SCIENCE OLYMPIAD FOUNDATION
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DPS Science & Mathematics TALENT EXAMINATION 2018-2019

Time : 2 hrs. Total Marks : 100

Guidelines for the Candidate

1. The paper consists of two sections –

   Science (60 Questions) : Physics (20 Questions), Chemistry (20 Questions) & Biology (20 Questions) and **Mathematics (40 Questions)**

2. All questions are compulsory and carry equal marks. There is no negative marking. Use of calculator is not permitted.
3. Write your Name, School Name and Roll No. clearly on the OMR sheet and do not forget to sign it.
4. There is only one correct answer hence mark one choice only.
5. Darken your choice with **HB Pencil** or **Blue / Black Ball Point Pen** only.

   For example :

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

   (A) Water vapour cooling down and turning into a liquid
   (B) Ice warming up and turning into a liquid
   (C) Liquid cooling down and turning into ice
   (D) Liquid warming up and turning into water vapour
   (E) None of these

As the correct answer is option (A), the candidate should darken the circle corresponding to option (A).

16. ● Ⓑ Ⓒ Ⓓ Ⓔ

6. Rough work should be done in the blank space provided in the booklet.

PHYSICS

1. A boy can jump h m high on the earth. The height (in m) he might be able to jump on a planet whose density is one eighth of the density of earth and radius is twice the radius of earth, is

(A) $2h$ (B) $4h$ (C) $8h$ (D) $16h$

(E) None of these.

2. Which of the following statements about action (A) and reaction (R) is/are correct?

(i) A and R act on two different bodies. (ii) A and R are equal and opposite in nature.

(iii) A and R can occur when two bodies are at rest or in motion.

(iv) A and R do not cancel each other.

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

(E) None of these

3. When a body is projected vertically upward with a velocity v from the ground, its potential energy and kinetic energy at a height h above the ground are in the ratio 2 : 3. If the same body is projected again but with velocity $2v$, it reaches a maximum height H. Find $h : H$.

(A) 1 : 4 (B) 1 : 6 (C) 1 : 8 (D) 1 : 10

(E) None of these

4. A 15 N force pulls a block of mass 2 kg from rest to the top of a ramp as shown in the figure. If the block reaches the top of the ramp with a speed of 4 m s^{-1}, then which of the following statements is incorrect? (Take $g = 10$ m s^{-2})

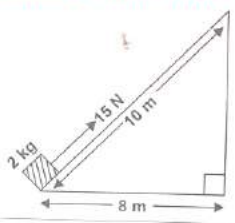
(A) Work done by the 15 N force on the block is 150 J.

(B) Gain in the kinetic energy of the block is 16 J.

(C) Gain in the gravitational potential energy of the block is 200 J.

(D) Work done against the friction is 14 J.

(E) None of these



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

Statement-I : An astronaut experiences weightlessness in a satellite.

Statement-II : When a body falls freely, it does not experience gravity.

(A) Both statements I and II are true and statement II is the correct explanation of statement I.

(B) Both statements I and II are true but statement II is not the correct explanation of statement I.

(C) Statement I is true but statement II is false. (D) Both statements I and II are false.

(E) None of these

6. When a block of mass 20 kg is pushed along a rough surface with a force of 80 N, it continues to move with a constant velocity. The force required to push the block along the same surface so that it moves with a constant acceleration of 0.4 m s^{-2} is

(A) 80 N (B) 84 N (C) 88 N (D) 96 N

(E) None of these.

7. The given speed-time graph shows the motion of a motorcar on a level road within an interval of 10 s. If the mass of motorcar is 500 kg and the resistive force on the car is 120 N, then find the power expended by the motorcar.

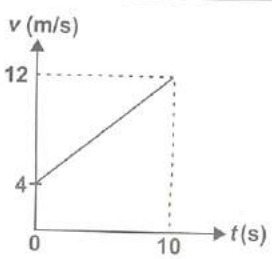
(A) 3200 W

(B) 4160 W

(C) 32000 W

(D) 41600 W

(E) None of these

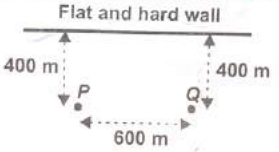


8. Two girls P and Q are facing a flat and hard wall as shown in the figure. When girl P makes a clap, girl Q hears two claps. The speed of sound is 320 m s^{-1}. What is the time interval between the two claps heard by girl Q?

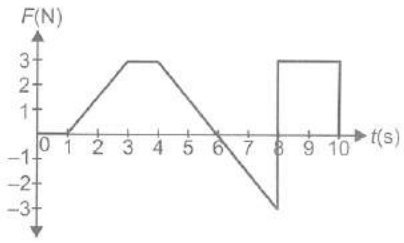
(A) 0.32 s (B) 0.67 s

(C) 1.25 s (D) 2.50 s

(E) None of these



9. A force-time graph for linear motion of a body is shown in the given figure. The change in linear momentum between 0 s and 10 s is



(A) 6 N s
(B) 12 N s
(C) 18 N s
(D) 36 N s
(E) None of these.

10. A wooden block floats in a liquid with 30% of its volume inside the liquid. When the vessel containing the liquid starts rising upwards with constant speed, the percentage of volume of wooden block inside the liquid will be

(A) 15% (B) 30% (C) 60% (D) 70%
(E) None of these.

11. A boy released a ball from certain height, which falls freely towards the earth. Exactly one second later another ball is released from same height. What is the distance between the two balls 2 seconds after the release of the second ball? (Take $g = 9.8\ m\ s^{-2}$)

(A) 4.9 m (B) 9.8 m (C) 24.5 m (D) 50 m
(E) None of these

12. If a vibrator generates waves of speed 330 m/s and wavelength 0.8 m, then the frequency and time period respectively are

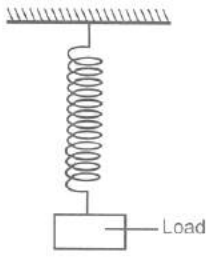
(A) 264 Hz, 0.0037 s (B) 42.5 Hz, 0.0024 s (C) 412.5 Hz, 0.0024 s (D) 264 Hz, 0.0030 s
(E) None of these

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

Column I	Column II
P. Electrostatic force	(i) Spring balance
Q. Frictional force	(ii) Pascal
R. Weight	(iii) Contact force
S. Pressure	(iv) Non-contact force

(A) P-(ii), Q-(iii), R-(iv), S-(i)
(B) P-(iii), Q-(iv), R-(ii), S-(i)
(C) P-(i), Q-(iii), R-(iv), S-(ii)
(D) P-(iv), Q-(iii), R-(i), S-(ii)
(E) None of these

14. In the given diagram, when a weight of 100 g is hung from the spring, its length is 9 cm. When a weight of 150 g instead of 100 g is hung from the spring, its length is 11 cm. What is the length of the spring when there is no weight hanging from it?



