SCIENCE OLYMPIAD FOUNDATION
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DPS Science & Mathematics TALENT EXAMINATION 2016-2017

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.
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).

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

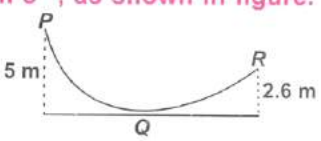
PHYSICS

1. If the change in the value of g (acceleration due to gravity) at a height h above the surface of the Earth is same as that of depth x below it, and both x and h are much smaller than the radius of the Earth, then

(A) $x = h$ (B) $x = h/2$ (C) $x = 2h$ (D) $x = h/4$

(E) None of these

2. A beed starts sliding from a point P on a frictionless wire with initial velocity 4 m s^{-1}, as shown in figure. On reaching point R of the wire, its velocity will be

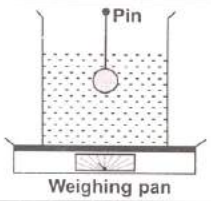


(A) 2 m s^{-1} (B) 4 m s^{-1}

(C) 6 m s^{-1} (D) 8 m s^{-1}

(E) Cannot be predicted

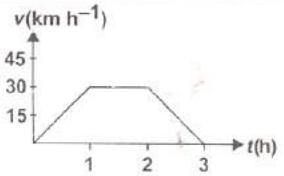
3. A glass vessel with water is placed on a weighing pan and it reads 500 g wt. A spherical body of mass 40 g and density 0.8 g cm^{-3} is sunk into the water with a pin of negligible volume as shown in figure. Find the reading that the weighing pan shows.



(A) 440 g wt (B) 540 g wt (C) 550 g wt

(D) 650 g wt (E) Cannot be predicted

4. The given graph shows the variation of velocity of a car with time. Find the distance travelled by the car during the entire motion.

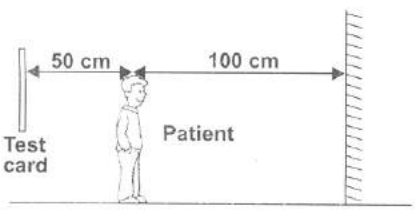


(A) 30 km (B) 60 km

(C) 120 km (D) 150 km

(E) None of these

5. An optician holds a test card 50 cm behind a patient. The patient then looks in the plane mirror which is 100 cm away. How far away from the patient's eyes is the image of the test card?



(A) 100 cm (B) 150 cm

(C) 200 cm (D) 250 cm

(E) None of these

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

Statement 1: Note is a sound of a single frequency.

Statement 2: Loudness of sound depends upon the square of the amplitude of the sound wave.

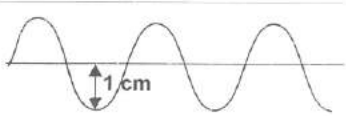
(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true and statement 2 is false.

(D) Statement 1 is false and statement 2 is true. (E) Both statements 1 and 2 are false.

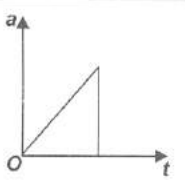
7. A sound wave travelling in a medium is represented as shown in figure. If a vibrating source of sound makes 360 oscillations in 2 minutes, then the amplitude, wavelength and frequency of the sound wave respectively are (Take velocity of sound, as 342 m s^{-1})

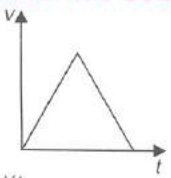


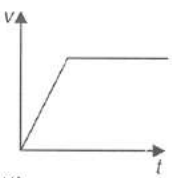
(A) 1 cm, 114 m, 3 Hz (B) 2 cm, 3 m, 14 Hz (C) 1 cm, 5 m, 20 Hz (D) 1 cm, 100 m, 10 Hz

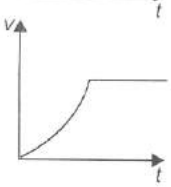
(E) None of these.

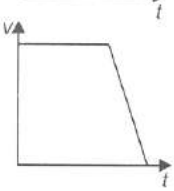
8. The acceleration-time graph for a body is shown in figure. Which of the following is the most probable velocity-time graph for the body?



(A) 

(B) 

(C) 

(D) 

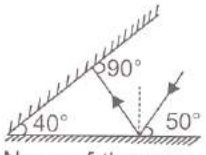
(E) Cannot be predicted

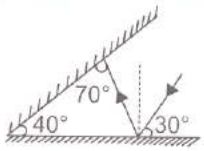
9. **A hammer weighing 2.5 kg moving with a speed of 1 m s^{-1} strikes the head of a nail driving it 10 cm into a wall. The acceleration of the nail and the impulse imparted to the wall will respectively be**

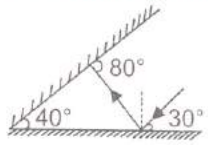
(A) -5 m s^{-2}, 2.5 N s (B) -10 m s^{-2}, 5 N s (C) -7.5 m s^{-2}, 3.5 N s (D) -6 m s^{-2}, 4 N s

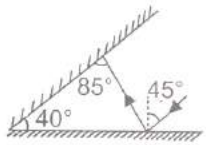
(E) None of these.

10. **Which of the following correctly depicts reflection in case of plane mirrors inclined at 40°?**

(A) 

(B) 

(C) 

(D) 

(E) None of these

11. **The process of depositing a layer of any desired metal on another material, by means of electricity, is known as**

(A) Chemical effect of current (B) Heating effect of current (C) Electroplating (D) Electrolysis

(E) None of these.

12. **The mass of the moon is (1/8) of that of the earth but the gravitational pull of the moon is (1/6) of that of the earth. It is due to the fact that**

(A) Moon is the satellite of the earth

(B) The radius of the earth is (8/6) of that of the moon

(C) The radius of the earth is $\sqrt{8/6}$ of that of the moon

(D) The radius of the moon is $\sqrt{8/6}$ of that of the earth

(E) None of these.

13. **Two bodies *A* and *B* have masses 20 kg and 5 kg respectively. Each one is acted upon by a force of 4 kg wt. If they acquire the same kinetic energy in time t_A and t_B, then the ratio $\frac{t_A}{t_B}$ is**

(A) $\frac{1}{2}$ (B) 2 (C) $\frac{2}{5}$ (D) $\frac{5}{6}$

(E) None of these

14. **Read the given statements and select the correct option.**

Statement 1 : If a body is momentarily at rest, it means that force and acceleration are necessarily zero at that instant.

