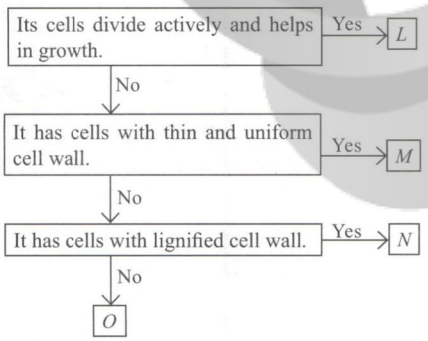
A. The $\frac{q}{m}$ ratio of the particle constituting X is 0.
B. The $\frac{q}{m}$ ratio of the particle constituting Z is not constant.
C. Absolute mass of the particle constituting Y is 9.1×10^{-28} g.
D. All of these

28. A mixture of three gases X, Y and Z is separated as follows:

The mixture is first passed through KOH. It dissolves the gas X which is obtained back from KOH by adding HCl. Gases Y and Z are separated by the process of diffusion in which gas Y comes out first. Gases X, Y and Z could be respectively

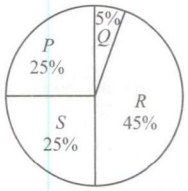
A. H_2, O_2 and N_2
B. CO_2, H_2 and O_2
C. CO_2, N_2 and H_2
D. N_2, CO_2 and O_2

29. Refer to the given flow chart regarding types of tissues in plants and select the incorrect statement regarding L, M, N and O.



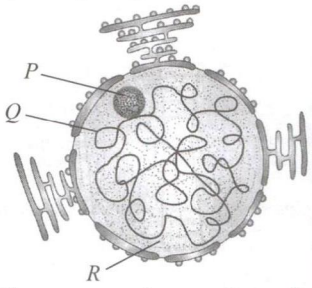
A. Division in cells of L could result in secondary growth of plant.
B. M could store waste products of plant such as gum, resins, tannin, etc.
C. In young dicotyledonous stems, N could be the chief supporting tissue and its cells are filled with protoplasm.
D. O could be present at margins of some leaves and resists tearing effect of the wind.

30. Soil is a complex mixture. The given figure shows the percentage by volume of different soil components as P, Q, R and S. What will you place at S?



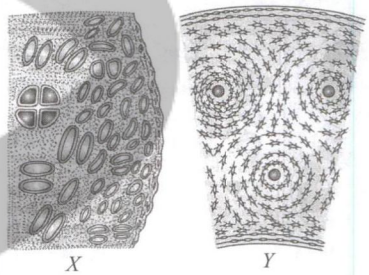
A. Air
B. Water
C. Organic matter
D. Either air or water

31. Refer to the given figure and select the incorrect statement regarding P, Q and R.



A. P could be an agranular membrane bound structure which is rich in DNA and proteins.
B. Q could occur in dividing nucleus and is made up of RNA and proteins.
C. R could be a clear fluid material that stains mainly with basic dyes.
D. All of these

32. Identify X and Y from the given figures and select the correct statement regarding them.



A. Matrix of X is composed of both organic and inorganic materials whereas that of Y is entirely organic in nature.
B. X occurs in the walls of trachea whereas Y serves as a storage site of calcium and phosphate.
C. Endoskeleton of *Hippocampus* is made up of X whereas in sting ray it is made up of Y.
D. Growth of both X and Y is unidirectional.

33. Read the given statements and select the option that correctly fills the blanks in any two of them.

(i) Hybridisation between different species of same genus is known as _____ hybridisation.
(ii) _____ is a well known drought breed of cattle.
(iii) _____ is a popular fresh water fish variety consumed as food.
(iv) _____ is an exotic variety of bee that yields large amount of honey.

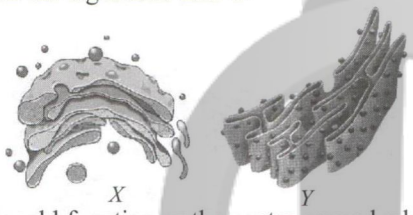
A. (i) Interspecific, (ii) Malvi
B. (i) Intervarietal, (iv) *Apis florae*
C. (ii) Gir, (iii) Hilsa
D. (ii) Sahiwal, (iv) *Apis indica*

34. Read the given paragraph where few words have been italicised. Make necessary changes (wherever necessary) and select the incorrect option.

