

PREVIOUS YEAR QUESTION PAPER

10th
CLASS



FEATURES

- Naso last 5 years question paper's.
- Answer keys for all the question papers.
- OMR Sheets at the end of all question papers to practice.
- Sample revision question paper for more practice.
- Recommended for all Science Olympiads / Competitions.

NASO OLYMPIAD COMPREHENSIVE GUIDE



NASO QUESTION PAPER 2018



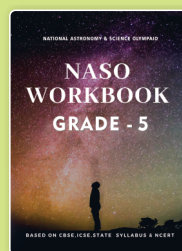
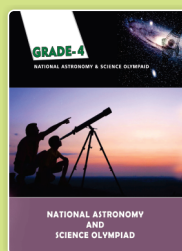
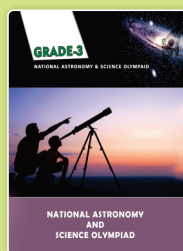
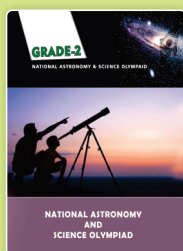
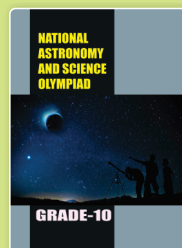
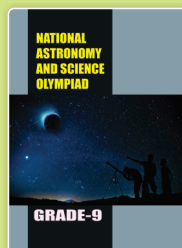
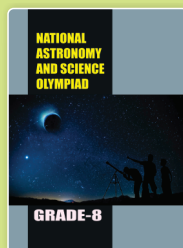
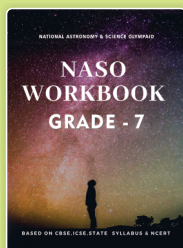
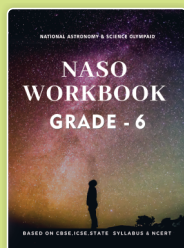
NASO MOCK TEST SERIES



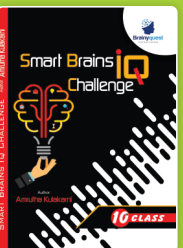
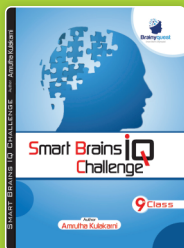
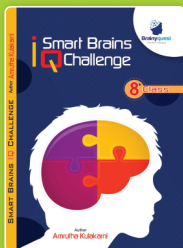
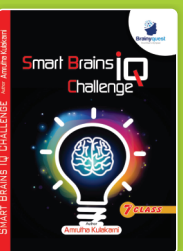
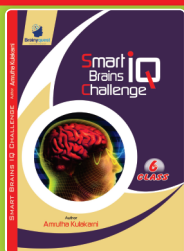
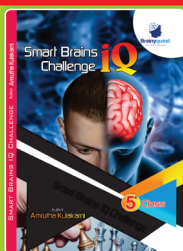
NASO PREVIOUS YEAR QUESTION PAPER



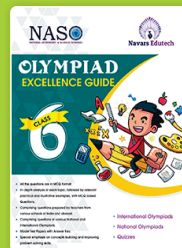
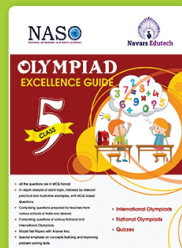
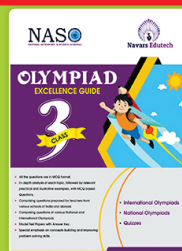
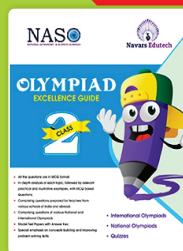
NASO WORKBOOK



SMART BAIN IQ PUZZLE

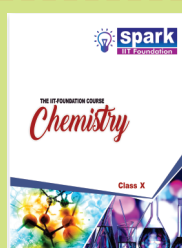
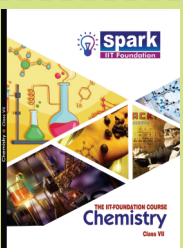


NASO EXCELLENCE GUIDE

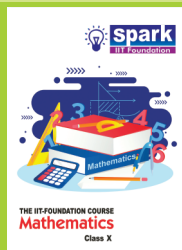
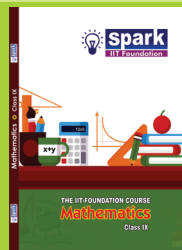
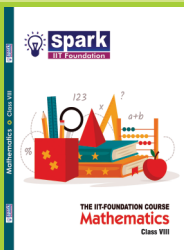
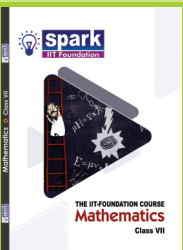


SPARK IIT FOUNDATION

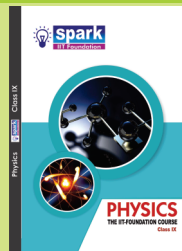
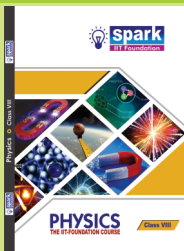
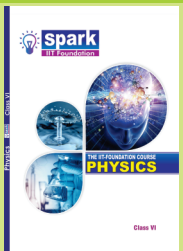
CHEMISTRY



MATHEMATICS



PHYSICS



Published by

Navar's Edutech Pvt. Ltd.,
2nd Floor, New JBR Plaza,
Reddy Colony, Beside Biryani Zone,
Nagarjuna Nagar, Hyderabad - 500 062
www.naso.in

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Duration : 60 Minutes

GENERAL INSTRUCTIONS

Max Marks : 50

1. Please collect the Answer Sheets (OMR) from the invigilator.
2. Please Write your Student ID, Name, Class, and School Name on the OMR Sheet.
3. This question paper contains 50 Questions, duration is 60 minutes.
4. Answer all the questions in OMR sheet only. And please do sign on it.
5. Use only Black or Blue Ball Point Pen to answer the question in OMR sheet.
6. Indicate the correct answer by darkening on the 4 responses provided.
7. After successful completion of the test please submit the OMR answer sheet to the invigilator.

1. A scientist took some plant cells and put them in a solution of glucose. He measured the concentration of glucose inside the cells after 30 minutes. The experiment was repeated, this time using double the concentration of glucose in the solution. It resulted in doubling of glucose inside the cells of the concentration. This experiment successfully demonstrates which principle?

- A. Glucose enters plant cells by active transport.
- B. Glucose enters plant cells by endocytosis.
- C. Some type of diffusion causes the glucose to enter plant cells.
- D. Plant cells cannot synthesize glucose.

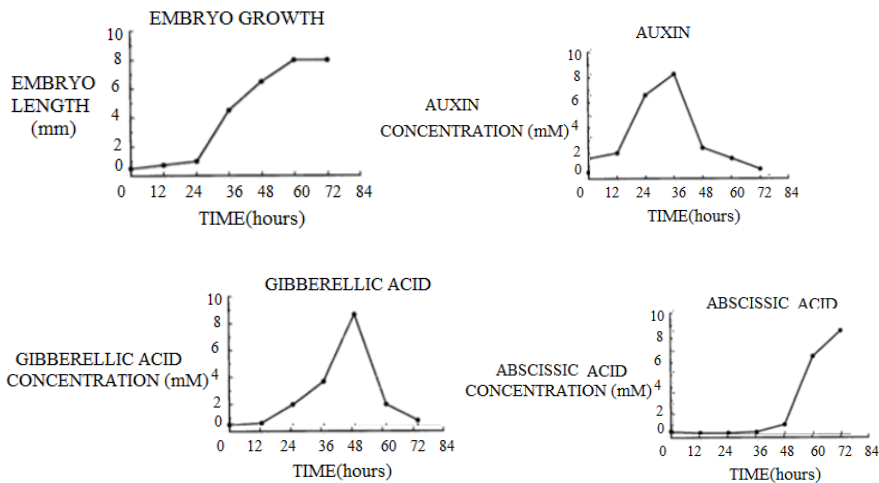
2. Consider such a plant, which has dominance of hairy leaves over smooth leaves, and dominance of blue flowers to white. A pure breeding hairy-leaved, blue-flowered strain is crossed with a pure breeding smooth-leaved, white-flowered strain. The offspring is allowed to self-fertilize. It is observed that the offspring are

hairy-leaved and blue-flowered	69%
smooth-leaved and white-flowered	19%
hairy-leaved and white-flowered	6%
smooth-leaved and blue-flowered	6%

Based on these observations, what can be concluded about the two genes?

- A. The same biochemical pathway of both the genes is same.
- B. The two genes segregate independently.
- C. the two genes exhibit typical Mendelian ratios.
- D. Chromosome of the two genes are the same.

3. While doing some routine micro-organisms' culturing in a lab, a hospital technician noticed a bacterial colony growing on a culture medium containing three different antibiotics. The bacterium is identified by him as one that did not cause a human disease. But as it was his duty, he still reported his observation to the hospital administration. What could be the cause of his worry?
- This bacterium was resistant to antibiotics and now it cannot be killed.
 - Through transduction or conjugation, resistance to antibiotics could be transferred to disease causing bacteria.
 - It is able to grow in people taking these antibiotics as the bacterium might feed on the antibiotics.
 - If people accidentally ingested the bacteria with their food, they would become resistant to the antibiotic
4. Plant hormones play a role in regulating the development of plant seeds. The embryo growth and the changes in hormone concentration over time is plotted in the graphs below:



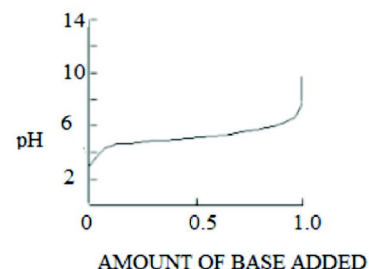
The embryo growth is regulated by which hormone(s)?

- Auxin alone
 - Gibberellic acid alone
 - Abscissic acid alone
 - Both auxin and gibberellic acid
5. There have been reported a number of unsuccessful efforts to repeat the cloning of Dolly the sheep. The sceptics suggest that a fetal cell might have contaminated the experiment. The scientists are now challenged to produce additional evidence proving that Dolly is really derived from an adult cell.
- Choose the correct option which can be produced as evidence of Dolly being created from an adult cell, rather than a fetal cell.
- The fingerprints of Dolly's DNA.
 - The heterozygosity of random pieces taken from Dolly's DNA.
 - Dolly's DNA's melting point.
 - Dolly's telomeres length.

6. The titration of acetic acid (CH_3COOH) is shown in the given graph. Identify the incorrect statement?

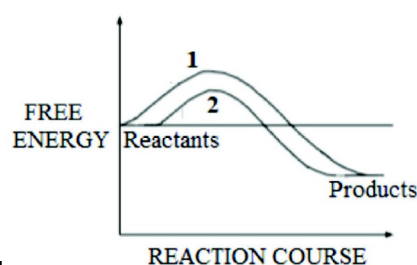
- A. $[\text{CH}_3\text{COOH}] = [\text{CH}_3\text{COO}^-]$ at the midpoint.
- B. pH is about 4.8 at the midpoint.
- C. All of the molecules of acetic acid have been titrated to the conjugate base, acetate at the endpoint.
- D. The buffering capacity is most effective at pH values below 4 and above

incorrect statement?



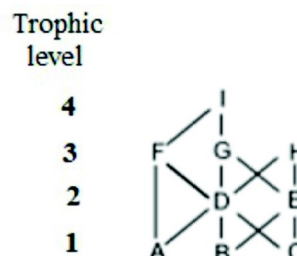
7. Two hypothetical reactions are shown below: 1 represents a reaction uncatalysed by an enzyme and 2 represents an enzyme-catalysed reaction. Identify the incorrect statement.

- A. both the forward and reverse reactions speed up as an enzyme changes the activation energy of a reversible reaction of the type xy .
- B. The energy required by uncatalysed reaction (1) is higher than the activation energy than does the enzyme-catalysed reaction (2).
- C. both reactions have same amount of change in free energy]
- D. The rate of reaching to for both the reactions is same.



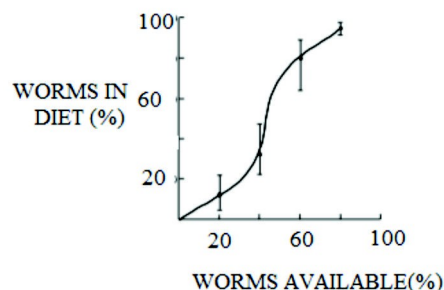
8. The feeding interactions between nine species (A to I) with four trophic levels of a food web are shown below. Identify the correct statement.

- A. Species A is a herbivore.
- B. Species D is a carnivore.
- C. Species G is an omnivore.
- D. Species H is a predator.



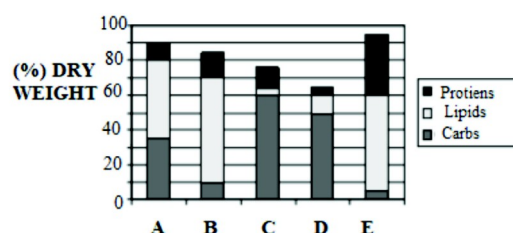
9. In order to determine the feeding preference of guppies, an experiment was conducted. Four treatments were conducted where guppies were offered different mixtures of worms and flies: from a mixture of 20% worms (and 80% flies) to a mixture of 80% worms (and 20% flies). The stomach contents of the guppies were compared to determine what they actually ingested. The results are shown below (circles = mean values, vertical bars = total ranges). What can be concluded from these results?

- A. Guppies prefer worms.
- B. Guppies prefer flies.
- C. Guppies prefer the least abundant food available.
- D. Guppies prefer the most abundant food available.



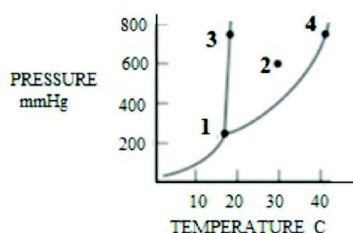
10. The percent content of proteins, lipids, and carbohydrates in the storage tissues of seeds from five different species is shown in the graph below. Identify the storage tissue which has the greatest lipid content?

- A. Species A
- B. Species B ...
- C. Species C
- D. Species D



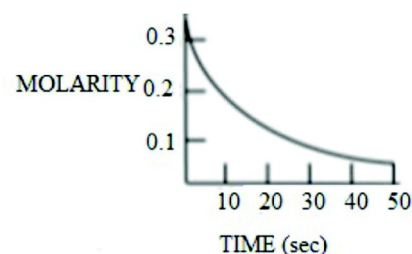
11. The normal boiling point is correctly represented by which of the the phase diagram?

- A. point 1
- B. point 2
- C. point 3
- D. point 4

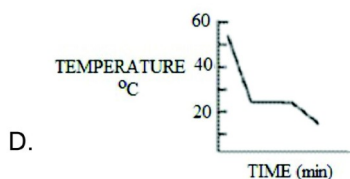
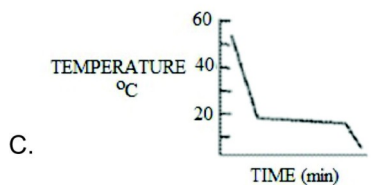
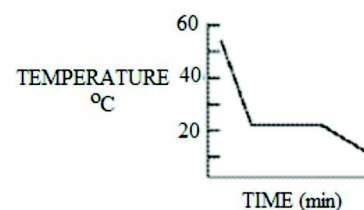
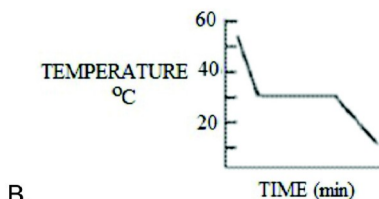
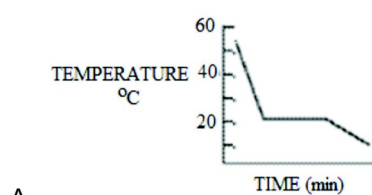


12. Which reaction rate is the greatest for the reaction represented by the given diagram?

- A. average rate
- B. final rate
- C. initial rate ...
- D. rate at 20 seconds 25

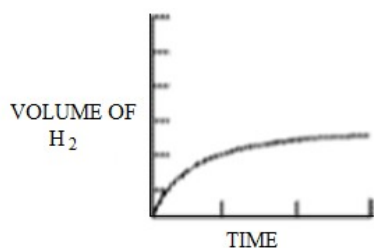


13. The given diagram represents the behavior of a pure solvent upon cooling.

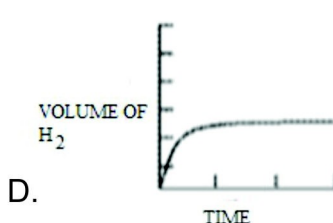
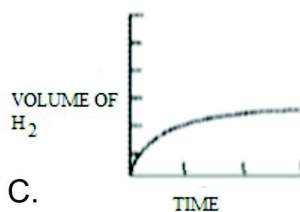
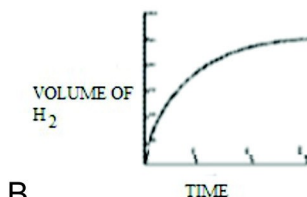
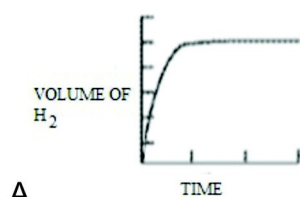


Assuming that all diagrams are drawn to the same scale, identify the diagrams which best represents the cooling curve of a solution in that solvent upon cooling?