Statement 2 : Force on a body at a given time is determined by the direction of motion only.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true and statement 2 is false.

(D) Statement 1 is false and statement 2 is true.

(E) Both statements 1 and 2 are false.

15. **Which of the following cases is correct regarding the net force acting on the body is not zero?**

(A) A drop of rain falling down with a constant speed. (B) A cork of mass 10 g floating on the surface of water.

(C) A block moving with a constant speed of 20 km h^{-1} on a rough road.

(D) A pebble of mass 0.05 kg is thrown vertically upwards. (E) None of these

16. **A cylindrical vessel is filled with a homogeneous liquid. Height of the liquid is such that the force exerted by it on the sides of the vessel is equal to the force exerted by the liquid on the bottom of the vessel. What should be the height of the liquid?**

(A) Equal to the radius (B) Half of the radius (C) Four times of the radius

(D) Twice of the radius (E) None of these

17. **A person sitting in an open car moving at constant velocity throws a ball vertically into air, the ball falls**

(A) Exactly in the hand of thrower

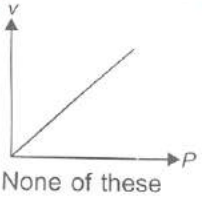
(B) Outside the car

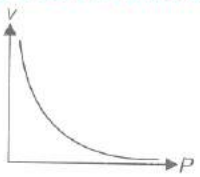
(C) In the car ahead of the person

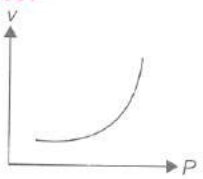
(D) In the car behind the person

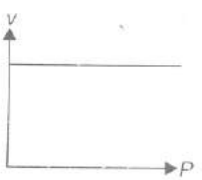
(E) Cannot be predicted

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

(A) 

(B) 

(C) 

(D) 

(E) None of these

19. **The height of mercury in a barometer at sea level is higher than that at the top of a hill. Which of the following inferences about this observation is correct?**

(A) The air molecules at sea level have higher mass than that at the top of a hill.
(B) The air molecules at sea level experience less gravitational force than that at the top of a hill.
(C) The air molecules per unit volume at sea level is greater than that at the top of a hill.
(D) The speed of air molecules at sea level is lower than that at the top of a hill.
(E) None of these

20. **By using a concave mirror, image of a distant tree is focussed on a screen. The distance between the screen and the mirror is**

(A) Equal to twice the focal length of the concave mirror
(B) Equal to one fourth of the focal length of the concave mirror
(C) Equal to half the radius of curvature of the concave mirror
(D) Equal to the radius of curvature of the concave mirror
(E) None of these.

CHEMISTRY

21. **Which of the following statements is correct?**

(A) On decreasing the pressure, a liquid evaporates and on increasing the pressure a gas liquefies.
(B) In frost free refrigerator, ice on the walls of the freezer melts when warm air is circulated through the compartment during defrost cycle.
(C) Only those substances whose vapour pressures become equal to the atmospheric pressure much before their respective boiling points are capable of undergoing sublimation.
(D) A liquid can be converted into vapour only at its boiling point.
(E) All of these

22. **Study the following table carefully and select the correct option.**

Material	Reacts with hydrochloric acid	Reacts with sulphuric acid
X	Yes	Yes
Y	No	Yes
Z	No	No

	X	Y	Z
(A)	S	Na	K
(B)	Na	Cu	S
(C)	K	Na	Cu
(D)	S	K	Na

(E) None of these

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

	Column I		Column II
P.	$^{3}_{1}A$	(1)	Forms cation
Q.	$^{4}_{2}B$	(2)	2 neutrons
R.	$^{7}_{3}C$	(3)	Forms anion
S.	$^{9}_{4}D$	(4)	Valency 2
T.	$^{19}_{9}E$	(5)	Noble gas

(A) P-(1), Q-(5), R-(2), S-(4), T-(3)
(B) P-(2), Q-(5), R-(1), S-(4), T-(3)
(C) P-(3), Q-(4), R-(1), S-(5), T-(2)
(D) P-(1), Q-(2), R-(4), S-(3), T-(5)
(E) None of these

24. **In foam type fire extinguisher, which of the following products are formed?**

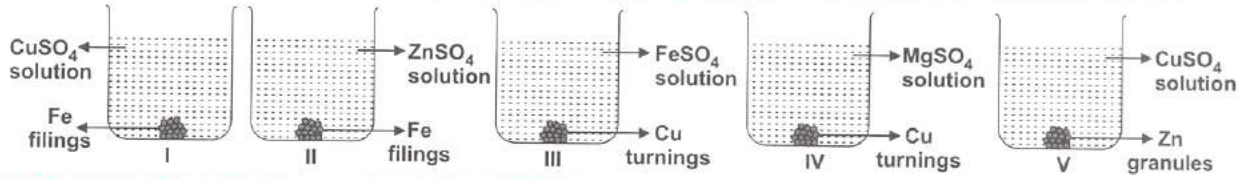
I. $Al(OH)_3$ II. CO_2 III. H_2 IV. Na_2CO_3 V. Na_2SO_4

(A) I and III only (B) I and V only (C) I, II and IV only (D) I, II and V only
(E) All of these

25. **When we put some crystals of potassium permanganate in a beaker containing water, we observe that after some time whole water has turned pink. This is due to _____ phenomenon.**

(A) Boiling
(B) Melting
(C) Sublimation
(D) Diffusion
(E) None of these

26. Tanvi took five beakers as shown in the figure, stirred the contents and recorded her observations.



Which of the following observations are correct?

1. Blue colour of copper sulphate solution disappears in beakers I and V.
2. There is no change in beakers II, III and IV.
3. Copper precipitates in beakers I and IV.
4. Colour of solution changes from blue to green in beaker V and blue to colourless in beaker I.

(A) 1 and 3 only (B) 1, 2 and 3 only (C) 1 and 2 only (D) 3 and 4 only
(E) All of these

27. Match column I with column II on the basis of separation technique used and select the correct option from the given codes.

