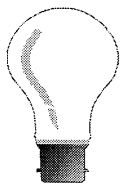


Answer all the questions, using the Answer grid.

1. Which object is made of aluminium?



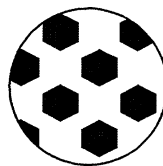
light bulb

A



saucepan

B



football

C



shirt

D

2. Air is a mixture of

- A fertilisers
- B gases
- C fossils
- D rocks

3. Ores are used to produce

- A plastic
- B wood
- C metals
- D paper

4. Which metal is usually extracted from its ore by electrolysis?

- A aluminium
- B gold
- C iron
- D silver

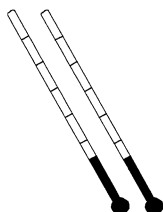
5. Which rock is described as metamorphic?

- A chalk
- B granite
- C limestone
- D marble

6. Which of the following is chemically inert (unreactive)?

- A hydrogen
- B lithium
- C sodium
- D neon

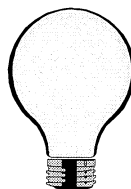
7. Argon is used in



thermometers
A



bread making
B



light bulbs
C



jewellery
D

8. Lithium is

- A a halide
- B an alkali metal
- C a compound
- D a noble gas

STANDARD DEMAND

9. Element X is soft, grey and has a low melting point.
It could be

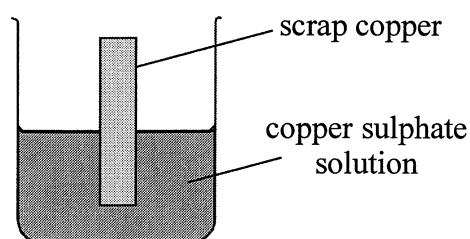
- A gold
- B sodium
- C iron
- D chlorine

10. Which compound is used as a fertiliser?

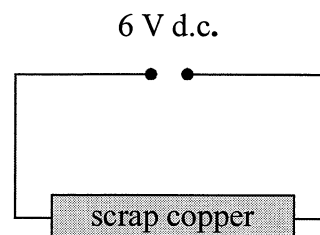
- A sulfuric acid
- B nitric acid
- C ammonium nitrate
- D water

11. Sodium reacts very vigorously with cold water. Bubbles of gas are seen and an alkali is produced. Which two substances are formed?
- A oxygen and sodium chloride
 - B oxygen and sodium hydroxide
 - C hydrogen and sodium chloride
 - D hydrogen and sodium hydroxide
12. The percentage of nitrogen in the air is
- A 1%
 - B 20%
 - C 50%
 - D 79%
13. In the Haber process, hydrogen and nitrogen are used to make
- A ammonia
 - B cement
 - C copper
 - D iron
14. Where does the nitrogen used in the Haber process come from?
- A air
 - B fertilisers
 - C plants
 - D nitric acid
15. Which reaction increases the amount of oxygen in the atmosphere?
- A extraction of iron from its ore
 - B photosynthesis in plants
 - C respiration of animals
 - D electrolysis of copper sulfate solution using copper electrodes

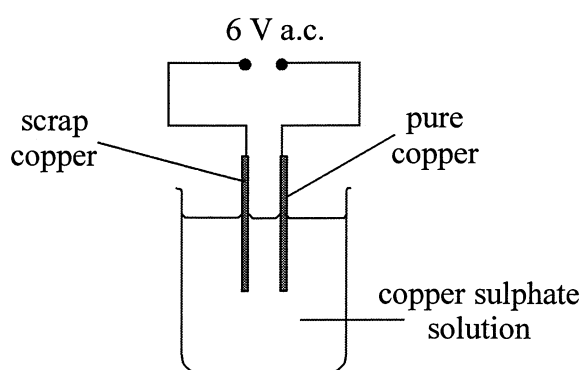
16. Judith wants to purify a piece of scrap copper. Which method would do this?



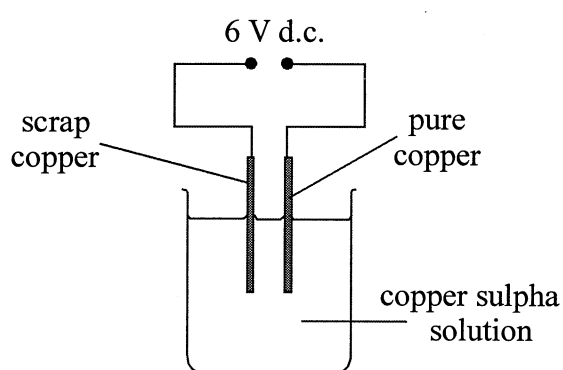
A



B



C



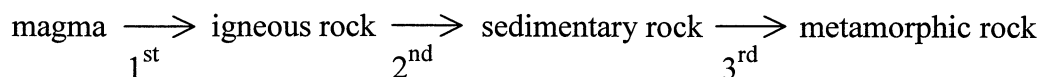
D

HIGH DEMAND

17. In a given reversible reaction, a higher yield is obtained by either raising the temperature or increasing the pressure. This shows that the forward reaction is

- A exothermic and reduces the number of gas molecules
- B exothermic and increases the number of gas molecules
- C endothermic and reduces the number of gas molecules
- D endothermic and increases the number of gas molecules

18. A sequence of three changes is shown below.



The three changes involved are:

- X Erosion, sedimentation and compression forms a new rock
 Y Heat and pressure change the rock type
 Z Molten erupted lava from inside the Earth cools down

In which order did the three changes occur?

	1 st	2 nd	3 rd
A	X	Z	Y
B	Y	X	Z
C	Z	Y	X
D	Z	X	Y

19. Which statement describes electrolysis?

- A movement of ions to electrodes, followed by discharge
 B disintegration of ions, followed by movement of ions
 C discharge of ions, followed by movement of ions
 D movement of atoms, followed by discharge of ions

20. Which equation shows an important part of the production of iron from iron ore?

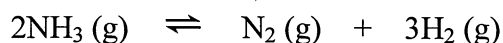
- A $2\text{H}_2\text{O} + \text{O}_2 \longrightarrow 2 \text{H}_2\text{O}_2$
 B $4\text{Fe} + 3\text{O}_2 \longrightarrow 2 \text{Fe}_2\text{O}_3$
 C $\text{Fe}_2\text{O}_3 + 3\text{CO} \longrightarrow 2\text{Fe} + 3\text{CO}_2$
 D $2\text{Fe}_2\text{O}_3 \longrightarrow 4 \text{Fe} + 3\text{O}_2$

21. Aluminium is extracted from purified bauxite using electrolysis.
 Which row of the table is correct?

	cathode made from	cathode reaction
A	carbon (graphite)	$\text{Al}^{3+} + 3\text{e}^- \longrightarrow \text{Al}$
B	carbon (graphite)	$2\text{O}^{2-} \longrightarrow \text{O}_2 + 4\text{e}^-$
C	cryolite	$\text{Al}^{3+} + 3\text{e}^- \longrightarrow \text{Al}$
D	cryolite	$2\text{O}^{2-} \longrightarrow \text{O}_2 + 4\text{e}^-$

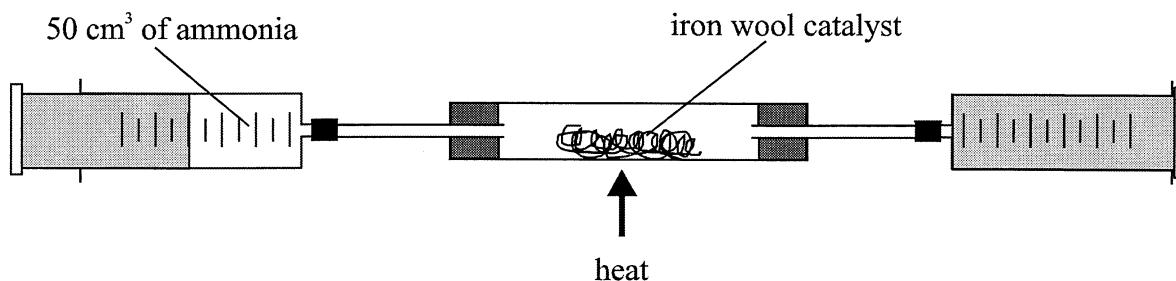
Use the information below to answer questions 22 and 23.

Ammonia can break down into nitrogen and hydrogen.
This reaction is reversible.

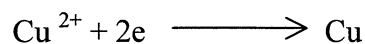


50 cm³ of ammonia is placed in a gas syringe.

It is passed over a heated iron wool catalyst until equilibrium is reached.



22. The iron wool catalyst
- A speeds up the reaction and increases the amount of ammonia at equilibrium
 - B speeds up the reaction and decreases the amount of ammonia at equilibrium
 - C speeds up the reaction but does not change the amount of ammonia at equilibrium
 - D does not change the speed of reaction, but increases the amount of ammonia at equilibrium
23. What is the **total** volume of **ammonia**, **nitrogen** and **hydrogen** at equilibrium?
- A 100 cm³
 - B more than 50 cm³ but less than 100 cm³
 - C 50 cm³
 - D less than 50 cm³
24. The reaction below shows copper ions gaining electrons



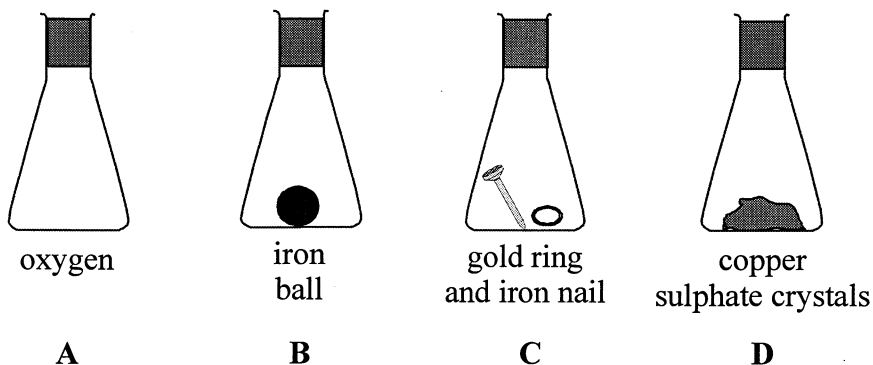
This reaction is an example of

- A reduction
- B oxidation
- C rusting
- D combustion

END

Answer all the questions, using the Answer grid.

1. Which bottle contains a compound?



2. Which particle has a positive charge?

- A proton
- B neutron
- C electron
- D atom

3. Which of these is a covalent compound?

- A hydrogen
- B hydrogen chloride
- C sodium
- D sodium chloride

4. Atoms of different chlorine isotopes have different numbers of

- A electrons
- B neutrons
- C nuclei
- D protons

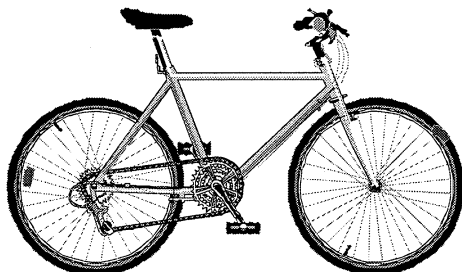
5. Ammonia is a simple molecular compound.
Simple molecular compounds are generally substances which

- A have low melting points
- B conduct electricity when solid
- C have high boiling points
- D conduct electricity when molten

6. Atoms of different elements combine chemically to form new

- A microorganisms
- B mixtures
- C solutions
- D compounds

7. A chemical reaction occurs on a bicycle when the



- A gears are oiled
- B tyres are pumped up
- C frame goes rusty
- D saddle is dried

8. When two substances share electrons, the substances

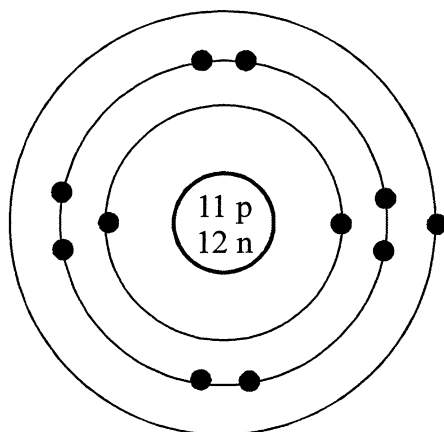
- A boil
- B bond
- C dissolve
- D expand

STANDARD DEMAND

8. Which of these particles is an ion?

- A NH_3
- B N^{3-}
- C N
- D N_2

10. An atom has the structure shown.



key
 p = proton
 n = neutron
 ● = electron

Which row of the table shows the correct atomic number and mass number?

	atomic number	mass number
A	12	34
B	12	23
C	11	12
D	11	23

11. Which row of the table correctly compares two isotopes of the same element?

	number of protons	number of neutrons
A	different	different
B	different	same
C	same	different
D	same	same

12. Which substance is an ionic compound?

- A** magnesium chloride, MgCl_2
- B** magnesium, Mg
- C** oxygen, O_2
- D** chlorine, Cl_2

13. Which of these is correct for an electron?

	charge	where found in atoms
A	+1	in the nucleus
B	-1	in the nucleus
C	+1	orbiting the nucleus
D	-1	orbiting the nucleus