14. The volume of H_2 gas produced as a function of time by the reaction of a given mass of magnesium turnings with excess 1 M HCl is shown in the plot.



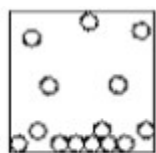
Identify the graph which results from the reaction of an equal mass of magnesium turnings with excess 2 M HCl?



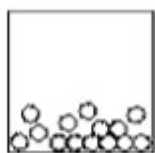
15. In order to determine the degree of hydration of a salt, a student was asked to conduct an experiment by finding the mass of a clean dried crucible and lid. Also the mass of the crucible and lid containing a sample of the salt. In a Bunsen burner flame, the crucible, lid and salt are heated. Later, these are cooled, and weighed. What will be the effect on the degree of hydration compared with the actual value If the crucible, lid and salt are heated only?

- A. too high
B. too low
C. unaffected
D. impossible to predict

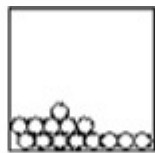
16. The circles in the given diagram represent molecules. In the process of melting, which of the following diagram provides the best molecular level representation of a pure solid?



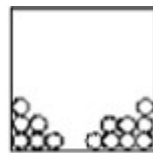
A.



B.

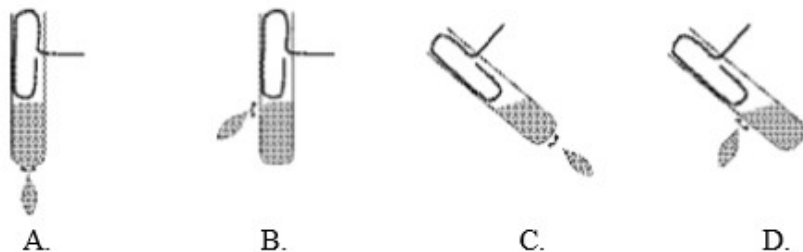


C.



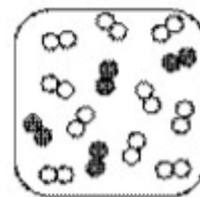
D.

17. Identify the correct way to heat a liquid in a test tube?



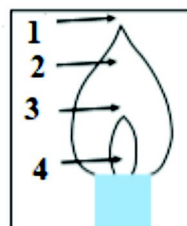
18. If nitrogen atoms are represented as filled circles and oxygen atoms as open circles, how much NO_2 can be prepared from the mixture shown?

- A. 10 molecules
B. 4 molecules
C. 16 molecules
D. 8 molecules



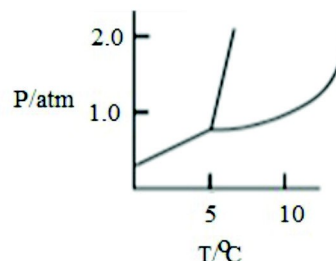
19. Which letter in the diagram depicts the hottest portion of a Bunsen burner flame?

- A. 1
B. 2
C. 3
D. 4



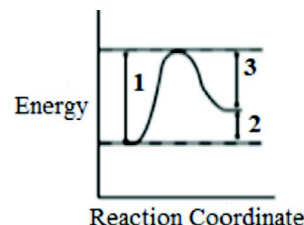
20. According to the phase diagram shown, at 1.0 atm and 0.0 $^{\circ}\text{C}$, in which state the substance exist?

- A. solid only
B. liquid only
C. gas only
D. solid and liquid only

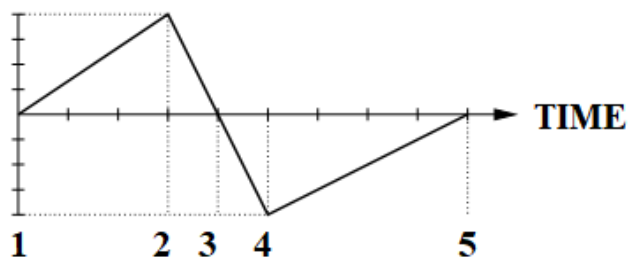


21. When a catalyst is added to the system represented by this energy-reaction coordinate diagram, which dimensions in the diagram are changed?

- A. 2 only
B. 1 and 3 only
C. 3 only
D. 1, 2, 3.



Read the given figure and answer questions 1 to 3. This figure shows the motion of a squirrel as it runs along a telephone wire in a straight-line. The indicated times are denoted by 1 through 5.



22. Consider the given graph to be a POSITION vs. TIME plot. At what time(s) the squirrel has the greatest speed or during what time interval(s)?

- A. From A to B
B. From B to C only
C. From B to D
D. From C to D only

23. Consider the given graph to be a VELOCITY vs. TIME graph. What is the time(s) at which the squirrel has the greatest speed?

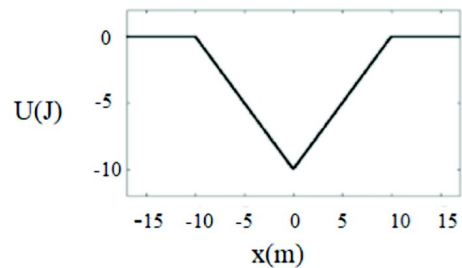
- A. at B
B. at C
C. at D
D. at both B and D

24. Consider the given graph to be an ACCELERATION vs. TIME graph. Let us assume that the squirrel starts from rest. At what time(s) does the squirrel has the greatest speed?

- A. at B
B. at C
C. at D
D. at both B and D

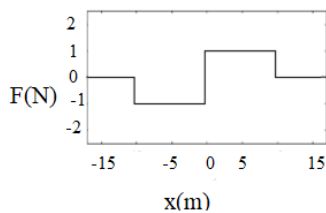
25. A few friends are lowering a piano from the window which is 10ft. high in the apartment building. When the piano is 30 meters above the ground, the rope breaks. The friends on the ground first noticed the piano by the alarming shouts of the movers above, when it is 14 meters above the ground. How much time do they have to get out of the way before the piano hits the ground?

- A. 0.66 sec
B. 0.78 sec
C. 1.67 sec
D. 1.79 sec

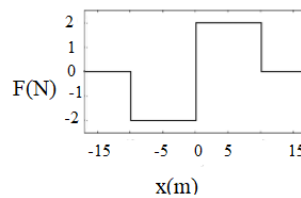


Use the given graph of potential energy used for answering the questions 26 and 27:

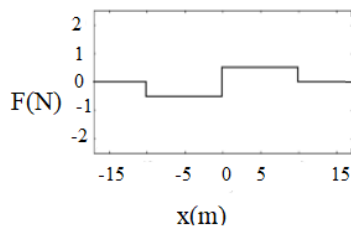
26. Identify the graph that represents the force corresponding to the given potential?



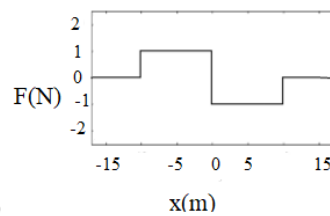
A.



B.

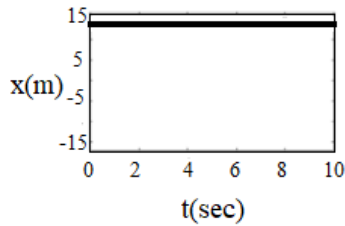


C.

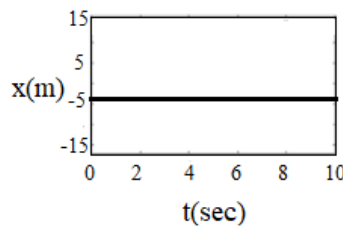


D.

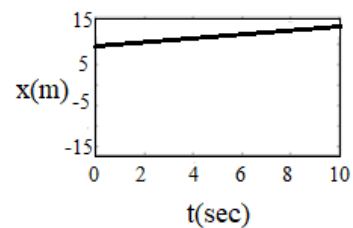
27. Consider the following graphs of position vs. time.



I



II

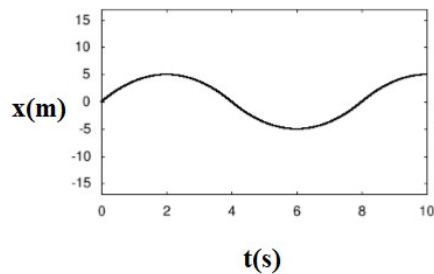


III

The motion of a particle in the given potential can be best represented by which of the following?

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

28. The given graph is a plot of position vs. time. It represents the motion of a certain particle in the given potential.

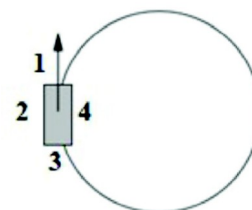


How much is the total energy of the particle?

- A. -5 J B. 0 J C. 5 J D. 10 J

29. A balloon filled is with helium gas. It is tied by a light string to the floor of a car. The car does not cause air from outside to affect the balloon as it is sealed in such a way. Also, the car is traveling along a circular path with constant speed. Identify the direction in which the balloon on the string lean towards?

- A. 1 B. 2
C. 3 D. 4

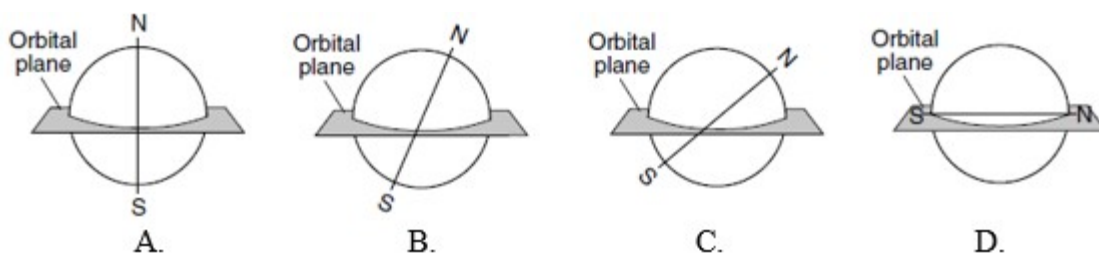


30. Through the U-shaped tubes, two streams of water flow as shown in the diagram. The cross-sectional area of the tube on the left is A . 'v' is the speed of the water flowing through it. The cross-sectional area of the tube on the right is $A_0 = 1/2A$. What must be the speed v_0 of the water flowing through the tube on the right if the net force on the tube assembly is zero? (Assume that, upon entry and exit, the speed of the water in each tube is the same and also neglect gravity).

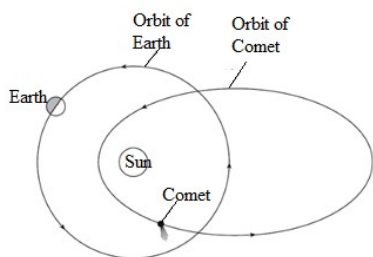
- A. $1/2v$ B. v
C. $\sqrt{2}v$ D. $2v$ (E) $4v$



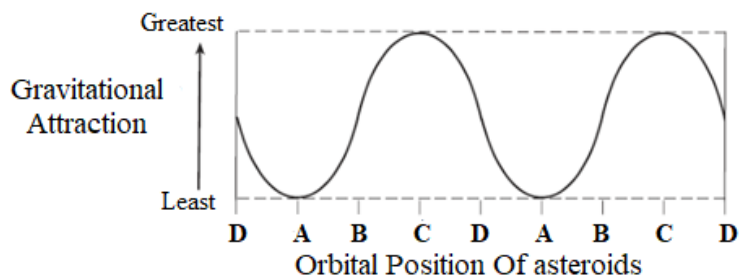
31. The following diagrams represent Earth's axis position relative to Earth's orbital plane. Choose the correct option.



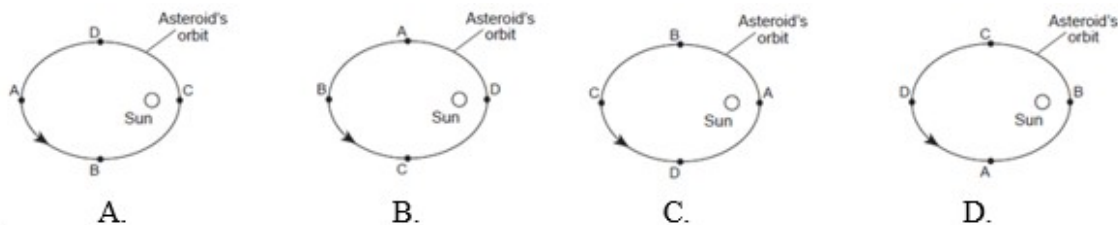
32. The position of Earth in its orbit and the position of a comet in its orbit around the Sun are shown in the diagram. When the comet's orbit is compared to Earth's orbit, which inference can be made?



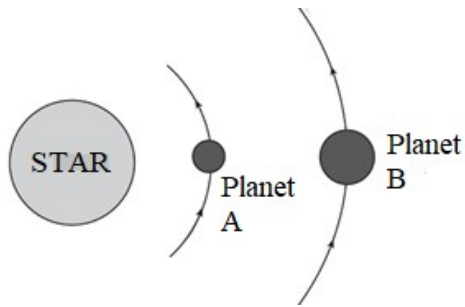
- A. Both the Earth's the comet's orbit have the same distance between foci.
 B. The distance between foci of Earth's orbit is greater as compared to the comet's orbit.
 C. The Earth's orbit has two foci and the comet's orbit has one focus.
 D. The distance between foci is greater for the comet as compared to Earth's orbit. ...
33. The varying amount of gravitational attraction between the Sun and an asteroid in our solar system is represented in the graph. The four positions in the asteroid's orbit are shown by 1, 2, 3 and 4.



Identify the diagram that best represents the positions of the asteroid in its orbit around the Sun?

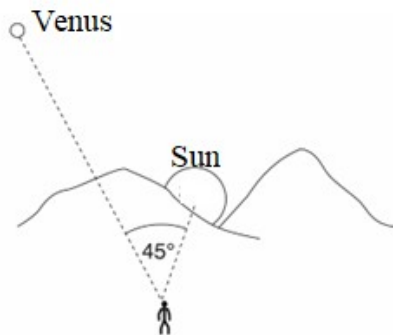


34. The planets A and B have equal mass and are revolving around a star.



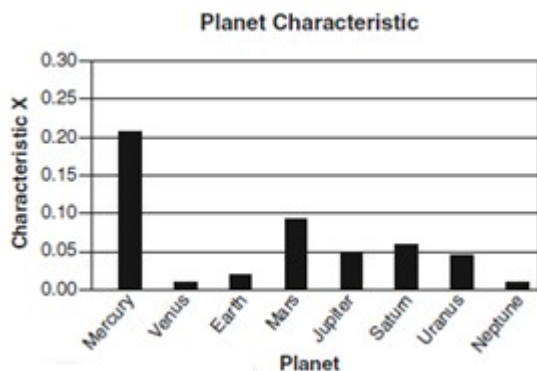
Chose the correct statement:

- A. Compared to planet A, planet B has a a shorter period of revolution and a weaker gravitational attraction to the star.
 - B. Compared to planet A, planet B has a weaker gravitational attraction to the star and a longer period of revolution
 - C. Compared to planet A, planet B has a stronger gravitational attraction to the star and a shorter period of revolution
 - D. Compared to planet A, planet B has a stronger gravitational attraction to the star and a longer period of revolution
35. The angle of sight is measured by an observer between Venus and the setting Sun.
The apparent motion of Venus over the next few hours is best described by which of the following options?



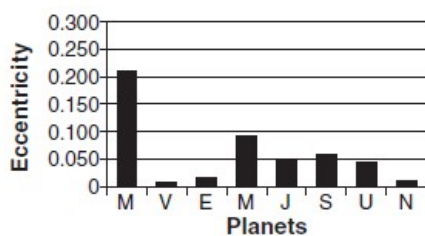
- A. Earth rotates at 45° per hour therefore Venus will set 1 hour after the Sun.
- B. Venus orbits Earth faster than the Sun orbits Earth therefore Venus will set 2 hours after the Sun
- C. Earth rotates at 15° per hour therefore Venus will set 3 hours after the Sun.
- D. Venus orbits Earth slower than the Sun orbits Earth therefore Venus will set 4 hours after the Sun.