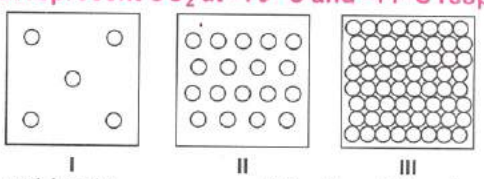
Column I	Column II
P. Oxygen from liquid air	(1) Chromatography
Q. Red blood cells from plasma	(2) Centrifugation
R. Amino acids from fruit juices	(3) Fractional distillation
S. Pieces of steel from engine oil	(4) Magnetic separation
T. Coffee grains from coffee solution	(5) Filtration
U. Kerosene from crude oil	(6) Simple distillation

(A) P-(6), Q-(1), R-(4), S-(5), T-(2), U-(3) (B) P-(6), Q-(2), R-(1), S-(5), T-(4), U-(3)
(C) P-(3), Q-(2), R-(1), S-(4), T-(5), U-(3) (D) P-(3), Q-(2), R-(1), S-(4), T-(5), U-(6)
(E) None of these is the correct match.

28. The correct sequence of fractions obtained in the fractionating column with rising temperature is

(A) Kerosene oil, Gasoline, Diesel (B) Diesel, Gasoline, Kerosene oil
(C) Gasoline, Diesel, Kerosene oil (D) Gasoline, Kerosene oil, Diesel
(E) None of these.

29. Which of the following diagrams best represent CO_2 at –79° C and –77°C respectively if it sublimes at –78°C?



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

30. Match the following for the flame of a candle and select the correct option from the given codes.

Column I	Column II (Zone)	Column III (Colour)
a. Hottest part	(i) Innermost zone of unburnt wax vapours	x. Blue
b. Moderately hot	(ii) Middle zone of partial combustion	y. Black
c. Least hot	(iii) Outer zone of complete combustion	z. Yellow

(A) a-(ii)-x, b-(i)-z, c-(iii)-y (B) a-(i)-z, b-(ii)-x, c-(iii)-y (C) a-(iii)-x, b-(ii)-z, c-(i)-y (D) a-(iii)-z, b-(i)-y, c-(ii)-x
(E) None of these

31. Read the following statements carefully.
X : It is a fossil fuel used in thermal power plants to produce electricity.
Y : It is a porous, black and almost pure form of carbon.
Z : It is a mixture of about 200 substances.
X, *Y* and *Z* are respectively

(A) Petroleum, Coal gas, Coke (B) Coal, Coke, Coal tar
(C) CNG, Bitumen, Diesel (D) Coal gas, Petrol, Paraffin wax
(E) None of these.

32. The given table shows the melting points, boiling points and densities of substances *P* to *S*.

Substance	Melting point/°C	Boiling point/°C	Density/g cm^{-3}
P	1110	2606	9.1
Q	–266	–252	0.07
R	40	94	1.6
S	–14	60	0.9

The substance ___1___ exists as a gas, substance ___2___ exists as a liquid and substance ___3___ exists as a solid at room temperature. Substance ___4___ is highly metallic while substance ___5___ is non-metallic in nature. Identify 1, 2, 3, 4 and 5.

	1	2	3	4	5
(A)	*S*	*Q*	*P*	*R*	*Q*
(B)	*Q*	*S*	*P*	*Q*	*R*
(C)	*Q*	*S*	*P*	*P*	*Q*
(D)	*S*	*S*	*P*	*S*	*R*

(E) None of these is the correct match.

33. During the science activity, teacher instructed the students to prepare 0.01% (by mass) solution of sodium chloride in water. To prepare the solution

I. Saisa dissolved 1.00 g of NaCl in 100 g of water.
II. Arjun dissolved 0.11 g of NaCl in 100 g of water.
III. Raunak dissolved 0.01 g of NaCl in 66.66 g of water.
IV. Dhriti dissolved 0.10 g of NaCl in 99.90 g of water.

Which one of them has prepared the desired solution?

(A) Raunak (B) Arjun (C) Saisa (D) Dhriti
(E) None of them

34. Choose the incorrect statement.

(A) Polyester is manufactured from petroleum.
(B) Water absorption capacity follows the order; wool > cotton > silk > nylon.
(C) Natural fibres are easily attacked by moths.
(D) In thermoplastics, the process of softening by heating and hardening on cooling can be repeated again and again.
(E) None of these

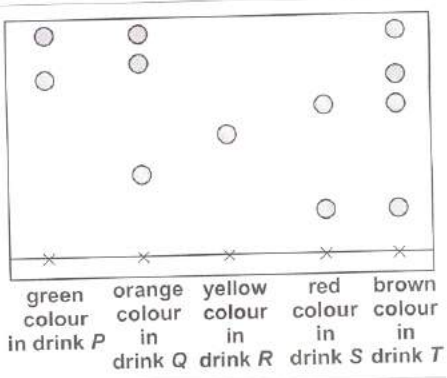
35. A metal *M* forms an ionic compound *X* of formula $M_2(SO_4)_3$. If the relative formula mass of compound *X* is 392 then the relative formula mass of its nitrate will be (Given : Atomic mass of S = 32 u, N = 14 u, O = 16 u)

(A) 288 (B) 238 (C) 392 (D) 338
(E) 292

36. Ravina took few synthetic and natural fibres to study the effect of their burning. She took nylon, cotton, wool, polyester and silk threads and burnt them one by one with a burning matchstick. After the experiment, what did she observe?

(A) Cotton and wool burnt to form a residue.
(B) Nylon and polyester melted on burning.
(C) Wool and silk burnt with smell of burning hair.
(D) All the observations were correct.
(E) None of the observations was correct.

37. In an experiment, the dyes used in five drinks were separated as shown:



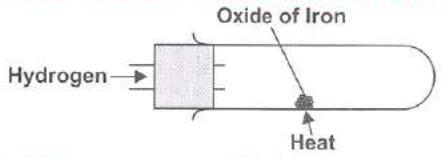
Which of the following statements is correct?