14. The formula for fluorine gas is F_2 .
An atom of fluorine has an atomic number of 9 and a mass number of 19.

The relative formula mass of fluorine is

- A 9
- B 19
- C 18
- D 38

Use this information to answer questions 15 and 16

The reaction of iron with sulfur is exothermic. The product formed is iron sulfide

15. The formula of iron sulfide is

- A FeS
- B $FeSO_4$
- C IrS
- D $IrSO_4$

16. An exothermic reaction is one which produces

- A a red glow
- B a black solid
- C heat
- D a smell

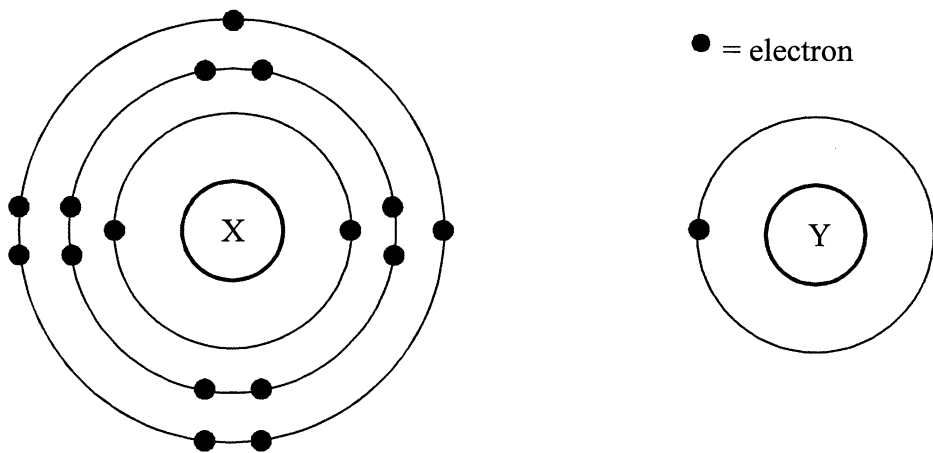
HIGH DEMAND

17. Both diamond (a high melting point solid) and bromine (a low boiling point liquid) contain covalent bonds.

Which structures do they have?

	diamond	bromine
A	giant molecular	giant molecular
B	giant molecular	simple molecular
C	simple molecular	giant molecular
D	simple molecular	simple molecular

18. The electronic structures of atoms X and Y are shown.



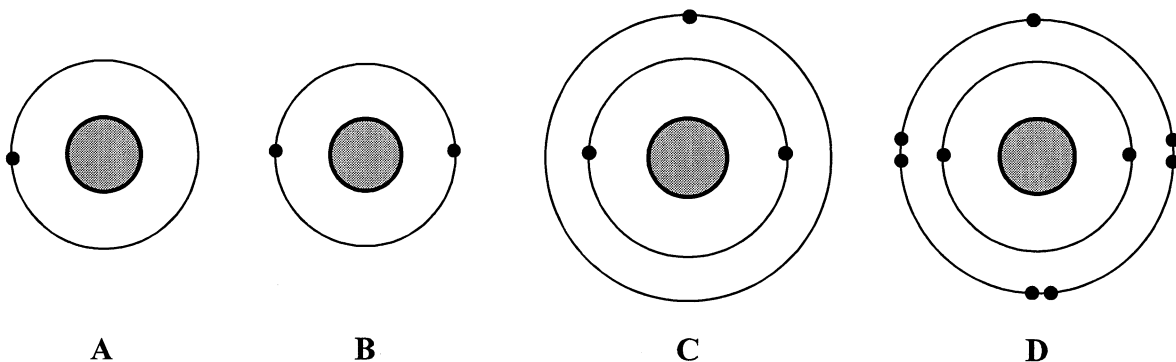
X and Y form a covalent compound.
What is its formula?

- A XY
- B X_6Y
- C X_2Y
- D XY_2

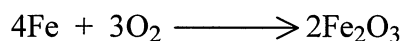
19. The molecular formula of sulfur trioxide is SO_3 .
What is the mass of oxygen present in 20 g of sulfur trioxide?
(Relative atomic mass: S = 32; O = 16)

- A 8 g
- B 12 g
- C 15 g
- D 16 g

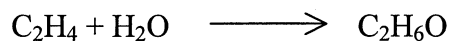
20. The electronic structures of four elements are shown.
Which element is most likely to be a reactive metal which forms an ion of charge +1?



21. What mass of iron oxide, Fe_2O_3 , can be produced from 112 g of iron?
(Relative atomic mass: Fe = 56; O = 16)



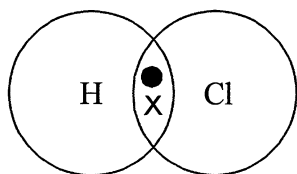
- A 40 g
B 80 g
C 160 g
D 320 g
22. What mass of ethanol is made when 7g of ethene (C_2H_4) is reacted with steam?
(Relative atomic mass: H = 1; C = 12; O = 16)



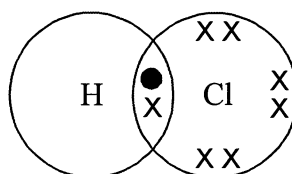
- A 11.5g
B 23.0g
C 27.5g
D 46.0g
23. How is the relative formula mass of lead sulfate, PbSO_4 calculated?
(Relative atomic mass : Pb = 207; S = 32; O = 16)

- A $207 + 32 + (4 \times 16)$
B $(207 + 32 + 16) \times 4$
C $207 + 32 + 16$
D $207 + (4 \times 32) + (4 \times 16)$

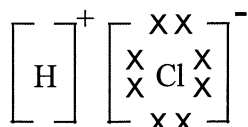
24. A chlorine atom has seven outer electrons (x) and a hydrogen atom has one electron (•).
Which of these diagrams shows all the **outer** electrons in **hydrogen chloride**?



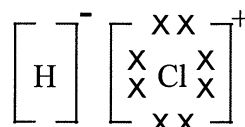
A



B



C



D

END

Answer all the questions, using the Answer grid.

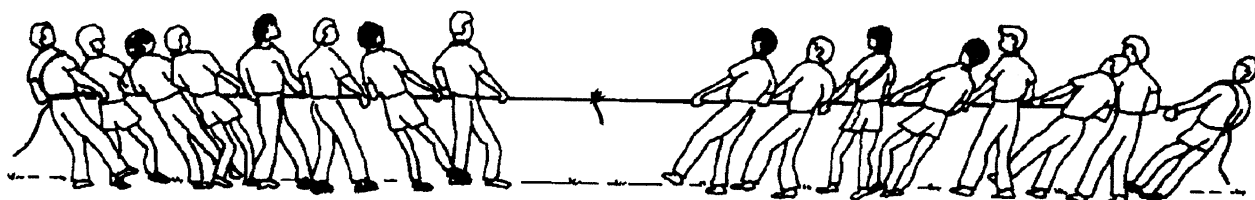
1. An athlete finishes a race. He slows down because

- A all forces are balanced
- B the forces on him are unbalanced
- C all forces are equal
- D no forces are acting

2. Energy is needed to climb stairs. The energy needed is measured in

- A joules
- B newtons
- C seconds
- D watts

3. A tug of war is shown below



Neither team is winning.

The forces acting upon the rope are

- A unbalanced
- B balanced
- C acting to the left only
- D acting to the right only

4. The stopping distance of a car is

thinking distance + braking distance

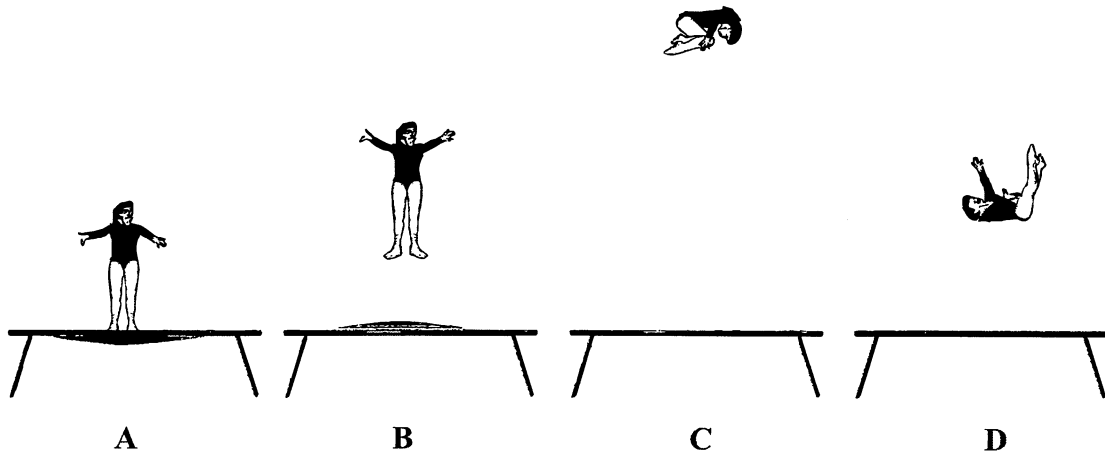
A car driver has a reaction time of 0.2 s. During this time she travels a distance of 10 m. Her braking distance is 100 m. What is the stopping distance, in m, of the car?

- A 10
- B 20
- C 90
- D 110

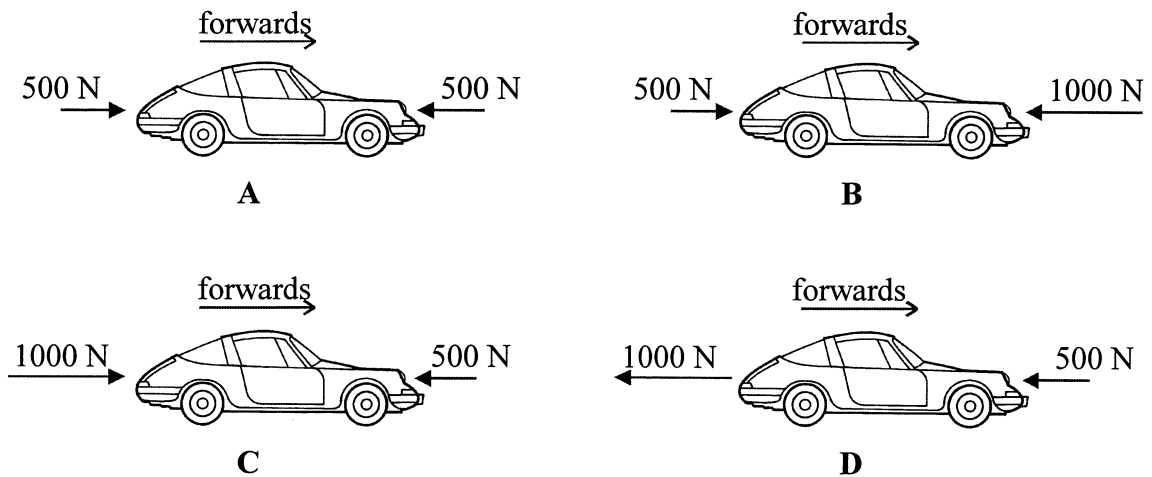
5. A parachutist falls at a steady speed of 3 m/s.
The velocity of the parachutist is
- A 3 N upwards
 - B 3 N downwards
 - C 3 m/s upwards
 - D 3 m/s downwards

6. Kinetic energy is energy due to
- A movement
 - B position
 - C chemicals
 - D temperature

7. Which diagram shows where Jane has most gravitational potential energy?

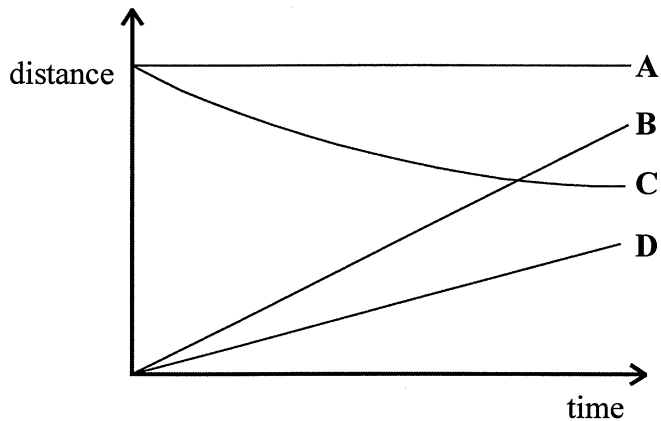


8. The diagrams show the forces acting on a car travelling forwards at 20 m/s.



Which car will increase its speed?