36. One planetary characteristic, X, plotted for the planets of our solar system is represented by the bar graph below shows.

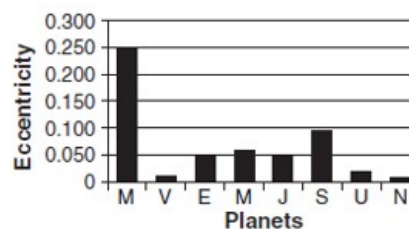


Which characteristic is represented by X?

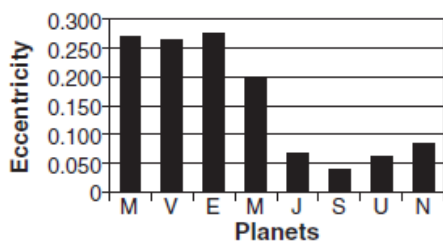
- A. gravity.
 - B. Weight.
 - C. eccentricity of orbit
 - D. rotational period
37. Identify the bar graph that correctly shows the orbital eccentricity of the planets in our solar system.



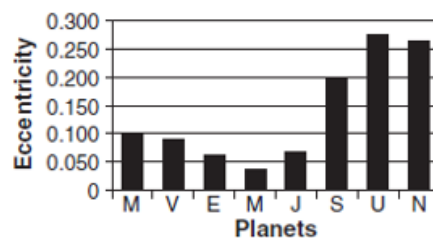
A.



B.



C.

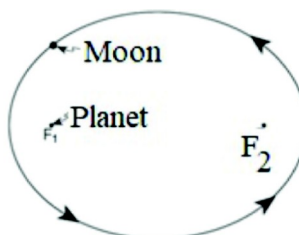


D.

38. The elliptical orbit of a moon revolving around a planet is shown below. The points labeled as F₁ and F₂ denotes the foci of this orbit. Find the approximate eccentricity of this elliptical orbit?

- A. 0.3
- C. 0.7

- B. 0.5
- D. 1.4



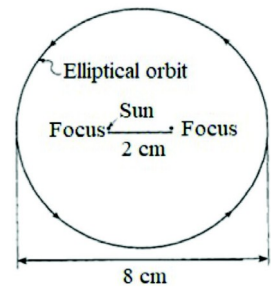
39. The apparent diameter of the Moon as viewed by an observer on Earth varies in a cyclic manner. What is the best explanation for this observation?

- A. Rotation of the Moon
- B. Elliptical orbit of the moon
- C. The changing atmospheric transparency of Moon
- D. The changing distance between the Moon and the Sun

40. Given below is the constructed ellipse which is a true scale model of the orbit of a planet in our solar system.

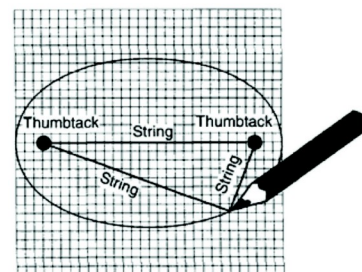
The orbit of which planet is best represented by the ellipse?

- A. Neptune
- B. Jupiter
- C. Pluto
- D. Mars

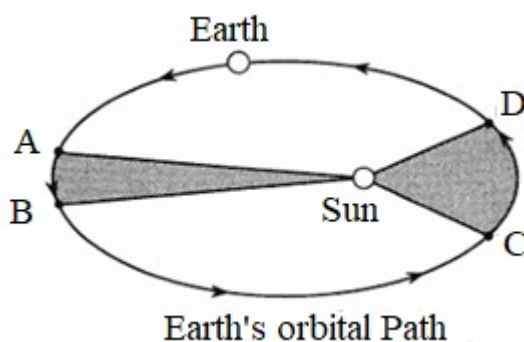


41. A student's constructed laboratory drawing is shown below. What does the student's drawing best represents?

- A. The shape of Moon of the Earth.
- B. An elliptical orbit's shape.
- C. An earthquake wave's path.
- D. Cannot determine.

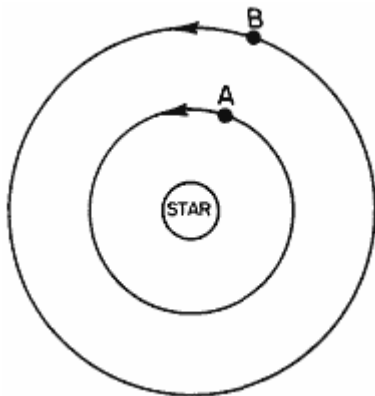


42. The Earth's orbital path around the Sun is shown below. In order to move from A to B and from C to D, the Earth takes the same amount of time. Chose the values which are equal within the system?



- A. Areas are equal for both the shaded sections of the diagram.
- B. At point A and at point D, the distance from the Sun to the Earth is the same.
- C. The orbital velocity at point C of the Earth is same as the orbital velocity at point A.
- D. The gravitational force between the Earth and the Sun at point B and D is the same.

43. The orbits of planets A and B in a star-planet system are shown in the diagram below. 40 days is the period of revolution for planet B. What is most likely the period of revolution for planet A?

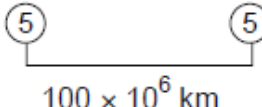
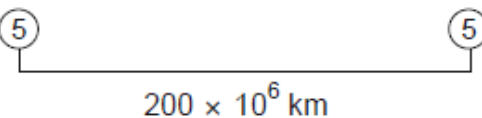
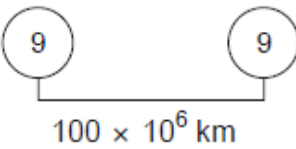
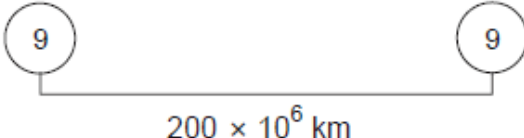


- A. less than 40 days ...
B. More than 40 days
C. 40 days
D. Cannot determine.
44. The two planets are represented by the symbols below.

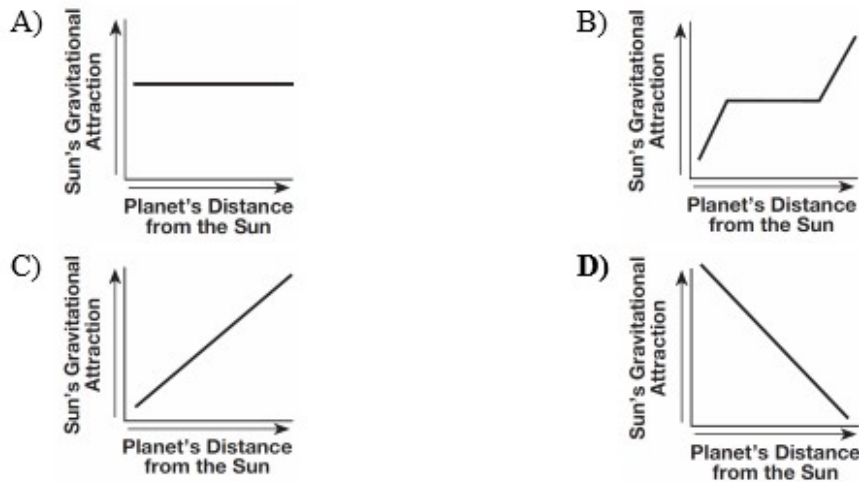
⑤ represents a planet with a mass 5 times Earth's mass.

⑨ represents a planet with a mass 9 times Earth's mass.

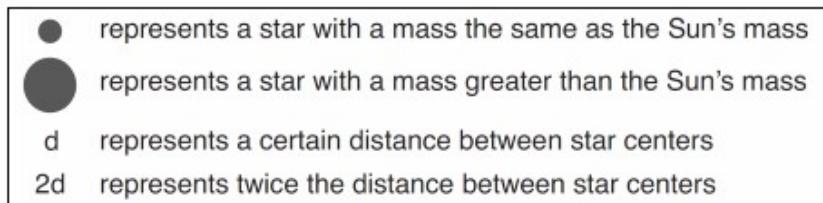
In order to get the greatest gravitational force between the planets, which combination of planet masses and distances should be considered?

- A) 
- B) 
- C) 
- D) 

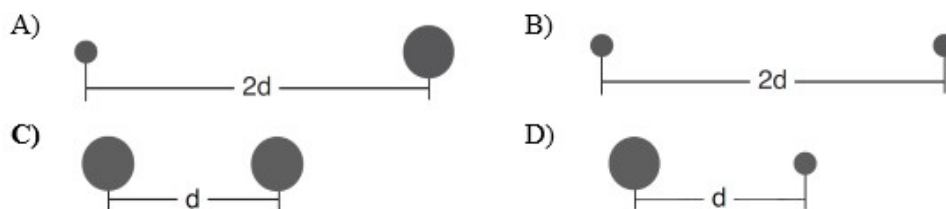
45. Read the graphs carefully and identify which graph best shows the general relationship between the Sun's gravitational attraction to the planet and the planet's distance from the Sun?



46. The star masses and distances are shown below:



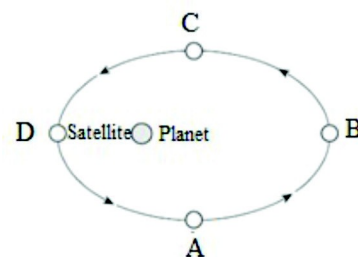
identify the diagram that correctly shows two stars having the greatest gravitational force between them?



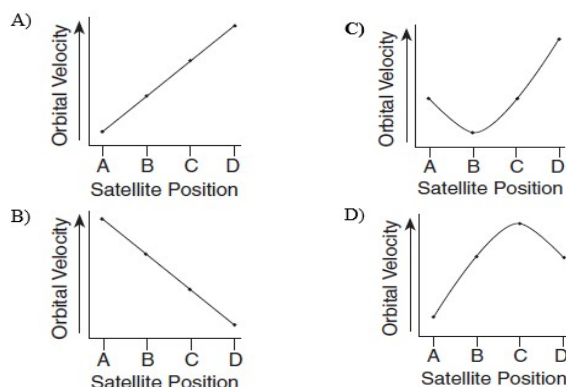
47. If the average distance is doubled between Earth and the Sun, what changes would possibly occur in the Sun?

- A. period of revolution would increase and Gravitational pull would decrease
- B. period of revolution would decrease and Gravitational pull would decrease.
- C. period of revolution would increase and Gravitational pull would increase
- D. period of revolution would decrease and Gravitational pull would increase

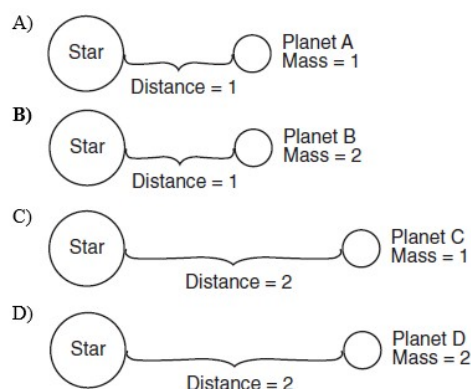
48. A satellite is shown to be revolving around a planet in four different positions:



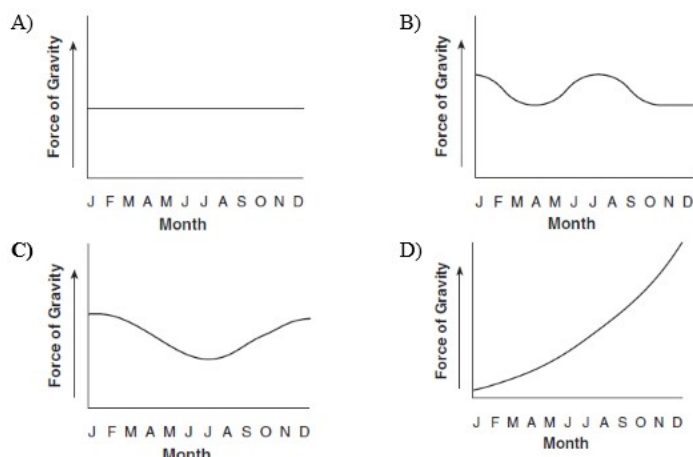
The changes in this satellite's orbital velocity as it revolves around the planet is best represented by which of the following graphs?



49. The mass of the star is the same in each diagram below. Identify the diagram in which the force of gravity is greatest between the star and the planet?



50. The force of gravity between Earth and the Sun is best represented by which of the following graphs during one revolution of Earth around the Sun?



NATIONAL ASTRONOMY & SCIENCE OLYMPIAD

General Instructions

Duration: 60 Minutes | Max Marks: 50

- Please collect the Answer Sheets (OMR) from the invigilator.
- Please Write your Student ID, Name, Class, and School Name on the OMR Sheet.
- This question paper contains 50 Questions, duration is 60 minutes.
- Answer all the questions in OMR sheet only. And please do sign on it.
- Use only Black or Blue Ball Point Pen to answer the question in OMR sheet.
- Indicate the correct answer by darkening on the 4 responses provided.
- After successful completion of the test please submit the OMR answer sheet to the invigilator.

SECTION-I

1. Use the below graph to answer the following question.

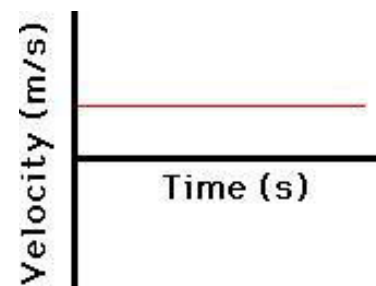
How much of Nevada's energy usage come from non renewable resources?

- a. 30%
- b. 56.8%
- c. 93.2%
- d. 100%

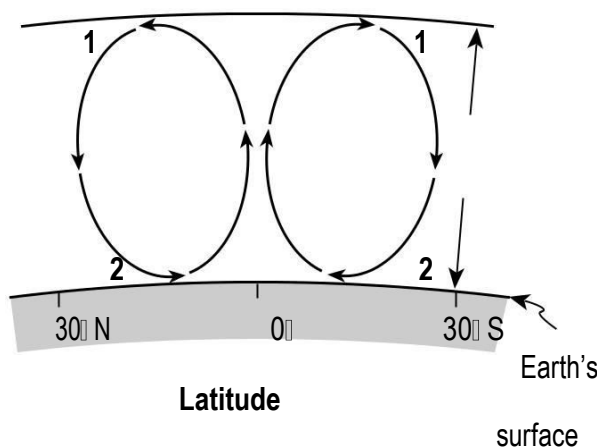
2. Use the graph below to answer the following question. The graph is a velocity vs. time graph showing the movement of a train over time.

Which statement is the **best** description of the train's motion? The train is

- a. Not moving in any direction.
- b. Continuously accelerating.
- c. Moving with constant velocity.
- d. Accelerating slowly.



Base your answers to questions 6 through 8 on the cross section below and on your knowledge of Earth science. The cross section shows the general movement of air within a portion of Earth's atmosphere located between 30° N and 30° S latitude. Numbers 1 and 2 represent different locations in the atmosphere.



6: Which temperature zone layer of Earth's atmosphere is shown in the cross section?

- a. Troposphere
- b. Stratosphere
- c. Mesosphere
- d. Thermosphere.

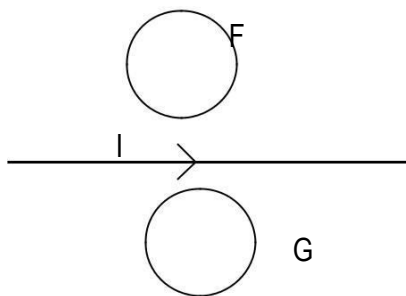
7: The air movement shown in the cross section is due to the process of ___?

- a. Condensation
- b. Conduction
- c. Evaporation
- d. Convection

8: What is the approximate percentage by volume of oxygen present in Earth's atmosphere at location 2?

- a. 10%
- b. 21%
- c. 33%
- d. 46%

9. Two conducting circular loops F and G are kept in a plane on either side of a straight current-carrying wire as shown in the figure below.



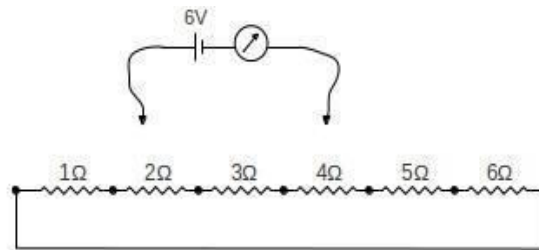
If the current in the wire decreases in magnitude, the induced current in the loops will be

- a. Clockwise in F and clockwise in G.
- b. Anti-clockwise in F and clockwise in G.
- c. Clockwise in F and anti-clockwise in G.
- d. Anti-clockwise in F and anti-clockwise in G.