(A) Orange colour in drink *Q* is a single dye.
(B) Red colour in drink *S* contains three dyes.
(C) Brown colour in drink *T* can be produced from green colour in drink *P* and red colour in drink *S*.
(D) The given method is not suitable for identifying dyes used in food.
(E) None of these

38. *X* volume of N_2O commonly known as laughing gas has the mass of 35.2 g. The mass of an equal volume of butene (C_4H_8) is (Given : Atomic mass of N = 14 u, O = 16 u, C = 12 u, H = 1 u)

(A) 22.4 g (B) 44.8 g (C) 0.80 g (D) 224 g
(E) 2.24 g

39. **The diagram shows the apparatus used in an experiment to determine the formula of an oxide of iron. Hydrogen reacts with the oxide to form iron and water.**



The results of the experiment were as follows :

Mass of combustion tube	**= 15.647 g**
Mass of combustion tube + oxide of iron	**= 20.287 g**
Mass of combustion tube + iron	**= 19.007 g**

The number of moles of iron formed and the empirical formula of the oxide of iron are respectively

(A) 0.08, Fe_2O_3 **(B)** 0.06, Fe_2O_3 **(C)** 0.06, Fe_3O_4 **(D)** 0.08, FeO

(E) None of these.

40. **Common salt was obtained from two different sources. In sample *A*, chlorine was 60.75% and in sample *B*, 3.888 g chlorine was present in 6.4 g of common salt. The percentage of chlorine in sample *B* and the law illustrated in the data are respectively**

(A) 70.65%, law of constant proportion **(B)** 60.75%, law of conservation of mass

(C) 60.75%, law of constant proportion **(D)** 60%, law of conservation of mass

(E) None of these.

BIOLOGY

41. **Read the given paragraph where few words have been italicised.**

Various irrigation systems have been adopted in our country to supply water to crops from different water sources. Groundwater serves as a source for *tanks* which can be used to irrigate crop fields whenever required. *Sprinklers* are storehouses of run off water from *catchment* areas and help in rainwater harvesting. *River lift system* is considered as best irrigation system because it is related to generation of hydroelectricity, flood controls etc. For economical use of water, newer methods of irrigation are practised nowadays. These include *swinging basket* which is especially helpful in irrigating crops in *arid* and *semi-arid* regions. Select the correct statement regarding this.

(A) *Tanks* should be replaced by *tubewells* and *catchment* should be replaced by *drought*.

(B) *River lift system* should not be replaced as it is correctly mentioned.

(C) *Sprinklers* should be replaced by *tanks* and *swinging basket* should be replaced by *drip irrigation*.

(D) *Arid* should be replaced by *wet* and *semi-arid* should not be replaced as it is correctly mentioned.

(E) None of these

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

Column I	**Column II**
a. Decomposition and nutrient cycling	**(i) *Streptomyces***
b. Source of antibiotics	**(ii) *Paramecium***
c. Cell wall absent but organised nucleus present	**(iii) *Pseudomonas***
d. Cell wall, organised nucleus and chlorophyll present	**(iv) *Amoeba***
	(v) *Chondrus*
	(vi) *Agaricus*
	(vii) *Penicillium*
	(viii) *Ulothrix*

(A) a - (iii, vi); b - (i, vii); c - (ii, iv); d - (v, viii) **(B)** a - (ii, vi); b - (iii, iv); c - (i, v); d - (vii, viii)

(C) a - (vi, viii); b - (v, vii); c - (i, iv); d - (ii, iii) **(D)** a - (i, viii); b - (ii, vi); c - (iii, v); d - (iv, vii)

(E) a - (iv, v); b - (i, vi); c - (ii, iii); d - (vii, viii)

43. **Read the given statements and select the correct option regarding them.**

Statement 1 : The existence of native species of an area is often threatened due to introduction of exotic or alien species from other geographical area.

Statement 2 : Exotic species compete with native species for all available resources, become invasive and drive away them causing their extinction.

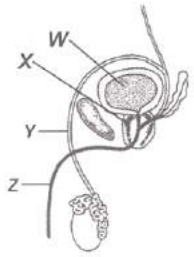
(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true but statement 2 is false. **(D)** Statement 2 is true but statement 1 is false.

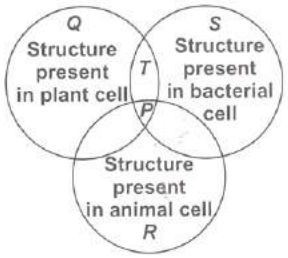
(E) Both statements 1 and 2 are false.

44. Refer to the given diagram of side view of a part of human male reproductive system. What are the functions of its labelled parts *W*, *X*, *Y* and *Z*?



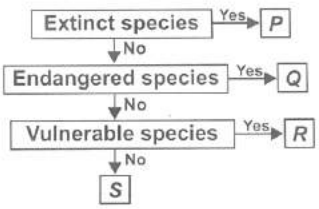
	W	*X*	*Y*	*Z*
(A)	Produces components of semen besides sperms	Produces urine	Carries both urine and sperms	Carries only urine
(B)	Stores urine temporarily	Produces nutrients and enzymes necessary for sperm activation	Carries only sperms	Carries both urine and sperms
(C)	Produces only sperms	Produces components of semen besides sperms	Carries only urine	Carries only sperms
(D)	Stores sperms	Produces sperms	Carries only sperms	Carries only urine
(E)	Produces urine	Stores sperms	Carries both urine and sperms	Carries only sperms

45. Refer to the given Venn diagram and select the correct option regarding structures *P*, *Q*, *R*, *S* and *T*.



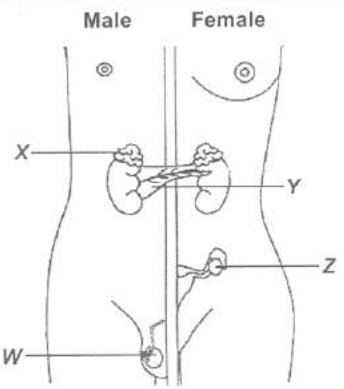
(A) Structure *P* takes part in protein synthesis whereas structure *S* is used as vector in genetic engineering.
(B) *T* represents outermost protective covering whereas *R* takes part in lipid synthesis.
(C) Both *Q* and *R* are double membraned structures but inner membrane of *Q* is smooth whereas that of *R* is thrown into folds.
(D) *P* and *T* are bound by single membrane but *P* takes part in cell autolysis whereas *T* helps in osmoregulation.
(E) None of these

46. Identify *P*, *Q*, *R* and *S* in the given flow chart and select the correct option.



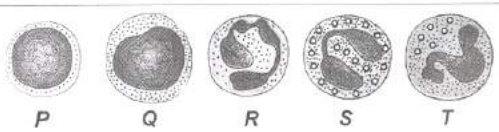
	P	*Q*	*R*	*S*
(A)	Olive ridley turtle	Indian rhinoceros	Two banded chameleon	Kangaroo rat
(B)	Passenger pigeon	Thorny tree frog	Asian elephant	Chinkara deer
(C)	Dodo	Giant panda	Blue whale	Sloth bear
(D)	Woolly mammoth	Golden langur	Giant panda	Silvery pigeon
(E)	Silvery pigeon	Chinkara deer	Thorny tree frog	Giant panda

47. The given diagram shows some of the major endocrine glands in human male and female. Which of the following holds true regarding glands *W*, *X*, *Y* and *Z*?



