I. E. A.

IEA/11 B
(P - U)

BOOKLET 11 B (P - U)

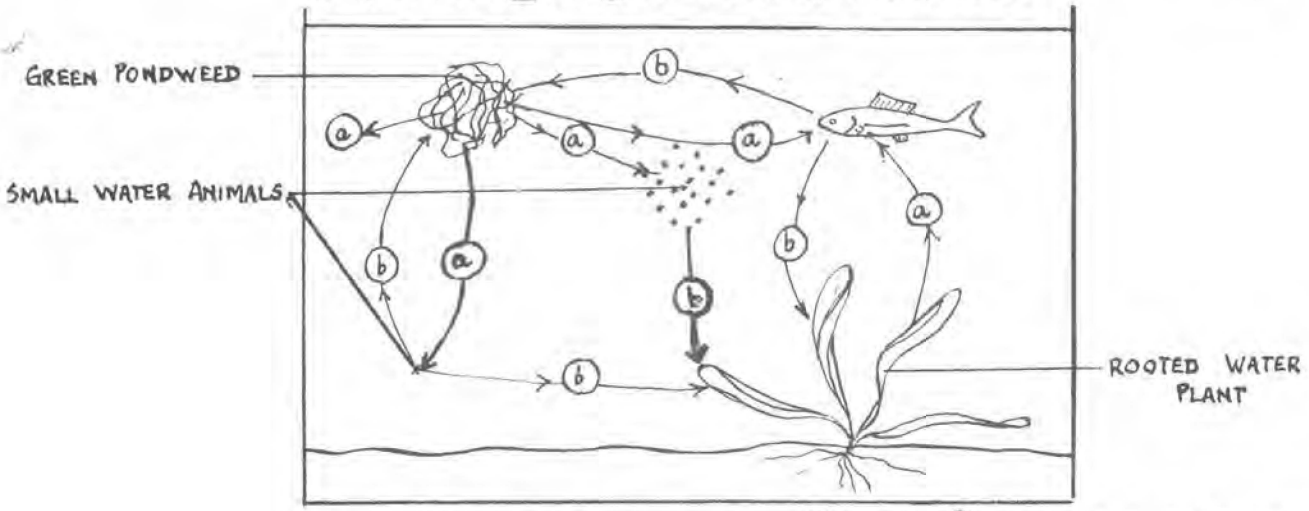
SCIENCE

SECTION B

1. The energy for photosynthesis is generally obtained from

   A. chlorophyll.
   B. chloroplasts.
   C. sunlight.
   D. carbohydrates.
   E. carbon dioxide.

2. The diagram below shows an example of interdependence among aquatic organisms. During the day the organisms either use up or give off (a) or (b) as shown by the arrows.



   Choose the right answer for (a) and (b) from the alternatives given

   A. a is oxygen and b is carbon dioxide.
   B. a is oxygen and b is carbohydrate.
   C. a is nitrogen and b is carbon dioxide.
   D. a is carbon dioxide and b is oxygen.
   E. a is carbon dioxide and b is carbohydrate.

3. Mushrooms can be grown in the dark because

   A. they are then in a constant temperature.
   B. they can then form more vitamins.
   C. they need not be pollinated by bees.
   D. they feed on decaying material.
   E. they do not produce seeds.

4. A person wanted to determine whether bile aided in the digestion of fats. He found that whenever he mixed pancreatic juice with fats a small amount of the fat was digested. But whenever he mixed pancreatic juice and bile with fat, he found that the fat was completely digested. When he mixed bile alone with fat, he found that there was no digestion.

   He interpreted this as showing that bile aided in the digestion of fats.

   Which of the following statements best describes this interpretation?

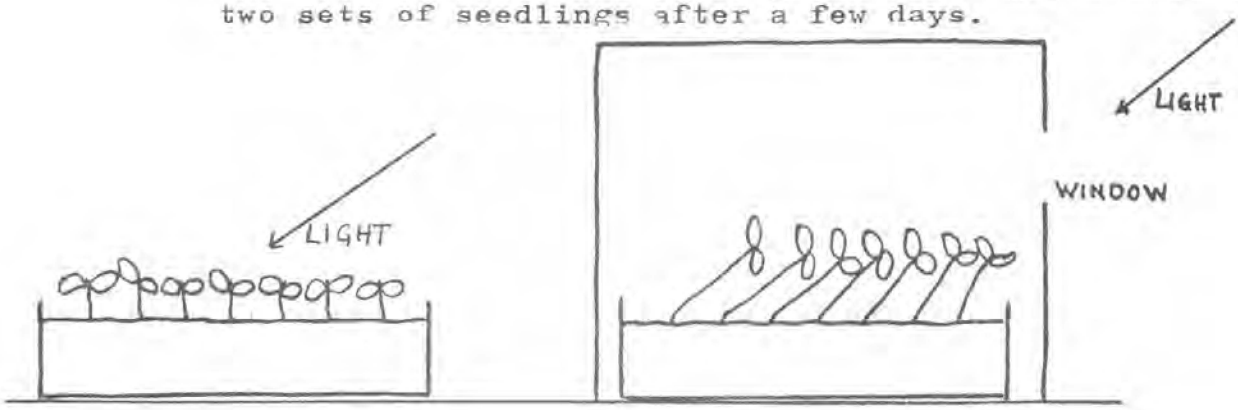
   The interpretation is

   A. justified.
   B. unjustified because it does not answer the question.
   C. unjustified because the experiment lacks a control.
   D. unjustified because the data are inadequate.
   E. unjustified because it is contradicted by the data.

5. Why is it that your body temperature does not fall even though you lose heat continually?

   A. The blood distributes heat round the body.
   B. Respiration results in the liberation of heat.
   C. Heat is constantly being absorbed from the sun.
   D. Hot meals are eaten regularly.
   E. Warm clothes are good insulators.