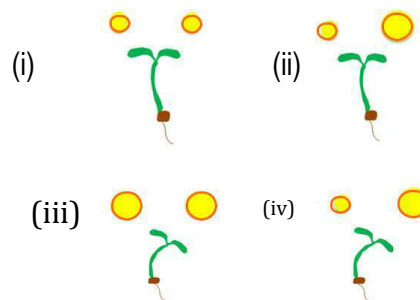
10. Consider six resistances connected as shown in the figure below. Note that the extreme ends are shorted. A circuit element consisting of a 6 V ideal battery and an ideal ammeter can be connected across any two of the different points marked by dots in the resistance network.

The *minimum* possible value of the current passing through the ammeter would be _____?

- a. 0.29 A
- b. 1.17 A
- c. 1.15 A
- d. 1.41 A



11. Charles Darwin observed that seedlings grow towards light. He called this response 'phototropism.' In an experiment two light sources are used to illuminate each seedling. Each source is indicated by a yellow circle in the diagrams below. The larger yellow circle represents a light source with twice the illumination than the light source represented by the smaller yellow circle.



Which of the above responses would be observed?

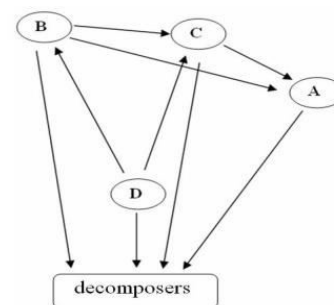
- a. Only (IV)
- b. (i) and (iii)
- c. Only (ii)
- d. (i) and (iv)

12. In an eukaryotic cell, mitochondria and chloroplasts are thought to have originated through end symbiosis, a process in which an organism engulfs another and the two continue to exist in a mutually beneficial arrangement. Which of the following observations best supports this theory?

- a. These organelles exchange metabolites with other cellular compartments.
- b. These organelles are capable of independent existence outside the cell.
- c. These organelles have their own genetic material.
- d. These organelles provide energy in the form of ATP to the cell.

13. Which letter(s) represent omnivores in the food web below?

- A and B
- C
- D
- B



14. Plants developing in dry conditions are _____?

- Xerophytes
- Lithophytes
- Mesophytes
- Hydrophytes

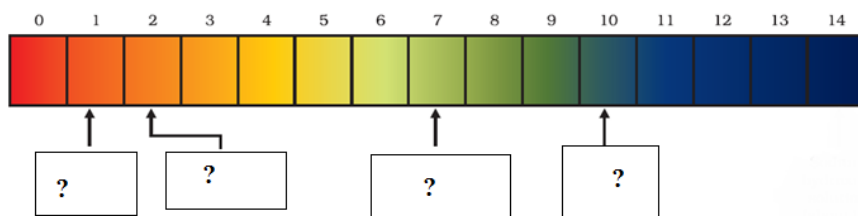
15. Osmosis is the flow of solution from higher concentration to a solution of lower concentration through a semi permeable membrane. What is incorrect in this statement?

- Exact concentration of solution is not given
- Character of semi permeable membrane is not given
- The flow of solution is not possible through semi permeable membrane
- All are incorrect

16. What would happen if human blood becomes acidic?

- Oxygen-carrying capacity of haemoglobin is increase
- Oxygen-carrying capacity of haemoglobin is decrease
- Will remain same
- Will be unpredictable

17. Arrange in the pH scale



- Lemon Juice, Gastric Juice, Blood, Milk of Magnesia
- Gastric Juice, Lemon Juice, Blood, Milk of Magnesia
- Gastric Juice, Lemon Juice, Milk of Magnesia, Blood
- Milk of Magnesia, Blood, Gastric Juice, Lemon Juice

18. Observe the below statements ?

- The basic components of a cell are cell membrane, cytoplasm and nucleus
 - Chromosomes help in inheritance or transfer of characters from the parents to the offspring
 - Animal cells differ from Plant cells in having an additional layer around the cell membrane termed cell wall
- 1 Only
 - 1 & 2
 - 3 Only
 - 1, 2 & 3

19. A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test tube well and leaves it to settle for some time. After about 5 minutes he observes that in the test tube there is?

- A clear transparent colourless solution
- A precipitate settling at the bottom of the test tube
- A clear transparent pink solution
- A layer of water the layer of acetic acid

20. A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction.

Some observations related to this are given below ____?

- Sodium hydroxide solution turns red litmus blue
- Sodium hydroxide readily dissolves in water

III. The beaker containing solution appears cold when touched from outside

IV. The blue litmus paper turns red when dipped into the solution

The correct observations are:

- a. I, II and IV b. I, II and III c. Only III and IV d. Only I and II

21. A student has to focus his compound microscope to observe a prepared slide showing different stages of binary fission in Amoeba. The steps he is likely to follow are listed below in a haphazard manner :

I. Adjust the diaphragm and the mirror of the microscope so that sufficient light may enter to illuminate the slide.

II. Fix the slide on the stage carefully.

III. Adjust the microscope to high power and focus.

IV. Adjust the microscope to low power and focus.

The correct sequence of the above steps to observe the slide under the microscope is?

- a. I, II, IV, III b. II, I, IV, III c. II, IV, I, III d. I, IV, II, III

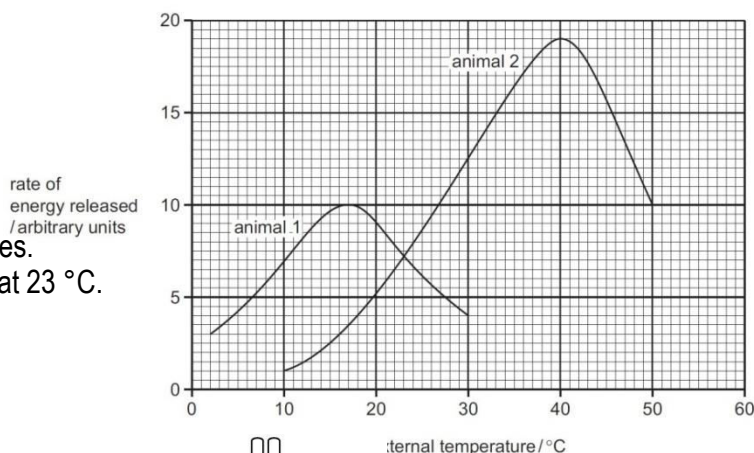
22. A student takes about 4 mL of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tubes marked_____?

- a. P and Q b. Q and R c. P, Q and S d. P, R and S

23. The graph shows the energy released by two animals through respiration as the external temperature changes.

Which conclusion can be drawn from the graph?

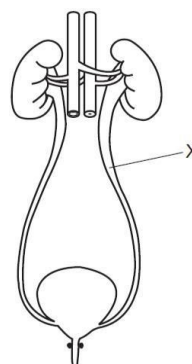
- a. Animals 1 and 2 release the least energy at 23 °C.
b. Animal 2 always respire faster than animal 1.
c. As the temperature rises, respiration always increases.
d. The rate of respiration is the same for both animals at 23 °C.



24. . The diagram shows the human urinary system.

What is the part labelled X?

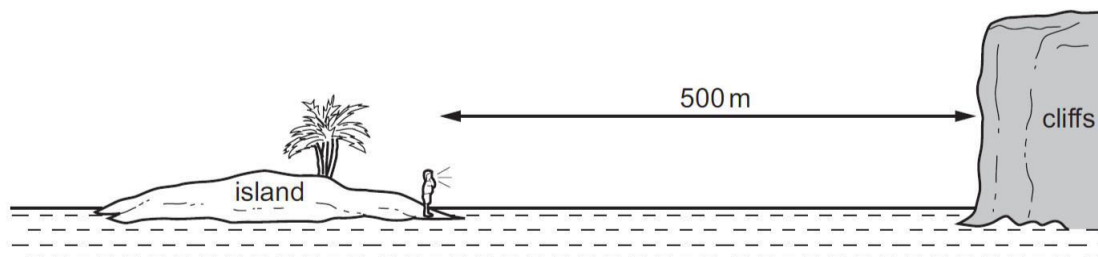
- a. Renal artery
b. Renal vein
c. Ureter
d. Urethra



25. What is the path of water through a plant?

- a. Cortex cells → xylem → stomata → roots
b. Root hair → xylem → mesophyll cells → stomata
c. Roots → cortex cells → stomata → phloem
d. Roots → root hair → stomata → xylem

26. A boy on an island is 500 m from some cliffs.



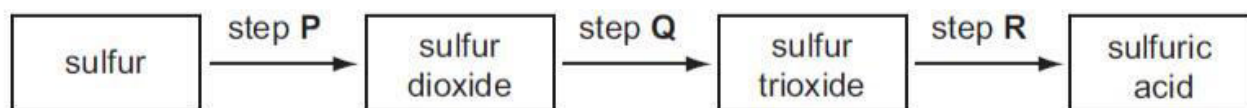
He shouts and he hears an echo from the cliffs.

Sound travels at 340 m / s through the air.

What is the time interval between when the boy shouts and when he hears the echo? Ans: B

- A $\frac{500}{340}$ s B $\frac{2 \times 500}{340}$ s C $\frac{340}{500}$ s D $\frac{2 \times 340}{500}$ s

27. The diagram shows three steps in the manufacture of sulphuric acid.



In which steps is a catalyst used?

- a- Step Q only
- b- Step R only
- c- Steps Q and R only
- d- Steps P and Q and R

28. What is the frequency of a wave?

- a. The number of waves passing a fixed point per second.
- b. The number of peaks added to the number of troughs passing a fixed point per second.
- c. The time taken for one wave to pass a fixed point.
- d. The time taken for the displacement to change from maximum to minimum.

29. Which source releases carbon dioxide, a greenhouse gas, when generating electricity?

- a. Fossil fuels
- b. Hydroelectric
- c. Geothermal
- d. Nuclear

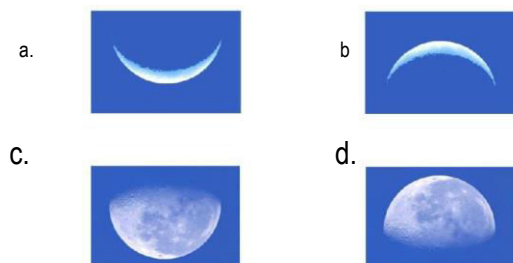
30. A piece of electrical equipment is sensitive to magnetic fields and is screened from them. To do this, it is enclosed in a box.

Which material should be used to make the box?

- a. Copper
- b. Plastic
- c. Iron
- d. Steel

SECTION-I

31. The Moon was observed near the eastern horizon at the Equator just before sunrise. The shape of the Moon would have been closest to:



32. What prevents a white dwarf from collapsing to a black hole?

- a. The highly compressed electrons exert degeneracy pressure.
- b. Fission of complex elements releases heat.
- c. Fusion of complex elements generates heat.
- d. The highly compressed neutrons exert degeneracy pressure.

33. Modern cosmology supposes that the Universe came from a "Big Bang" event about 13 billion years ago.

Evidence for this is _____?

- a. The uniformity of the abundance of hydrogen and helium.
- b. The cosmic background radiation.
- c. The Hubble expansion.
- d. All of these answer.

34. Hubble classified galaxies by their appearance. Which of the following types of galaxies do NOT fall on Hubble's tuning fork diagram?

- a. Peculiar galaxies.
- b. Elliptical galaxies.
- c. Spiral galaxies.
- d. Barred spiral galaxies.

35. In which part of the Milky Way are Population I stars like the sun most likely to be found?

- a. Bulge.
- b. Halo.
- c. Nucleus.
- d. Disk.

36. Interstellar dust between the Earth and a star causes the star's light to appear _____?

- a. Dimmer and bluer.
- b. Brighter and redder.
- c. Brighter and bluer.
- d. Dimmer and redder.

Base your answers to questions 37 through 41 on the *Earth Science Reference Tables* and the diagram below. The diagram represents latitude and longitude lines on Earth. Points A through E represent locations on Earth. Arrows represent direction of rotation.

37. What is the approximate latitude and longitude of location A?

- a. 160° N, 15° E
- b. 15° N, 160° E
- c. 160° S, 15° W
- d. 15° N, 160° W

38. When the local time at location C is 3 p.m., the local time at location D is?

- a. 1 p.m.
- b. p.m.
- c. 5 p.m.
- d. a.m.

39. Locations C and D both have the same _____?

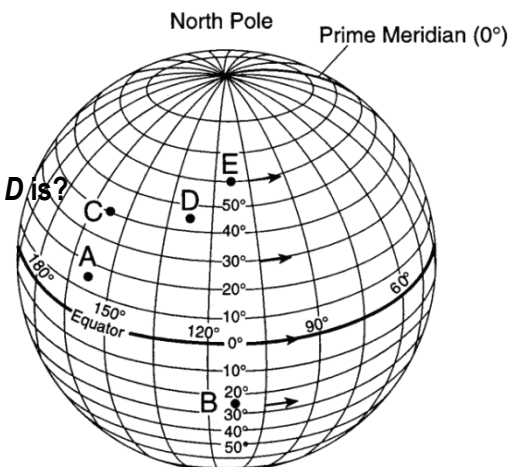
- a. Prevailing wind direction
- b. Latitude
- c. Altitude of Polaris
- d. Longitude

40. Which location has the longest duration of insolation on December 21?

- a. A
- b. B
- c. C
- d. E

41. At which location will the Sun reach the highest angle above the horizon at solar noon?

- a. A
- b. E
- c. C
- d. D



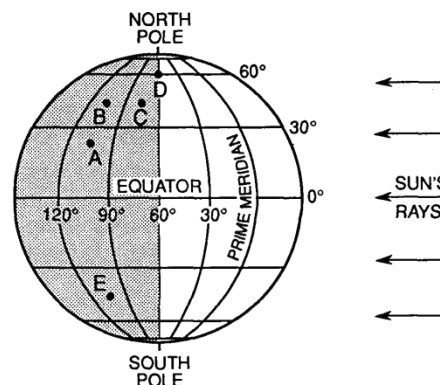
Base your answers to questions 42 through 43 on the *Earth Science Reference Tables* and the diagram of the Earth below. Some of the latitude and longitude lines have been labeled. Points A through E represent locations on the Earth's surface.

42. What do locations A, B, and E have in common?

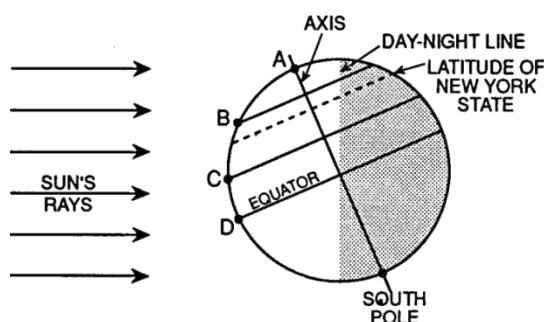
- a. They are in the same season.
- b. They have the same local time.
- c. They have the same prevailing wind direction.
- d. They are at the same latitude.

43. What is the approximate time at location D?

- a. 6 a.m.
- b. Noon
- c. 6 p.m.
- d. Midnight



Base your answers to questions 43 and 44 on the diagram below which shows the Earth as viewed from space. The shaded side represents the night time side of the Earth.



44. Which point on the Earth's surface is receiving the greatest intensity of insolation?
- A
 - B
 - C
 - E
45. The total number of hours of daylight received by New York State on the date represented in the diagram is closest to _____?
- 9 hr
 - 12 hr
 - 15 hr
 - 20 hr
46. Planet A has a greater mean distance from the Sun than planet B. On the basis of this fact, which further comparison can be correctly made between the two planets?
- Planet A is larger.
 - Planet A's speed of rotation is greater.
 - Planet A's revolution period is longer.
 - Planet A's day is longer.
47. The gravitational attraction between the Earth and the Sun is greatest at the time when the _____?
- Earth is moving slowest in its orbit
 - Earth is moving fastest in its orbit
 - Northern Hemisphere is receiving maximum intensity of insolation
 - Northern Hemisphere is receiving maximum duration of insolation
48. Which planet's orbital shape would be most similar to Jupiter's orbital shape?
- Uranus
 - Pluto
 - Venus
 - Mercury
49. Question:

Types of Space		
Type	Example	Description
Space Station	Skylab 1	A spacecraft with supplies and areas for humans staying a long time in space.
Satellite	Sputnik 1	An object that revolves around another object.
Probe	Pathfinder	An instrument that sends information from space back to Earth.
Space Shuttle	Columbia	A spacecraft that can carry people and objects into and back from space.

According to the chart, a spacecraft that is designed to take pictures of planets for scientists back on Earth is _____?