(A) 2 cm
(B) 4 cm
(C) 5 cm
(D) 7 cm
(E) None of these

15. Which of the following statements is/are correct?

I. Friction opposes the relative motion between the surfaces in contact with each other.
II. Friction depends on the nature of surfaces.
III. Friction produces heat.
IV. Sprinkling of powder on the carrom board reduces friction.

(A) I only (B) I and III only (C) II and IV only (D) I, II, III and IV
(E) None of these

16. Consider the list of terms given here.

(i) Tsunami (ii) Floods (iii) Landslide (iv) Lightning

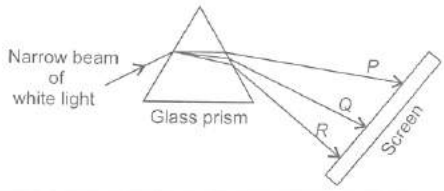
Earthquakes can cause

(A) (i), (ii) and (iii) only (B) (ii) and (iv) only (C) (ii), (iii) and (iv) only (D) (iii) and (iv) only
(E) None of these.

17. A narrow beam of white light is passed through a glass prism as shown in the figure.
Which of the following is the correct order of colours emerging from the prism?

	P	Q	R
(A)	Red	Blue	Green
(B)	Red	Green	Blue
(C)	Blue	Green	Red
(D)	Blue	Red	Green

(E) None of these



18. Which of the following statements is/are correct?

I. Area under an acceleration-time graph represents a physical quantity which has the unit m/s.

II A passenger in a moving train tosses a coin which falls behind him, it means train is accelerating.

III. Sound travels in air if particles of medium travel from one place to another.

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

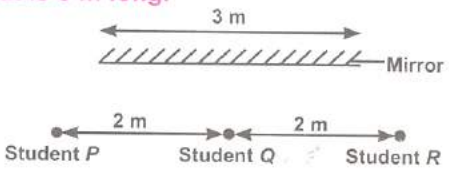
(E) None of these

19. Three students *P*, *Q* and *R* stand 2 m apart in front of a plane mirror that is 3 m long.
Student *Q* is standing opposite the mid-point of the mirror.
How many students can see the images of the other two?

(A) 0 (B) 1

(C) 2 (D) 3

(E) None of these



20. A man stands on the edge of a cliff. He throws a stone upwards with a velocity of 19.6 m s^{-1} at time $t = 0$. The stone reaches the top of its trajectory after 2 s and falls towards the bottom of the cliff. Air resistance is negligible.
Which option shows the correct velocity *v* and acceleration *a* of the stone at different times?

	t(s)	v(m s^{-1})	a(m s^{-2})
(A)	1.00	9.81	9.81
(B)	2.00	0	0
(C)	3.00	9.81	–9.81
(D)	5.00	–29.4	–9.81

(E) None of these

CHEMISTRY

21. Which of the following statements about sublimation are incorrect?

I. Solids, whose vapour pressures become equal to the atmospheric pressure after reaching their melting points undergo sublimation.

II. Freeze-dried foods prepared by sublimation cannot be stored for a long time.

III. Dry ice undergoes sublimation when pressure is decreased to 1 atm.

IV. Snow sublimes directly to vapours in very cold places.

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

(E) None of these

22. The forms of coal which contain the lowest and the highest amount of carbon are respectively

(A) Peat and lignite (B) Lignite and bituminous

(C) Peat and anthracite (D) Bituminous and anthracite

(E) None of these.

23. Four mixtures are prepared as follows :

Mixture I : Water + Charcoal powder Mixture II : Water + Magnesium hydroxide

Mixture III : Water + Detergent powder Mixture IV : Water + Copper sulphate

Which of the following statements is correct regarding these mixtures?

(A) On filtration both mixtures I and IV will leave behind a residue.

(B) When light is passed through mixtures I and II, its path becomes visible.

(C) Mixtures III and IV are clear solutions and are translucent to light.

(D) Mixtures I, II and III when allowed to stand undisturbed for some time, the particles will settle down.

(E) None of these

24. The formula unit mass of a metal nitrate $M(NO_3)_3$ is 238 u. What will be the formula unit mass of its sulphate?
(Given : Atomic mass of S = 32 u, N = 14 u, O = 16 u)

(A) 238 u (B) 392 u (C) 115 u (D) 52 u
(E) None of these

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

Column I (Materials)	Column II (Uses)
P. Bakelite	(i) Sweaters
Q. Acrylic	(ii) Toothbrushes
R. Nylon	(iii) Floor tiles
S. Melamine	(iv) Electrical switches

(A) P-(iv); Q-(i); R-(ii); S-(iii)
(B) P-(ii); Q-(iv); R-(i); S-(iii)
(C) P-(i); Q-(iv); R-(ii); S-(iii)
(D) P-(iii); Q-(ii); R-(iv); S-(i)
(E) None of these

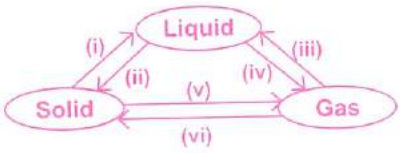
26. Study the given table carefully and select the correct statement(s).

Atoms/ Ions	Number of protons	Number of neutrons
P^+	11	12
Q^{3-}	15	16
R^-	17	18
S^{3+}	13	14
T	20	20
U	15	15

I. P^+ and S^{3+} have same number of electrons.
II. R and S combine to form RS_3.
III. T has three electron shells and is trivalent.
IV. Q and U are isobars.

(A) I only (B) IV only
(C) II and III only (D) II, III and IV only
(E) None of these

27. The given figure shows the interconversion of three states of matter. Which of the following represents a correct match of the temperature and pressure conditions required to carry out the given processes?