6. Two similar boxes of soil were sown with the same kind of seeds and placed side by side in a greenhouse. One was covered with a light-tight box which had a small "window" cut in one side. The drawings show the appearance of the two sets of seedlings after a few days.



   What is the best conclusion from this experiment?

   A. The seedlings grow quicker if they are stimulated by light.
   B. Seedlings grow towards the light.
   C. Seedlings grow quicker in limited light and they bend towards the light.
   D. Seedlings illuminated on one side bend towards that side.
   E. Light slows down the rate of growth of that part of the stem on which it falls.

7. Fossils very similar in shape to marine shellfish which live in oceans today have been found in the rocks of high mountains. The most likely explanation of this is that

   A. the particular marine shellfish can live in the sea or on land.
   B. marine forms once had organs that enabled them to breathe atmospheric air.
   C. the rocks in which the fossils were found were formed under the sea.
   D. marine forms,in certain cases, migrate on to the land.
   E. marine forms have evolved from land forms.

8. You can be reasonable certain that organs in two different animals are homologous and not merely analogous if both organs

   A. fulfill similar functions but have different names.
   B. excrete metabolic waste.
   C. are used for locomotion.
   D. are called by the same name.
   E. originate from the same part of the embryo.

9. When alcohol is burned in air, water is formed. Another product of the the combustion is a gas which turns lime water cloudy. Consider the following three statements with regard to these two facts.

   Statements.
   I. Carbon is a constituent element of alcohol.
   II. Hydrogen is a constituent element of alcohol.
   III. Oxygen is a constituent element of alcohol.

   Which statement or combination of these statements can be deduced from the two facts given?

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

10. Zinc strips are inserted into each of four beakers containing four different liquids. Each beaker is identified by a single Roman numeral.

The following observations were made.

Beaker	Initial Observation	Conductivity before zinc is added
I	no visible reaction	very poor
II	bubbles of a colourless gas form on the zinc strip	good
III	a reddish-brown gas is evolved from the surface of the zinc strip	good
IV	no visible reaction	very poor

On the basis of the evidence given which one of the following is the most reasonable inference?

A. Beakers I and IV contain aqueous solutions of strong acids.
B. Beaker II could contain an aqueous acid.
C. Beaker III could not contain an aqueous acid.
D. Beaker III must contain sulphuric acid, H_2SO_4.
E. Beakers I and IV contain alkalies.

11. **Flour is a fine powder obtained by grinding wheat or other cereal grains. A pile of grain burns only very slowly whereas flour dust suspended in the air is explosive. Which of the following is the best explanation of this?**

A. **The heat produced when small particles burn is greater than the heat produced by the burning of large particles of the same substance.**
B. **Grinding the grain changes its chemical composition.**
C. **For the same quantity of the material small particles have a greater surface area in contact with the air than large particles.**
D. **Small particles possess more energy than large particles.**
E. **The flour burns completely whereas the grain does not.**

12. On a new temperature scale, graduated in degrees N, the reading 0°N corresponds to 0° K and the reading 100° N corresponds to 273° K (the freezing point of water).

If the temperature of a sample of 100 cm^3 of gas were changed from 50°N to 49°N, at constant pressure, its volume would

A. increase to 101 cm^3.
B. decrease to 99 cm^3.
C. increase to 102 cm^3.
D. decrease to 98 cm^3.
E. remain constant

13. A 15.0 millilitre sample of a 1.00 molar solution of HCl will exactly neutralize 7.5 millilitres of a 1.00 molar solution of

A. $NaHCO_3$
B. KOH
C. C_2H_5OH
D. $Ba(OH)_2$
E. $MgCl_2$

14. Chemical equilibrium occurs only when

A. all components stop reacting.
B. the substances initially present have now reacted completely.
C. the substances start reacting.
D. the components decompose at the same rate as they are formed.
E. the concentrations of all the components become equal.

15. Some nitrogen, hydrogen and ammonia reach equilibrium in a stainless steel container at 500°C.

The equilibrium is symbolised by the equation

$$N_2 + 3H_2 \rightleftharpoons 2\ NH_3 + \text{heat}$$

(i.e. reaction to the right is exothermic)

Which of the following is the best description of the effect of now increasing the concentration of hydrogen and allowing a new equilibrium to be reached?

A. There is a decrease in the yield of ammonia but no rise in temperature.
B. The equilibrium concentrations remain the same as in the initial system.
C. There is an increase in the yield of ammonia.
D. There is a rise in temperature.
E. Both C and D are correct.

16. Which one of the following substances does not consist mainly of carbon atoms?

A. Diamond.
B. Graphite.
C. Soot.
D. Ruby.
E. Charcoal.

17. A hydrocarbon is found to contain carbon and hydrogen atoms in the ratio 1 : 2 and to have a molecular weight about 28. Which of the following is the most likely molecular formula of the compound

A. CH_2 .
B. CH_2N.
C. C_2H_4.
D. C_3H_6N.
E. C_4H_8.

Atomic weights: H = 1, C = 12, N = 14.

18. An iron container is evacuated and weighed. It is then filled with hydrogen gas and weighed again.

The weight of the container full of hydrogen compared to the weight of the evacuated container is

A. less.
B. greater.
C. the same.
D. greater or less depending on the volume of the gas in the container.
E. greater or less depending on the temperature of the gas in the container.