- A Space station
 - A Probe
 - A Satellite
 - A Space shuttle
50. There is less concentrated energy and therefore not much warmth in regions which are away from _____?
- Sun
 - Horizon
 - Equator
 - Axis

Duration : 60 Minutes

GENERAL INSTRUCTIONS

Max Marks : 50

1. Please collect the Answer Sheets (OMR) from the invigilator.
2. Please Write your Student ID, Name, Class, and School Name on the OMR Sheet.
3. This question paper contains 50 Questions, duration is 60 minutes.
4. Answer all the questions in OMR sheet only. And please do sign on it.
5. Use only Black or Blue Ball Point Pen to answer the question in OMR sheet.
6. Indicate the correct answer by darkening on the 4 responses provided.
7. After successful completion of the test please submit the OMR answer sheet to the invigilator.

SECTION -I

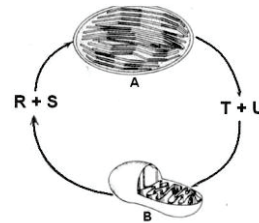
1. Which of the following cannot be listed as an abiotic component in the ecosystem?

- | | |
|-----------------------------|-----------------------------------|
| a. Oxygen in the atmosphere | c. Water vapour in the atmosphere |
| b. Bacteria in the soil | d. Organic material in the soil |

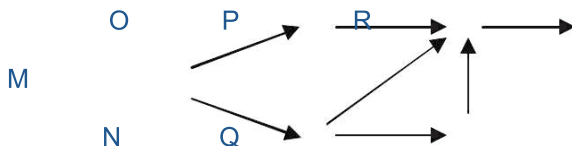
2. Answer the question which is based on the following diagram.

The letters, R, S, T and U, represent the following respectively:

- Carbon dioxide, oxygen, water and glucose
- Carbon dioxide, water, glucose and oxygen
- Oxygen, glucose, carbon dioxide and water
- Glucose, carbon dioxide, water and oxygen



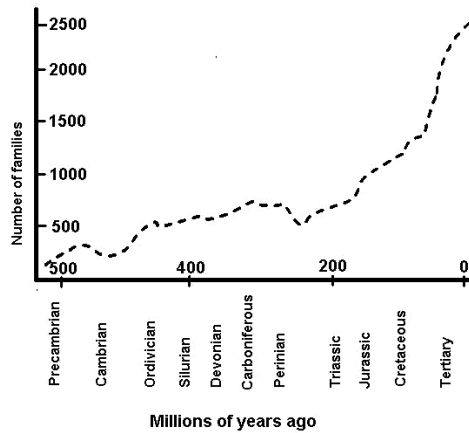
3. Answer the following question which is based on part of a food web.



If P represents a large bird of prey, then Q, N and M represent the following respectively:

- | | |
|------------------------|-----------------------|
| a. Snake, mouse, seeds | b. Seeds, frog, mouse |
| c. Hare, frog, wheat | d. Hare, wheat, mouse |

4. The number of taxonomic groups found at different times in the Earth's history is indicated by the following graph?



It can be concluded that dinosaurs would have existed during the period when there were approximately _____ families on Earth.

- a. 800 b. 1200 c. 700 d. 1000
5. The two-kingdom system of classification, Plant Kingdom and Animals Kingdom, can be traced to classification according to Linnaeus. Subsequently, scientists realized that certain organisms, for example, Fungi, could not be easily classified into either plant or animal kingdoms. Fungi were, for some time, “forced” into Kingdom of Plants, because they
- a. Reproduce rapidly b. Plants are saprophytic
c. Lack chlorophyll d. Plants have cell walls
6. Human activities have had many effects on food chains and food webs. Indigenous people try to reduce the negative effects of agricultural practices on ecosystems by using a technique called *intercropping* (planting many different kinds of crops in the same field at the same time). In central Africa, millet, sorghum, peanuts, sweet potatoes, soy beans and cotton are planted together. The most useful reason for planting beans and peas in the field is that they ...
- a. They are harvested before other crops and used as a food source.
b. Enrich the soil with nitrogen.
c. They are tall and protect other plants from strong wind.
d. Provide support for climbing crops.
7. Arrange the following terms in a hierarchy (an order) of descending (decreasing) size and complexity.

(i) Biosphere

(ii) Biome

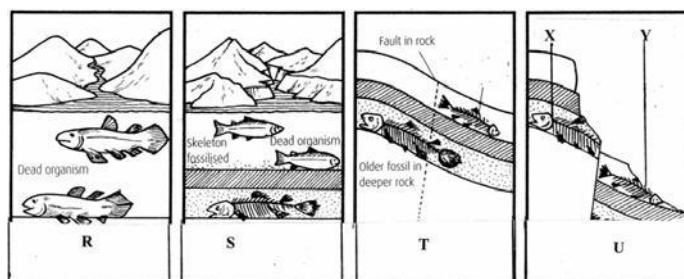
(iii) Ecosystem

(iv) Habitat

- a. (i); (ii); (iii); (iv)
b. (iv); (iii); (ii); (i)

- c. (ii); (iii); (iv); (i)
d. (iii); (i); (ii); (iv)

8. Study the diagrams which represent fossilization



If a palaeontologist finds a fossil represented by diagram U, which statement represents a correct conclusion?

- X represents a younger fossil because it is exposed
 - Y represents an older fossil because erosion has caused it to become exposed
 - X represents a younger fossil because it is more complete
 - Y represents an older fossil because it lies in a deeper layer of rock compared to X.
9. Darwin's theory of evolution, where he provided evidence from fossils, was criticized because there were gaps in the fossil record in some cases. The record did not provide complete information to show how one group of organisms evolved from another group. The discovery of *Archaeopteryx* helped fill the gap. Which two groups of animals were linked by *Archaeopteryx*?

- Birds and mammals
- Dinosaurs and mammals
- Birds and dinosaurs
- Amphibians and dinosaurs

10. Sound waves are produced by _____?

- Linear motion.
- Vibrating bodies
- Circular motion
- Transitional motion

11. Compound containing some amount of radioisotope is _____?

- Tracer
- Non radioactive
- Radioactive compound
- Linear active compound

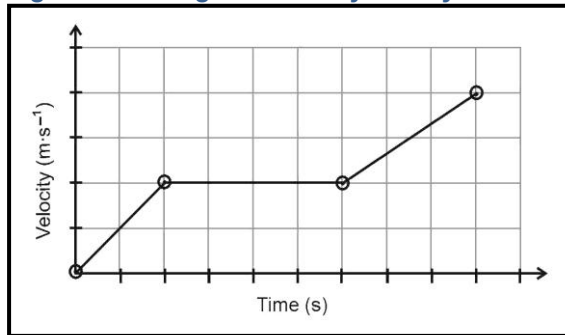
12. Joseph is leaning on the railing of a tall building. His cell phone drops out of his hands and falls to the ground. Which of the following combinations of velocity and acceleration for the motion of the cell phone is correct?

	Velocity	Acceleration
A	Increases	Increases
B	Decreases	Increases
C	Increases	Remains constant
D	Remains constant	Remains constant

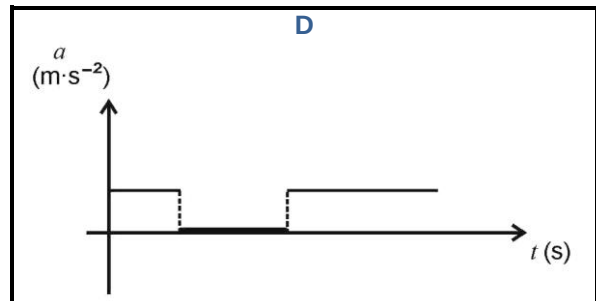
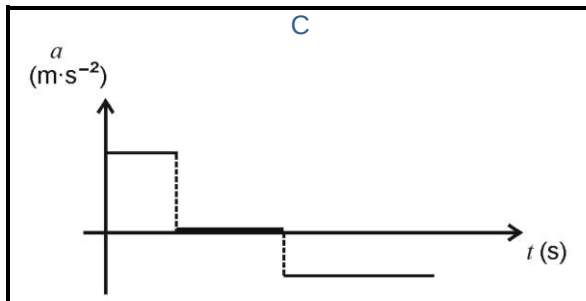
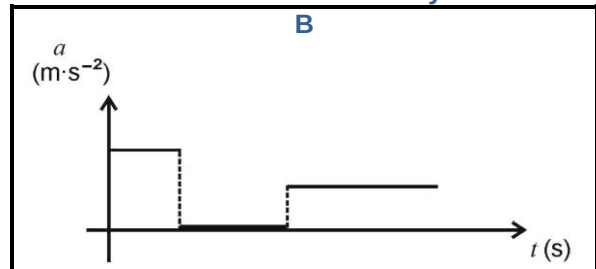
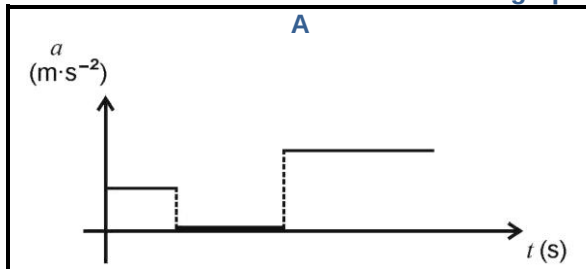
13. A girl is standing 4 m in front of a plane mirror. The distance she must walk forward so that her image appears 2 m away from her is_____?

- a. 0 m b. 2 m c. 3 m d. 4 m

14. Consider the diagram showing the velocity of a cyclist versus time?



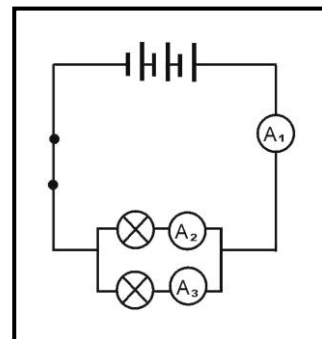
Which ONE of the acceleration versus time graphs best describes the motion of the cyclist?



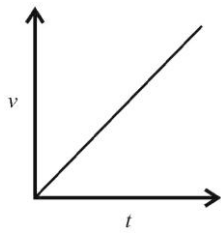
15. Consider the following diagram of a circuit. The light bulbs are not necessarily identical_____?

The reading on A_2 will be equal to:

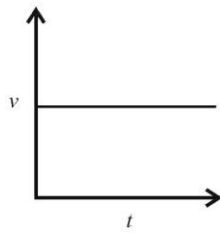
- a. The reading on A_1
 b. Half the reading on A_1
 c. The reading on A_3 minus the reading on A_1
 d. The reading on A_1 minus the reading on A_3



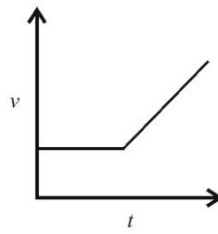
16. A truck is travelling at a constant velocity along a straight road. As it travels up a steep hill it slows down uniformly. Which ONE of the following velocities vs. time graphs best represents the motion of the car?



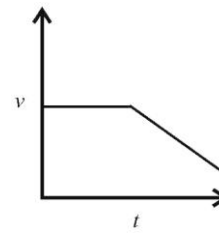
A



B



C

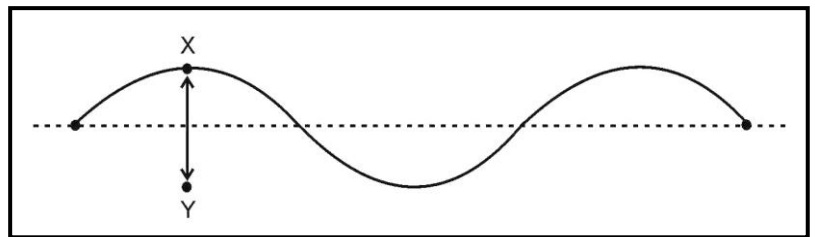


D

17. Consider the diagram of a wave with a frequency of 5 Hz?

The distance XY can be described as:

- a. The wavelength
- b. The amplitude
- c. The period
- d. Twice the amplitude.



18. A cricket ball is thrown vertically upwards and reaches a height of 18 m above the ground. On the way down it gets stuck in a tree 10 m above the ground. What is the resultant displacement of the ball?

- a. 10 m downwards
- b. 10 m upwards
- c. 8 m downwards
- d. 8 m upwards

19. Which element increases its electrical conductivity as its temperature increases?

- | | |
|------------|------------|
| a. Cobalt | c. Caesium |
| b. Silicon | d. Sulphur |

20. Bees must collect nectar from approximately how many flowers to make 1 pound of honeycomb? It is ____?

- | | |
|----------------|---------------|
| a. 10 thousand | c. 2 million |
| b. 20 million | d. 50 million |

21. The branch of medical science which is concerned with the study of disease as it affects a community of people is called _____?

- | | |
|-----------------|--------------|
| a. Epidemiology | c. Oncology |
| b. Paleontology | d. Pathology |

22. The study of how people use tools to perform work and how people physically relate to their working environment is called:

- | | | | |
|----------------|---------------|-------------|---------------|
| a. Engineering | b. Ergonomics | c. Agronomy | d. Physiology |
|----------------|---------------|-------------|---------------|

23. A type of plastic that is biodegradable has been in the news lately. The ingredient that makes it biodegradable is_____?

- a. Vegetable oil
- b. Petroleum
- c. Cornstarch
- d. Leather

24. Cystitis is the infection of which of the following?

- a. Liver
- b. Urinary bladder
- c. Pancreas
- d. Lungs

25. The Statue of Liberty is green because of_____?

- a. Green stone
- b. Oxidized brass
- c. Steel painted green
- d. Oxidized copper

SECTION-II

26. In the outline of the Big Bang cosmology, all of the matter and radiation in the universe was occupying a tiny volume?

- a. One hundred billion
- b. One billion
- c. One hundred million.
- d. Fifteen billion

27. One method of keeping the universe in a Steady State is to postulate_____?

- a. The steady expansion of the universe.
- b. The spontaneous creation of matter.
- c. The production of supernovae.
- d. The rotation of galaxies

28. The outer Galilean moons of Jupiter are thought to consist primarily of_____?

- a. Hydrogen, methane, and ammonia.
- b. Carbon dioxide and nitrogen.
- c. Metals and rock.
- d. Ice, water, and rock.

29. A newly-formed star with the Sun's mass slowly contracts toward the main sequence, radiating at the expense of _____ until the onset of _____ stops the contraction and supports the star for its main sequence lifetime.

- a. Electromagnetic energy, hydrogen fusion
- b. Gravitational potential energy, hydrogen fusion
- c. Gravitational potential energy, helium fusion.
- d. Hydrogen fusion, helium fusion

30. The particle nature of light is demonstrated by_____?

- a. Refraction.
- b. Short wavelength of x-rays.
- c. The photoelectric effect.
- d. The interference effect.

31. The greatest proportion of the mass of the atom is found in _____?
- In the protons.
 - In the nucleus.
 - In the electrons.
 - In the neutrons.
32. The most simply constructed atom, consisting of a single proton plus one orbiting electron, is?
- Neutral helium
 - Doubly ionized helium
 - Ionized hydrogen
 - Neutral hydrogen
33. If an electron is completely detached from an atom _____?
- The atom is ionized.
 - The atom is an isotope.
 - The atom is at absolute zero.
 - The atom is in its ground state.
34. The primary reason that radio telescopes are made larger by spreading them out across whole continents is _____?
- To gather as much light as possible.
 - To magnify images greatly.
 - To make sharp images (very small angular resolution).
 - To show colours correctly
35. Consider that you are stranded on a desert island and have lots of time for naked-eye observations. You see three planets complete one circuit (360 degrees) relative to the stars. The durations of these motions are _____?
- | | |
|-----------------------|----------------------|
| a. Planet A: 2 years | c. Planet B: 1 year |
| b. Planet C: 12 years | d. Planet D: 6 years |
36. In a basic geocentric model, you can estimate the relative distances of the planets from the earth and the correct order from nearest to farthest is _____?
- | | |
|------------|------------|
| a. A, B, C | c. C, B, A |
| b. B, A, C | d. B, C, A |
37. A basic geocentric model predicts that stellar parallax occurs _____?
- | | |
|-----------------|------------------|
| a. Once a year. | c. Once a month. |
| b. Once a day. | d. Not at all |
38. Observed from the sun, Jupiter takes about 12 years to circuit the zodiac once eastward. Now imagine that you lived on Jupiter and observed the sun. It would take the sun _____ to circuit the zodiac once in a(n) _____ direction in a heliocentric model.
- | | |
|----------------------|----------------------|
| a. 1 year/eastward | c. 1 year/westward |
| b. 12 years/eastward | d. 12 years/westward |
39. Imagine a new planet appears in the sky. After some time of naked-eye observations, we find that the planet stays close to the sun with a maximum elongation of 30 degrees. For comparison, the maximum elongation angle of Venus is about 46 degrees; for Mercury, 23 degrees. In a basic heliocentric model, we can conclude that _____?
- The planet is closer to the sun than Mercury.
 - The planet lies between Mercury and Venus.
 - The planet lies between Venus and the earth.
 - We cannot tell the relative distance of the planet from the sun.