There are four main concentric layers of atmosphere that differ in *density*, temperature and composition. The lowest layer troposphere is rich in moisture and the *upper* part of this layer is the reservoir of life supporting gases. Stratosphere has ozone shield that protects us from harmful UV radiations and here temperature changes *immensely* with height. In mesosphere, temperature first *decreases* and then *increases* with height. Last is thermosphere where temperature increases with height.

A. *Density* should not be replaced as it is correctly mentioned.
B. *Upper* should be replaced by *lower*.
C. *Immensely* should not be changed as it is correctly mentioned.
D. Positions of *increases* and *decreases* should be interchanged.

35. Select the incorrect statements regarding the organelles shown in the figures *X* and *Y*.



X *Y*

(i) *X* could function as the centre around which yolk is deposited in oocytes.
(ii) *Y* could provide surface for synthesis of steroid hormones.
(iii) *X* plays an important role during metamorphosis in frog.
(iv) Both *X* and *Y* are single membrane bound and are absent in prokaryotic cells.
(v) Proteins synthesised at *X* are glycosylated at *Y*.

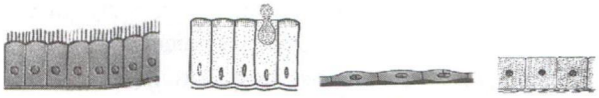
A. (i), (ii) and (iv) only
B. (ii), (iii) and (v) only
C. (iii) and (v) only
D. (ii), (iv) and (v) only

36. Identify *X*, *Y* and *Z* in the given table and select the correct option.

Disease	Causative agent	Mode of transmission
Measles	*X*	Droplet infection
Y	*Haemophilus influenzae*	Sputum of patient
Dum-Dum fever	*Z*	Bite of sandfly

A. *X* could be *Rubeola* virus whereas *Y* could be Pneumonia.
B. *X* could be *Varicella Zoster* virus whereas *Z* could be *Trypanosoma cruzi*.
C. *Y* could be tuberculosis whereas *Z* could be *Leishmania donovani*.
D. *X* could be *Rubeola* virus, *Y* could be whooping cough and *Z* could be *Trypanosoma gambiense*.

37. Refer to the given figures showing four different types of epithelial tissues (*P*, *Q*, *R* and *S*) and select the correct option regarding these.



P *Q* *R* *S*

A. *P* is found in mammary gland ducts and urethra.
B. *Q* is found in organs involved in secretion such as gastric and intestinal glands.
C. *R* is found in ovaries and sperm producing tubules.
D. *S* forms the outermost layer of intestine and gall bladder.

38. Refer to the given table regarding disease caused in cattle and select the correct option regarding *X*, *Y* and *Z*.

Criterion	*X*	*Y*	*Z*
Caused due to virus	✓	×	✓
Can spread to humans	×	✓	✓
Causes ulceration in mouth	✓	×	×

A. *X* could be encephalitis and *Y* could be cowpox.
B. *Y* could be amoebiasis and *Z* could be brucellosis.
C. *X* could be rinderpest and *Z* could be rabies.
D. *Y* could be rabies and *Z* could be cowpox.

39. Match column I with column II and select the correct option from the given codes.

	Column I		Column II
(a)	Pore bearing animals	(i)	Arthropoda
(b)	Cnidoblasts	(ii)	Coelenterata
(c)	Metameric segmentation	(iii)	Porifera
(d)	Jointed legs	(iv)	Echinodermata
(e)	Soft bodied animals	(v)	Mollusca
(f)	Spiny skinned animals	(vi)	Annelida

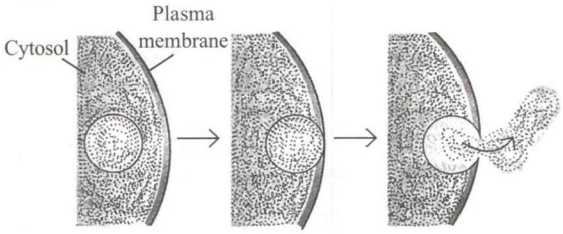
A. (a)-(iv), (b)-(v), (c)-(i), (d)-(vi), (e)-(iii), (f)-(ii)
B. (a)-(vi), (b)-(i), (c)-(iv), (d)-(ii), (e)-(v), (f)-(iii)
C. (a)-(iii), (b)-(ii), (c)-(vi), (d)-(i), (e)-(v), (f)-(iv)
D. (a)-(i), (b)-(ii), (c)-(iv), (d)-(vi), (e)-(v), (f)-(iii)