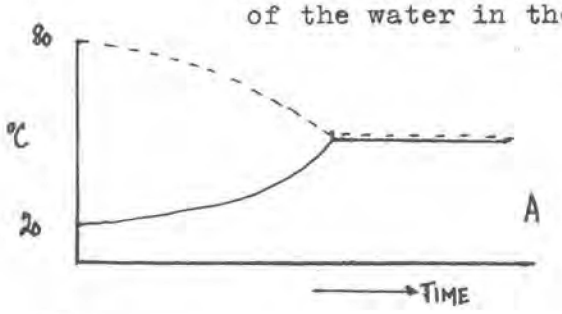
19. A certain force was needed to keep a trolley moving along a horizontal surface at a uniform velocity. This indicates that

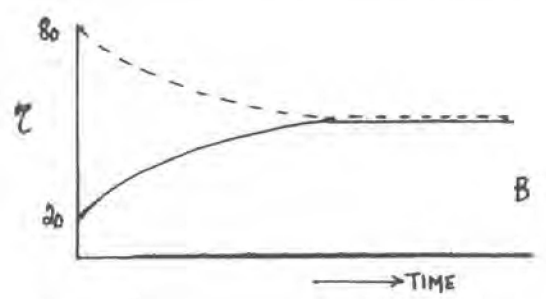
A. the trolley had inertia.
B. the trolley had weight.
C. the friction forces acting on the trolley were equal to the force applied.
D. the friction forces acting on the trolley were just less than the force applied.
E. the trolley had mass.

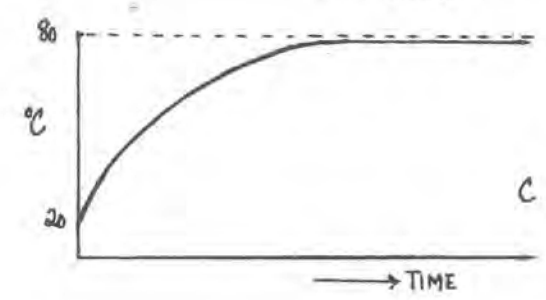
20. A stone is thrown upward at an angle of 45°. At the highest point reached by the stone its

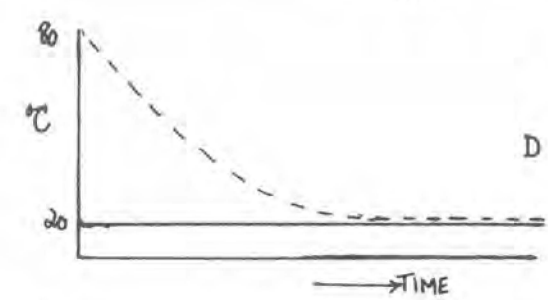
A. acceleration is zero.
B. acceleration is at a minimum, but not zero.
C. total energy is at a maximum.
D. potential energy is at a minimum.
E. kinetic energy is at a minimum.

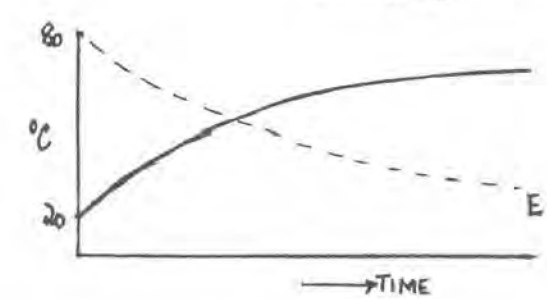
21. Using the apparatus shown in the figure below, 100g of water at 20° C was poured into the outer container P and its temperature read at intervals from thermometer 2. At the same time 100g of water at 80° C was poured into the inner container Q and its temperature read at intervals from thermometer 1. Which of the following graphs best represents the changes in the temperatures of the water in the two containers.

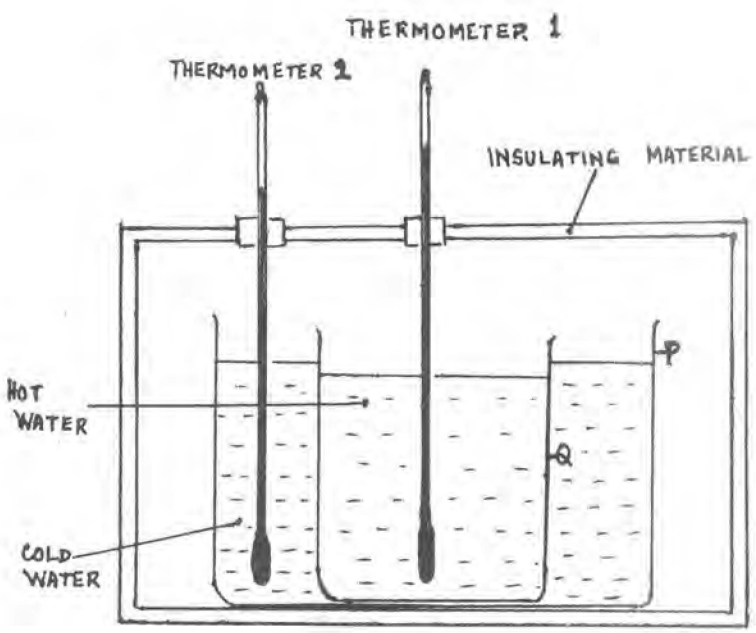












THERMOMETER 1

THERMOMETER 2

22. A one-ton truck coasts from rest down an incline of a vertical height of 30 metres and is braked to a stop at the bottom. Air friction is negligible. In order to estimate the quantity of heat produced by the brakes what additional information is required?

A. The length of the incline.
B. The length and slope (gradient) of the incline.
C. The rise in temperature of the brake surfaces.
D. The average speed of the truck.
E. None of the information in statements A to D is required.

23. A man standing outdoors in the cold sounds an instrument at pitch C. Another man, standing in a warm room, hears the sound. What will be the pitch of the note heard by the man in the room.

A. The note will seem higher in pitch than C.
B. The note will seem lower in pitch than C.
C. The note will sound in the pitch of C.
D. Any of the above, depending on the difference in temperature.
E. Any of the above, depending on the amplitude of the sound.