40. You are carried away by an alien spacecraft to a different star planetary system. You are set down on a planet with cloudless skies. After some time, you notice five planets in the sky. Three retrograde after greatest eastern elongation with the "sun"; two at opposition. From this observation, you infer that, in a heliocentric model, you are on the _____ planet outward from the "sun".

- a. First
- b. Second
- c. Third
- d. Fourth

41. Which of these would be shorter if Earth rotated faster?

- a. Years
- b. Weeks
- c. Months
- d. Days

43. One astronomical unit (AU) is _____?

- a. 150 million kilometres.
- b. The semi major axis of any ellipse.
- c. The average distance between the Earth and the sun.
- d. Both (a) and (b)

44. Which of the following statements is TRUE?

- a. During an annular eclipse, the solar corona is visible.
- b. A solar eclipse can be viewed from only a few locations on Earth.
- c. Annular eclipses occur because the moon's orbit is not completely circular.
- d. All of the above

45. Which constellation is sometimes referred to as the thirteenth sign of the zodiac?

- a. Ophiuchus
- b. Cetus
- c. Cancer.
- d. Leo

46. An astronomer can estimate the temperature of a star by observing its _____?

- a. Size
- b. Colour
- c. Shape
- d. Brightness

47. Which stars are the youngest?

- a. Supergiant
- b. Blue star
- c. White dwarf
- d. Red Dwarfs

48. During a total solar eclipse one might view _____?

- a. Sun spots
- b. The sun's solar winds
- c. The sun's corona
- d. Nothing of the sun, since it is totally blocked by the moon.

49. Sun spots are believed to be most closely related to the sun's _____?

- a. Corona
- b. Period of rotation
- c. Magnetic field
- d. Changing size

50. In the H-R diagram, 90 percent of all stars fall _____?

- a. In the Red Dwarf region.
- b. In the Supergiant region.
- c. Among the White Dwarfs
- d. On the Main Sequence

INSTRUCTIONS FOR FILLING THE SHEET

1. This sheet should not be folded or crushed.
2. Use only blue/black ball point pen to fill the circles.
3. Use of pencil is strictly prohibited.
4. Circles should be darkened completely and properly
5. Cutting and erasing on this sheet is not allowed.
6. Do not use any stray marks on the sheet.
7. Do not use marker or white fluid to hide the mark.

CORRECT METHOD



Gender

Male ☐

Female ☐

[illegible][illegible]**School Code**

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1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
0	0	0	0	0	0	0

Mobile No.[illegible][illegible]

MARK YOUR ANSWERS HERE

A B C D

1					11					21					31					41				
2					12					22					32					42				
3					13					23					33					43				
4					14					24					34					44				
5					15					25					35					45				
6					16					26					36					46				
7					17			<																

Invigilator's Signature

Total Questions : 50

Time : 1 hr.

DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Name : Class :

Section : Roll No : Contact No.

INSTRUCTIONS :

- ◆ Please collect the Answer Sheets (OMR) from the invigilator.
- ◆ Please Write your Student ID, Name, Class, and School Name on the OMR Sheet.
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- ◆ After successful completion of the test, please submit the OMR answer sheet to the invigilator.

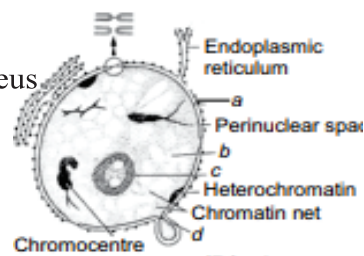
1. Identify from the marked alphabets (a, b, c, d) which part is responsible for the following functions.

(I) For localization of the chromosomes within the cell.

(II) For allowing certain selective substances in or out of the nucleus

(III) Means of sequestering many of the mRNA processing activities from the cytosol and separating nuclear and cytoplasmic constituent.

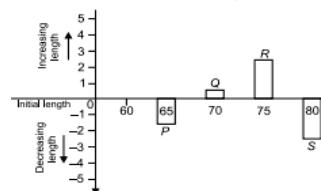
A) c B) a C) b D) a and d



2. In solutions of different concentrations, four strips of fresh potato P, Q, R and S were immersed. Osmosis occurred in accordance with the difference of concentration between cell sap and ambient solution. Given is a graph plotted between the change in length after osmosis and initial length of strips.

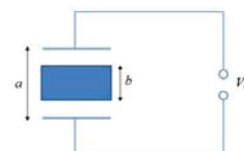
Which of these strips was placed in the most diluted solution ?

(A) S (B) Q (C) R (D) P



3. Two capacitors are connected in series. The centre part has length b and is made by the movable rigid metal section as shown in the following Figure. There is constant voltage difference of V_0 , between the outside plates and the area is A . If the center section is removed, find out the change in the energy stored in the capacitors?

A. $\frac{\epsilon_0 A V_0}{2(a-b)} \left(\frac{a}{b}\right)$. B. $\frac{\epsilon_0 A V_0}{2(a-b)} \left(\frac{a}{b}\right)^2$ C. $\frac{\epsilon_0 A V_0^2}{2(a-b)^2} \left(\frac{a}{b}\right)^2$ D. $\frac{\epsilon_0 A V_0^2}{2(a-b)} \left(\frac{a}{b}\right) \dots$

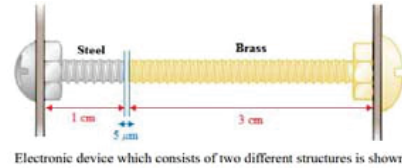


Capacitors constructed by using movable rigid center section

4. The given figure shows a poorly designed electronic device that has two bolts that almost touch each other in its interior although attached to different parts of the device.

The two bolts- one of steel and one of brass, are at different electric potentials. In case they touch, a short circuit will develop that will damage the device. Let us consider that the initial gap between the ends of the two bolts is $5.00 \mu\text{m}$ at 27.0°C , at what temperature will the bolts touch? Given, thermal expansion coefficient for brass is $19.0 \times 10^{-6} \text{ per } ^\circ\text{C}$ and for steel is $11.0 \times 10^{-6} \text{ per } ^\circ\text{C}$.

- A. 34.4°C ... B. 36.6°C C. 42.9°C D. 46.2°C .



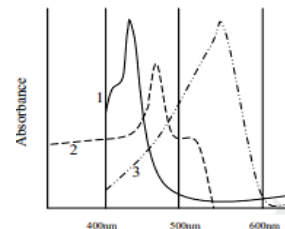
5. The figure shows a floating iceberg in seawater. Most of the ice is below the surface and hence it is extremely dangerous. The ship that still seems a considerable distance away from the visible ice, can be damaged by the hidden Underwater ice. Given that the density of seawater is 1030 kg/m^3 and the density of iceberg is 917 kg/m^3 . Approximately, what fraction of the iceberg lies below the water level?



- A. 0.352 B. 0.756 C. 0.781 D. 0.890...

6. Given figure shows absorption spectra of some photosynthetic pigments. These pigments show specific absorption patterns in a spectrum. Identify pigments 1, 2 and 3.

- A. 1: Chlorophyll a 2: Phycobilin 3: Carotene
B. 1: Chlorophyll a 2: Carotene 3: Phycoerythrin ...
C. 1: Carotene 2: Chlorophyll a 3: Phycoerythrin
D. 1: Phycoerythrin 2: Carotene 3: Chlorophyll a

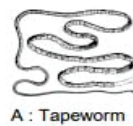


7. Based on which criteria can protostomes and deuterostomes taxonomically be distinguished?

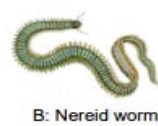
- A. body symmetry
B. embryonic development pattern
C. segmentation pattern
D. presence or absence of coelom

8. Three categories of animals with segmented bodies are shown here. Which of these animal/s show metameric segmentation?

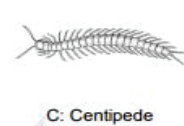
- A. B only B. A and B
C. B and C D. A and C



A : Tapeworm



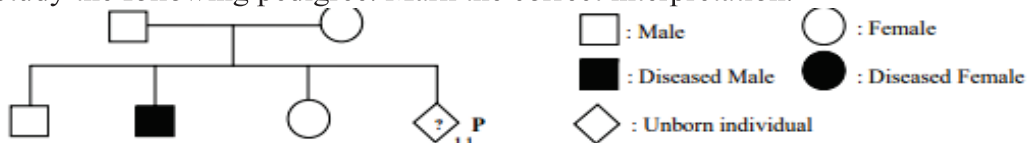
B: Nereid worm



C: Centipede

9. With reference Question no. 8, identify correct statements.
- Segments possessing elements of the excretory, nervous and circulatory systems are involved in Metameric design.
 - Metameric design is found in radially symmetrical animals.
 - The mode of respiration and circulation in the animal determines the Metameric design.
 - Metameric design makes every segment indispensable for survival.
- A. i and ii B. ii, iii and iv C. i and iv D. ii and iii only

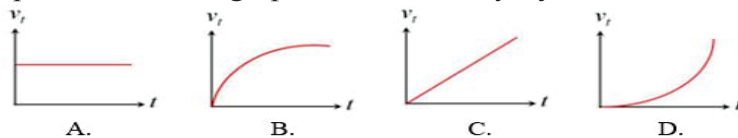
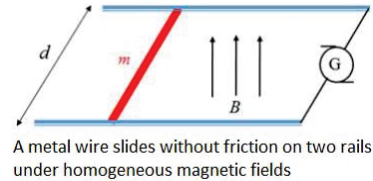
10. Study the following pedigree. Mark the correct interpretation.



- A. If the pedigree shows autosomal recessive trait, then the probability of child P to be diseased is $\frac{1}{2}$.
 B. The probability of child P to be diseased is $\frac{1}{4}$ if the pedigree depicts X-linked recessive trait.
 C. If the pedigree shows sex-linked trait, then there is a 50% chance of P being normal.
 D. X-linked dominant trait are depicted in the pedigree.

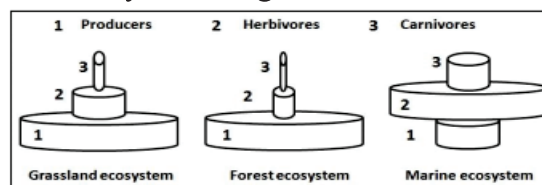
11. As shown in the Figure below, there is a track which lies in a vertical uniform magnetic field B .

Through generator G , a constant current I flows along the path- one rail, across the wire, and back down the other rail. Assume that the wire is initially at rest at $t = 0$, which out of the given options is correct graph for the velocity v_t as a function of time t ?



12. Typical pyramids of biomass of three different ecosystems in g/m^2 are shown below.

An inverted pyramid is observed in a marine ecosystem. The possible reason for this could be:



A. The dominant producers in a marine ecosystem are bacteria which divide rapidly to generate sufficient biomass.

B. The plants are represented by algae in the inter-tidal area in a marine ecosystem which constitute less biomass compared to the other trophic levels.

C. There is no predatory control in a marine ecosystem, unlike terrestrial ecosystems.

D. In a marine ecosystem, the producer biomass remains low as the herbivore population is very high.

13. On roads, a car depends on friction while turning through a curve, otherwise the car will skid and slip off the road. In order to be independent of this friction, a civil engineer wishes to design such a curved exit ramp for a highway on which a car will be able to round the curve without skidding. What type of the road should it be?

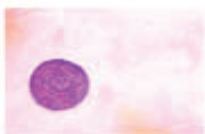
A) The road should be in banked shape.

B) The roadway should be tilted toward the inside of the curve with some angle.

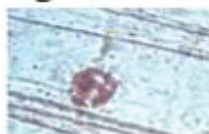
C) Both A and B. ...

D) The road should be bulged outwards.

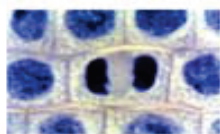
14. A series of changes happen in Apototic and cell including fragmentation of nucleus forming micronuclei. Researchers used onion cells to study the cell death. Which picture corresponds to cell with nuclear fragmentation?



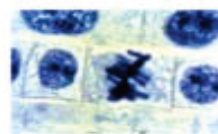
A.



B.



C.



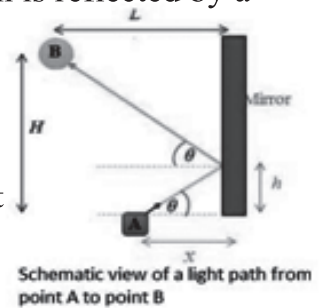
D.

15. The A located on point A produces

an incident light is produced by light source device at point A which is reflected by a mirror with the shown configuration in the Figure.

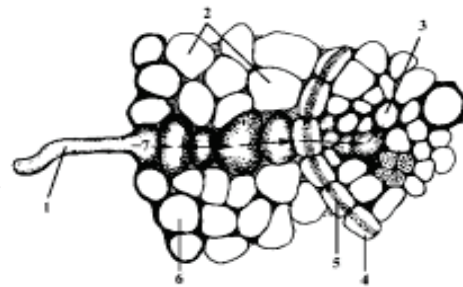
The aim target of the reflected light is an object which is located on the point B. Given that the vertical distance between A and B (H), the horizontal distance of the object in the point B to the mirror is 2.20 m, and the distance between A is 1.68 m and the point of reflection (h) are 0.430 m. Find the distance (x).

- A. 0.381 m B. 0.757 m ... C. 1.04 m D. 1.42 m



16. The cross - section of a plant root is shown here. Parts are indicated by 1-6 and pathway in the root indicated by the arrow (7). Which of the following options provide a correct explanation of the drawing?

- A. 1 – trichome, 2 – cortex, 3 – phloem, 4 – pericycle, 5 – endodermis, 6 – epidermis, 7– water and sugars path.
- B. 1 - root hair, 2 – cortex, 3 – xylem, 4 – endodermis, 5 – Casparian strip, 6 - epidermis 7 – water and minerals path
- C. 1 - root hair, 2 – cortex, 3 – xylem, 4 – Casparian strip, 5 -pericycle, 6 – epidermis, 7 – water and minerals path.
- D. None of the above.



17. At depths of the ocean, Red algae grows beyond the point to which red and blue light can penetrate. What could be the reason for this?

- A. Red algae absorbs wavelengths of light through available pigments ...
- B. Infrared energy is used by red algae to power photosynthesis
- C. Red algae immediately absorbs red and blue light.
- D. Red algae are heterotrophs

18. Various sections are cut from a willow branch and planted in pots of soil in a greenhouse. The shoot end of the section is kept exposed and the root end is digin the soil. Which statement about the sections is true?

- A. The property of polarity is missing in the sections.
- B. There is same concentration of auxin in the sections.
- C. The root end will produce shoots
- D. In the process of root and shoot formation, differentiation will be the first step

19. With respect to diamond, which of the following statements is correct?

- A) The carbon atoms are inter-connected by metallic bonds.
- B) The carbon atoms are very loosely packed in the diamond crystal.
- C) Each carbon atom in the crystal forms a rigid 3-D structure.
- D) Diamond can be synthesized by subjecting pure carbon to very low pressure and temperature ...

20. During flow of charge in superconductors, no heat loss occurs. The reason being:

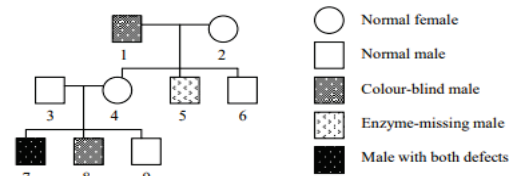
- A) charge speed is slow in it B) It is an insulator.
- C) It pertains zero resistance ... D) It generates negligible voltage.

21. How do we know that fission isn't responsible for the Sun's energy?

- A) Fission doesn't produce enough energy.
- B) the Sun would have exploded if fission was there.
- C) the Sun's mass would have increase.
- D) Fissionable material is rare on the Sun ...

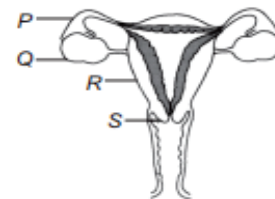
22. Two X-linked genetic defects have been studied by genealogical method (family history): color blindness and deficiency of certain enzyme in red blood cells. The pedigree shows the results. Which individual/sshow the occurrence of crossing over?

- A. 8 and 9 B. 1 C. 7 and 8 D. 7 and 9



23. Identify the labelled part of the given figure where the fertilization of an ovum by a sperm takes place?

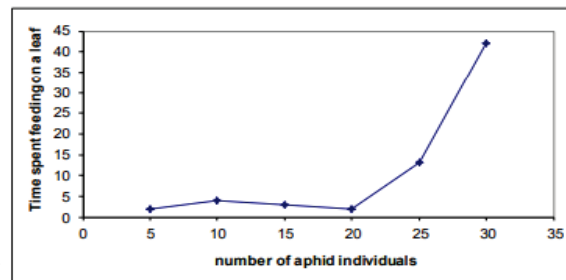
- A) P. ... B) Q. C) R. D) S.