9. Which line on the graph shows the highest speed?



10. Energy transferred is equal to

- A power
- B work done
- C power per second
- D work done per second

11. Which of these is equal to work done?

- A force + distance moved in direction of force
- B force – distance moved in direction of force
- C force \times distance moved in direction of force
- D force \div distance moved in direction of force

- 12.

$$\text{power (W)} = \frac{\text{work done (J)}}{\text{time (s)}}$$

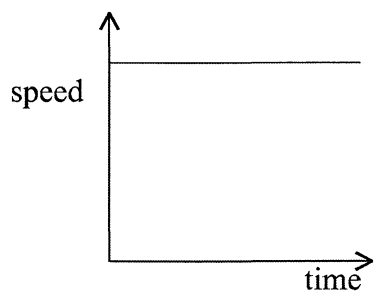
The motor in a ski lift does 200 000 J of work in a time of 5 seconds.
The power of the motor, in watts, is

- A 40 000
- B 400 000
- C 1 000 000
- D 10 000 000

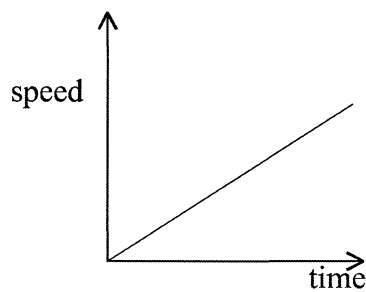
13. A parachutist in free fall reaches his terminal velocity. Which row of the table is correct?

	acceleration of the parachutist	forces on the parachutist
A	between 0 and 10 m/s ² downwards	balanced
B	between 0 and 10 m/s ² downwards	unbalanced
C	zero	balanced
D	zero	unbalanced

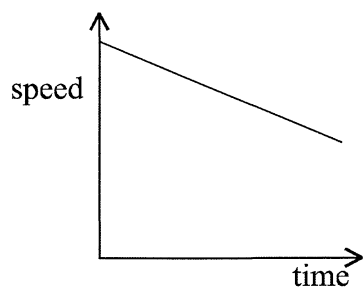
Use these speed time graphs to answer questions 14 and 15.



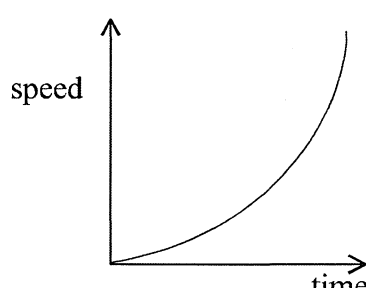
A



B



C



D

14. Which of these graphs shows an athlete running with constant speed?
15. Which of these graphs shows an athlete running with increasing acceleration?
16. A player throws a netball. The acceleration of the ball depends on
- A** only the force applied
 - B** only the mass of the ball
 - C** the force applied and the pressure in the ball
 - D** the force applied and the mass of the ball

17. Seismic waves can be longitudinal (P) or transverse (S).
Which row of the table is correct?

	can travel through the mantle	can travel through the core
A	P	P and S
B	S	P and S
C	P and S	S
D	P and S	P

18. An astronaut standing on the Moon holds a hammer and a feather.
They are both released from the same height at the same time.

Which of these is correct?

- A** The hammer will hit the Moon's surface first
B The feather will hit the Moon's surface first
C They will both float off into space
D They will both hit the Moon's surface at the same time
19. A cyclist and his bicycle have a mass of 120 kg and a velocity of 8 m/s.

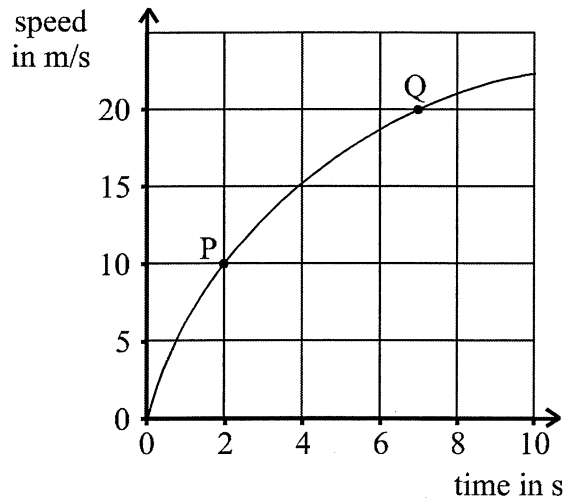
The kinetic energy, in J, is

- A** 480
B 960
C 3840
D 7680
20. A swimmer pushes off from the end of the pool. She accelerates from 0 m/s to 2 m/s in 0.5s.
Her acceleration, in m/s^2 , is

- A** 0.25
B 0.4
C 1
D 4
21. The half-life of technetium-99 is 6 hours.
A freshly prepared sample of technetium-99 has an activity of 300 Bq.
24 hours later, the activity of the sample is likely to be

- A** 0 Bq
B 18 Bq
C 300 Bq
D 2 400 Bq

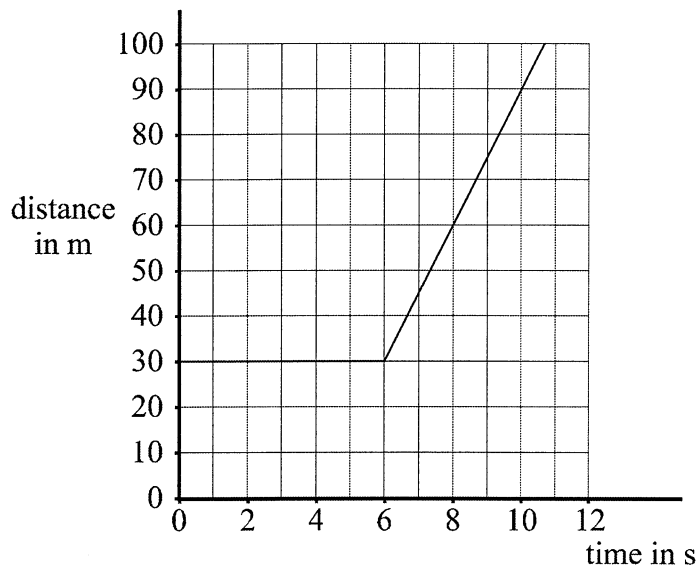
22. Here is the speed-time graph for a skier.



Compared to point P, how much kinetic energy does he have at point Q?

- A four times as much
- B twice as much
- C half as much
- D a quarter as much

23. The diagram shows a distance – time graph for a car.



The average speed, in m/s, of the car between 6 and 10 seconds is

- A 9
- B 15
- C 60
- D 240

24. Here are some statements about the factors which affect the acceleration of a swimmer.

- 1 The acceleration depends upon the force applied by the swimmer
- 2 The acceleration depends upon the mass of the swimmer
- 3 The acceleration depends upon the resistance of the water

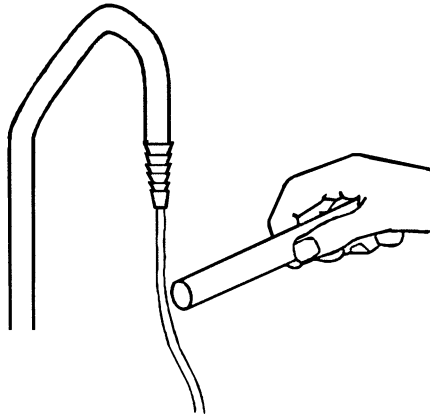
The correct statements are

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

END

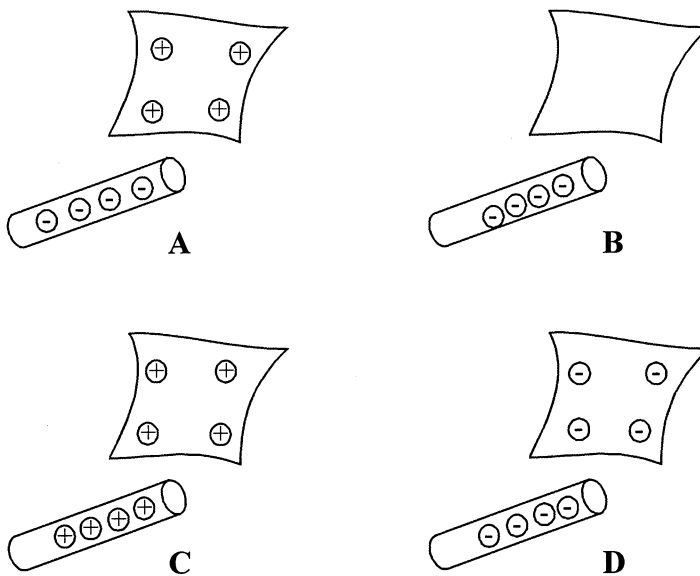
Answer all the questions, using the Answer grid.

1. The diagram shows a stream of water being bent by a charged insulating rod. The rod could be made from

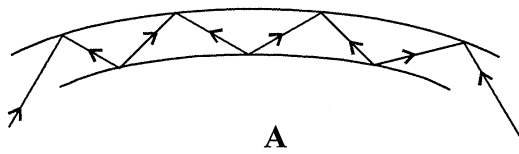


- A iron
- B steel
- C copper
- D plastic

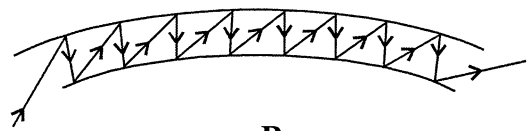
2. A plastic rod is rubbed with a cloth. The plastic rod becomes negatively charged. Which diagram shows the charges on the rod and cloth after rubbing?



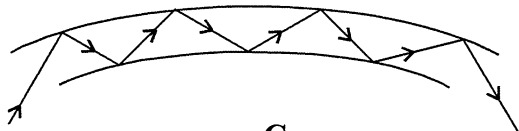
3. Which of these shows the total internal reflection in an optical fibre?



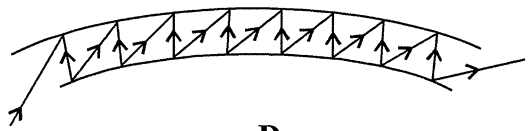
A



B



C

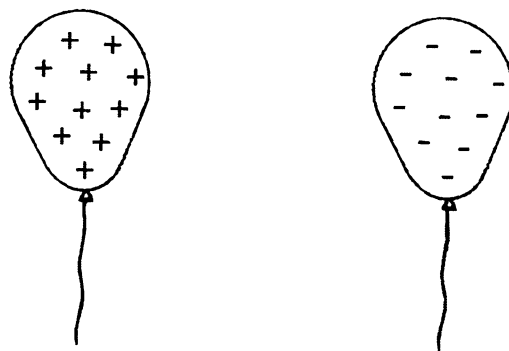


D

4. Sometimes you can get a shock from a car. This is because

- A the battery is charging up
- B the car has become charged
- C the indicator is flashing
- D the lights are switched on

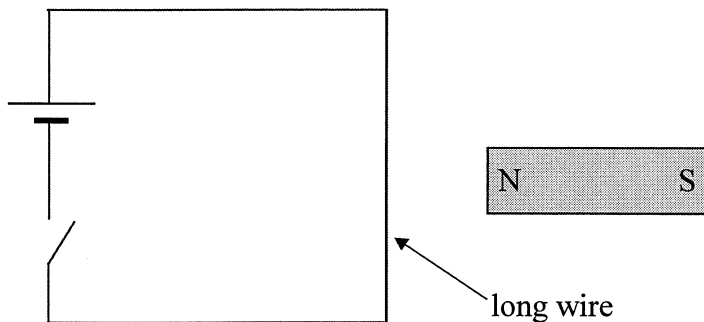
5. A positively charge balloon is brought near to, but not touching, a negatively charged balloon.



The outcome is that

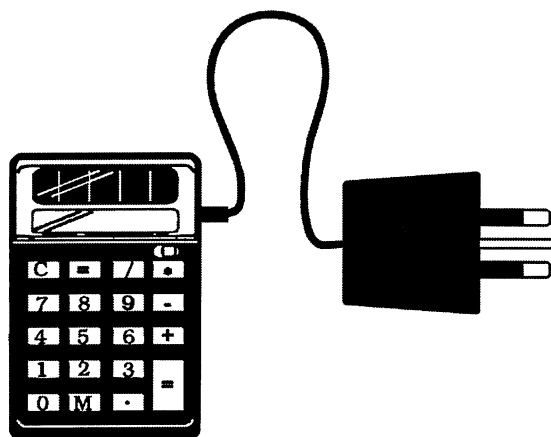
- A both balloons get zero charge and float off
- B each balloon gets a larger plus or minus charge
- C both balloons are attracted to one another
- D both balloons are repelled by one another

6. Alice puts a magnet near a wire as shown.



When she presses the switch, a current passes in the wire.
Which of these also happens?

- A A force acts
 - B The wire becomes shorter
 - C The wire vibrates constantly
 - D The magnet vibrates constantly
7. When total internal reflection takes place at a surface
- A all light passes through the surface
 - B no light passes through the surface
 - C only red light passes through the surface
 - D only blue light passes through the surface
8. A mains adaptor is used to power a calculator.