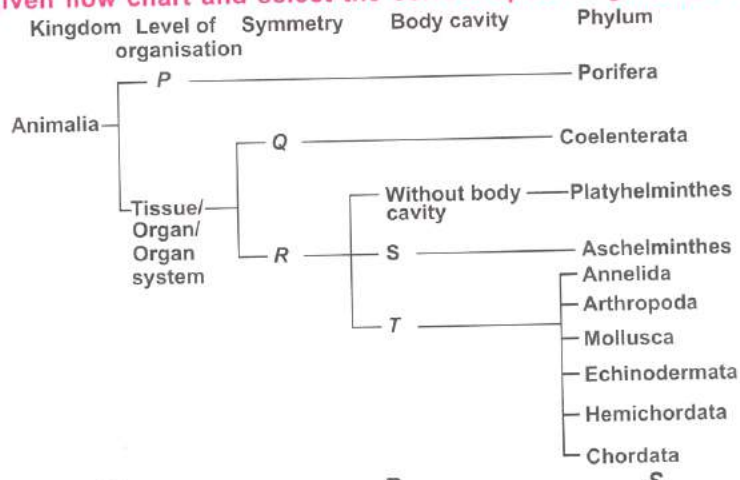
(A) Insulin injections are given to those patients in which gland *X* is not functioning properly.
(B) Glands *W* and *Z* control secondary sexual characters and are themselves under the control of pituitary gland.
(C) Gland *X* secretes hormone which maintains salt balance in the blood whereas gland *Y* secretes a hormone which helps the body to adjust in stress conditions.
(D) A drop in blood glucose level will result in secretion of hormone by gland *Y* but a rise in blood glucose level will result in secretion of hormone by gland *X*.
(E) None of these

48. The given figure shows different types of blood corpuscles, *P*, *Q*, *R*, *S* and *T*. Identify these and select the correct option regarding them.



(A) *P* secretes antibodies to destroy microbes whereas *Q* and *R* engulf pathogens.
(B) Granules are found in the cytoplasm of *S* and *T* only.
(C) Number of *R* increases in people with allergic conditions such as asthma whereas *S* releases histamine and heparin at the site of inflammation.
(D) *P*, *Q* and *R* are phagocytic whereas *S* and *T* are non-motile and non-phagocytic.
(E) None of these

49. Study carefully the given flow chart and select the correct option regarding *P*, *Q*, *R*, *S* and *T*.



	P	*Q*	*R*	*S*	*T*
(A)	Cellular level	Bilateral symmetry	Radial symmetry	Pseudocoelomates	Coelomates
(B)	Cellular level	Radial symmetry	Bilateral symmetry	Coelomates	Acoelomates
(C)	Cellular level	Bilateral symmetry	Radial symmetry	Coelomates	Pseudocoelomates
(D)	Cellular level	Radial symmetry	Bilateral symmetry	Pseudocoelomates	Coelomates
(E)	Cellular level	Bilateral symmetry	Radial symmetry	Pseudocoelomates	Acoelomates

50. Shown below are four organisms *P*, *Q*, *R* and *S*. Identify these organisms and select the correct option regarding them.

P *Q* *R* *S*

(A) *P* and *Q* are diploblastic whereas *R* and *S* are triploblastic animals.

(B) *P* respires through general body surface, *R* respires through book lungs however, respiratory organs are altogether absent in *Q*.

(C) *P* and *Q* are acoelomates, *R* is pseudocoelomate and *S* is true coelomate.

(D) Excretory organs of *Q* are green glands and that of *R* are coxal glands but specialised excretory organs are absent in *P* and *S*.

(E) *P* and *Q* are parasitic whereas *R* and *S* are free living.

51. Refer to the given dichotomous key.

I. (a) It is a plant tissue. – Go to II
(b) It is an animal tissue. – Go to III
II. (a) It is a simple living tissue made up of cells which possess thickenings of cellulose and pectin at corners. – *P*
(b) It is a complex living conducting tissue. – *Q*
III. (a) It forms outer protective covering. – Go to IV
(b) It serves the function of binding one tissue to another. – Go to V
IV. (a) It consists of cube like cells having polygonal outline in surface view. – *R*
(b) It consists of pillar like cells that bear cilia on their free surfaces. – *S*
V. (a) It is primarily a fat storing tissue. – *T*
(b) It forms packing in nearly all organs. – *U*

Select the incorrect option regarding this.

(A) *P* is present below epidermis in herbaceous dicot stems whereas *U* is found around blood vessels and nerves.

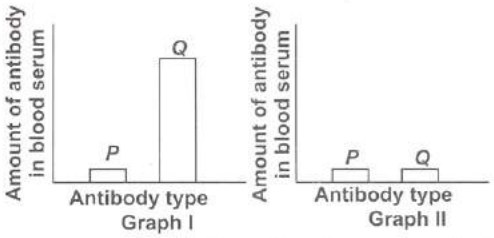
(B) *P* occurs in endocarp of almond and husk of coconut whereas the conducting cells of *Q* have lignified walls and conduct solutes in both upward and downward directions.

(C) *S* helps in movement of mucus and egg in a particular direction whereas *R* helps in gamete formation.

(D) *T* is present abundantly in blubber of whales and hump of camels whereas *U* consists of collagen and elastin fibres which give flexibility, strength and elasticity.

(E) None of these

52. **The given graphs show antibody titre in blood of a person during illness (graph I) and after recovery (graph II). What could be inferred from the given graphs?**



(A) The person suffered from two pathogenic diseases at the same time against which his body produced antibodies *P* and *Q*.

(B) The person suffered only from one pathogenic disease in his lifetime against which his body produced antibody *Q*.

(C) Small amount of antibody *P* in both graphs I and II signifies that the person never suffered from the disease against which his body produced antibody *P*.

(D) Small amount of antibody *Q* in graph II signifies that person's immune system has recognised and eliminated non-self antigens.