(A) Processes (i) and (vi) - Increase in temperature and increase in pressure
(B) Processes (ii) and (v) - Decrease in temperature and increase in pressure
(C) Processes (iii) and (vi) - Decrease in temperature and increase in pressure
(D) Processes (i) and (iv) - Increase in temperature and increase in pressure
(E) None of these

28. A few atoms are listed in the given box.

(i) $^{18}_{8}O$ (ii) $^{114}_{48}Cd$ (iii) $^{19}_{9}F$ (iv) $^{59}_{27}Co$ (v) $^{27}_{13}Al$ (vi) $^{59}_{28}Ni$ (vii) $^{16}_{8}O$

Which of the following statements are correct regarding these atoms?
P. Atoms (i) and (iii) contain same number of neutrons.
Q. Atoms (iv) and (vi) are isotopes as they have same mass number.
R. Atoms (i) and (vii) have similar chemical properties as they have same number of electrons.
S. Atoms (iii) and (v) will form univalent anion and trivalent cation respectively to attain stable electronic configuration.

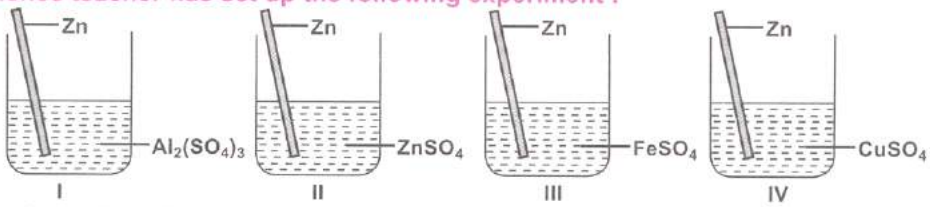
(A) Q and R only (B) P and S only (C) P, R and S only (D) Q and S only
(E) None of these

29. A brief information about four polymers is given as :
W : Can be easily moulded and is used to insulate the hollow walls of refrigerators
X : A strong but flexible thermoplastic
Y : An insulator which is tougher than polythene
Z : Slippery and does not react chemically with other substances
Which of the following options correctly identifies *W*, *X*, *Y* and *Z*?

	W	*X*	*Y*	*Z*
(A)	Styrofoam	PVC	Bakelite	Melamine
(B)	Polystyrene	Polythene	PVC	Teflon
(C)	PVC	Polythene	Melamine	Teflon
(D)	Polystyrene	PVC	Bakelite	Melamine

(E) None of these

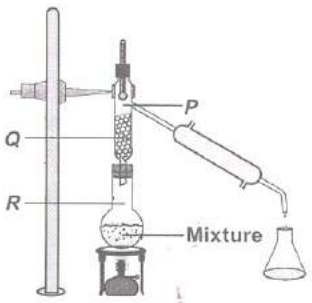
30. **Ms Ankita, a science teacher has set up the following experiment :**



If the apparatus is kept undisturbed for two hours, then which of the following represents the correct observations after two hours?

(A) Zinc rod loses weight in all the four beakers.
(B) Colour changes from blue to green in beaker IV.
(C) No colour change is observed in beakers I, II and III.
(D) Colour change is observed in beakers III and IV.
(E) None of these

31. **The given apparatus is set up to separate chloroform (boiling point : 334 K) and benzene (boiling point : 353 K) from their mixture. Which of the following statements is correct when the mixture starts boiling?**



(A) The vapours formed at point *R* consist mainly of chloroform.
(B) In part *Q*, vapours of chloroform condense back into the distillation flask more readily than those of benzene.
(C) Point *P* will be richer in vapours of chloroform.
(D) Both (A) and (C)
(E) None of these

32. **In a gaseous mixture, the ratio of the weights of methane and sulphur dioxide is 1:2. What will be the ratio of the number of molecules of sulphur dioxide to the number of molecules of methane?**
(Given : Atomic mass of C = 12 u, H = 1 u, S = 32 u, O = 16 u)

(A) 1 : 2 (B) 3 : 1 (C) 1 : 4 (D) 4 : 1
(E) None of these

33. **Select the incorrect statement(s).**

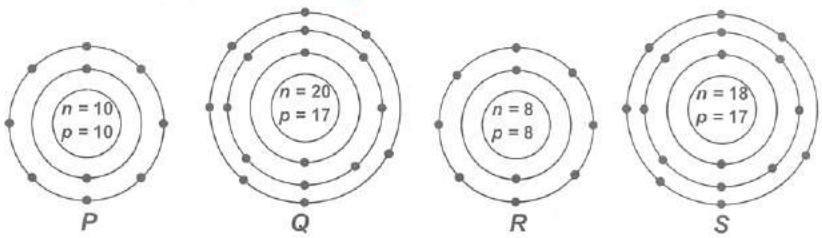
I. **Coal tar is the purest form of carbon.**
II. **On heating coal produces mainly nitrogen dioxide gas.**
III. **Hydrogen gas is used in the production of urea.**
IV. **Heavy motor vehicles like trucks and tractors run on diesel.**

(A) I and II only (B) I and III only (C) I only (D) IV only
(E) None of these

34. **When the matchstick strikes against the rubbing surface, what happens to red phosphorus?**

(A) It gets converted into white phosphorus.
(B) It reacts with potassium chlorate.
(C) It reacts with antimony trisulphide.
(D) Both (A) and (C)
(E) None of these

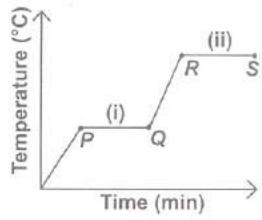
35. **Schematic representations of *P*, *Q*, *R* and *S* are given as :**



Which of the following statements is incorrect?

(A) *P* is a noble gas.
(B) *Q* and *S* are different atoms of the same element.
(C) *R* is a neutral atom having a stable configuration.
(D) *Q* and *S* both will form univalent ions.
(E) None of these

36. The given graph represents the temperature changes when 1 kg of ice was heated strongly until it turned into a gas.



The values of heat energy absorbed in processes (i) and (ii) are respectively

(A) 1.13×10^5 J and 1.46×10^5 J
(B) 3.35×10^3 J and 2.26×10^3 J
(C) 3.35×10^5 J and 22.6×10^5 J
(D) 11.3×10^5 J and 14.6×10^5 J
(E) None of these.

37. Different zones of a candle flame are shown in the figure. Refer to the given figure and select the correct statement.

(A) Complete combustion occurs in zone *Q* because of the adequate supply of oxygen.
(B) Zone *P* is moderately hot.
(C) In zone *S*, colour of the flame appears yellow.
(D) Zone *R* is the hottest part of the flame.
(E) None of these

38. Fill in the blanks by selecting an appropriate option.
3.42 g of sucrose ($C_{12}H_{22}O_{11}$) contains __(i)__ molecules of sucrose, __(ii)__ atoms of carbon, __(iii)__ atoms of hydrogen and __(iv)__ atoms of oxygen.