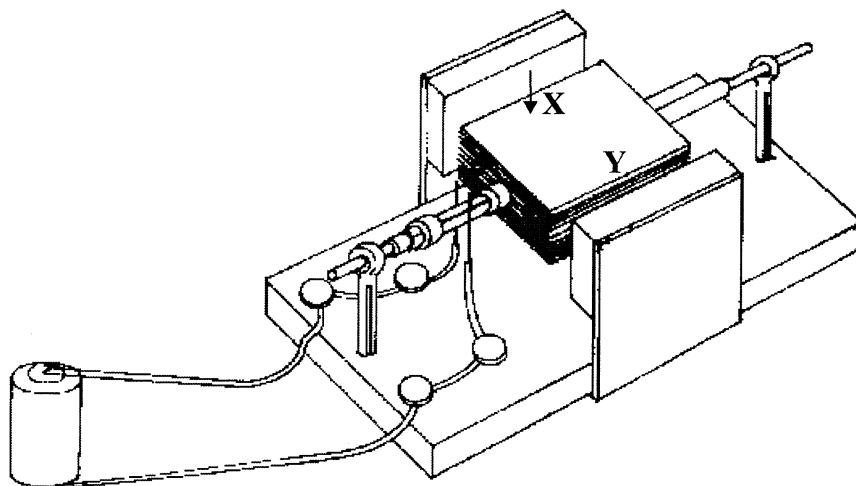
The voltage is changed by

- A an electromagnet
- B a resistor
- C a motor
- D a transformer

STANDARD DEMAND

9. The current in a lamp filament is 3.0 A when the voltage across it is 12 V.
The power of the filament is
- A 4 J
 - B 36 J
 - C 4 W
 - D 36 W
10. A strip of sticky tape is pulled from a roll. This strip is charged with static electricity because
- A the roll of sticky tape acts as a battery
 - B the tape is a conductor
 - C of friction between the roll and the strip
 - D the strip becomes magnetised
11. A transformer can be used to
- A change the size of an alternating voltage
 - B change the size of a direct voltage
 - C change an alternating voltage to a direct voltage
 - D change a direct voltage to an alternating voltage
12. Electricity is transmitted at high voltages because
- A high voltages are safer than low voltages
 - B high voltages allow large currents to be used
 - C less power is wasted when high voltages are used
 - D high voltages are needed for overhead pylons
13. Transformers are used in the transmission of electricity.
At the power station,
- A a step-up transformer increases the current
 - B a step-down transformer increases the current
 - C a step-up transformer increases the voltage
 - D a step-down transformer increases the voltage

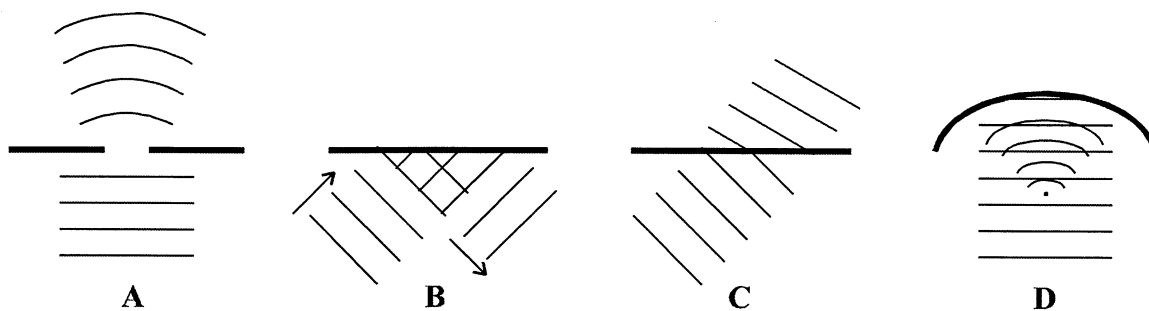
14. The diagram shows the force on side X of the coil in an electric motor.



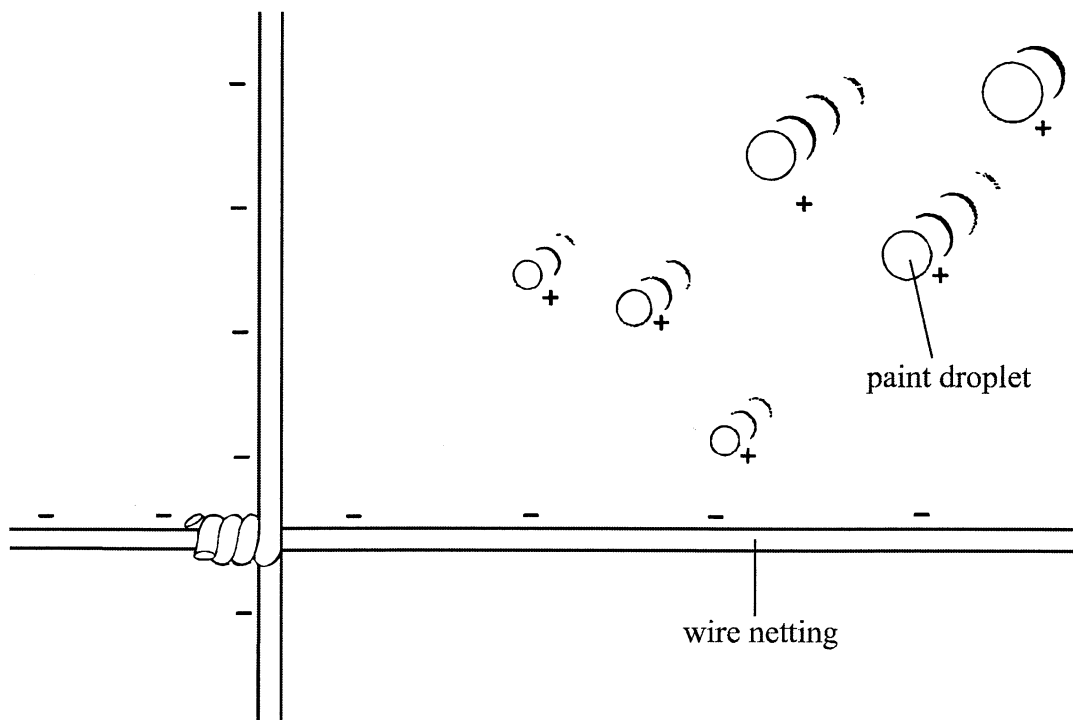
The force on the other side Y of the coil is

- A smaller and in the same direction
- B smaller and in the opposite direction
- C the same size and in the same direction
- D the same size and in the opposite direction

15. Which of these shows diffraction?



16. A farmer is spraying paint on to some wire netting. The paint is given a positive charge and the wire is given a negative charge.



This is so that

- A the farmer will not get a shock
 - B there will be no sparks
 - C the paint will not catch fire
 - D less paint is wasted
- HIGH DEMAND**
17. Which row of the table describes the currents in the coils of a transformer?

	current in primary coil	current in secondary coil
A	a.c.	d.c.
B	a.c.	a.c.
C	d.c.	a.c.
D	d.c.	d.c.

18. In 30 s, 15 C of charge flows through a lamp.
The current, in amps, is
- A 0.5
 - B 2
 - C 15
 - D 450

19. Here are two statements about gases

1. Particles in a gas have random motion
2. The pressure of a fixed mass of gas is proportional to its volume

Which statements are correct?

- A 1 only
- B 2 only
- C both 1 and 2
- D neither 1 nor 2

20. A 2000 W heater works from the 230 V electric mains supply. What is the current, in amps?

- A 230×2000
- B $2000 + 230$
- C $\frac{230}{2000}$
- D $\frac{2000}{230}$

21. When 4 coulombs of charge flow through a lamp, 6 joules of electrical energy are transferred into other forms. The voltage, in V, across the lamp is

- A 0.66
- B 1.5
- C 10
- D 24

22. A flow of electrons in a metal wire

- A causes electrostatics
- B is an electric current
- C is caused by resistance
- D is carried by insulators

23. A positively charged sphere is earthed. This means that

- A positive atoms flow from the sphere to earth
- B positive atoms flow from earth to the sphere
- C electrons flow from earth to the sphere
- D electrons flow from the sphere to earth

24. Here are two statements about diffraction.

- 1 Both sound and light waves show diffraction effects
- 2 Increasing the wavelength **always** increases the extent of diffraction

The correct statements are

- A 1 only
- B 2 only
- C both 1 and 2
- D neither

END

Answer all the questions, using the Answer grid.

1. Penicillin is
 - A a fungus
 - B a disinfectant
 - C an antiseptic
 - D an antibiotic

2. The influenza virus is spread
 - A in air
 - B in food
 - C by contact
 - D by animal vectors

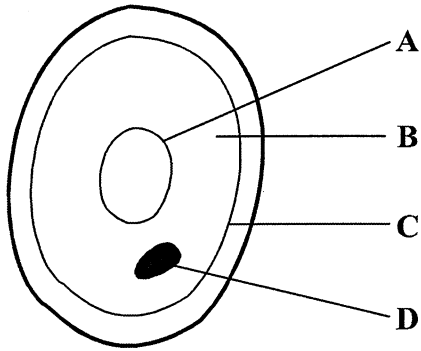
3. Properly cooked chicken meat may still cause food poisoning because the meat contains
 - A protein
 - B antibodies
 - C toxins
 - D blood

4. Antibodies are produced by
 - A red and white blood cells
 - B red blood cells only
 - C all white blood cells
 - D only certain white blood cells

5. A microorganism which causes disease is a
 - A toxin
 - B phagocyte
 - C protozoan
 - D pathogen

6. Fungi reproduce by producing
 - A gametes
 - B spores
 - C plasmids
 - D seeds

7. The diagram shows a yeast cell.



Which part is the cell membrane?

8. Pasteurisation is when food is

- A exposed to X-rays or gamma rays
- B heated to boiling temperature
- C heated to 72 °C for 15 seconds and then rapidly cooled to 10 °C
- D kept at a low temperature for about 4 °C

STANDARD DEMAND

9. Bacteria can double in number every 30 minutes.

Starting with one bacterium, the number that could exist after three hours is

- A 6
- B 8
- C 12
- D 64

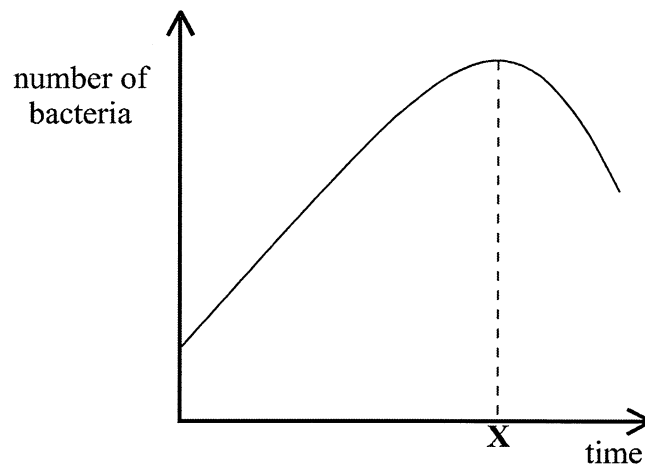
10. Which of the following statements about methods of food preservation is correct?

- A Sterilisation may involve heating food to boiling temperature
- B Irradiation exposes food to light rays
- C Pasteurisation involves heating milk at boiling temperature for several hours
- D Refrigeration uses low temperatures to kill microorganisms

11. The gas produced by sewage treatment which can be used as a fuel is

- A hydrogen sulphide
- B carbon dioxide
- C oxygen
- D methane

12. Bacteria do not form spores when
- A moisture is absent
 - B harmful chemicals are present
 - C the temperature is warm
 - D the pH is unsuitable
13. Which of these may cause intensively reared chickens to be infected with *Salmonella* bacteria?
- A They have plenty of room to move about
 - B They are given specially designed food
 - C They live among accumulated faeces
 - D They are provided with more water than they need
14. The graph shows the change in the numbers of bacteria in a flask containing nutrients, kept at constant temperature.



Which row of the table describes the amounts of nutrients and toxic waste products in the flask at time X?

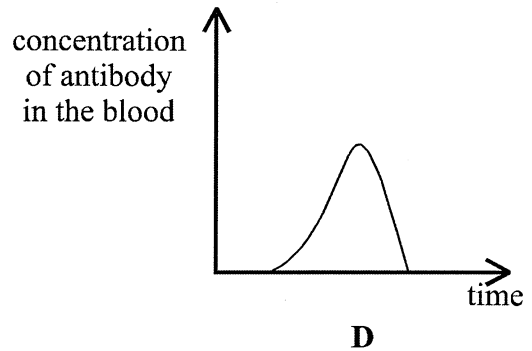
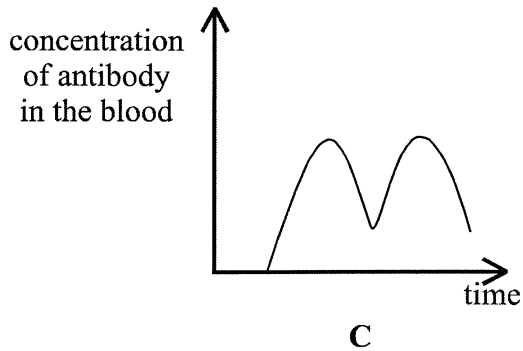
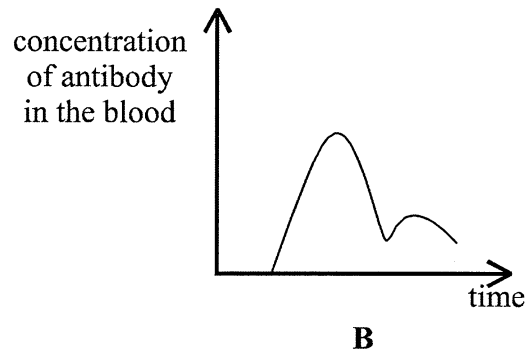
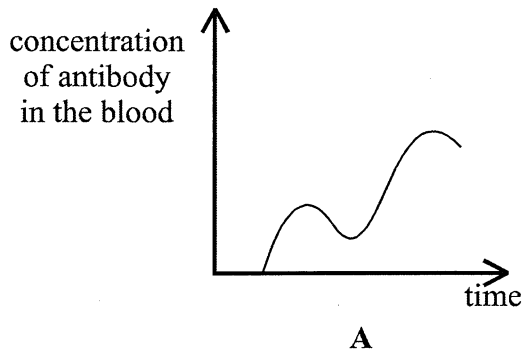
	amount of nutrients	amount of toxic waste products
A	much	little
B	much	much
C	little	little
D	little	much