24. One example of a common prey for ladybird beetles is Aphids.

The given graph depicts the amount of time spent by ladybirdbeetles feeding on a leaf. What does the graph shoe?

1. When stationary prey is abundant, ladybird beetles become confused and havespend a longer time capturing prey.
2. The number of available aphids decide the size of the ladybird population.
3. When they are in short supply, ladybirds do not waste energy searching for aphids.



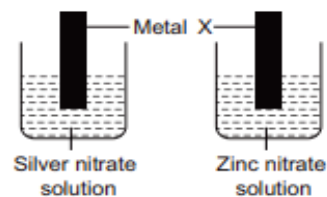
4. Ladybird beetles spend more time where there are more aphids, i.e. on leaves.

- A. Only 1 B. Only 2 C. Only 3 D. 3 and 4

25. Into two solutions, strips of metal X were dipped as shown:

On both strips, a greyish metallic deposit was found. Which of the following could be metal X?

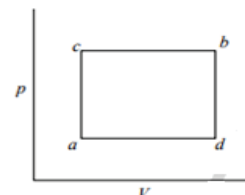
- A) Fe B) Mg ... C) Cu D) Pb



26. When a system is taken from state a to state b along the path a – c

– b, 30J of work is done by the system and 60J of heat flows into the system. If the work done by the system is 10 J, what will be the heat flow into the system along the path a – d – b.

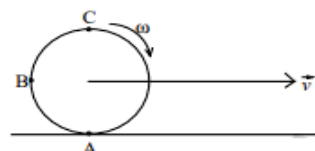
- A) 100 J B) 20 J
- C) 80 J D) 40 J



27. On a horizontal road, a rigid wheel of radius R rolls without slipping.

$\vec{v}$ is the linear velocity of the center of the wheel with w.r.t. to the road and the angular speed is ω . Estimate the direction of instantaneous velocity of point B with respect to the road.

- (a) ↘ (c) →
- (b) ↗ (d) ↑

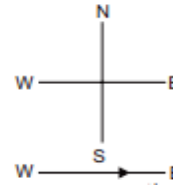


28. Rank order the speeds of points A, B, C at the rim of the wheel with respect to the road, largest first (see the figure above).

A) $V_A = V_B = V_C$. B) $V_A < V_B < V_C$.
C) $V_A > V_B = V_C$. D) $V_A > V_B > V_C$.

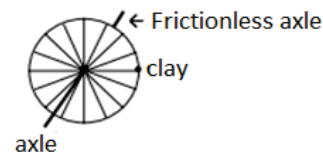
29. Consider a horizontal wire in the plane of the paper in which a constant current flows from west to east as shown in the figure. At which point will the direction of magnetic field be from north to south?

A) Right above the wire....
B) Just below the wire
C) On the north side of the wire in plane of the paper.
D) Cannot determine.



30. A bicycle wheel is free to rotate about a horizontal frictionless axle. A small lump of clay is attached to the rim as shown in the figure, and the wheel is released from rest. About the motion of the wheel, which one of the given statements is correct?

A) No matter what the mass of the lump of clay, the wheel will remain at rest.
B) The wheel will oscillate.
C) When lump of clay is at the lowest possible point the wheel will rotate and come to rest.
D) The number of full revolutions of the wheel depends on the mass.



31. Scientists have been deciding to send James Webb Space Telescope to the second Lagrange point of the Earth-Sun system. What significance are scientists looking for by doing so?

A. Little amount of energy is required for the telescope to maintain its orbit
B. The telescope remains shielded from the intense solar radiation
C. The telescope charges itself from the energy of the moon.
D. All of the above.

32. Consider a Dobsonian telescope of length of 8 inch and its focal ratio is $f/6$. It uses a Plossel eyepiece of 12mm. Calculate the magnifying power of the telescope. (1 inch = 25.4mm)

A. 30x B. 50x
C. 100x D. 200x

33. Consider that a telescope has an aperture of 200mm and human eye's diameter is around 5mm. (5-unit magnitude difference corresponds to a difference of 100 units in luminosity). Find out the approximate limiting magnitude of a telescope is how much higher than that of the human eye?

A. 6.0 B. 7.0 C. 8.0 D. 9.0

Stars that never set below the horizon are called Circumpolar stars. Consider such a star whose declination is given as δ , when seen at latitude Φ by a northern observer.

34. For the star to be circumpolar, what condition δ and Φ must fulfill?

A. $\phi + \delta > 90^\circ$ B. $\phi + \delta < 90^\circ$ C. $\phi + \delta > 180^\circ$ D. $\phi + \delta > 360^\circ$

35. The angle of a star from its north is called azimuth of a star. For a circumpolar star that cannot reach 180 degrees, what would be appropriate expression (in terms of δ and Φ) for the maximum azimuth...

A. $\sin^{-1} \left(\frac{\cos \delta}{\cos \phi} \right)$. B. $\sin^{-1} \left(\frac{\sin \delta}{\cos \phi} \right)$
C. $\cos^{-1} \left(\frac{\cos \delta}{\cos \phi} \right)$ D. $\sin^{-1} \left(\frac{\sin \delta}{\sin \phi} \right)$

36. There exist an exoplanet orbiting a star 40 light years away. This star has a mass equivalent of 5 solar masses after every 14 years. As viewed from Earth, what is the projected diameter of the exoplanet's orbit, assuming this system has an inclination of 90° ?
 A. $0.3''$ B. $0.8''$ C. $1.6''$ D. $2.5''$
37. Given that dark energy is vacuum energy, and that the densities of dark energy, dark matter and normal matter in the universe are currently $\rho_A = 6.7 \times 10^{-30} \text{ g/cm}^3$, $\rho_{DM} = 62.4 \times 10^{-30} \text{ g/cm}^3$ and $\rho_A = 0.5 \times 10^{-30} \text{ g/cm}^3$, what is the ratio of the density of dark energy at the time of the cosmic microwave background emission, to the current density of dark energy?
 A. 0.432 B. 2.31 C. 1 D. 2.5
38. RR Lyrae variables are commonly found in globular clusters and are periodic variable stars used for measuring galactic distances. The absolute magnitude M of all RR Lyrae variables is approximately 0.75. Assume that an RR Lyrae star is observed and found to have an apparent magnitude of 16.0. Find out the distance to the star in kilo parsec (kpc=1,000 parsecs or 3,260 light years)?
 A. 11.2 kpc B. 17.6 kpc C. 27.3 kpc D. 36.5 kpc
39. Periodic variations in brightness exhibited by a particular star suggest a transiting companion. What is the radius of the companion in stellar radii if the minimum stellar flux is 98.2% of the uneclipsed flux? Assume that the companion is not emitting.
 A. 0.018 stellar radii B. 0.134 stellar radii
 C. 0.268 stellar radii D. 0.974 stellar radii

STARKILLER BASE

The First Order has created the Star killer Base as part of their plan to rule the galaxy. It is charged using the power of stars and is built within an ice planet. It has a super weapon of its own which is capable of destroying entire star systems. The Star Killer Base has moved into the solar system and seeks to use the Sun to power its weapon to destroy the Earth.

For this question you will need that the gravitational binding energy, U, of a uniform density spherical object with mass M and radius R is given by $U = \frac{3GM^2}{5R}$. Also $L \propto M^4$ is the mass-luminosity relation of low-mass main sequence stars.



Figure 3: The Starkiller Base charging its superweapon by draining energy from the local star. Credit: Star Wars: The Force Awakens, Lucasfilm.

40. The nuclear fusion in the Sun's core can be stopped by Star killer Base. Estimate how long would it take the Sun to radiate away all of its gravitational binding energy at its current luminosity? Or in other words, when charging the super weapon radiatively, find out an estimate of how long it would take to drain a whole star.)
 A. $5.91 \times 10^{14} \text{ s}$ B. $8.90 \times 10^{14} \text{ s}$ C. $0.08 \times 10^{59} \text{ s}$ D. $3.91 \times 10^{14} \text{ s}$
41. What do you think, were (or will be) there any events with a timescale of this order such event. of magnitude in the life of the Sun?
 A. The gravitational collapse of the protostar before it joined the main sequence is one
 B. The formation of planet Earth is one such event.
 C) When Sun eliminates heat, it is one such event.
 D) Cannot determine.

42. Taking the Star killer Base's ice planet to have a diameter of 660 km, the Schwarzschild radius for the Sun is found out to be smaller than the radius of the base which is $R_s = 2.95 \text{ km}$. What does it denote?
- The sun is doomed.
 - the Sun can be safely contained, even if it was fully drained.
 - The sun still has millions of years before it gets drained.
 - Cannot say.

The Star killer Base wants to destroy all the planets in a stellar system on the far side of the galaxy and so drains 0.10 M from the Sun to charge its weapon. Assuming that U per unit (i.e. total gravitational binding energy or $3GM^2$) volume of the Sun stays approximately constant during this process, calculate:

43. The ratio of new luminosity of the Sun to previous luminosity.
A. 0.66. B. 9.45 C. 0. D. 100.
44. The ratio of new radius of the Sun to the previous one.
A. 8.66 B. 4.56 C. 0.95. D. 3.95
45. The new temperature of the surface of the Sun (current $T = 5780 \text{ K}$) is 5340 K. What changes in terms of color, will be seen in the sun?
A. The Sun gets redder. B. The sun turns pale white.
C. The sun turns black. D. All of the above.
46. Which of the following is not a zodiacal constellation, according to the astronomical definition?
A. Aquila B. Aquarius C. Ophiuchus D. Pisces



47. When the Sun aligns with the east-west streets of the New York grid system just before sunset or just after sunrise. This is called "Manhattanhenge". It occurs 4 times a year. One of the setting dates this year was on 11th July. Which of these is another date you are likely to see the "Manhattanhenge" sunset?
A. 30th May B. 30th June
C. 11th December D. 11th January
48. Suppose a colony is established on Mars. If a Martian doctor has to send a query to a colleague on Earth and wants to receive a response, how long will it take? Specially for the case when Mars is closest to Earth. Assume that instant replay comes from the colleague. The radius of Mars's orbit is given to be 1.524 AU.
A. 8.7 minutes B. 25.3 minutes
C. 4.3 minutes D. 12.7 minutes 10
49. In one of the truly revolutionary finds of the 20th century, Howard Carter discovered the tomb of the Egyptian Pharaoh (emperor) Tutankhamen in 1922. Some items, along with the mummy of the Pharaoh, were removed from the tomb and are enlisted below. In order to fix the period of the Pharaoh, which of these items could have been carbon dated?
A. Fragments of glass. B. Golden Bracelets
C. Dried Fruits. D. none.
50. Which of the following phenomena is / are useful, in estimating distances in the Universe?
A. Sometimes Venus can be seen transiting over the solar disc.
B. When viewed six months apart; Stars appear to change their position in the sky with no proper motion.
C. Doppler shift is exhibited in stars.
D. a,b and c

INSTRUCTIONS FOR FILLING THE SHEET

1. This sheet should not be folded or crushed.
2. Use only blue/black ball point pen to fill the circles.
3. Use of pencil is strictly prohibited.
4. Circles should be darkened completely and properly
5. Cutting and erasing on this sheet is not allowed.
6. Do not use any stray marks on the sheet.
7. Do not use marker or white fluid to hide the mark.

CORRECT METHOD



Gender

[illegible]

Male ☐

Female ☐

[illegible][illegible][illegible][illegible][illegible][illegible]

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1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
0	0	0	0	0	0	0

MARK YOUR ANSWERS HERE

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

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Candidate's Signature

Invigilator's Signature

➤ Total Questions : 50

➤ Time 1 Hour

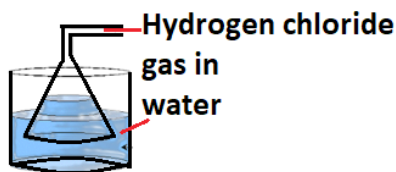
10
CLASS



INSTRUCTIONS

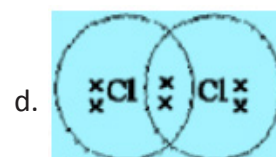
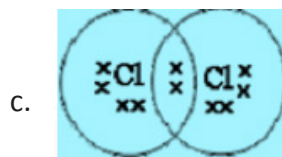
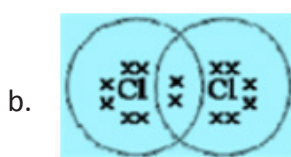
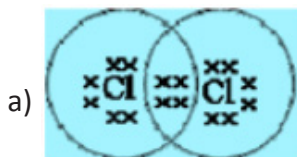
- Please Write your Student ID, Name, Class, and School Name on the OMR Sheet.
- This question paper contains 50 Questions, duration is 60 minutes.
- Answer all the questions in OMR sheet only and please do sign on it.
- Use only Black or Blue Ball Point Pen to answer the questions in the OMR sheet.
- Indicate the correct answer by darkening one of the 4 responses provided.
- After successful completion of the test, please submit the OMR answer sheet to the invigilator.
- ★ Marked Questions are HOT's or Critical Type Questions.

1. Consider the situation in which HCl is passed through water. Identify the true facts about such situation from the options given in the table:



1	It does not ionize in the solution as it is covalent compound
2	It ionizes in the solution
3	It gives both hydrogen and hydroxyl ion in the solution
4	It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule.

- a) 1, 2 and 3 b. 2 and 4 c. 1 and 2 d. 2 and 3
2. Sohan is the only student who has correctly drawn the electron dot structure of a chlorine molecule. Which of the following structures represents his answer?

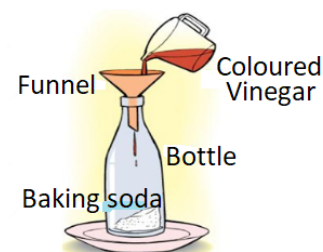


3. As an experiment, a student mixes calcium oxide (CaO) with water in a test tube and observes the side surfaces of the test tube. CaO reacts with water exothermically. In which of the following statements the student's observations are correctly stated?

- a) The test tube becomes hot.
b) The test tube becomes cold.
c) The test tube remains the same.
d) The test tube cracks immediately.

4. Students mixes 2g of baking soda and 5g of vinegar in a beaker and observes the formation of bubbles in the beaker. The resultant liquid is 6.7g by weight, which is less than expected total mass. What changes should the students make in the experiment for better accuracy?

- a) Use less vinegar and more baking soda.
b) Use more vinegar and less baking soda.
c) Use only vinegar to react with air.
d) Trap the escaping gases.



5. Consider a hypothetical situation in which humans had a two-chambered heart(one atrium and one ventricle), with the vena cava entering the atrium and aorta leaving the ventricle. Which statement would be correct in such a situation?

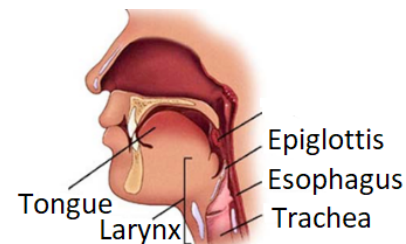
- a) Blood would not reach the head and neck.
b) Blood would not be able to carry food to the cells.
c) Oxygen would not reach the cells.
d) Body blood circulation would be at a halt.

6. Some students managed to connect an active xylem vessel (using a micro pipe) from a shoot to an active phloem sieve-tube membrane from a leaf. What can be said about the flow of solution between the two?

- a) The solution would flow from xylem to phloem.
b) The solution would flow from phloem to xylem.
c) The solution would flow back and forth from xylem to phloem and vice versa.
d) The solution would not flow between the two.

7. What effects can a malfunctioning epiglottis have on a person?

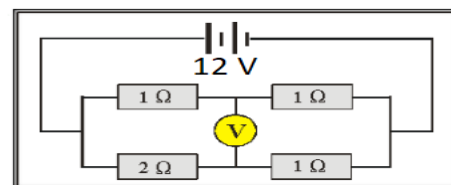
- a) The person might choke.
- b) Peristalsis will stop.
- c) Oesophagus will be damaged because of acid reflux.
- d) Swallowing will be impossible.



8. Shivam has given a circuit as shown in the diagram:

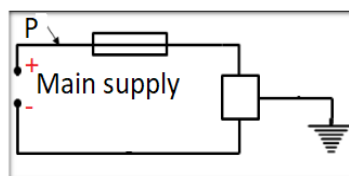
What reading will he get on the voltmeter?

- a) 14V
- b) 2V
- c) 12V
- d) 8V



9. In the given diagram, identify P.

- a) P is Neutral wire.
- b) P is earth wire.
- c) P is Live wire.
- d) Cannot determine.



10. What will happen if a bird sits on P?

- a) The bird will get shock.
- b) The bird will not get any shock.
- c) The bird will get such an intense shock that it will burn to ashes immediately.
- d) Cannot determine.