	(i)	(ii)	(iii)	(iv)
(A)	6.023×10^{21}	7.227×10^{22}	1.2×10^{23}	6.62×10^{21}
(B)	6.023×10^{20}	3.01×10^{23}	1.325×10^{23}	3.01×10^{23}
(C)	3.01×10^{23}	3.01×10^{23}	1.4×10^{23}	6.02×10^{22}
(D)	6.023×10^{21}	7.227×10^{22}	1.325×10^{23}	6.625×10^{22}

(E) None of these

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

Column I (To separate)	Column II (Methods)
P. Water from brine	(i) Fractional distillation
Q. Small pieces of metals from the engine oil of a car	(ii) Centrifugation
R. Different gases from liquid air	(iii) Chromatography
S. Fine mud particles from water	(iv) Simple distillation
T. Different pigments from chlorophyll	(v) Filtration

(A) P-(ii), Q-(iv), R-(i), S-(iii), T-(v)
(B) P-(v), Q-(iv), R-(iii), S-(ii), T-(i)
(C) P-(iv), Q-(v), R-(i), S-(ii), T-(iii)
(D) P-(v), Q-(iv), R-(ii), S-(i), T-(iii)
(E) None of these

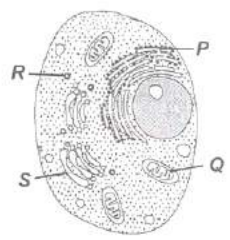
40. A few elements are grouped together randomly as :
Group I : Sodium, Hydrogen, Magnesium, Calcium
Group II : Germanium, Silicon, Iodine, Antimony
Group III : Silver, Gold, Calcium, Platinum
Group IV : Chlorine, Oxygen, Nitrogen, Bromine
Select the odd one out in each group.

	Group I	Group II	Group III	Group IV
(A)	Calcium	Germanium	Calcium	Chlorine
(B)	Hydrogen	Iodine	Gold	Oxygen
(C)	Sodium	Silicon	Platinum	Nitrogen
(D)	Hydrogen	Iodine	Calcium	Bromine

(E) None of these

BIOLOGY

41. Which of the following holds true regarding labelled parts *P*, *Q*, *R* and *S* of the given figure?



(A) *P* synthesises proteins whereas *Q* synthesises carbohydrates.
(B) *Q* is bound by single membrane whereas *S* is bound by double membrane.
(C) Polypeptides synthesised at *S* are transported to *P* to become functional proteins.
(D) *R* disposes off foreign particles by hydrolysing them through enzymes.
(E) None of these

42. **Refer to the given diagram.**

Select the correct option for *X* and *Y*.

(A) Female of species *Y* produces and releases large number of gametes at a time whereas female of species *X* produces only one gamete at a time.

(B) Species *Y* may be oviparous or viviparous.

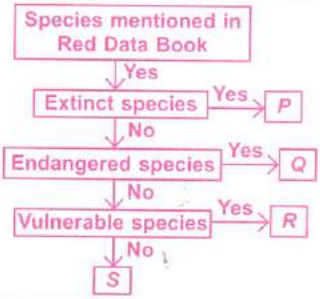
(C) Eggs of species *X* lack a hard protective shell and are enclosed in jelly like substance but eggs of species *Y* can have hard calcareous shell giving them better protection.

(D) Both (B) and (C)

(E) None of these

43. **Refer to the given flow chart.**

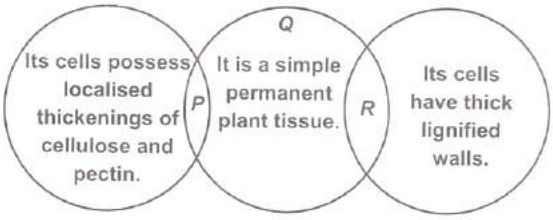
Select the option that correctly identifies *P*, *Q*, *R* and *S*.



	P	*Q*	*R*	*S*
(A)	Passenger pigeon	Blackbuck	Lion-tailed macaque	Spiny anteater
(B)	Dodo	Sloth bear	Asiatic wild ass	Duck billed platypus
(C)	Dodo	Chinkara	Pangolin	Bengal tiger
(D)	Passenger pigeon	Cheetah	Hog deer	American bison

(E) None of these

44. **Refer to the given Venn diagram.**
Select the correct option regarding tissues *P*, *Q* and *R*.



(A) *P* acts as water storage tissue in succulents and provides buoyancy to aquatic plants.

(B) *Q* provides strength and elasticity to the herbaceous dicot stems and leaves.

(C) *R* fibres of plants like flax, hemp and jute are commercially exploited.

(D) *Q* is a living tissue whereas *P* and *S* are dead tissues.

(E) None of these

45. **Several red cabbage leaves were placed in a beaker of water for 5 minutes. The surrounding water remained colourless after 5 minutes. The beaker was then heated to 100°C for another 5 minutes. Following this, the surrounding water turned red. Which of the following best explains this?**

(A) At higher temperature, the red pigment gained more kinetic energy to diffuse out of the cabbage leaves.

(B) Heating caused the pigment to become small enough to pass through the partially permeable cell membrane.

(C) The cell wall gets denatured upon boiling, allowing the escape of pigment.

(D) Upon boiling, the cell membrane gets damaged and becomes fully permeable.

(E) None of these

46. **Refer to the given table and select the incorrect option for diseases *P*, *Q*, *R*, *S* and *T*.**

Disease	Characteristics				
	Acute	Chronic	Viral	Bacterial	Hormonal
P	✓	×	✓	×	×
Q	✓	×	×	✓	×
R	×	✓	✓	×	×
S	×	✓	×	✓	×
T	×	✓	×	×	✓

(A) *P* could be rhinitis whereas *R* could be AIDS.

(B) *Q* could be cholera whereas *S* could be elephantiasis.

(C) *R* could be hepatitis whereas *T* could be diabetes.

(D) *P* could be measles whereas *Q* could be typhoid.

(E) None of these

47. **Select the correct match.**

(A) Gir Forest National Park - Maharashtra

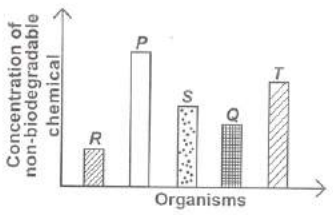
(B) Kanha National Park - Uttarakhand

(C) Keoladeo National Park - Rajasthan

(D) Dudhwa National Park - Madhya Pradesh

(E) None of these

48. The given graph shows the concentration of a non-biodegradable chemical in the bodies of different organisms inter-related in an aquatic food chain. Select the correct option regarding this.