24. By which one of the following methods can geological time be measured most accurately?

A. Size of fossils.
B. Thicknesses of the layers of sedimentary rocks.
C. Proportion of uranium isotopes in certain rocks.
D. Rate of salt accumulation in the ocean.
E. Temperatures in the mantle of the earth.

National Centers : Set P or Q or R or S or T or U to be entered here.

TEST 11 B

SET P

SCIENCE - TEST 11B Set P

25. What fills the space between the cell wall and the protoplast when a plant cell is plasmolyzed with a salt solution?

A. Water.
B. Air.
C. Salt solution.
D. Ectoplasm.
E. Cell sap.

26. In order to obtain two crops in one growing season a farmer planted some seeds which he had harvested the previous week, but the seeds failed to germinate. What can be concluded from this observation?

A. The farmer did not provide the right conditions for germination.
B. The seeds needed a longer period of maturation.
C. The farmer had not removed inhibiting substances.
D. The seeds required a period of low temperature.
E. The data are inadequate for a conclusion to be reached.

27. What is the change in oxidation number (oxidation state : valency) of manganese in the reaction represented by the equation

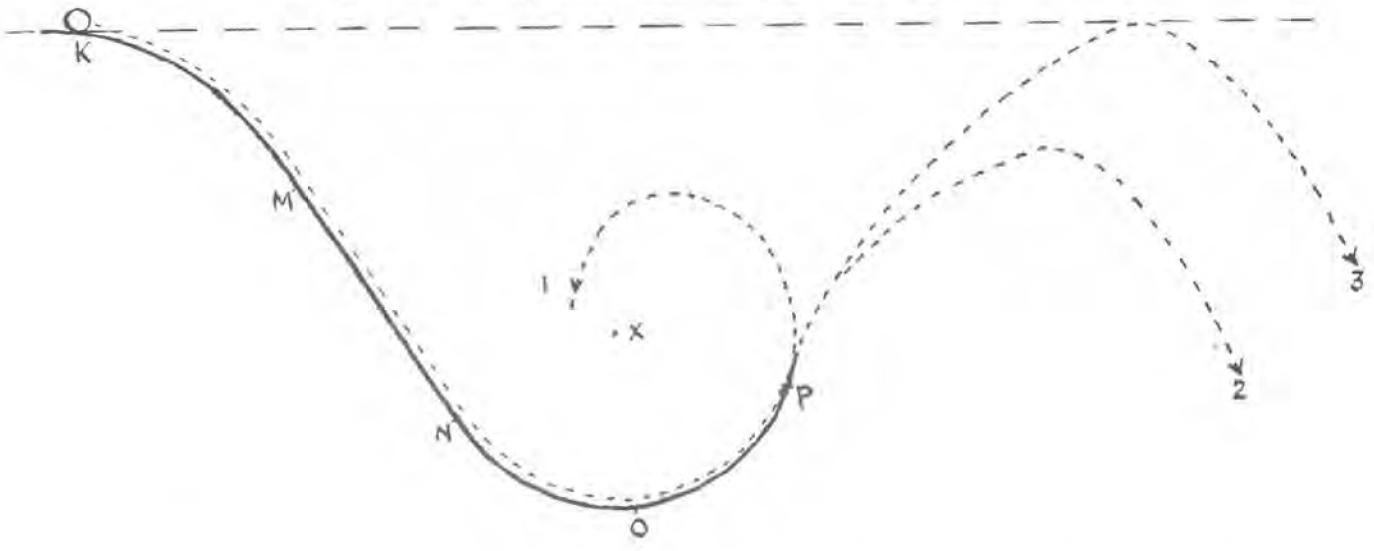
$$MnO_2 + 4\ HCl \longrightarrow MnCl_2 + Cl_2 + 2\ H_2O$$

A. 2.
B. 3.
C. 4.
D. 5.
E. 6.

28. Selenium is the element below sulphur in the periodic table. One would expect selenium to

A. be a metal with a high boiling point.
B. form a potassium oxy-salt of formula K_2SeO_4.
C. burn in air to form an oxide SeO.
D. dissolve in nitric acid to form a salt $Se(NO_3)_4$.
E. form a compound H_2Se which is weakly acidic in aqueous solution.

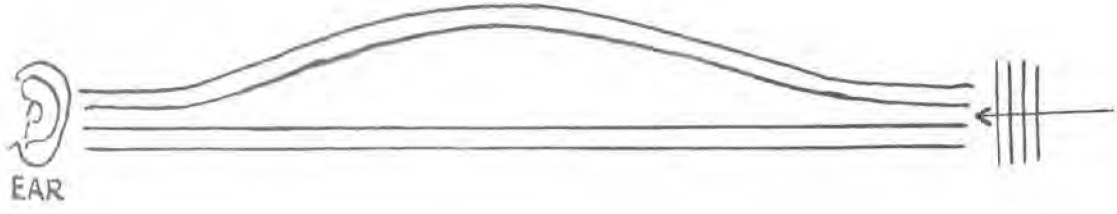
29. A ball was released at the position K on the rail shown in the figure. On the rail the part MN is a straight line, and the part N O P is a circular arc with its center at X. The ball moved along the rail and then went off from the rail at the position P, which is lower than X.



Assuming that the friction between the ball and the rail, the rotation of the ball and the air resistance are all negligible, which one of the alternatives is correct?

A. The ball moved as shown in the curve 1 in the figure running off from the circular path owing to the gravitation.
B. As there is not any resistance, it reached the same height as the point K, but that actual path cannot be determined.
C. As the mechanical energy of the ball changed owing to contact with the rail, it did not reach quite the same height as the point K.
D. As the direction of the ball going off from the point P is inclined to the vertical, it moved as shown in the curve 2 in the figure.
E. As the mechanical energy is conserved, it moved as the curve 3 in the figure.