15. A safe supply of drinking water prevents the spread of
- A athlete's foot
 - B hepatitis B
 - C cholera
 - D malaria

16. Penicillin stops the reproduction of bacteria by preventing the formation of
- A cell wall
 - B more cytoplasm
 - C more nucleic acid
 - D plasmids

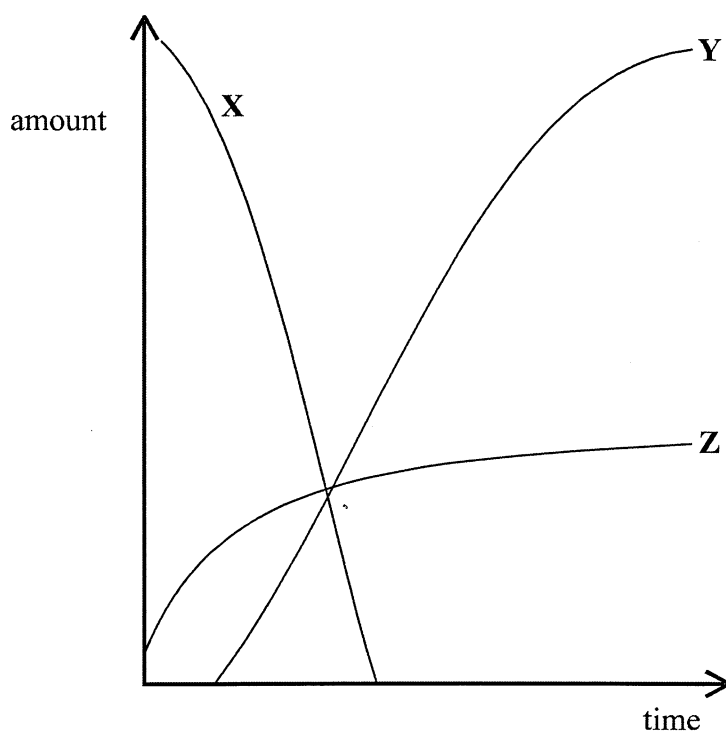
HIGH DEMAND

17. Which graph shows the primary and secondary response to the same antigen?



18. Antibiotics are useful in treating infections caused by the
- A influenza virus
 - B *Salmonella* bacterium
 - C athlete's foot fungus
 - D malarial protozoa

19. The graph shows changes taking place in sugar concentration, penicillin concentration and fungal biomass during the making of penicillin.



Which row of the table shows the correct changes?

	line X	line Y	line Z
A	concentration of sugar	amount of penicillin	amount of fungus
B	amount of penicillin	amount of fungus	concentration of sugar
C	amount of fungus	concentration of sugar	amount of penicillin
D	concentration of sugar	amount of fungus	amount of penicillin

20. Monoclonal antibodies could **not** be used to

- A detect molecules in the urine of pregnant women
- B destroy cancer cells
- C promote a secondary immune response
- D establish links in food chains by detecting molecules in gut extracts

21. Phagocytes help in the body's defence against infection by

- A acting as memory cells
- B producing antibodies
- C recognising antigens
- D digesting microorganisms

22. Which of these does not contribute to the development of antibiotic-resistant strains of bacteria?
- A using antibiotics to treat influenza
 - B using antiseptics on skin wounds
 - C mutations in bacteria
 - D natural selection

23. The list gives statements about the production of monoclonal antibodies.

- 1 B lymphocyte cells are involved
- 2 Hybridoma cells are involved

Which statements are correct?

- A 1 only
- B 2 only
- C both 1 and 2
- D neither 1 nor 2

24. The list gives statements about the replication of viruses.

- 1 Viral DNA is injected into a host cell
- 2 Protein manufacture is controlled by host DNA
- 3 New viruses escape to attack new host cells

Which statements are correct?

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

END

Answer all the questions, using the Answer grid.

1. Which food is not made using yeast?
 - A beer
 - B bread
 - C soy sauce
 - D yoghurt

2. The process of putting semen into the vagina of a cow by using a catheter is called
 - A fertilisation
 - B artificial insemination
 - C cloning
 - D sexual reproduction

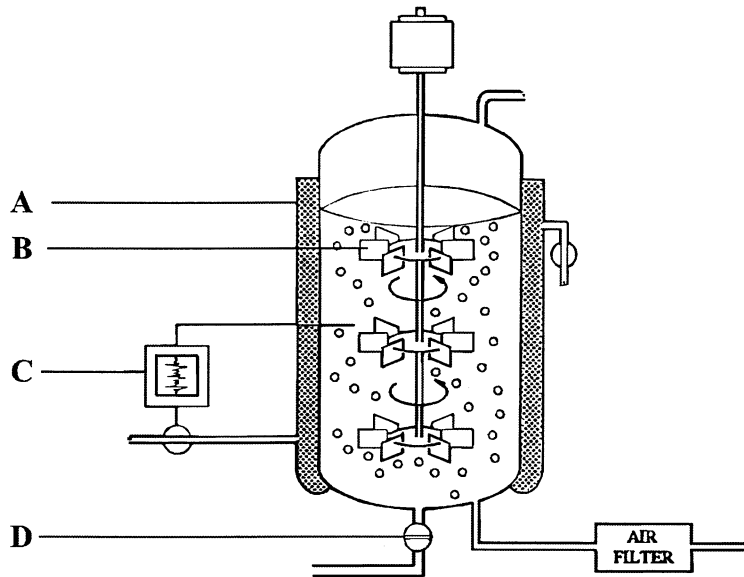
3. Micropropagation involves using nutrient agar to culture
 - A small pieces of a plant
 - B bacteria
 - C human cells
 - D animal embryos

4. To make yoghurt, you add
 - A dead bacteria to milk which has been heated to a high temperature and cooled
 - B dead bacteria to milk which has not been heated to a high temperature
 - C live bacteria to milk which has been heated to a high temperature and cooled
 - D live bacteria to milk which has not been heated to a high temperature

5. The component used in the storage of cattle semen which prevents ice crystals forming during freezing is
 - A egg yolk
 - B liquid nitrogen
 - C glucose
 - D glycerol

6. Soy sauce is made using
 - A a bacterium only
 - B a fungus only
 - C a bacterium and a fungus
 - D neither a bacterium nor a fungus

Use the diagram of a fermenter to answer questions 7, 8 and 9.



7. Which part is used to stir the contents?
8. Which of these substances is produced by fermentation and is used to control a disease?
- A alcohol
 - B insulin
 - C mycoprotein
 - D soy sauce

STANDARD DEMAND

9. Which of these is an aseptic precaution?
- A adding antibiotics to the mixture
 - B bubbling air through the fermenter
 - C keeping the pH of the mixture constant
 - D sterilising the fermenter before use
10. Compared to natural breeding, artificial insemination
- A is more expensive
 - B is less safe to cows
 - C transmits fewer diseases to offspring
 - D produces poorer quality offspring

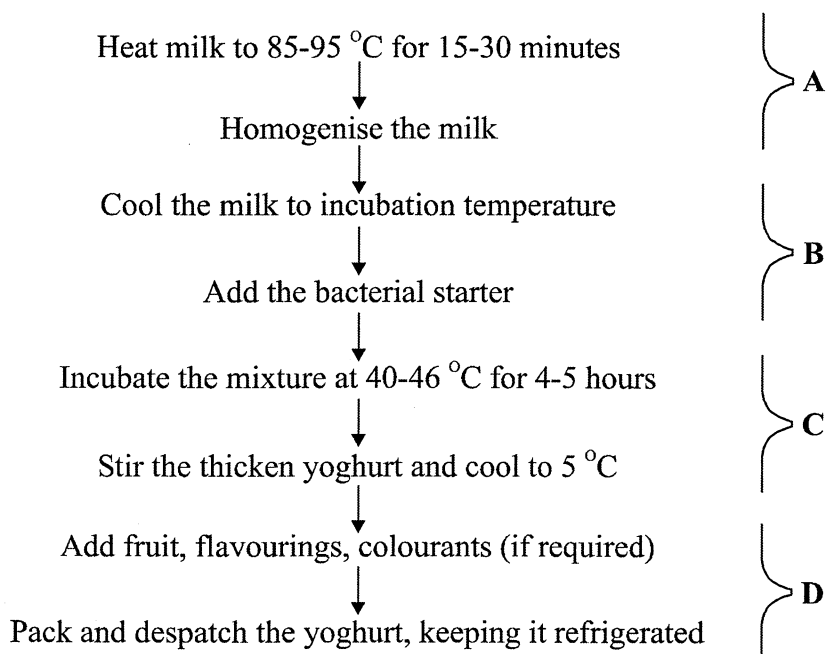
11. The table gives information about two pies of the same size.

	meat pie	mycoprotein pie
energy	1010 kJ	424 kJ
animal fat	19 g	nil
vegetable fat	Nil	4 g
cholesterol	20 mg	nil
protein	18 g	14 g
dietary fibre	Nil	7 g

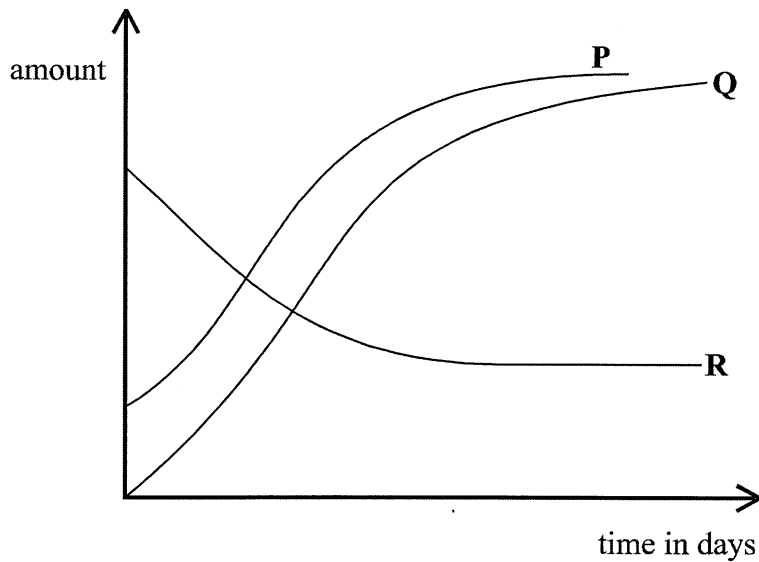
The information suggests that mycoprotein pies are more healthy to eat than meat pies because they

- A are made from fungus
 - B contain less protein
 - C contain less animal fat
 - D taste better
12. Insulin is made up of
- A bases
 - B DNA
 - C RNA
 - D protein
13. Which of these statements about the production of food using microorganisms is **not** true?
- A The microorganisms reproduce rapidly during the process
 - B The process is easy to control
 - C The climate influences the product
 - D The product can be made into a variety of foods

14. The flow diagram represents the production of yoghurt. During which stage would the pH fall?



15. Beer is made in a fermenter using a mixture of malt, hops, water and yeast. The graph shows how the amount of yeast, ethanol and the pH change during the process.



Which row of the table shows the correct changes?

	line P	line Q	line R
A	yeast	ethanol	pH
B	ethanol	pH	yeast
C	pH	yeast	ethanol
D	ethanol	yeast	pH

16. The order of amino acids in a protein is determined by

- A the amino acid order in DNA
- B the amino acid order in RNA
- C the base order in DNA
- D the base order in RNA

HIGH DEMAND

17. An animal that contains a gene from a different species is called

- A a clone
- B transgenic
- C a surrogate
- D resistant

18. Genetically modified crops are different from normal crops because they

- A contain genes from a different species
- B result from natural mutations
- C result from selective breeding
- D are grown on trial plots of land

19. Which of these is **not** an advantage of micropropagation of plants?

The new plants are

- A free from viruses
- B identical to the parent plant
- C produced rapidly
- D resistant to fungal disease

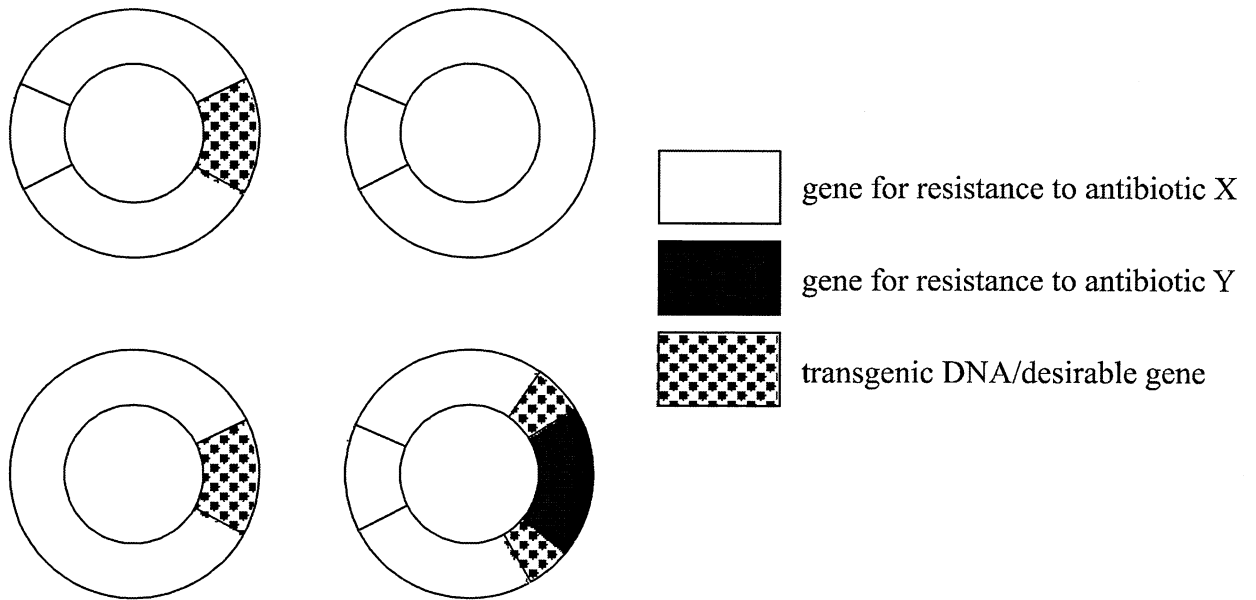
20. The list gives the steps involved in the creation of a genetically modified plant which is resistant to herbicide.