(A) P is the top carnivore that feeds on T in this food chain.
(B) A very small population of Q can support a big R population in terms of food.
(C) If Q, S and T are aquatic organisms used as food by humans then Q will cause most toxicity as compared to S and T in human population.
(D) The correct interlinking of these organisms in a food chain will be $R \rightarrow Q \rightarrow T \rightarrow S \rightarrow P$.
(E) None of these

49. Read the given statements and select the correct option.
Statement I : Groundnut and sunflower are generally grown in intercropping pattern.
Statement II : Groundnut crop when grown in one season reduces soil fertility hence is alternately succeeded by sunflower crop in next season that is a leguminous crop and resumes nitrogen content of soil.
(A) Both statement I and statement II are true and statement II is the correct explanation of statement I.
(B) Both statement I and statement II are true but statement II is not the correct explanation of statement I.
(C) Statement I is true but statement II is false.
(D) Both statements I and II are false.
(E) None of these

50. Read the given passage.
X causes amoebiasis in humans, Y causes red rot of sugarcane, whereas Z causes tuberculosis in cattle. Identify X, Y and Z and select the correct option regarding them.
(A) X and Y are eukaryotic microbes whereas Z is a prokaryotic microbe.
(B) Y and Z belong to those groups to which decomposer microbes also belong.
(C) X is *Colletotrichum falcatum*, Y is *Entamoeba histolytica* and Z is *Mycobacterium*.
(D) Both (A) and (B)
(E) None of these

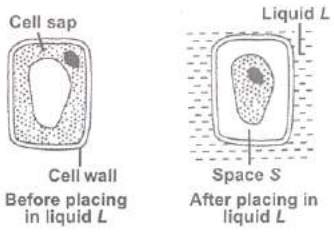
51. Refer to the given dichotomous key and select the incorrect option.
I. (a) It is a non-vascular plant. – Go to II
(b) It is a vascular plant. – Go to III
II. (a) It has non-jacketed sex organs. – [P]
(b) It has jacketed sex organs. – [Q]
III. (a) It is a seedless plant. – [R]
(b) It bears seeds. – Go to IV
IV. (a) It bears naked seeds. – [S]
(b) Seeds are enclosed inside fruits. – [T]
(A) P lives in symbiotic association with fungi forming lichens which colonises bark of trees or bare rocks.
(B) Gametophytic phase is dominant in Q whereas sporophytic phase is dominant in R, S and T.
(C) Embryo stage is absent in P but present in Q, R, S and T.
(D) Pollination takes place by agency of wind, water or insects in R, S and T.
(E) None of these

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

Column I	Column II
P. Squamous epithelium	(i) Sweat and salivary glands
Q. Cuboidal epithelium	(ii) Gall bladder
R. Columnar epithelium	(iii) Alveoli of lungs
S. Ciliated epithelium	(iv) Blubber of whale
T. Adipose tissue	(v) Fallopian tubes

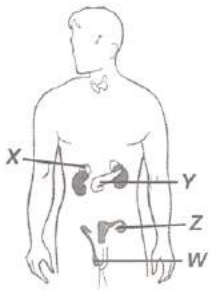
(A) P-(v); Q-(ii); R-(i); S-(iv); T-(iii)
(B) P-(iii); Q-(i); R-(ii); S-(v); T-(iv)
(C) P-(iv); Q-(iii); R-(v); S-(i); T-(ii)
(D) P-(ii); Q-(iv); R-(iii); S-(v); T-(i)
(E) None of these

53. The given diagram shows a plant cell before and after it was immersed in liquid *L* for 10 minutes. Select the correct option regarding this.



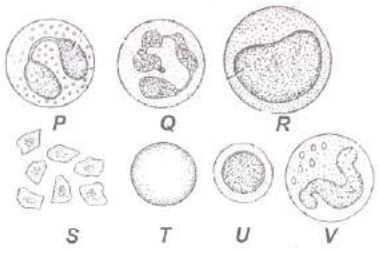
(A) The plant cell gets deplasmolysed after being immersed in liquid *L*.
(B) The space *S* is occupied by liquid *L*.
(C) Liquid *L* is hypertonic to cell sap.
(D) Both (B) and (C)
(E) None of these

54. Refer to the given figure showing locations of various endocrine glands in human body. Select the incorrect option regarding this.



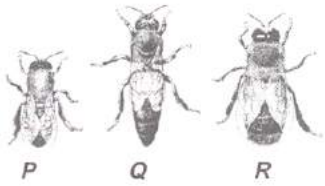
(A) Level of hormone secreted by *X* rises in blood of a person who is watching some horror movie and getting scared.
(B) Level of hormone secreted by *Y* is much lower than normal in a person suffering from diabetes mellitus.
(C) Hormone secreted by *Z* is responsible for development of breasts and broadening of pelvis in adolescent girls.
(D) Deficiency of hormone secreted by *W* leads to dwarfism in males.
(E) None of these

55. Refer to the given figure representing different human blood corpuscles (*P*-*V*) and select the incorrect statement regarding them.



(A) *T* takes part in transport of gases within the body whereas *S* helps in blood clotting at the site of external injury.
(B) Number of *P* increases during hay fever whereas *U* produces antibodies against pathogens.
(C) *V* releases histamine and heparin whereas *R* shows allergic responses and antihistamine properties.
(D) *R* and *U* are agranulocytes whereas *P*, *Q* and *V* are granulocytes.
(E) None of these

56. Given figure shows three different castes of a colony of honey bees. Select the incorrect statement regarding the three castes.

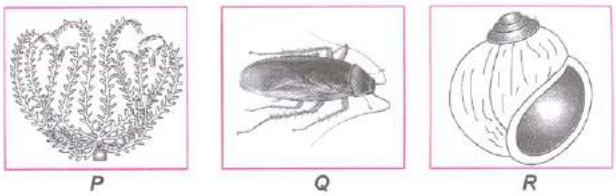


(A) *P* is the worker bee, which is a sterile female.
(B) *Q* is the queen, which lays both fertilized and unfertilized eggs.
(C) *R* is the drone, which is a fertile male.
(D) *P* and *Q* emerge from unfertilized eggs, while *R* emerges from a fertilized egg.
(E) None of these

57. Catalytic converters are fitted into automobiles to reduce emission of harmful gases. Catalytic converters change unburnt hydrocarbons into

(A) Carbon dioxide and water
(B) Carbon monoxide
(C) Methane
(D) Carbon dioxide and methane
(E) None of these.