(E) None of these

53. **Which of the following statements is correct about laterite soils?**

(A) These are red in colour.

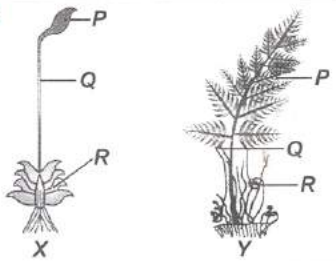
(B) These are formed in tropical climate.

(C) These contain hydrated oxides of aluminium and iron.

(D) (A) and (B) only

(E) All of these

54. **Refer to the given figures of two plants *X* and *Y* with their parts labelled as *P*, *Q* and *R* and select the correct option.**



(A) Both *X* and *Y* are gametophytes where *P* in both is the spore producing part.

(B) *Q* represents true stem and *R* represents true leaves in both plants *X* and *Y*.

(C) Vascular tissues are present in *Y* but absent in *X* due to which *X* does not attain tall height.

(D) Both *X* and *Y* have parasitic sporophytes.

(E) None of these

55. **Four strips were cut from a fresh potato. The length of each strip was measured. One strip was placed in water and others were placed in different concentrations of sugar solution. After an hour, the strips were measured again. The results are shown in the table below. Which of the liquids *P*, *Q*, *R* and *S* is water?**

Liquid	Original length of strip (in mm)	Final length of strip (in mm)
P	75	75
Q	78	80
R	82	80
S	86	85

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

(E) Cannot be predicted

56. **Suppose you accidently find an old preserved permanent slide without a label. In order to identify it, you place the slide under microscope and observe the following features:**

(i) Unicellular

(ii) Well defined nucleus

(iii) Biflagellate - one long flagellum, lying longitudinally and the other short flagellum.

Identify the organism, and also the kingdom to which it belongs.

(A) Diatom ; Protista (B) *Trypanosoma* ; Monera (C) *Paramecium* ; Fungi (D) *Euglena* ; Protista

(E) Yeast ; Fungi

57. **Read the following statements carefully and select which of them is true (T) and which of them is false (F).**

(i) Sahiwal and Gir are milch breeds whereas Malvi and Nagori are draught breeds of cow.

(ii) Rinderpest is a highly contagious bacterial cattle disease characterised by ulceration in mouth.

(iii) Egg laying birds are called broilers whereas those birds whose flesh is eaten as meat are called layers.

(iv) In composite fish culture system, 5-6 species of fish are selected which do not compete with each other for space and nutrition.

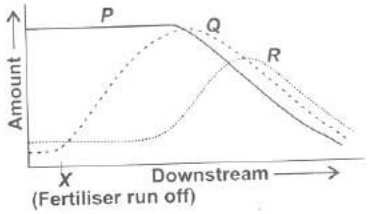
	(i)	(ii)	(iii)	(iv)
(A)	T	F	F	T
(B)	T	T	F	F
(C)	F	F	T	T
(D)	T	F	T	F
(E)	T	T	T	F

58. Study the given table carefully and select the option that correctly fills the blanks *P*, *Q*, *R* and *S*.

Disease	Causative agent	Mode of transmission
Sleeping sickness	*P*	Bite of infected tsetse fly
Q	*Wuchereria*	Bite of infected *Culex* mosquito
Dengue	Virus	*R*
S	*Leishmania*	Bite of infected sandfly

	P	*Q*	*R*	*S*
(A)	*Entamoeba*	Ascariasis	Bite of infected *Anopheles* mosquito	Malaria
(B)	*Trypanosoma*	Elephantiasis	Bite of infected *Aedes* mosquito	Kala azar
(C)	*Fasciola*	Yellow fever	Bite of infected *Anopheles* mosquito	Gonorrhoea
(D)	*Ascaris*	Plague	Bite of infected *Aedes* mosquito	Diphtheria
(E)	*Taenia*	Chikungunya	Bite of infected *Culex* mosquito	Whooping cough

59. The given graph shows changes in three components *P*, *Q* and *R* in a water body from point *X* (where fertiliser run off from a crop field took place), downstream.



Identify *P*, *Q* and *R* and select the correct option.

	P	*Q*	*R*
(A)	Nitrates	Phosphates	Aquatic animals
(B)	Decomposer microbes	Nitrates	Phosphates
(C)	Dissolved oxygen	Algae	Decomposer microbes
(D)	Aquatic animals	Dissolved oxygen	Nitrates
(E)	Biological oxygen demand	Phytoplankton	Dissolved oxygen

60. Which of the following statements is incorrect about Dolly, the first cloned mammal?

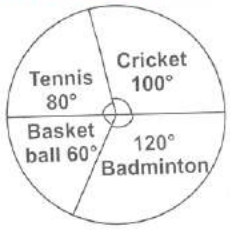
(A) It was cloned by Ian Wilmut and his colleagues in Edinburgh, Scotland.
(B) During the process of cloning Dolly, a nucleus collected from the udder cell of a female Finn Dorsett sheep was inserted into the enucleated egg cell of a Scottish blackface ewe.
(C) Dolly died in 2003 due to a lung disease.
(D) Dolly was genetically similar to the Scottish blackface ewe.
(E) None of these

MATHEMATICS

61. The value of $\frac{\sqrt{15+4\sqrt{11}}}{\sqrt{31+8\sqrt{15}}} \times \frac{1}{8+4\sqrt{11}-\sqrt{165}-2\sqrt{15}}$ is _____.

(A) 0 (B) 1 (C) 2 (D) $\sqrt{15}+\sqrt{11}$
(E) None of these

DIRECTION (62 - 63) : The given pie-chart shows the games liked by 180 students of class VIII.



62. How many more students are interested in Badminton than in Cricket?

(A) 40
(B) 30
(C) 10
(D) 20
(E) None of these

63. Find the ratio of the number of students who like Tennis to the number of students who like Basketball.

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

64. **Which of the following is NOT a Euclid's postulate?**

(A) The whole is greater than the part.

(B) A circle can be drawn with any centre and any radius.

(C) All right angles are equal to one another.

(D) A terminated line can be produced indefinitely.