30. Sound waves 1 m. in length are carried to a man's ear by two rubber tubes. With which of the following combinations of tube-lengths will the man hear no sound?



A. $\frac{3}{4}$ m., $1\frac{3}{4}$ m.
B. $\frac{3}{4}$ m., $2\frac{1}{4}$ m.
C. 1 m., $2\frac{3}{4}$ m.
D. $1\frac{1}{2}$ m., $2\frac{3}{4}$ m.
E. 2 m., 4 m.

TEST 11 B

SET Q

SCIENCE - Test 11B Set Q

25. In many breeds of cattle the polled condition (absence of horns) is dominant over the presence of horns, and homozygous red crossed with homozygous white produces roan (intermingled red and white hairs) colour. Which of the following crosses will produce only horned roan offspring?

A. Polled red x horned white.
B. Horned roan x horned roan.
C. Horned red x horned white.
D. Polled roan x horned roan.
E. Polled white x horned roan.

26. Which of the following does NOT provide evidence of evolution?

A. Green plants can be arranged in order from simple to complex.
B. Embryos of birds, reptiles, and mammals have gill clefts resembling those of a fish embryo.
C. The ancestry of animals like the horse can be traced through the fossil record.
D. The caecum is present in all mammals including man but is only functional in some.
E. The individuals within a species differ considerably one from another.

27. In the periodic table group beginning with nitrogen, which one of the following changes can be noted as the elements are considered in the order of their increasing atomic weight?

A. The elements become more metallic.
B. The elements become less metallic and the heaviest element in the group is non-metallic.
C. The elements have about the same metallic properties.
D. The elements show no trend in their metallic properties, which vary periodically and not by groups.
E. The elements show no trend in their metallic properties because the periodic table gives no guide to metallic and non-metallic properties.

28. When a small speck of lead monoxide was added to a concentrated solution of hydrogen peroxide, the solution became hot and eventually erupted violently. In this process large amounts of oxygen were given off. Which of the following is the best explanation?

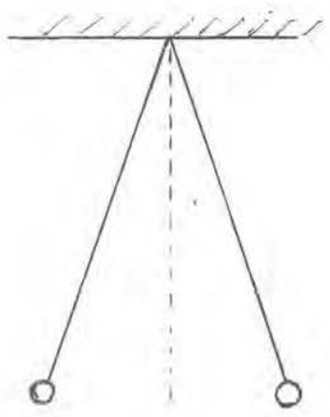
A. The great amount of heat is due to the release of oxygen by the decomposition of lead monoxide; no catalysis is involved.
B. The reaction is catalysed by lead monoxide but unaffected by a rise in temperature.
C. The reaction is not catalysed by lead monoxide but is accelerated by a rise in temperature.
D. The reaction is unaffected by a rise in temperature but catalysed by products.
E. The reaction is catalysed by lead monoxide and accelerated by a rise in temperature.

29. Sound is not an electromagnetic radiation. The best evidence for the truth of this statement is the fact that

A. audible sounds have a wavelength (in air) of about 1 m (about middle E).
B. diffraction effects can be observed.
C sound can be produced by vibrating solids.
D. sound travels at 300 m/s in air.
E. sound can be refracted.

30. Two electrically charged spheres are suspended from the same point by insulating threads of equal length and repel each other so that the threads make equal angles with the vertical. What can be said of the balls?

A. Their masses and charges are equal.
B. Their masses are equal, the charges may or may not be.
C. Their charges are equal, the masses may or may not be.
D. The ratio of charge to mass is the same for both.
E. The repulsive force on each must be equal to its weight.



TEST 11 B

SET R

SCIENCE - TEST 11B Set R

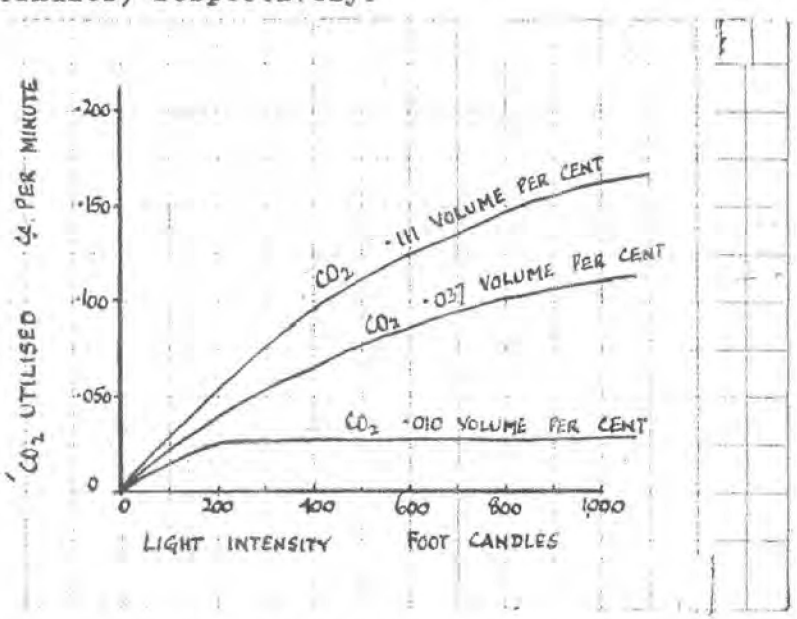
25. What is the minimum weight of NaCl that is needed to prepare 7.1 g of chlorine? (Approximate atomic weights: Na= 23, Cl= 35.5).

A. 5.9 g.
B. 7.1 g.
C. 11.7 g.
D. 12.7 g.
E. 14.2 g.

26. On the basis of the periodic table, which of the following would be described best as an oxide which is only basic?

A. Al_2O_3.
B. CO.
C. P_2O_5.
D. NO_2.
E. CaO.

27. The graph shows the relationships between the carbon-dioxide (CO_2) utilisation by wheat plants, the carbon-dioxide concentration (volume per cent) in the outside air and the light intensity (foot candles) respectively.