58. Refer to the given figures.



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

(A) *Holothuria* belongs to the same phylum to which organism *R* belongs.
(B) Organism *P* is diploblastic and pseudocoelomate whereas organisms *Q* and *R* are triploblastic and eucoelomate.
(C) Organism *P* excretes through special excretory structures that are also present in *Dugesia*.
(D) Respiratory structures of organism *Q* are similar to those present in *Scolopendra*.
(E) None of these

59. Select the option that correctly categorises the given crops into kharif and rabi.

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

(A) Kharif : Paddy, Wheat, Maize, Barley, Groundnut
Rabi : Mustard, Cotton, Pea, Soybean, Linseed

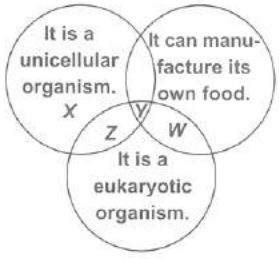
(B) Kharif : Paddy, Maize, Groundnut, Cotton, Soybean
Rabi : Wheat, Barley, Mustard, Pea, Linseed

(C) Kharif : Paddy, Mustard, Wheat, Cotton, Barley
Rabi : Maize, Pea, Groundnut, Soybean, Linseed

(D) Kharif : Wheat, Barley, Mustard, Pea, Linseed
Rabi : Paddy, Maize, Groundnut, Cotton, Soybean

(E) None of these

60. Refer to the given Venn diagram.
Identify *W*, *X*, *Y* and *Z* and select the correct option.



	W	*X*	*Y*	*Z*
(A)	*Euglena*	*Aspergillus*	*Pinus*	*Paramecium*
(B)	*Ginkgo*	*Anabaena*	*Agaricus*	*Adiantum*
(C)	*Pogonatum*	*Escherichia*	*Chlorella*	*Saccharomyces*
(D)	*Rhizopus*	*Entamoeba*	*Ulothrix*	*Hydrilla*

(E) None of these

MATHEMATICS

61. Which of the following statements is incorrect?

(A) An event for an experiment is the collection of some outcomes of the experiment.

(B) The empirical probability $P(E)$ of an event E is given by $P(E) = \frac{\text{Number of trials in which } E \text{ has happened}}{\text{Total number of trials}}$

(C) The probability of an event lies between 0 and 1 (0 and 1 exclusive).

(D) The sum of all the probabilities is 1.

(E) None of these

62. A number is multiplied by $2\frac{1}{3}$ times of itself and then 61 is subtracted from the product obtained. If the final result is 9200, then the number is _____.

(A) 36 (B) 63 (C) 67 (D) 37

(E) None of these

63. Match the following.

Column-A	Column-B
P. $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}} =$	(i) 3
Q. If $x = 7+4\sqrt{3}$, then $x+\frac{1}{x} =$	(ii) 2
R. If $\frac{\sqrt{5}-1}{\sqrt{5}+1}+\frac{\sqrt{5}+1}{\sqrt{5}-1} = a+b\sqrt{5}$, then $a =$	(iii) 14

(A) P → (iii), Q → (i), R → (ii)

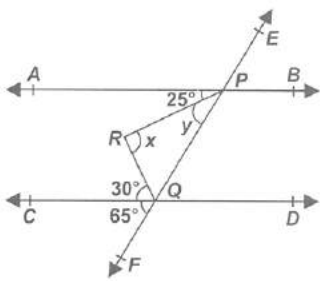
(B) P → (ii), Q → (iii), R → (i)

(C) P → (i), Q → (iii), R → (ii)

(D) P → (ii), Q → (i), R → (iii)

(E) None of these

64. In the given figure, *AB* and *CD* are two parallel lines and transversal *EF* intersects them at *P* and *Q* respectively. Find the values of *x* & *y* respectively.



(A) 55°, 40°

(B) 40°, 35°

(C) 60°, 40°

(D) 35°, 60°

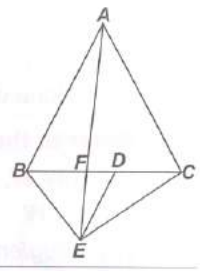
(E) None of these

65. A 5-digit number $xy235$ is divisible by 3 such that $x + y < 5$, where x and y are single digits, then possible values of (x, y) are ____.

(A) (1, 1) or (4, 0) (B) (1, 1) or (2, 0) (C) (1, 1) or (0, 2) (D) (2, 0) or (0, 2)

(E) None of these

66. In the given figure, ΔABC & ΔBDE are two equilateral triangles such that $BD = CD$ i.e., D is the mid-point of BC. If area $(\Delta BDE) = K$ area (ΔABC), then find the value of K.



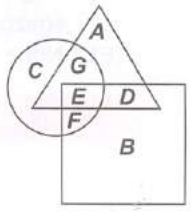
(A) $\frac{3}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{8}$ (D) $\frac{1}{4}$

(E) None of these

67. In the given diagram, the triangle represents women in villages, the square represents the unemployed women and the circle represents the educated women.

What does letter D represent?



(A) Uneducated men in villages

(B) Unemployed women in villages who are not educated

(C) Educated unemployed women

(D) Educated employed women

(E) Can't be determined

68. The population of a town was decreasing every year due to migration, poverty and unemployment. The present population of the town is 6,31,680. Last year the migration was 4% and the year before last, it was 6%. What was the population two years ago?

(A) 9,00,000 (B) 5,00,000 (C) 6,00,000 (D) 7,00,000

(E) None of these

69. Read the following statements made by Mohit, Rohit and Rehan.

Mohit : The assumptions used throughout in Mathematics which are obvious universal truths are called axioms.

Rohit : A plane surface is a surface which lies evenly with the straight lines on itself.

Rehan : Three or more lines are said to be concurrent, if they all pass through a unique point.

Who among the following made the correct statement?

(A) Only Mohit (B) Rohit and Rehan

(C) Only Rehan (D) Mohit, Rohit and Rehan

(E) None of these

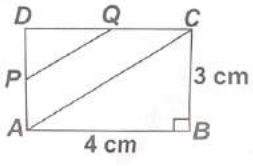
70. The points (other than the origin) for which abscissa is equal to the ordinate will lie in

(A) The first quadrant only (B) The first and the second quadrants

(C) The first and the third quadrants (D) The second and the fourth quadrants

(E) None of these.