11. Various tests have found the presence of coliform bacteria in the Ganges. What could possibly be the main reason for the abundant coliform bacteria in the water of river Ganga?

- a) Immersion of ashes of the dead into the river.
- b) Washing of clothes on the banks of river.
- c) Discharge of industrial wastes into river water
- d) Disposal of unburnt corpses into river water.



12. The pH of a sample of water collected from a river is found to be in the range of 3.5 to 4.5. Identify the most suitable source of this waste discharged into the river.

- a) Soap and detergent manufacturing factory.
- b) Car battery manufacturing factory.
- c) Alcohol manufacturing factory.
- d) Plastic cups moulding factory.

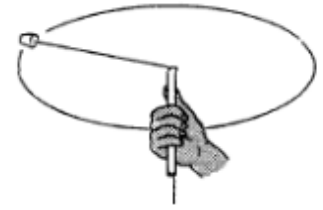
13. Raghu observed a strange liquid coming out of a tree. What do we call it?

- a) Glue.
- b) Drip.
- c) Sap.
- d) Honey.



14. Shyam is whirling a stone tied with a string horizontally in a circular path. What will happen with the stone if the string breaks?

- The stone will move along a straight line towards the centre of the circular path
- The stone will move along a straight line the tangential to the circular path.
- The stone will move along a straight line perpendicular to the circular path away from the boy.
- The stone will continue to move in the circular path



15. Kalpana was brave enough to have climbed Mount Everest. What is the value of acceleration due to gravity 'g' experienced on Everest?

- g.
- $> g$.
- $< g$.
- 0.

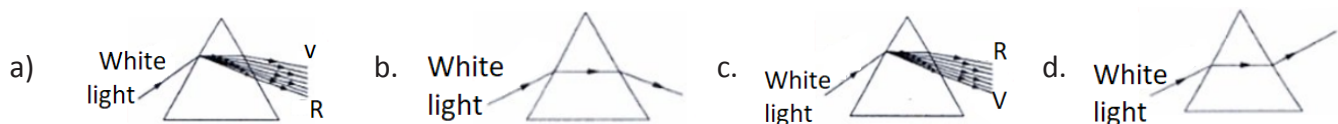
16. The four basic blood types in the human blood grouping are type A, type B, type AB, and type O. What are the blood proteins A and B?

- Simple dominant and recessive traits.
- Incomplete dominant traits.
- Co-dominant traits.
- Sex-linked traits.

17. A pregnant woman has an equal chance of her baby being blood group A or blood group AB, as told by the doctor. What can be concluded about the possible genotypes of the woman and the father of her child?

- I^A and $I^B I^O$
- $I^A I^B$ and $I^B I^O$
- $I^A I^O$ and $I^B I^O$
- $I^A I^B$ and $I^A I^O$

18. The passage of white light through prism is correctly represented by which of the following figures?

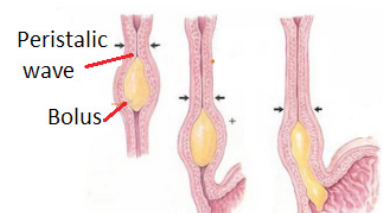


19. A person is short sighted and he cannot see clearly beyond 2m. What power of the lens should be recommended to him to correct his vision?

- 0.5 D
- 2.5 D
- +2 D
- 0.5 D

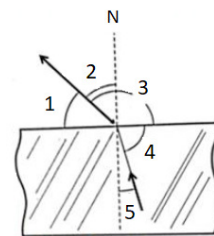
20. The diagram represents a long tube-like canal called the alimentary canal or the digestive tract, through which digestion takes place. Identify the correct order in which food travels through these organs.

- Mouth, gullet, stomach, small and large intestine and rectum.
- Mouth, oesophagus, stomach, large intestine, small intestine and rectum.
- Mouth, stomach, oesophagus, small and large intestine and rectum.
- Mouth, stomach, gullet, small and large intestine and rectum.



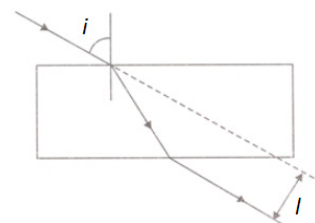
21. The given diagram shows a beam of light passing from a thick piece of glass into the air. Identify which of the following is the angle of refraction?

- 1
- 2
- 3
- 4

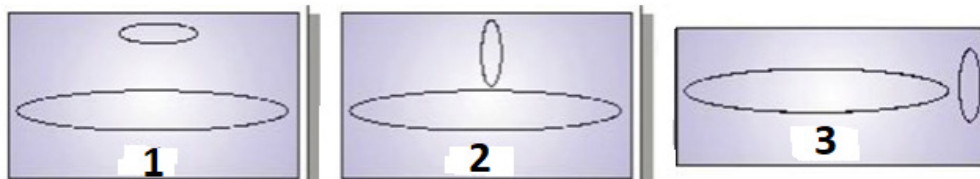


22. A student traces the path of a ray of light passing through a rectangular slab for three different values of angle of incidence ($\angle i$) namely 30 degrees, 45 degrees and 60 degrees. He then measures the perpendicular distance 'l' between the emergent ray and extended incident ray. What observations will he make?

- With increase in angle of incidence, 'l' keeps on increasing.
- With increase in angle of incidence, 'l' keeps on decreasing.
- For all three angles of incidence 'l' remains the same.
- 'l' is the maximum for $\angle i = 45$ degrees and is less than this value for



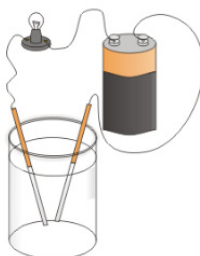
23. If two circular coils can be arranged in any of the three situations shown in the diagram below, then their mutual induction will be:



- Maximum in situation (1)
- Maximum in situation (2)
- Maximum in situation (3)
- The same in all situations.

24. Sushil creates a set up as shown below.

CCl_4
NaCl
MgCl_2
CaCl_2



He has four options to fill the jar so that the bulb lights up. Which of the given compounds should he not choose if he wants the bulb to light up.

- CC
- NaCl
- MgC
- CaC

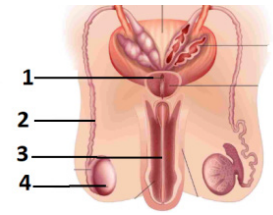
25. The table under stores certain information about species X and Y: Compare the radii of these two.

- Radius of X > radius of Y.
- Radius of X < radius of Y.
- Radius of X = radius of Y.
- Cannot determine.

SPECIES	PROTONS	ELECTRONS
X	12	12
Y	12	10

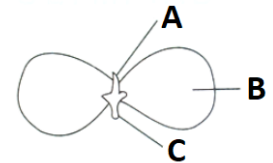
26. The given figure shows the human male reproductive organs. Identify the structures that make sperms and seminal fluid?

- a) 1 makes sperms and 4 makes seminal fluid.
- b) 2 makes sperms and 3 makes seminal fluid.
- c) 4 makes sperms and 1 makes seminal fluid.
- d) 3 makes sperms and 1 makes seminal fluid.



27. In the figure given along side, the parts marked A, B and C are sequentially:

- a) Cotyledon, plumule and radicle.
- b) Plumule, radicle and cotyledon.
- c) Plumule, cotyledon and radicle.
- d) Radicle, cotyledon and plumule.

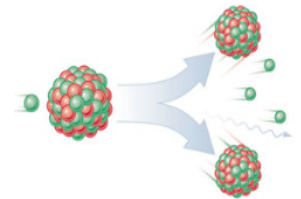


28. During which of the following activities, the breathing rate is lowest?

- a) Eating.
- b) Sleeping.
- c) Walking.
- d) Running.

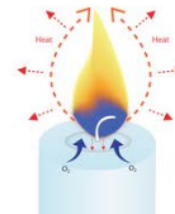
29. Neutrons involved in fission are kept under severe control. How is that done?

- a) Using boron as absorber.
- b) Using garphite as absorber.
- c) Using Boron as moderator.
- d) Using graphite as moderator.



30. In which part does the unburnt carbon particles of a flame are stored?

- a) Blue zone
- b) Dark inner zone.
- c) Luminous zone .
- d) Non luminous zone.

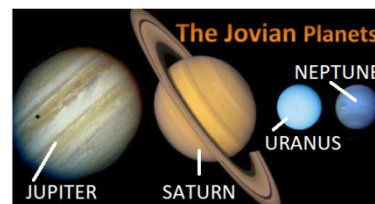


31. On a certain planet the sun rise in the west. Identify the planet?

- a) Saturn
- b) Pluto
- c) Mercury
- d) Venus.

32. If the rotational speed of a JOVIAN planet be compared with that of Earth's, which planet rotates slower than the earth?

- a) Jupiter.
- b) Uranus.
- c) Neptune.
- d) None.



33. Sunspots are nothing but temporary phenomena on the Sun's photosphere that appear as spots which are darker than the surrounding areas. What can be said about the region around a sunspot?

- a) The region around a sunspot is cooler.
- b) The region around a sunspot is hotter.
- c) The region around a sunspot is about the same temperature.
- d) Cannot determine.



34. The length of time that the sun takes to orbit the galaxy is called a cosmic year or Galactic year. How long is a Galactic year and Earth years?

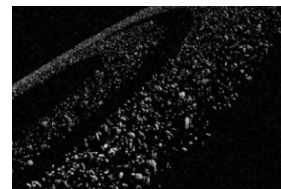
- a) 150 million years.
- b) 200 million years.
- c) 230 million years.
- d) 400 million years.

35. Some stars are referred to as First Magnitude stars since they are all 1 magnitude or brighter. How many times is a first magnitude star brighter than a second magnitude star?

- a) 3.8
- b) 2.5
- 3) 10
- 3) 5.7

36. The circumstellar disc of asteroids located roughly between the orbits of two planets in the Solar System is called the asteroid belt. Name these two planets between which the Asteroid Belt is found?

- a) Mars and Jupiter.
- b) Jupiter and Neptune.
- c) Mars and earth.
- d) Mercury and earth.



37. When asked an example of a planetary nebula, Rohan said- 'The ring nebula'. Now the teacher asks him to explain the Ring Nebula to the class. What should be his explanation?

- a) The ring nebula is a ring of planets circling a star.
- b) The Ring Nebula is an expanding ring of gas being released from a dying star.
- c) The Ring Nebula is a contracting ring of gas and dust falling circling into a massive object.
- d) The Ring Nebula is a ring of stars in a circular orbit.

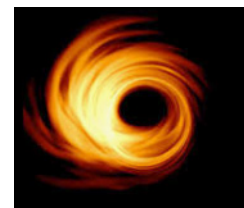
38. Sometimes a diffused brown or bluish halo can be observed around the sun. This is known as the Bishop's ring. After which occurrence one might see Bishop's Ring?

- a) Volcanic eruptions.
- b) Cyclones.
- c) Earthquakes.
- d) All of the above.



39. Consider a black hole with the mass equal to that of the earth. What would be the size of such a black hole?

- a) The Sun.
- b) The Moon.
- c) A bowling ball.
- d) A marble.



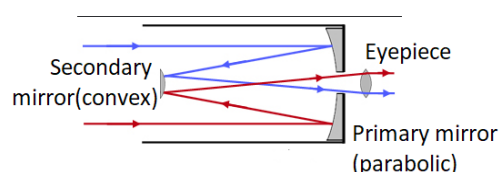
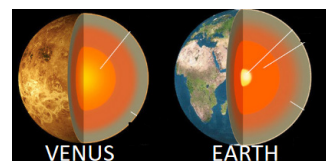
40. Raman hypothetically says that he would be the next person to land on moon. If somehow it is true, Raman would be....

- a) 12th man to have set foot on the Moon.
- b) 11th man to have set foot on the Moon.
- c) 13th man to have set foot on the Moon.
- d) 15th man to have set foot on the Moon.

41. If you gaze the night sky at midnight, you will never be able to see which two planets?

- a) Mercury and Venus.
- b) Mars and Venus.
- c) Neptune and Uranus.
- d) Earth and Mercury.

42. Suman is reading a paradox which asks- 'If the universe is infinite in extent and uniformly filled with stars, why the sky is not ablaze with starlight?' Whose paradox is this?
- Olber's
 - Greigheim's
 - Schuller's
 - Miller's.
43. On one of the astronauts who landed on moon intentionally left an object on the moon. Scientists periodically use this object to measure the distance between the earth and the moon by bouncing a laser beam off of this object. Identify this object?
- A diamond.
 - A crystallized stone.
 - A mirror.
 - An aluminum sheet.
44. Teacher writes down a few examples on the board viz., Schmidt, Cassegrainian, and Galilean. What are all these examples of?
- Telescope.
 - Microscope.
 - Satellites.
 - Space stations.
45. There are two bright spots of light visible on the opposite sides of a halo around the sun. What are these called?
- Sun dots.
 - Sun spots.
 - Sun dogs.
 - Sun cats.
46. Not all stars are as hot as the sun, some are cooler. In which form do these stars (including the planets, interstellar clouds and star-forming regions) emit most of their radiant energy?
- Visible.
 - X-ray region.
 - Ultraviolet.
 - Infrared.
47. Sirius was identified as a binary star. It has a small companion which was identified much later. The small companion of this binary system is what kind of star?
- Red dwarf.
 - White dwarf.
 - Red giant.
 - Neutron star.
48. The atmosphere on Venus is much denser and hotter than that of Earth which makes optical observation of the surface quite difficult. In order to see through Venus's clouds which of the following can be used?
- Refracting telescopes.
 - Radar.
 - Ultraviolet.
 - X-rays.
49. A certain type of reflecting telescope focuses the light by the primary mirror intercepting short of focal point and refocuses by a secondary mirror through a hole in the center of the primary mirror. Identify the type of design of such a telescope?
- Gregorian.
 - Newtonian.
 - Cassegrain or Cassegrainian.
 - Off-axis.
50. Out of the observable matter in our universe what fraction, by mass, is helium?
- 40%.
 - 24%.
 - 2%.
 - 87%.



INSTRUCTIONS FOR FILLING THE SHEET

1. This sheet should not be folded or crushed.
2. Use only blue/black ball point pen to fill the circles.
3. Use of pencil is strictly prohibited.
4. Circles should be darkened completely and properly
5. Cutting and erasing on this sheet is not allowed.
6. Do not use any stray marks on the sheet.
7. Do not use marker or white fluid to hide the mark.

CORRECT METHOD



Grade

Gender

2nd 3rd 4th 5th 6th 7th 8th 9th 10th

Male ☐

Female ☐

RollNo.

[illegible]

Father's Name

[illegible]

School Name

[illegible]

E-mail Id

[illegible]

City

[illegible]

School Code

1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0

MARK YOUR ANSWERS HERE

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

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Candidate's Signature

Invigilator's Signature



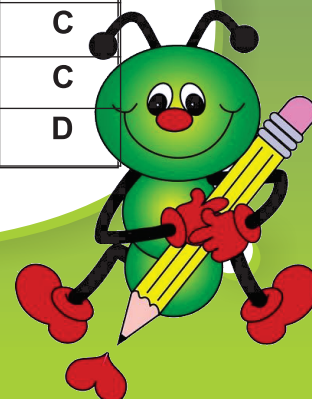
2015 QUESTION PAPER - ANSWER KEY

QUESTION NO. 1	2	3	4	5	6	7	8	9	10
ANSWERS	C	D	B	D	D	D	D	D	B
QUESTION NO.11	12	13	14	15	16	17	18	19	20
ANSWERS	D	C	C	D	B	B	D	D	A
QUESTION NO.21	22	23	24	25	26	27	28	29	30
ANSWERS	B	C	D	B	A	D	D	A	D
QUESTION NO.31	32	33	34	35	36	37	38	39	40
ANSWERS	B	D	A	B	C	C	A	C	B
QUESTION NO.41	42	43	44	45	46	47	48	49	50
ANSWERS	B	A	A	C	A	D	C	C	B



2016 QUESTION PAPER - ANSWER KEY

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





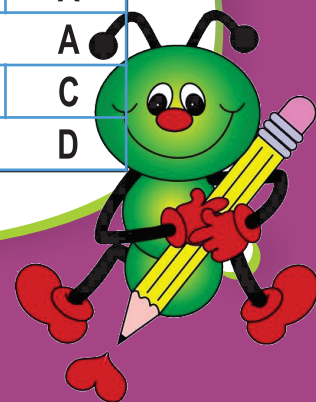
2017 QUESTION PAPER - ANSWER KEY

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



2018 QUESTION PAPER - ANSWER KEY

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





2019 QUESTION PAPER - ANSWER KEY

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



REVISION QUESTION PAPER - ANSWER KEY

Question and Answer
not given



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Learning Through | Experiential Learning**



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own making images, like car, aeroplane
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