- 1 Transgenic cells cultured
- 2 Cells taken from normal plant
- 3 Herbicide resistance gene for DNA introduced
- 4 Herbicide resistant plants grown

The correct order of steps is

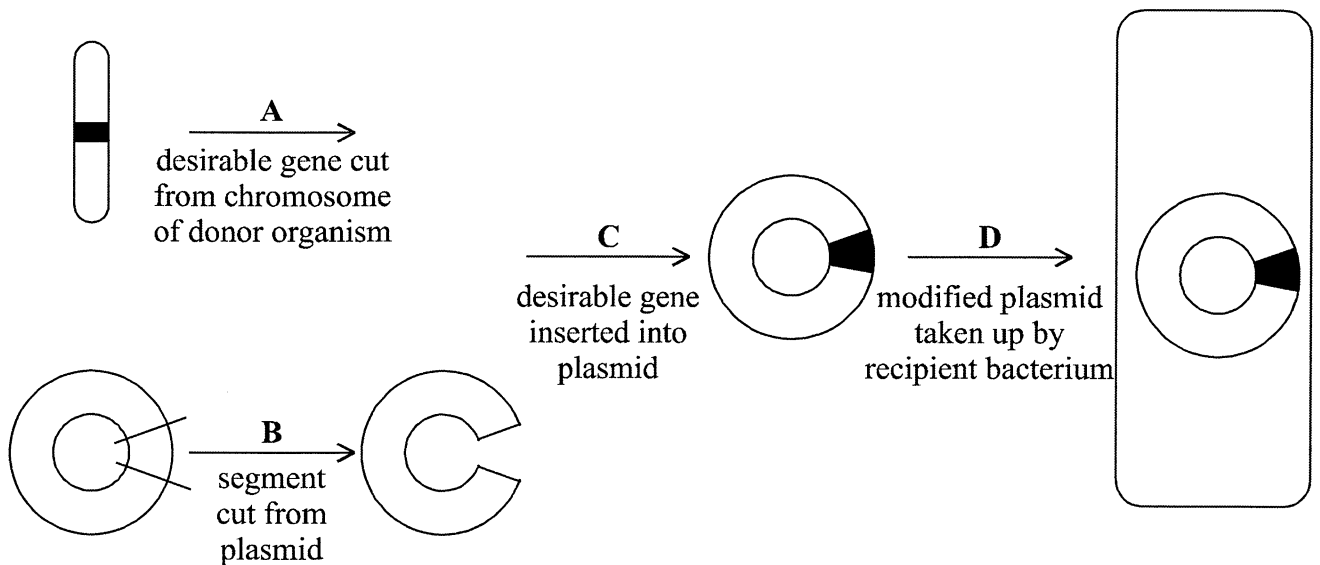
- A 1 → 2 → 3 → 4
- B 2 → 3 → 1 → 4
- C 4 → 2 → 3 → 1
- D 3 → 1 → 4 → 2

21. Four types of bacteria were cultured, each containing a different type of plasmid. The diagrams show the four different types of plasmid.



The number of bacteria types that could grow in a medium containing antibiotic Y is

- A 1
 B 2
 C 3
 D 4
22. The diagram shows stages involved in transferring a gene to a donor to a recipient. At which stage is ligase used?



23. Which of the following is not the result of transgenic work?

- A Sheep secreting human protein in their milk
- B A plant lacking resistance to herbicide
- C A plant capable of fixing nitrogen from the air
- D Pig hearts for use in human transplantation

24. The list shows three items which may be needed to clone a sheep.

- 1 A haploid nucleus from a mature cell
- 2 An enucleated egg cell
- 3 Sperm from a donor

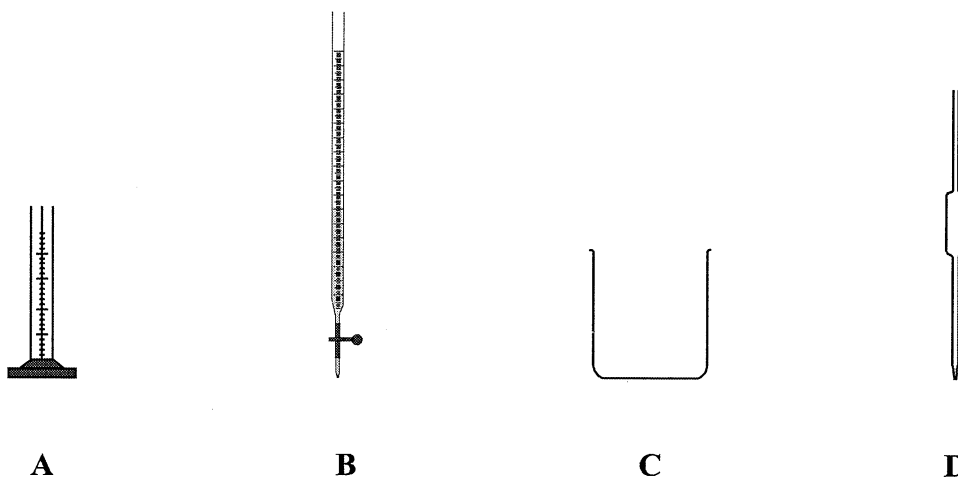
Which of these items are needed?

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

END

Answer all the questions, using the Answer grid.

1. Which diagram shows a burette?



2. Matthew does a flame test on a white solid.
Which of these ions produces a coloured flame?

- A bromide ion
- B chloride ion
- C iodide ion
- D potassium ion

Use the information in the table to answer questions 3 and 4.

soluble compounds	insoluble compounds
all nitrates all sodium salts	lead chloride lead sulfate silver chloride

3. What does soluble mean?

- A dissolves in water
- B made of sodium
- C makes a froth in water
- D neutralises acid

4. Which compound is soluble?

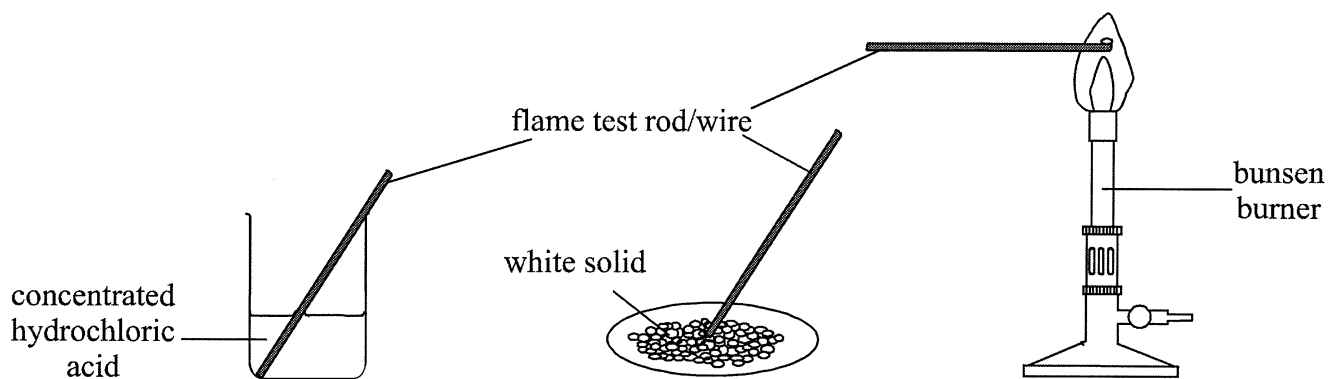
- A lead chloride
- B sodium chloride
- C silver chloride
- D lead sulfate

5. A precipitate is
- A a calcium compound
 - B an insoluble substance
 - C a type of reaction
 - D a type of reagent
6. Copper sulfate solution and sodium carbonate solution react according to the equation.



When the reaction takes place, you see

- A bonds breaking
 - B a solid forming
 - C a gas given off
 - D no visible change
7. What happens when a flame is applied to a test tube of hydrogen?
- A blue smoke
 - B white smoke
 - C squeaky pop
 - D no change
8. A sample of a metal compound is held in a flame.



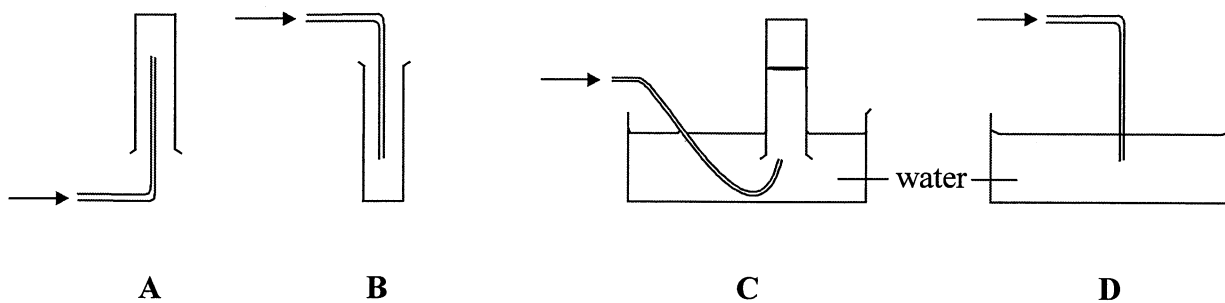
A yellow colour is seen.
What metal ion is present in the compound?

- A calcium
- B iron
- C potassium
- D sodium

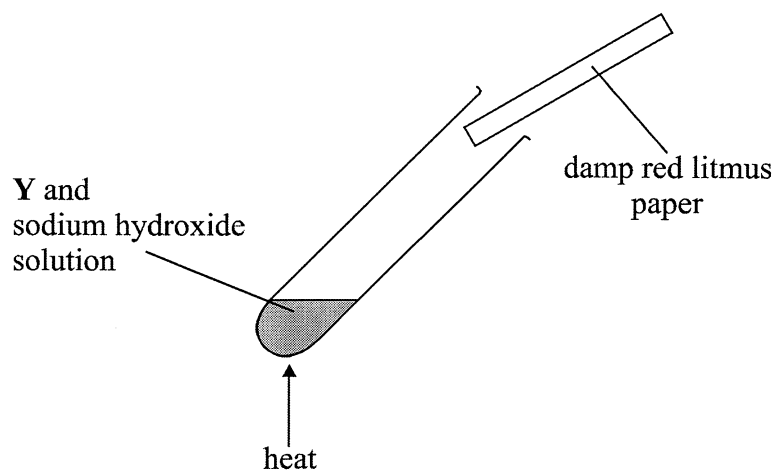
STANDARD DEMAND

9. Calcium sulfate can best be prepared by adding sulfuric acid to
- A calcium carbonate
 - B calcium metal
 - C calcium nitrate solution
 - D calcium oxide powder
10. Which gas turns moist litmus paper red?
- A ammonia
 - B hydrogen
 - C oxygen
 - D sulfur dioxide
11. What type of reaction occurs in the titration of sodium hydroxide solution with dilute hydrochloric acid?
- A combustion
 - B neutralisation
 - C oxidation
 - D reduction
12. Which equation shows the best method of preparation of a pure sample of silver chloride?
- A $2\text{Ag (s)} + 2\text{HCl (aq)} \longrightarrow 2\text{AgCl (s)} + \text{H}_2 \text{(g)}$
 - B $\text{Ag}_2\text{O (s)} + 2\text{HCl (aq)} \longrightarrow 2\text{AgCl (s)} + \text{H}_2\text{O (l)}$
 - C $\text{AgNO}_3 \text{(aq)} + \text{NaCl (aq)} \longrightarrow \text{AgCl (s)} + \text{NaNO}_3 \text{(aq)}$
 - D $\text{Ag}_2\text{SO}_4 \text{(s)} + 2\text{NaCl (aq)} \longrightarrow 2\text{AgCl (s)} + \text{Na}_2\text{SO}_4 \text{(aq)}$
13. A precipitate is formed if sodium hydroxide solution is added to
- A sulfuric acid
 - B sodium chloride solution
 - C iron(II) sulfate solution
 - D nitric acid

14. Ammonia gas is less dense (lighter) than air.
It dissolves in water.
Which diagram shows how it should be collected?



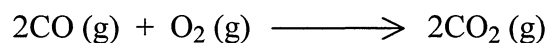
15. A chloride, Y, is heated as shown.