71. In the given figure, if $ABCD$ is a rectangle and P, Q are the mid-points of AD and DC respectively, then the ratio of lengths PQ and AC is equal to



(A) 1 : 1 (B) 1 : 2

(C) 2 : 1 (D) 3 : 2

(E) None of these.

72. The symbol-letter-number sequence is given below.

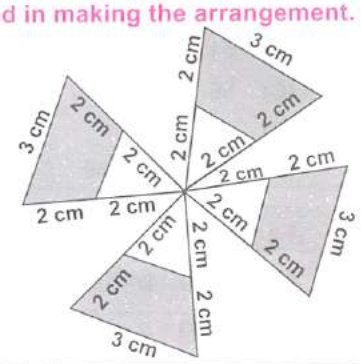
X q ★ L J K S d F 4 @ z t A E m 8 + P M 1 * Z D O 7

If the given sequence is reversed, then what will be the 6th character to the left of 5th to the right of 10th from the right end?

(A) @ (B) z (C) F (D) A

(E) None of these

73. Priya made an arrangement with white and grey coloured paper sheets as shown in the figure (not drawn to scale). Find the total areas of the white and grey paper sheets respectively used in making the arrangement.



(A) $\frac{9}{4}\sqrt{55}$ cm^2, $\frac{3}{4}\sqrt{55}$ cm^2

(B) $\frac{3}{4}\sqrt{55}$ cm^2, $3\sqrt{55}$ cm^2

(C) $\frac{3}{4}\sqrt{55}$ cm^2, $\frac{9}{4}\sqrt{55}$ cm^2

(D) $3\sqrt{55}$ cm^2, $\frac{9}{4}\sqrt{55}$ cm^2

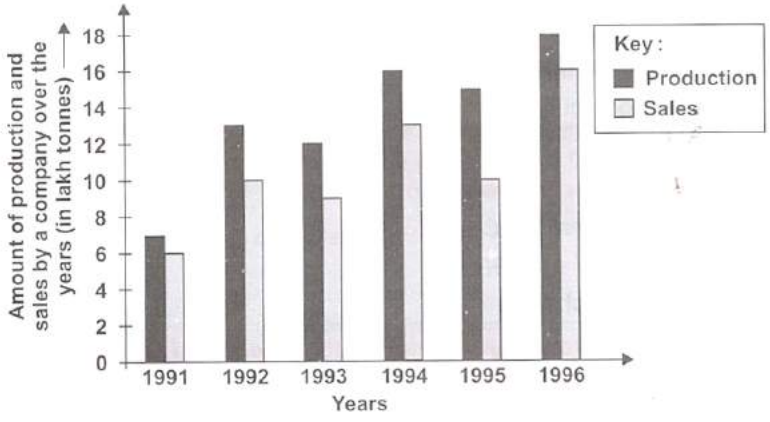
(E) None of these

74. If a polyhedron has 12 vertices and 8 faces, then the number of edges of the polyhedron is _____.

(A) 12 (B) 14 (C) 16 (D) 18

(E) None of these

DIRECTION (75-76) : Read the given bar graph carefully and solve the questions given below.



75. Total sales in 1991 and 1992 together is approximately what percentage of the sales in 1994?

(A) 140% (B) 100%

(C) 123% (D) 200%

(E) None of these

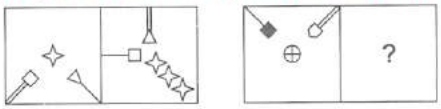
76. In which year, the difference between the production and the sales was maximum?

(A) 1992 (B) 1993

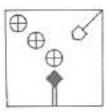
(C) 1995 (D) 1996

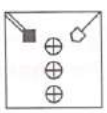
(E) None of these

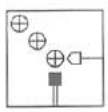
77. There is a certain relationship between figures (1) and (2). Establish the same relationship between figures (3) and (4) by selecting a suitable figure from the options which will replace (?) in fig. (4).

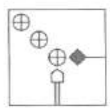


(1) (2) (3) (4)

(A) 

(B) 

(C) 

(D) 

(E) None of these

78. If the mean of 10 observations is 20 and that of another 15 observations is 16, then the mean of these 25 observations is _____.

(A) 18 (B) 18.2 (C) 17.6 (D) 17

(E) None of these

79. The mid-points of the sides of a triangle ABC along with any of the vertices as the fourth point make a parallelogram of area equal to

(A) $ar(\Delta ABC)$ (B) $\frac{1}{2}ar(\Delta ABC)$ (C) $\frac{1}{3}ar(\Delta ABC)$ (D) $\frac{1}{4}ar(\Delta ABC)$

(E) None of these.

80. Which of the following equations of line passes through the point (1, 2)?

(A) $2x + 3y = 12$ (B) $5x + 2y = 17$ (C) $7x + 2y = 11$ (D) $x + 2y = 6$

(E) None of these

81. Find the missing number, if a certain rule is followed either row-wise or column-wise.

6	15	20
8	4	5
3	5	20
51	65	?

(A) 12
(B) 51
(C) 56
(D) 120
(E) None of these

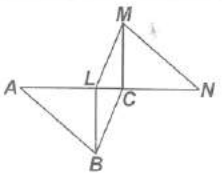
82. Factorise : $3\sqrt{3}a^3 - b^3 - 5\sqrt{5}c^3 - 3\sqrt{15}abc$

(A) $(\sqrt{3}a - b - \sqrt{5}c)(3a^2 + b^2 + 5c^2 + \sqrt{3}ab - \sqrt{5}bc + \sqrt{15}ac)$
(B) $(\sqrt{3}a + b - \sqrt{5}c)(3a^2 + b^2 + 5c^2 - \sqrt{3}ab - \sqrt{5}bc + \sqrt{15}ac)$
(C) $(\sqrt{3}a - b - \sqrt{5}c)(3a^2 + b^2 + 5c^2 - \sqrt{3}ab - \sqrt{5}bc + \sqrt{15}ac)$
(D) $(\sqrt{3}a + b - \sqrt{5}c)(3a^2 + b^2 + 5c^2 + \sqrt{3}ab - \sqrt{5}bc + \sqrt{15}ac)$
(E) None of these

83. A cistern has two inlets *A* and *B* which can fill it in 12 minutes and 15 minutes respectively. An outlet *C* can empty the full cistern in 10 minutes. If all the three pipes are opened together in the empty cistern, then the time taken to fill the cistern completely is ____.