It has been stated that the data shown by the graph indicate that one of the factors which limit carbon-dioxide utilisation under the range of conditions covered by the graph is the concentration of carbon-dioxide present in the air. Which of the following is correct?

A. The statement is true according to the graph.
B. The statement is false according to the graph.
C. The statement cannot be judged by the graph but is in accord with an established biological principle.
D. The statement cannot be judged by the graph and is not in accord with an established biological principle.
E. The statement cannot be judged by the graph or by an established biological principle.

28. Someone proposes to design an electric motor so that it can be used to operate an electric generator which will, in turn, alone provide the voltage to drive the motor in such a way that the frequency of rotation of the motor remains constant. His proposal would not work because

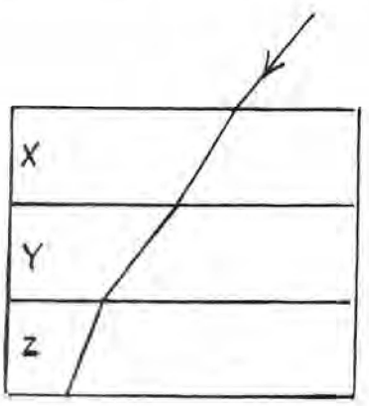
A. more current would be produced in the generator than the motor can use.
B. of the direction of rotation.
C. of the induced voltage.
D. of the magnetic field that would be set up.
E. in the generator and motor, some energy would always be transformed into heat.

29. In slightly diluted sea water, the small marine worm Gunda swells when deprived of oxygen and shrinks again when oxygen is supplied. What is the most likely explanation?

A. Lack of oxygen results in an incomplete oxidation of waste products.
B. The lack of oxygen increases water absorption.
C. Excess water is poisonous to the organism.
D. When less oxygen is available, there is not enough energy to oppose osmotic entry of water.
E. An increase of surface area gives a better means of oxygen absorption.

30. A ray of blue light passes through a stack of three parallel-sided blocks made of different materials. The path of the beam is shown. In which of the three blocks is the velocity of blue light greatest?

A. X.
B. Y.
C. Z.
D. The velocity is the same in all the blocks.
E. The information given is insufficient to be able to say.

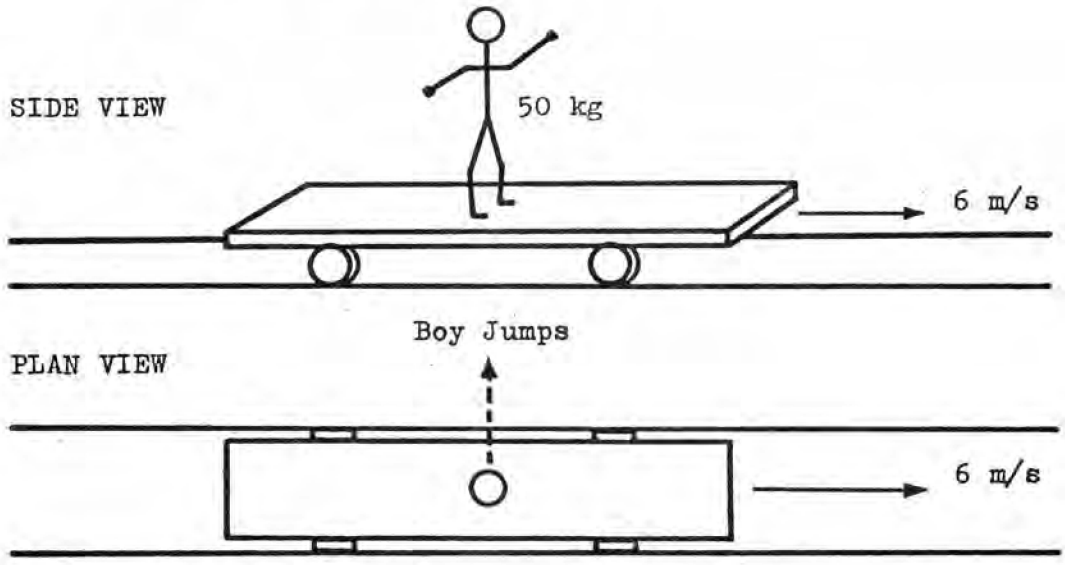


TEST 11 B

SET S

SCIENCE - TEST 11B Set S

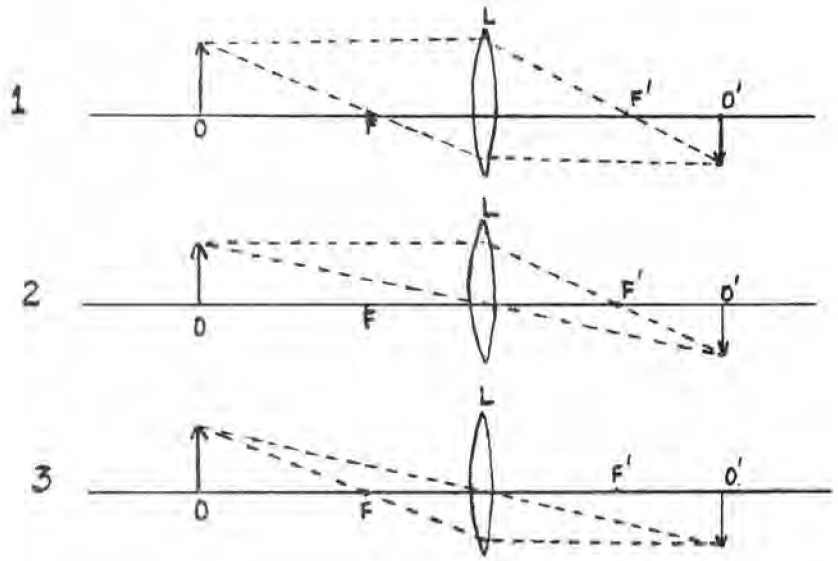
25. A 50 kg boy stands on a trolley of mass 100 kg. The trolley is travelling to the right on rails at a constant speed of 6 m/s.