The damp red litmus paper turns blue.
What is Y?

- A ammonium chloride
 - B copper(II) chloride
 - C potassium chloride
 - D sodium chloride
16. Dilute hydrochloric acid **and** barium chloride solution are used to test for
- A carbonate ions
 - B hydrogen ions
 - C hydroxide ions
 - D sulfate ions

17. The equation represents the reaction of carbon monoxide with oxygen.

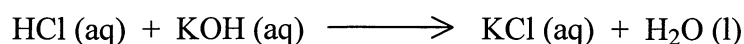


What volume of oxygen, in cm^3 , reacts with 40 cm^3 of carbon monoxide?

- A 10
 B 20
 C 30
 D 40
18. A mixture of nitric acid and copper(II) nitrate leaked into a river.
 What are the results of testing the water with universal indicator and sodium hydroxide solution?

	result of testing river water with	
	universal indicator	sodium hydroxide solution
A	pH 11	orange precipitate
B	pH 11	blue precipitate
C	pH 3	orange precipitate
D	pH 3	blue precipitate

19. Hydrochloric acid neutralises potassium hydroxide solution.

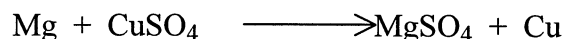


20.0 cm^3 of 0.1 mol dm^{-3} potassium hydroxide (KOH) solution is placed in a conical flask with a suitable indicator.

What volume of 0.2 mol dm^{-3} hydrochloric acid (HCl) is needed for neutralisation?

- A 4 cm^3
 B 10 cm^3
 C 20 cm^3
 D 40 cm^3
20. What is the mass of 1 mole of sodium carbonate, Na_2CO_3 ?
 (Relative atomic masses: C = 12, O = 16, Na = 23)
- A 51 g
 B 95 g
 C 106 g
 D 130 g

21. The equation represents the reaction of magnesium with copper(II) sulfate solution.



What mass of copper is formed when 6 g of magnesium reacts completely?
(Relative atomic masses: Mg = 24; Cu = 64)

- A 4 g
- B 16 g
- C 32 g
- D 384 g

Use the following information to answer questions 22 to 24.

A solution containing iron(II) ions reacts with sodium hydroxide solution.
A green gelatinous solid forms.

22. What type of reaction occurs?

- A decomposition
- B neutralisation
- C oxidation
- D precipitation

23. What is the ionic equation for this reaction?

- A $\text{Fe}^{2+} + \text{NaOH} \longrightarrow \text{NaFeOH}$
- B $\text{Fe}^{2+} + \text{OH}^- \longrightarrow \text{FeOH}$
- C $\text{Fe}^{2+} + 2\text{OH}^- \longrightarrow \text{Fe}(\text{OH})_2$
- D $\text{Fe}^{3+} + 3\text{OH}^- \longrightarrow \text{Fe}(\text{OH})_3$

24. What is seen if a solution containing iron(III) ions is mixed with sodium hydroxide solution?

- A green gelatinous solid
- B red-brown gelatinous solid
- C fizzing
- D no visible change

END

Answer all the questions, using the Answer grid.

- Alloys are mixtures of
 - compounds
 - gases
 - liquids
 - metals

- Ethanoic acid will react with an alkali to form
 - an alcohol
 - a base
 - an element
 - a salt

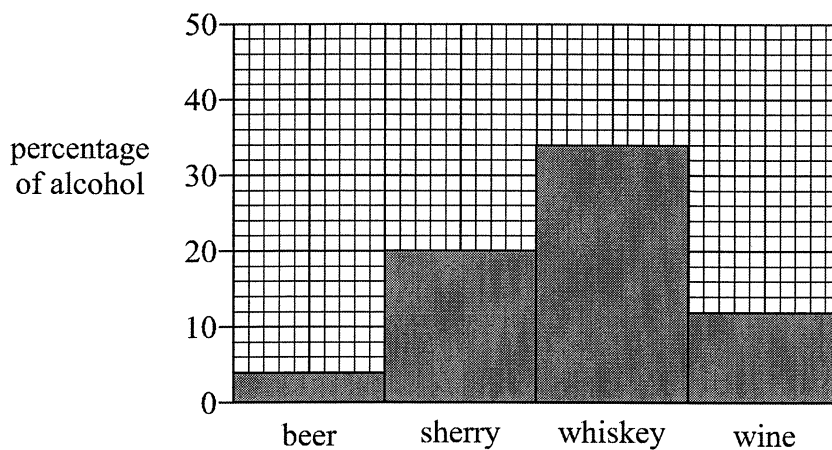
- Vinegar contains the compound
 - ethanoic acid
 - ethanol
 - ethyl ethanoate
 - methanol

- Propanol can be separated from a water and propanol mixture by
 - evaporation
 - fermentation
 - filtration
 - fractional distillation

- Ethanoic acid solution has a pH of
 - 1
 - 3
 - 9
 - 14

- The formula of ethanol is C_2H_5OH .
How many hydrogen atoms are there in a molecule of ethanol?
 - 1
 - 2
 - 5
 - 6

7. The bar chart below shows the percentage of alcohol present in four different drinks.



Which drink contains the highest percentage of alcohol?

- A beer
 - B sherry
 - C whiskey
 - D wine
8. What must be added to sugar solution for fermentation to take place?

- A salt
- B vinegar
- C water
- D yeast

STANDARD DEMAND

9. Methylated spirit is a mixture of

- A ethanol + methanol
- B ethanol + water
- C methanol + ethanol
- D methanol + water

10. Iron from the blast furnace is not very useful because

- A it is pure
- B its carbon content is too high
- C its carbon content is too low
- D it has a high carbon content, and other impurities

11. Which of the following industrial processes does **not** use sulfuric acid?
- A making detergents from oil
 - B making fertilisers from ammonia
 - C making synthetic fibres
 - D making oxygen from air
12. Ethanoic acid can be formed by the action of air on ethanol. This reaction is an example of
- A combustion
 - B fermentation
 - C neutralisation
 - D oxidation
13. An important use of ethanol is
- A as a fuel
 - B for making bread rise
 - C for making plastics
 - D for neutralising acids
14. Which of the following is **not** a harmful effect of ethanol in alcoholic drinks?
- A causes damage to lungs
 - B causes damage to liver
 - C causes long-term addiction
 - D in large concentrations, can cause death
15. What is formed when ethanol reacts with ethanoic acid?
- A vinegar
 - B carbohydrate
 - C ethyl ethanoate
 - D methylated spirits
16. Three reactions which are used in the manufacture of sulfuric acid are shown below.
- | | | | |
|---|-------------------------|--------|-------------------|
| 1 | sulfur trioxide + water | —————> | sulfuric acid |
| 2 | sulfur + oxygen | —————> | sulfuric dioxide |
| 3 | sulfur dioxide + oxygen | —————> | sulfuric trioxide |
- In which order are the reactions carried out?
- A 1, 2, 3
 - B 2, 3, 1
 - C 3, 1, 2
 - D 2, 1, 3

16. Which formula represents an acid?

- A C_3H_8
- B C_3H_7OH
- C $C_3H_7CO_2H$
- D C_3H_6

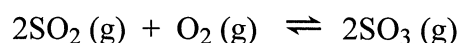
18. Which row of the table shows the correct boiling points of ethanol, methanol and propanol?

	boiling point in °C		
	ethanol	methanol	propanol
A	64	78	97
B	78	97	64
C	97	64	78
D	78	64	97

19. Which of these describes the anodising of a piece of aluminium?

- | | aluminium connected to | electrolyte |
|----------|------------------------|--------------------------|
| A | positive electrode | dilute sulfuric acid |
| B | negative electrode | dilute sulfuric acid |
| C | positive electrode | dilute hydrochloric acid |
| D | negative electrode | dilute hydrochloric acid |

20. Sulfur dioxide is converted into sulfur trioxide by the following reaction.



The forward reaction is exothermic.

The highest yield of sulfur trioxide is obtained at

- | | pressure | temperature |
|----------|----------|-------------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

21. What is the main reducing agent in a blast furnace?

- A carbon
- B carbon monoxide
- C calcium carbonate
- D calcium oxide

Answer all the questions, using the Answer grid.

1. A geostationary satellite orbits the Earth once every
 - A day
 - B week
 - C month
 - D year

2. Which transducer produces sound from an electrical signal?
 - A microphone
 - B loudspeaker
 - C record head
 - D erase head

Use this information about radio waves to answer questions 3 and 4.

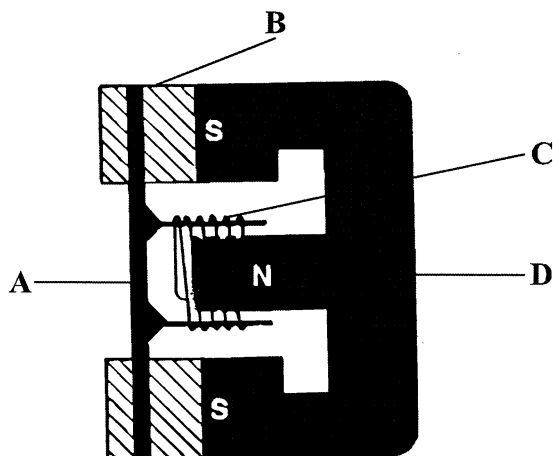
wave band	modulation	range
long	amplitude	hundreds of km
medium	amplitude	50 km
VHF	frequency	50 km

3. Which statement about the modulation of the waves is correct?
 - A long waves use frequency modulation
 - B medium waves use frequency modulation
 - C VHF waves use frequency modulation
 - D VHF waves use amplitude modulation

4. Which statement about the range of waves is correct?
 - A long waves have the greatest range
 - B medium waves have the greatest range
 - C medium waves have the shortest range
 - D VHF waves have the greatest range

5. John speaks to Anne. In this communication, his mouth is the
 - A decoder
 - B encoder
 - C transmitter
 - D receiver

6. The diagram shows a loudspeaker.



Which label shows the diaphragm?

7. Information can be sent along an optical fibre using

- A light
- B radio waves
- C sound
- D X-rays

8. The carrier waves for an optical fibre system could be produced by a

- A photodiode
- B light dependent resistor
- C light emitting diode
- D radio transmitter

STANDARD DEMAND

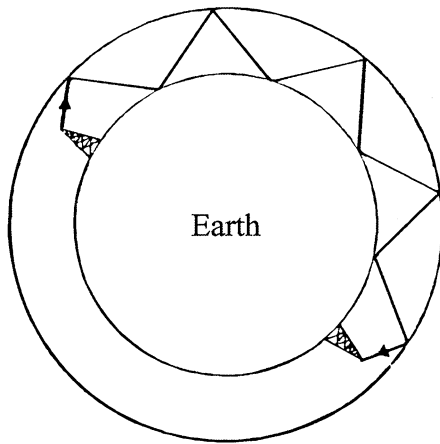
9. Noise is

- A a large amplitude radio wave signal
- B a frequency modulated carrier wave signal
- C any random electrical energy added to a signal
- D any carrier wave which enters a loudspeaker

10. A sound wave has a frequency of 250 Hz and a speed of 300 m/s.
The wavelength of the wave is

- A 1.2 m
- B 50 m
- C 550 m
- D 75 000 m

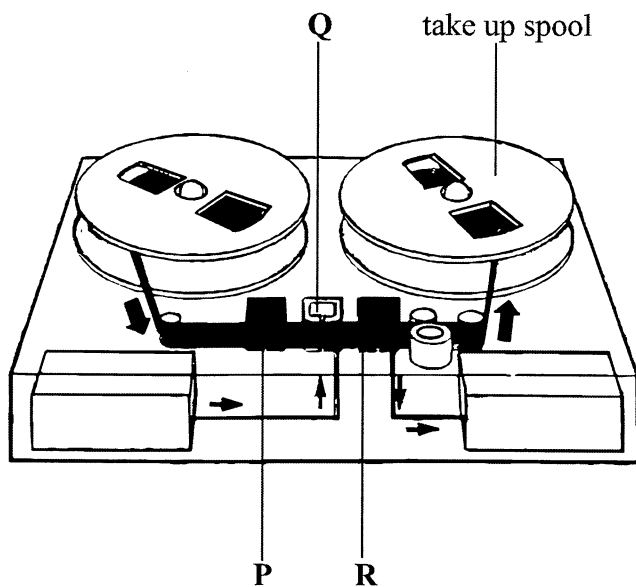
11. Some radio waves can be transmitted as shown.