(A) 20 minutes (B) 10 minutes (C) 15 minutes (D) 5 minutes
(E) None of these

84. In the given figure, $BL \perp AC$, $MC \perp LN$, $AL = NC$ and $BL = MC$.
Which of the following options hold?



(A) $\Delta MLC \cong \Delta BLC$ (B) $\Delta MNL \cong \Delta ABC$
(C) $\Delta MCN \cong \Delta ABL$ (D) $\Delta MCN \cong \Delta BLA$
(E) None of these

85. A dice is thrown 500 times. The frequencies of different numbers (1, 2, 3, 4, 5 and 6) appearing on the uppermost face are given below.

Outcomes	1	2	3	4	5	6
Frequency	89	75	78	73	88	97

Find the probability of having an outcome with a number greater than 4 on the uppermost face and a number between 1 and 3 on the uppermost face respectively.

(A) 0.37, 0.15 (B) 0.516, 0.15 (C) 0.37, 0.306 (D) 0.516, 0.306
(E) None of these

86. The following letters are coded as follows :

Letters:	E	Q	B	K	N	P	L	I	T	C	S	F	H	W	A
Digits/Symbols:	5	★	$	2	©	#	4	9	@	6	1	8	%	7	3

While coding the given letters following conditions are also to be observed.
Conditions:
(i) If the first letter is a consonant and the last a vowel, both are to be coded as the code for vowel.
(ii) If the first letter is a vowel and the last a consonant, the codes for the two are to be interchanged.
(iii) If both the first and the last letters are consonants, both are to be coded as "d".
(iv) If there are more than two vowels in the group of letters, all vowels are to be coded as '£'.

IKBQFA

(A) 92$★83 (B) 923$★8 (C) 92★83$ (D) £2$8★£
(E) None of these

87. Find the value of $\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2} \times \left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2} \times \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2}$

(A) 0 (B) 1 (C) x^{abc} (D) abc
(E) None of these

88. **Fill in the blanks.**

Let $p(x)$ be any polynomial of degree __P__ or __Q__ one and let a be any real number. If $p(x)$ is divided by the linear polynomial $(x - a)$, then the remainder is equal to __R__.

	P	Q	R
(A)	Less than	Equal to	$p(a)$
(B)	Greater than	Equal to	$p(a)$
(C)	Less than	Not equal to	0
(D)	Greater than	Not equal to	0

(E) None of these

89. **In the given question, two rows of numbers are given. The resultant number in each row is to be worked out separately based on the following rules and the question below the rows of numbers is to be answered. The operations on numbers progress from left to right.**

Rules:

(i) If an odd number is followed by another composite odd number, they are to be multiplied.

(ii) If an even number is followed by an odd number, they are to be added.

(iii) If an even number is followed by a number which is a perfect square, then even number is to be subtracted from the perfect square.

(iv) If an odd number is followed by a prime odd number, the first number is to be divided by the second number.

(v) If an odd number is followed by an even number, the second one is to be subtracted from the first one.

27 12 5

28 64 k

If the resultant of the first row is k, then what will be the resultant of the second row?

(A) 42 (B) 33 (C) 108 (D) 39

(E) None of these

90. **"Two years later, a father will be 8 years more than three times the age of the son". Taking the present age of father and son as x and y years respectively**

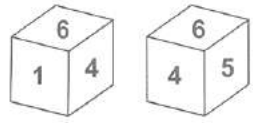
(i) Find the linear equation for the above condition.

(ii) Find the present age of the father when the son's present age is 10 years.

	(i)	(ii)
(A)	$x - 3y - 12 = 0$	56 years
(B)	$x + 3y - 14 = 0$	56 years
(C)	$x - 3y - 12 = 0$	42 years
(D)	$x - 3y - 14 = 0$	56 years

(E) None of these

91. **Two positions of a dice are shown here. When number 1 is on the top, then which number will be at the bottom?**



(A) 2 (B) 3

(C) 5 (D) 4

(E) Can't be determined

92. **The difference between outside and inside surfaces of a cylindrical metallic pipe 14 cm long is 44 cm^2. If the pipe is made of 99 cubic centimeters of metal, find the outer and inner radii of the pipe respectively.**

(A) 3 cm, 2.5 cm (B) 2.5 cm, 2 cm (C) 2 cm, 1.5 cm (D) 4 cm, 3 cm

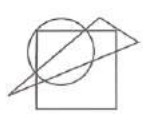
(E) None of these

93. **Select the figure from the options which satisfies the same conditions of placement of the dots as in Fig. (X).**

Fig. (X)

(A) 

(B) 

(C) 

(D) 

(E) None of these

94. **A, B, C, D, E, F, G and H are sitting around a circle facing the centre. E and G always sit next to each other. D sits third to the right of C. F sits second to the left of H. C never sits next to A while D never sits next to G. H is not the neighbour of D and C.**
Who sits between A and D?
(A) B (B) F (C) C (D) E
(E) None of these

95. **Find the value of $64x^3 - 125z^3$, if $4x - 5z = 16$ and $xz = 12$.**
(A) 20429 (B) 10216 (C) 15616 (D) 42512
(E) None of these

96. **A man pointing to a lady says, "Her brother is the father of my only son's sister". How is that lady related to the man?**
(A) Aunty (B) Mother (C) Grand daughter (D) Sister
(E) None of these

97. **Which of the following is incorrect?**
(A) The angle bisectors of a parallelogram intersect at right angle.
(B) The quadrilateral formed by joining the mid-points of the sides of a quadrilateral, in order, is a parallelogram.
(C) The line segment joining the mid-points of two sides of a triangle is parallel to the third side.
(D) Diagonals of rhombus bisect at acute angles.
(E) None of these

98. **A line separates a plane into _____ parts namely the _____ and the _____ itself.**
(A) Three, one plane, line (B) Two, line, plane
(C) Two, two planes, line (D) Three, two planes, line
(E) None of these

99. **The denominator of a rational number is greater than its numerator by 3. If 3 is subtracted from the numerator and 2 is added to its denominator, then the new number becomes 1/5. The original rational number is _____.**
(A) $-\frac{5}{8}$ (B) $\frac{7}{8}$ (C) $\frac{3}{8}$ (D) $-\frac{3}{8}$
(E) None of these

100. **A piece of land is in the shape of a trapezium whose parallel sides are 50 m and 35 m. The non parallel sides are 30 m and 35 m. The area of the land is _____.**
(A) $\frac{1700\sqrt{5}}{3}$ m^2 (B) $\frac{170\sqrt{5}}{3}$ m^2 (C) $\frac{17\sqrt{5}}{3}$ m^2 (D) $\frac{1700}{3}$ m^2
(E) None of these

SPACE FOR ROUGH WORK