After the boy jumps sideways off the trolley pushing off at right angles to it, the speed of the trolley is about

A. 3 m/s.
B. 4 m/s.
C. 6 m/s.
D. 9 m/s.
E. 12 m/s.

26. The three figures 1, 2, and 3 give the graphical construction for the image O' of the object O as produced by the thin lens L with foci F and F'.



Which, if any, of these three figures are correct?

A. Figures 2 and 3 are correct.
B. Figures 1 and 3 are correct.
C. Figures 1 and 2 are correct.
D. None of the figures are correct.
E. All three figures are correct.

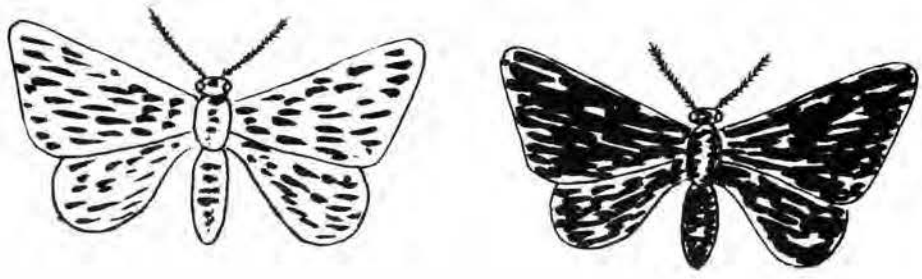
27. The presence of ions in an aqueous (water) solution of a substance is most directly detected by

A. finding out if it conducts electricity.
B. measuring the density of the solution and comparing it with those of the pure solute and water.
C. seeing if the solution has an electric charge.
D. evaporating the solution and testing the residue for conductivity.
E. adding an ionic substance and seeing if there is a reaction.

28. The electronegativity (electron attracting power) of a given element on Pauling's scale can be estimated from the electronegativities of the neighbouring elements in the periodic table. In estimating the electronegativity of chlorine from those of the elements to the left and right of it in period III, the determining factor is that, in going to the right in the period

A. chemical reactivity decreases.
B. the number of filled energy levels per atom increases.
C. the van der Waals radius increases.
D. the density decreases.
E. the nuclear charge increases.

29. X and Y represent two forms of the same moth, a light speckled form and a predominantly dark, or melanic, form.



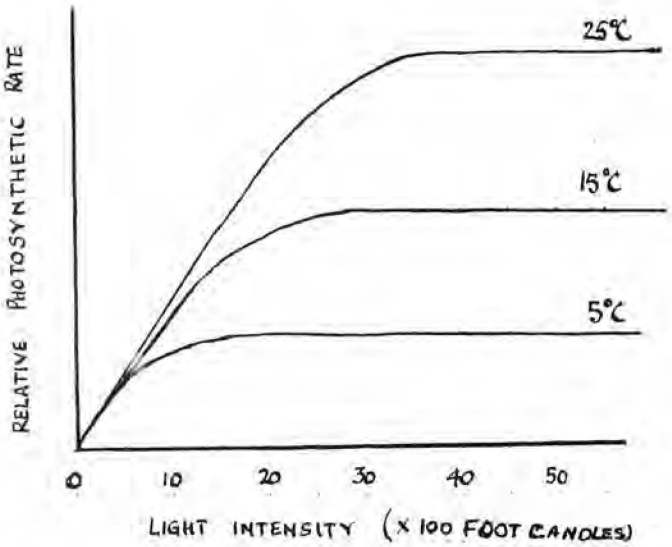
During the 19th century the air in some parts of England became increasingly polluted with soot through the growth of industry based on the burning of coal. One effect of this pollution was that lichens would no longer grow on the trunks and branches of trees as these became blackened with soot.

Until 1850 the only form of this moth that had been recorded was the light form X. Then in 1850 the dark form Y was reported from one of these industrial areas. By the end of the 19th century the dark form had become quite common and now it is, in many localities, the commoner of the two forms, especially in the vicinity of large towns, where it often comprises as much as 95% of the total population, although the light form predominates in areas away from large centres of population.

Which of the following best explains the appearance of the dark specimen in 1850?

A. The colour change was induced by air pollution.
B. The organisms adapted themselves to the change in external environment.
C. Air pollution affected the moths directly after their emergence from the pupal stage.
D. A mutation, that had occurred before but had failed to become established, became established because it was favoured by changed in the external environment.
E. The caterpillars ate soot contaminated leaves and dark moths developed from them.

30. In an experiment with a certain plant, the photosynthetic rate per unit of leaf area was measured at different light intensities. The experiment was repeated at three different temperatures, 5°C, 15°C and 25°C. An adequate supply of carbon-dioxide was maintained throughout the experiments. The graph shows the results.



On the basis of the data given in the graph, what factor or factors determine the photosynthetic rate in light intensities more than 3,000 foot-candles?

A. Light intensity.
B. Temperature.
C. Temperature and light intensity.
D. Water status of plant.
E. No factor can be ascertained from the graph.