40. Which of the following analogies are incorrect?

(i) Acute disease : Cough :: Chronic disease : Typhoid
(ii) Hypersecretion of thyroid hormone : Grave's disease :: Hyposecretion of thyroid hormone : Myxoedema
(iii) Virus : Chicken pox :: Bacteria : Tuberculosis
(iv) Communicable disease : Scurvy :: Non-communicable disease : Cancer

A. (i) and (ii) only
B. (i) and (iv) only
C. (ii) and (iv) only
D. (i), (iii) and (iv) only

41. The process shown in the given figure is also responsible for



A. Replacement of internalised membrane by the fusion of the vesicle with the cell membrane
B. Internalising solid particles and small molecules
C. Formation of phagosome
D. Carrying segments of cell membrane into the cytoplasm.

42. Given below is a list of crops. How many of these are rabi and kharif crops respectively?

Wheat, Soybean, Pea, Cotton, Groundnut, Mustard, Linseed, Gram, Maize, Paddy

A. 6, 4 B. 4, 6
C. 5, 5 D. 7, 3

43. Identify the type of plant tissue from the given statements (I-III) and select the correct option regarding it.

I. Cells of the tissue are living and have localised thickening in corners.
II. It occurs mostly in aerial parts of the plants restricted to the outer layers.
III. It is the chief mechanical tissue of the young parts of the plant.

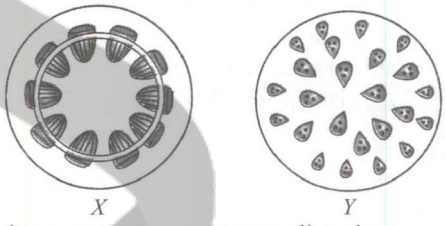
A. Cells of the tissue manufacture sugar and may store it as starch.
B. Cells of the tissue act as water storage tissue in succulent plants.
C. Cells of the tissue serve as packing tissues in between the other tissues.
D. Cells of the tissue provides a protective covering around seeds and nuts.

44. Identify organisms *W*, *X*, *Y* and *Z* from the given table and select the correct option.

Organism	Characteristic			
	Unicellular	Eukaryotic	Cell wall is made up of chitin	Autotrophic
W	✓	✓	×	✓
X	✓	✓	×	×
Y	×	✓	✓	×
Z	×	✓	×	✓

	W	*X*	*Y*	*Z*
A.	*Physarum*	Diatom	*Rhizopus*	*Riccia*
B.	Dinoflagellate	*Streptomyces*	*Ectocarpus*	*Azolla*
C.	*Chlamydomonas*	*Paramecium*	*Agaricus*	*Equisetum*
D.	*Mycobacterium*	*Giardia*	*Ulva*	*Sargassum*

45. Ratnika observed T.S. of stems of two different plants sunflower (*X*) and maize (*Y*) under the microscope and made the following diagrams.

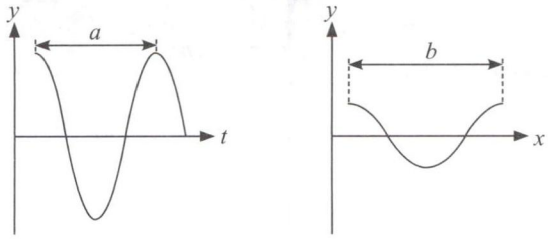


Select the correct statement regarding them.

A. *X* belongs to plant in which flowers are trimerous whereas *Y* belongs to plant in which flowers are pentamerous.
B. *X* belongs to plant in which leaves show parallel venation whereas *Y* belongs to plant in which leaves show reticulate venation.
C. *X* belongs to plant which has fibrous root system whereas *Y* belongs to plant having tap root system.
D. Vascular bundles are of open type in *X* whereas in *Y* they are of closed type.