(E) None of these

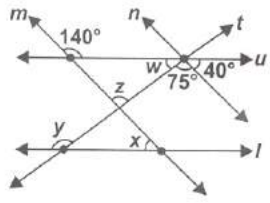
65. **How many letters are there from the English alphabetical series between the second letter of the word which is second from the right end and the second letter of the word which is second from the left end of the given sequence of words?**

RAG FIN PUT LOW SUE

(A) Two (B) Five (C) Six (D) Nine

(E) None of these

66. **In the given figure, $l \| u$ and $m \| n$. Find x, y, z and w respectively.**



(A) 50°, 135°, 120°, 30°

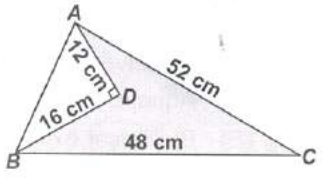
(B) 40°, 115°, 75°, 65°

(C) 35°, 140°, 110°, 45°

(D) 40°, 165°, 115°, 55°

(E) None of these

67. **Find the ratio of area of the shaded region to the unshaded region in ΔABC.**



(A) 3 : 1

(B) 4 : 1

(C) 1 : 4

(D) 2 : 3

(E) None of these

68. **Fill in the blanks.**

(i) If in two triangles ΔABC and ΔPQR, $AB = QR$, $\angle A = \angle Q$ and $\angle B = \angle R$, then $\Delta ABC \cong$ _____.

(ii) If in two triangles ΔPQR and ΔDEF, $PR = EF$, $QR = DE$, $PQ = FD$, then $\Delta PQR \cong$ _____.

(iii) If altitudes CE and BF of a triangle ABC are equal, then $AB =$ _____.

(iv) In right angled triangles ABC and DEF, if hypotenuse $AB = EF$ and side $AC = DE$, then $\Delta ABC \cong$ _____.

	(i)	(ii)	(iii)	(iv)
(A)	ΔQRP	ΔFED	BC	ΔEFD
(B)	ΔQPR	ΔFDE	AC	ΔFDE
(C)	ΔQPR	ΔFDE	BC	ΔEFD
(D)	ΔQRP	ΔFDE	AC	ΔEFD

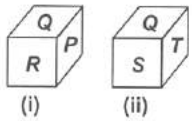
(E) None of these

69. **A cylindrical block of wood has radius 70 cm and length 2 m is to be painted with blue coloured enamel. The cost of painting is ₹ 1.25 per 100 cm^2. Find the cost of painting the block. Take $\pi = \frac{22}{7}$.**

(A) ₹ 1485 (B) ₹ 1600 (C) ₹ 1590 (D) ₹ 1670

(E) None of these

70. **Two positions of a dice are shown below. Which letter is on the face opposite to S?**



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

(E) Can't say

71. The solution of the equation $x - \frac{x+1}{4} = 2 - \frac{x-3}{3}$ is ________.

(A) $\frac{13}{3}$ (B) 3 (C) –3 (D) 15
(E) None of these

72. If 10 men can do a work in 6 days and 15 women can do the same work in 6 days, then 8 men and 3 women together can do the same work in how many days?

(A) 7 (B) 6 (C) 5 (D) 4
(E) Can't be determined

73. If two polynomials $ax^3 + 3x^2 - 3$ and $3x^3 - 7x + a$, when divided by $(x - 1)$ each leave remainders m and n, respectively such that $m + n = 0$, then the value of a is ________.

(A) 0 (B) 1 (C) 2 (D) 3
(E) None of these

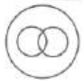
74. The coordinates of two points are $A(3, 4)$ and $B(-2, 5)$, then (abscissa of A) – (abscissa of B) = ________.

(A) 1 (B) –1 (C) 5 (D) –5
(E) None of these

75. If $x * y = x + y - \sqrt{xy}$, then the value of $7*63$ is equal to ________.

(A) 63 (B) 49 (C) 21 (D) 7
(E) None of these

76. Which of the following groups correctly represents the given Venn diagram?

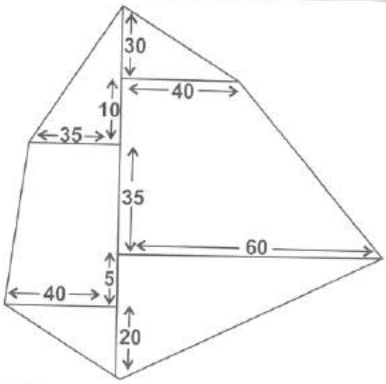


(A) Niece, Females, Air hostess
(B) Teachers, Air hostess, Females
(C) Doctors, Eye Specialists, Females
(D) Males, Teachers, Females
(E) None of these

77. Two dice are rolled out simultaneously. Find the probability of getting 10 as the sum of numbers on both the dice.

(A) $\frac{2}{7}$ (B) $\frac{1}{24}$ (C) $\frac{1}{12}$ (D) $\frac{3}{8}$
(E) None of these

78. Determine the area of the field shown here. (All measurements are in cm).



(A) 7700 cm²
(B) 6200 cm²
(C) 8200 cm²
(D) 6400 cm²
(E) None of these

79. Choose the correct water image of the given combination of letters and numbers.

US914M5W

(A) ∩Ƨ∂⅃ᔭWƧW (B) ∩Ƨ6⅂ᔭWƧM (C) ∩Ƨ∂⅃ᔭWƧM (D) ∩S∂⅃ᔭWƧM
(E) None of these

80. If we interchange the length of the base with the height of the cuboid to get another cuboid. Then, its lateral surface area will ________.

(A) Change
(B) Remain same
(C) Be less than first cuboid
(D) Be more than first cuboid
(E) Can't say

81. If $x^2 - 1$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$, then _____.

(A) $a - c + e = b + d$ (B) $a - c - e = b + d$ (C) $a + c + e = b + d$ (D) $a + c + e = b - d$

(E) None of these

82. 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 operation on numbers progresses from left to right.

Rule :

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

(ii) If an even number is followed by an odd number, which is not a perfect square, they are to be added.

(iii) If an even number is followed by a number which is the perfect square, the 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.

16	64	7
49	34	z

If z is the resultant of the first row, what is the resultant of the second row?

(A) 825 (B) 40 (C) 225 (D) 70

(E) None of these

83. Which of the following statements is/are true?

Statement - I : $\sqrt[3]{288} \times \sqrt[3]{432} \times \sqrt[3]{648} = 432$

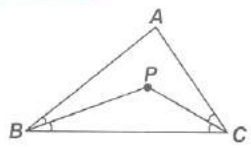
Statement - II : The value of $12^3 - 11^3 + 10^2$ is 497.