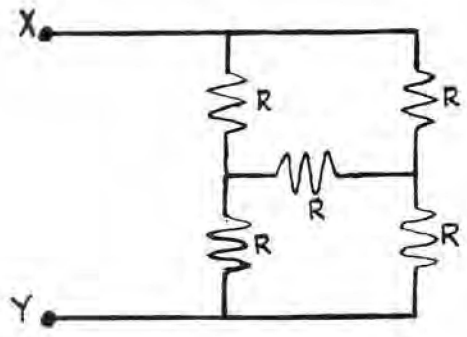
TEST 11 B

SET T

SCIENCE - TEST 11B Set T

25. Each resistor in the diagram has the same resistance R. What resistance will be measured between terminals X and Y?

A. 2R.
B. $\frac{4R}{3}$.
C. R.
D. $\frac{R}{2}$.
E. $\frac{R}{3}$.



26. A jar of oxygen gas and a jar of hydrogen gas are at the same temperature. The molecules of the two gases have on average the same

A. velocity.
B. momentum.
C. force.
D. potential energy.
E. translational kinetic energy.

27. The rate of reaction of two substances X and Y is measured at several concentrations of X and Y as shown in the table.

Rate of reaction millimoles/litre second	12	36	24
Concentration of X moles/litre	5	15	10
Concentration of Y moles/litre	5	5	10

The rate of reaction is

A. proportional to the concentration of X but independent of the concentration of Y.
B. proportional to the concentration of X and Y.
C. proportional to the concentration of Y but independent of the concentration of X.
D. dependent on the concentrations of X and Y but not satisfactorily expressed in A, B or C.
E. dependent on some unspecified factors other than concentration.

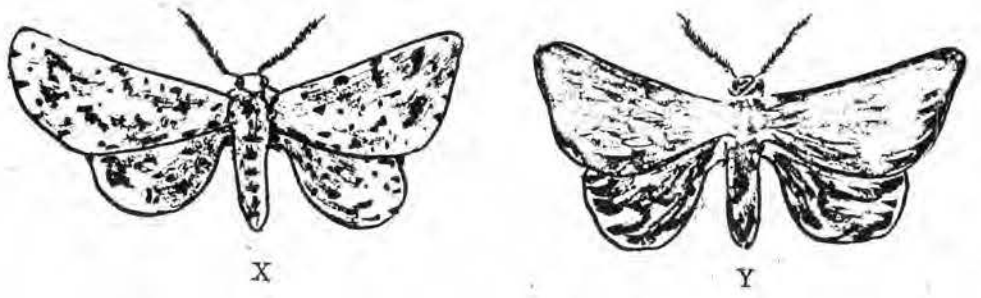
28. Which of the following best describes the egg cell in the embryo sac of a plant?

A. It is formed by mitosis.
B. It gives rise to the endosperm.
C. It is analogous to a pollen grain.
D. It is a zygote.
E. It is a female gamete.

29. Which one of the following formulae represents a substance which you would NOT expect to exist under normal laboratory conditions?

A. NaH.
B. H_2S.
C. SiO_2.
D. $AlCl_2$.
E. O_3.

30. X and Y represent two forms of the same moth, a light speckled form and a predominantly dark, or melanic, form.



X Y

During the 19th century the air in some parts of England became increasingly polluted with soot through the growth of industry based on the buring of coal. One effect of this pollution was that lichens would no longer grow on the trunks and branches of trees as these became blackened with soot.

Until 1850 the only form of this moth that had been recorded was the light form X. Then in 1850 the dark form Y was reported from one of these industrial areas. By the end of the 19th century the dark form had become quite common and now it is, in many localities, the commoner of the two forms, especially in the vicinity of large towns, where it often comprises as much as 95% of the total population, although the light form predominates in areas away from large centres of population.

The papagraph describes a case of evolution through

A. sexual selection.
B. natural selection.
C. intra-specific competition.
D. geographical isolation.
E. the inheritance of acquired characters.

TEST 11 B

SET U

SCIENCE - TEST 11B Set U

25. If a photon collides with a free electron

A. energy is conserved; momentum is not.
B. momentum is conserved; energy is not.
C. both energy and momentum are conserved.
D. neither energy nor momentum need be conserved.
E. momentum is conserved; the nature of the collision determines whether energy is conserved.

26. If, in an imaginary situation, a 1 kg block of ice at $0^{\circ}C$ is dropped from such a height that all of it is melted by the heat generated on impact with the ground, from what height would a 25 kg block of ice have to be dropped to melt completely, assuming that in both cases all of the heat is absorbed by the ice?

A. 25 times as high.
B. 5 times as high.
C. 1/5 as high.
D. 1/25 as high.
E. The same height.

27. A student wishes to see how temperature affects the solubility of a salt in water. His method is as follows:

He shakes an excess of the salt with water at a known temperature until no more appears to dissolve. He then filters to obtain a clear solution. After weighing a portion of this solution, he evaporates the water and weighs the dry salt. He then repeats the procedure at the same temperature as a check before proceeding to another temperature.

Which of the following is apt to cause the greatest error during determination of the solubility at a given temperature.

A. Allowing solution temperature to change prior to filtration.
B. Allowing solution temperature to change during evaporation.
C. Allowing solution temperature to change at any time during the procedure.
D. Not using the same size of salt crystals in the check determinations.
E. Not adding the same excess of salt in the check determinations.

28. The maintenance of a constant body temperature in man involves a balance between production of heat and loss of heat. Which of the factors given below <u>least</u> affects this balance?

A. The circulation of the blood.
B. Evaporation of water from the body surfaces.
C. Muscular contraction.
D. Dilation of blood vessels in the skin.
E. The heating of cold air in the lungs.

29. A compound X, of the formula C_3H_8O, on partial oxidation gives C_3H_6O. From this information, X is most likely to be

A. an alkanal (aldehyde).
B. a tertiary alkanol (alcohol).
C. an alkene (olefin).
D. a secondary alkanol (alcohol).
E. an ether

30. Some organisms are difficult to classify as plants or animals because they are

A. decomposers.
B. capable of acting as both producers and consumers.
C. microscopic and thus too difficult to study.
D. able to build up complex foods, by making use of light energy.
E. producers.