ACHIEVERS SECTION

46. A sound wave is represented by the following graphs.



Displacement *y* against time *t* for constant position

Displacement *y* against position *x* for constant time

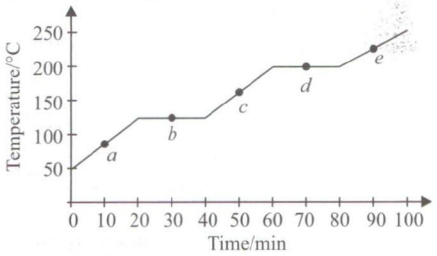
Which of the following gives the speed of propagation of the wave?

A. ab B. $\frac{a}{b}$
C. $\frac{b}{a}$ D. $\frac{1}{b}$

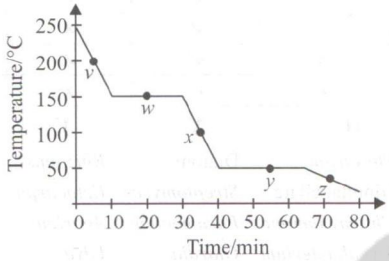
47. Consider an isolated system of three particles of masses $2M$, m and M placed at points *P*, *Q* and *R* with $PQ = 1/2(QR)$ as shown in the figure. m is much-much smaller than M and at time $t = 0$, they are all at rest. At subsequent times before any collision takes place,

A. m will remain at rest
B. m will move towards M
C. m will move towards $2M$
D. m will have oscillatory motion.

48. Study the given graphs carefully.



Graph-1 : The heating curve of substance *P*



Graph-2 : The cooling curve of substance *Q*

Which of the following statements is incorrect?

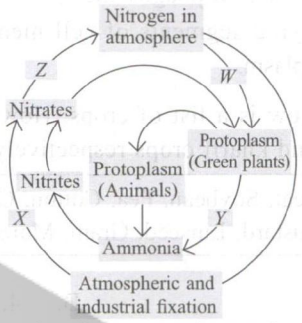
A. The melting point of substance *P* is 200°C.
B. The boiling point of substance *Q* is 50°C.
C. At point '*x*', the substance *Q* exists in both liquid and gaseous states while at point '*d*', the substance *P* exists in liquid state only.
D. All of these

49. Refer to the given dichotomous key and select the correct option regarding it.

I. (a) Animal shows radial symmetry - Go to II
   (b) Animal shows bilateral symmetry - Go to III
II. (a) Acoelomate animal - *P*
   (b) Coelomate animal - *Q*
III. (a) Anus develops prior to mouth in the embryo - *R*
   (b) Mouth develops prior to anus in the embryo - *S*

A. *P* could be *Spongilla* that reproduces asexually by formation of gemmule.
B. *Q* could be *Ophiothrix* having body surface covered by mesodermal endoskeleton of calcareous spines.
C. *R* could be *Dugesia* having an incomplete digestive tract.
D. *S* could be *Milvus* that respires through lungs.

50. Refer to the given flow chart representing nitrogen cycle in nature and identify the processes *W*, *X*, *Y* and *Z*.



Select the option that correctly matches microorganism involved in processes *W*, *X*, *Y* and *Z*.

	W	*X*	*Y*	*Z*
A.	*Pseudomonas*	*Clostridium*	*Nitrosomonas*	*Rhizobium*
B.	*Rhizobium*	*Nitrococcus*	Putrefying bacteria	*Pseudomonas*
C.	*Nitrosomonas*	*Nitrobacter*	*Pseudomonas*	*Clostridium*
D.	*Rhizobium*	Putrefying bacteria	*Penicillium*	*Nitrocystis*

SPACE FOR ROUGH WORK

CLASS24

CLASS24 | **CLASS - IX** | **2018-19**

NSO (LEVEL-II) **ANSWER KEY**

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	2	2	4	4	3	1	1	4	3	3	1	4	1	3	1	4	2	3	3
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	1	2	3	1	3	3	4	2	3	4	4	2	1	4	2	1	2	3	3	2
Que.	41	42	43	44	45	46	47	48	49	50										
Ans.	3	3	1	3	4	2	3	4	2	2										