(A) Both Statement-I and Statement-II (B) Only Statement-I

(C) Only Statement-II (D) Neither Statement-I nor Statement-II

(E) Can't say

84. In the given figure, $AB > AC$, PB and PC are bisectors of $\angle B$ and $\angle C$ respectively, then _____.



(A) $PB = PC$

(B) $PB > PC$

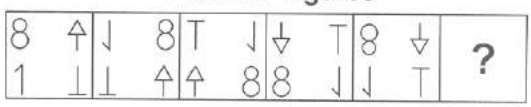
(C) $PB < PC$

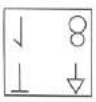
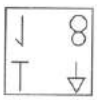
(D) No relationship between PB and PC

(E) None of these

85. Select a figure from the options which will continue the series established by the Problem figures?

Problem Figures



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

(E) None of these

86. If $x = \frac{4\sqrt{3}}{2-\sqrt{2}} - \frac{30}{4\sqrt{3}-3\sqrt{2}} - \frac{3\sqrt{2}}{3+2\sqrt{3}}$, find the value of $(x^4 + x^2 + 3) - \frac{1}{(x^4 + x^2 + 3)}$.

(A) $\frac{8}{3}$ (B) $\frac{10}{3}$ (C) $\frac{4}{9}$ (D) $-\frac{8}{11}$

(E) None of these

87. The conclusions obtained through deductive reasoning, previously proved statements, definitions and some axioms constitute a statement which is known as _____.

(A) Property (B) Theorem (C) Both (A) and (B) (D) Can't be determined

(E) None of these

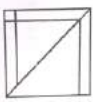
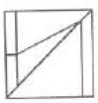
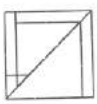
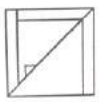
88. The difference between compound interest and simple interest for 2 years at the rate of 10% per annum is ₹ 36. Find the sum.

(A) ₹ 3000 (B) ₹ 3200 (C) ₹ 3500 (D) ₹ 3600

(E) None of these

89. Select a figure from the options in which the Fig. (X) is exactly embedded as one of its part.

Fig. (X)

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

(E) None of these

90. Which of the following statements is INCORRECT?

(A) If $x^2 + y^2 = 40$ and $x \times y = 2$, then $x - y$ is ± 6.

(B) If $a = b = c$, then $a^2 + b^2 + c^2 - ab - bc - ca$ is 0.

(C) If $x + \frac{1}{x} = 9$, then $x^2 + \frac{1}{x^2}$ is 79.

(D) The value of $(z + 2)^3 - (z - 2)^3$ is 1.

(E) None of these

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

(i) 'P × Q' means 'P is the brother of Q'.

(ii) 'P ÷ Q' means 'Q is the mother of P'.

(iii) 'P – Q' means 'P is the father of Q'.

(iv) 'P + Q' means 'Q is the sister of P'.

Which of the following means 'M is the daughter of T'?

(A) M + N ÷ J – T (B) T – J × R + M (C) M – J × T ÷ K (D) M + W × R ÷ T

(E) Can't say

92. The area of the triangle formed by the points $P(0, 1)$, $Q(0, 5)$ and $R(3, 4)$ is _____.

(A) 16 sq. units (B) 8 sq. units (C) 4 sq. units (D) 6 sq. units

(E) None of these

93. A 20 cm long iron pipe has external diameter equal to 25 cm. If the thickness of the pipe is 1 cm, find the whole surface area of the pipe.

(A) 2451 cm^2 (B) 3768 cm^2 (C) 3168 cm^2 (D) 2862 cm^2

(E) None of these

94. Find the values of k, if $(x - 1)$ is a factor of $k^2x^3 - 4kx^2 + 4k - 1$.

(A) 2, 1 (B) 3, –1 (C) 4, 1 (D) –1, 1

(E) None of these

95. A, B, C, D, E, F, G and H are sitting around a circle facing the centre. A sits fourth to the right of H while second to the left of F. C is not the neighbour of F and B. D sits third to the right of C. H never sits next to G. Which of the following pairs sit between H and G?

(A) BH (B) EF (C) CE (D) DB

(E) Can't be determined

96. Select a figure from the options which shows the same placement of dots as in Fig. (X).

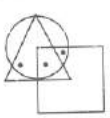
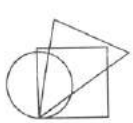
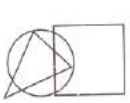
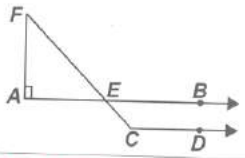


Fig. (X)

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

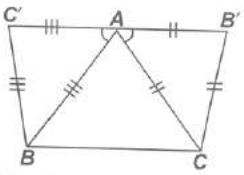
(E) None of these

97. In the given figure, FEC is a straight line, $AB \| CD$ and $\angle F = 30°$. Find $\angle ECD$.



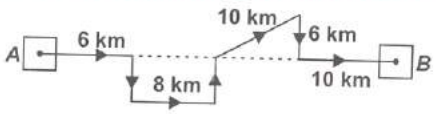
(A) 150°
(B) 160°
(C) 90°
(D) 120°
(E) None of these

98. If equilateral triangles ABC' and ACB' are drawn on the side AB and AC of a triangle ABC, then _____.



(A) $CC' < BB'$
(B) $CC' = BB'$
(C) $CC' > BB'$
(D) Both (A) and (B)
(E) None of these

99. Study the following map and find the shortest distance between points A and B.



(A) 34 km
(B) 32 km
(C) 30 km
(D) 40 km
(E) None of these

100. Match the following :

Column-I	Column-II
(a) $\frac{(16)^{2m+1} \times (64)^5}{(256)^2 \times 4} = (256)^{3m}$, then the value of m is	(i) 3
(b) $(4^{-1} + 8^{-1}) \div \left(\frac{2}{3}\right)^{-1} =$	(ii) 1
(c) $\frac{8^{x+1}}{2^{x+2}} = 128$, then the value of x is	(iii) $\frac{1}{4}$

(A) (a) - (ii), (b) - (i), (c) - (iii)
(B) (a) - (ii), (b) - (iii), (c) - (i)
(C) (a) - (i), (b) - (iii), (c) - (ii)
(D) (a) - (iii), (b) - (i), (c) - (ii)
(E) None of these

SPACE FOR ROUGH WORK