These waves are

- A reflected at the ionosphere
- B refracted at the outside edge of the atmosphere
- C reflected from a series of satellites
- D diffracted by the atmosphere

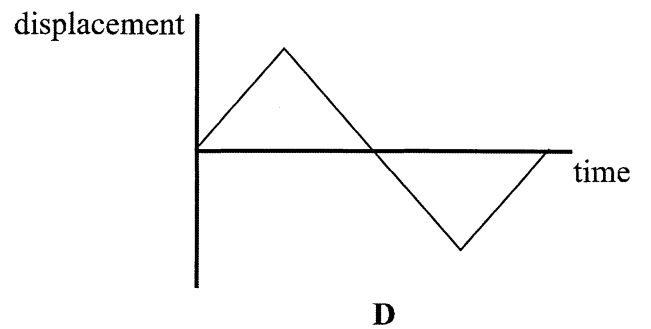
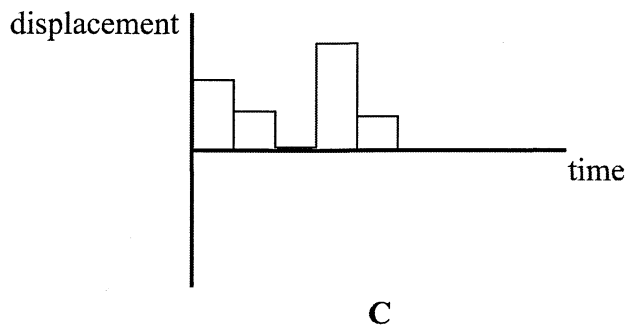
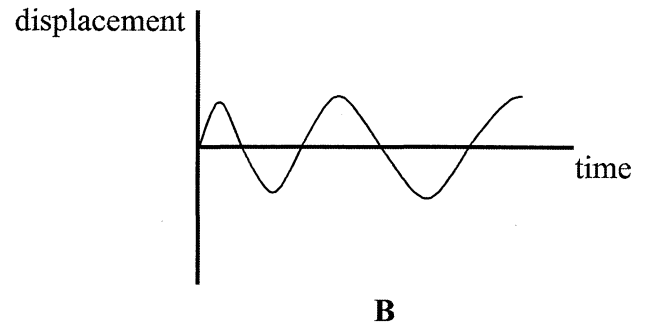
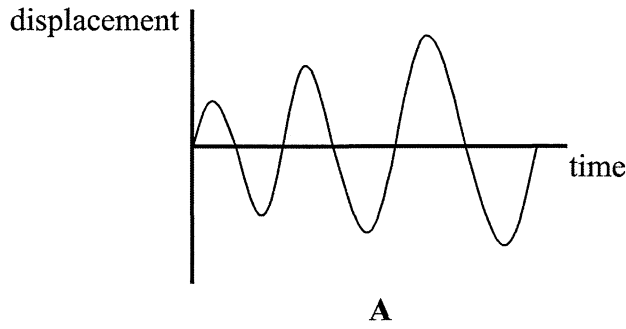
12. The diagram shows the three heads on a video recorder/player.



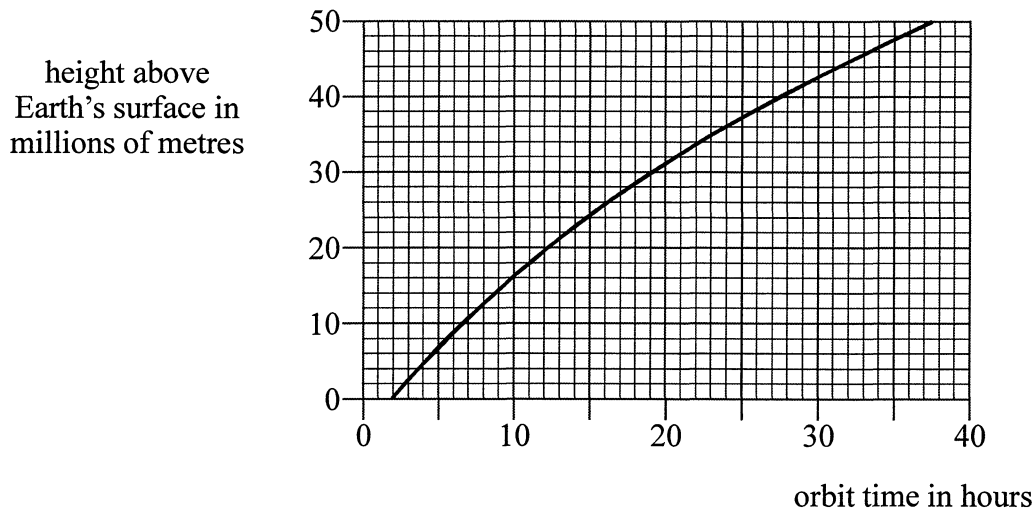
Which row of the table shows the correct order of the heads?

	P	Q	R
A	erase	record	play
B	play	record	erase
C	record	play	erase
D	record	erase	play

13. Which diagram shows an amplitude-modulated wave?



14. The graph shows how the orbit of an artificial satellite depends on its height above the Earth's surface.



A geostationary satellite orbits at a height of

- A** 20 million metres
- B** 24 million metres
- C** 33 million metres
- D** 36 million metres

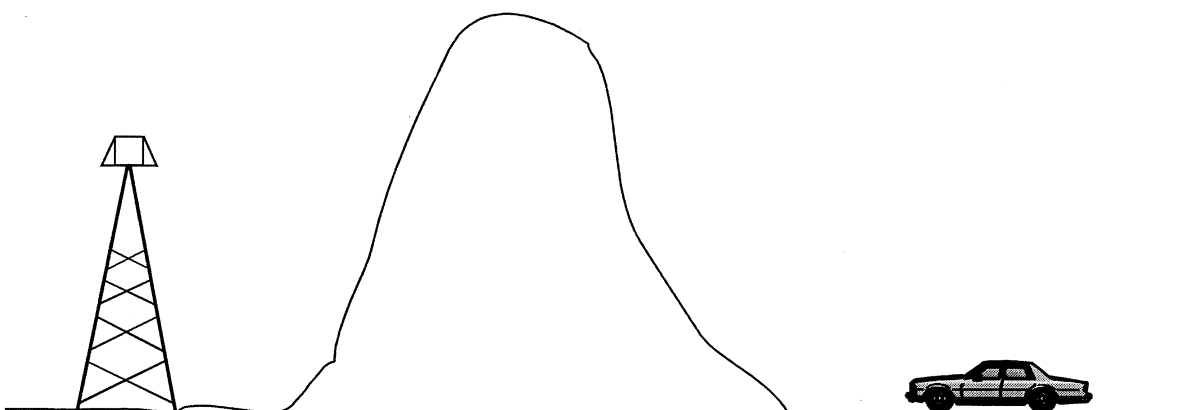
15. The diagram shows a digital signal before and after noise has been removed.



This process is called

- A attenuation
- B modulation
- C regeneration
- D repetition

16. A motorist receives a faint signal from a long-wave radio transmitter even when its direct path is blocked by a large hill.



A faint signal is most likely due to

- A diffraction
- B refraction
- C electromagnetism
- D interference

HIGH DEMAND

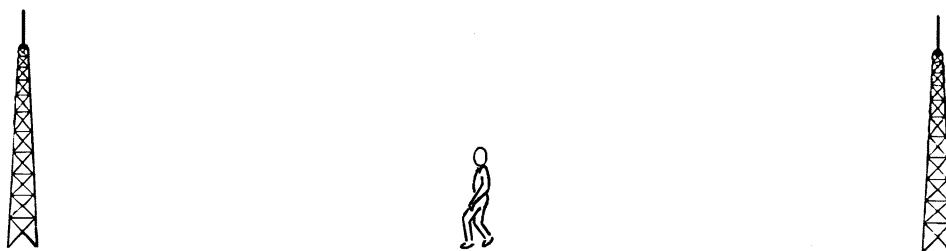
17. Which is a correct description of radio waves?

- A longitudinal electromagnetic waves
- B transverse electromagnetic waves
- C longitudinal compression waves
- D transverse compression waves

18. For a satellite to remain in a circular orbit, the centripetal force is
- A zero
 - B less than the pull of the Earth
 - C equal to the pull of the Earth
 - D more than the pull of the Earth

19. The effect of attenuation on a radio signal is to
- A make the signal stronger
 - B make the signal weaker
 - C add noise to the signal
 - D remove noise from the signal

20. Two radio transmitters broadcast identical signals.



A person walking between the transmitters notices that the signal strength rises and falls. This is due to

- A diffraction
 - B interference
 - C reflection
 - D refraction
21. Which row of the table shows the relationship between carrier wave and signal frequencies for a transmitted radio wave signal?

	carrier wave	Signal wave
A	300 kHz	300 kHz
B	300 kHz	20 kHz
C	20 kHz	300 kHz
D	20 kHz	20 kHz

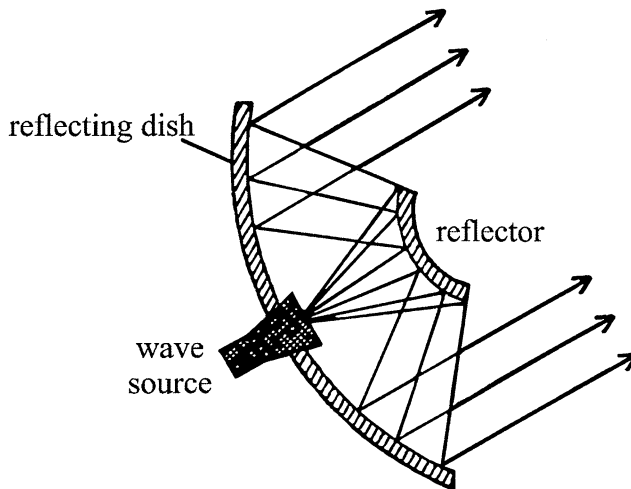
22.

$$F = \frac{mv^2}{r}$$

A satellite of mass 50 kg, orbits Earth at a constant speed of 6.4×10^3 m/s. Its orbit has a radius of 9.7×10^6 m. The force on the satellite, in N, is approximately

- A 0.033
- B 11.8
- C 210
- D 75 800

23 The diagram shows a dish aerial used to transmit waves to a satellite.



Which combination of dish diameter and wavelength of radio waves would result in the least amount of diffraction taking place?

	dish diameter	wavelength
A	3 mm	3 m
B	3 cm	30 cm
C	30 cm	3 cm
D	3 m	3 mm

24. Here are two statements about radio waves.

- 1 Radio waves can be totally internally reflected in the Earth's atmosphere
- 2 Interference can occur between the transmissions from two radio stations

The correct statements are

- A 1 only
- B 2 only
- C both 1 and 2
- D neither 1 nor 2

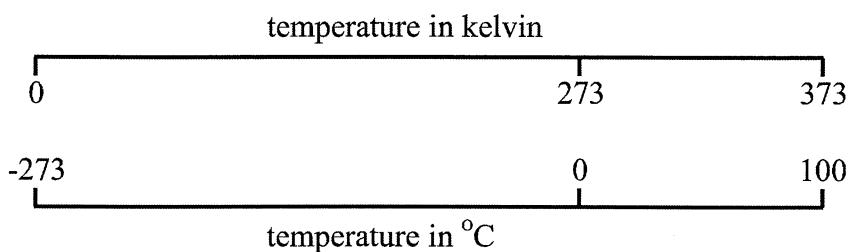
END

Answer all the questions, using the Answer grid.

1. Increasing the temperature of a gas causes the particles to

- A stop moving
- B increase in speed
- C move in an orderly way
- D move less randomly

2. The diagram shows the relationship between the kelvin and Celsius temperature scales.



Ice melts at 0 °C. The equivalent temperature, in kelvin, is

- A -273
- B 0
- C 273
- D 373

3. The absolute zero of temperature is

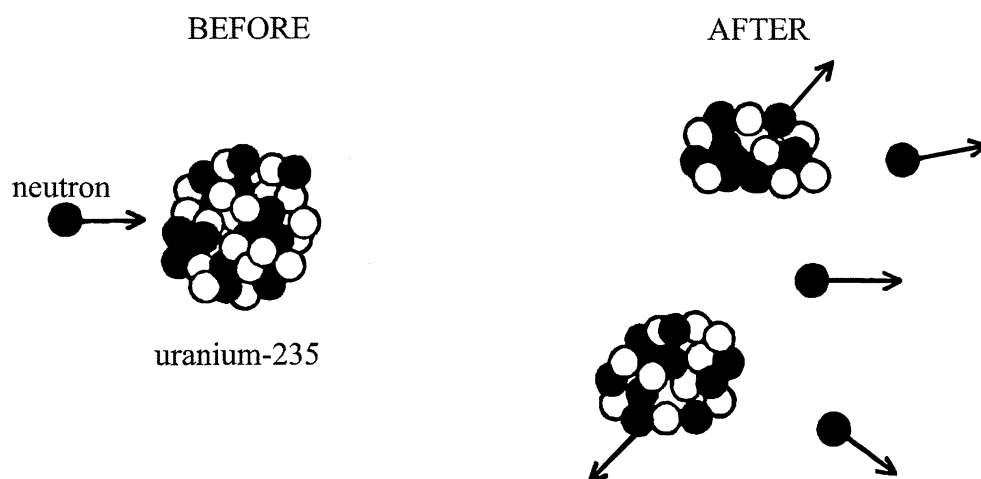
- A 0 °C
- B 0 K
- C 273 °C
- D 373 K

4. When an unstable atom decays by β^- decay it emits

- A a proton from the nucleus
- B a neutron from the nucleus
- C an electron from the nucleus
- D an electron from an electron shell

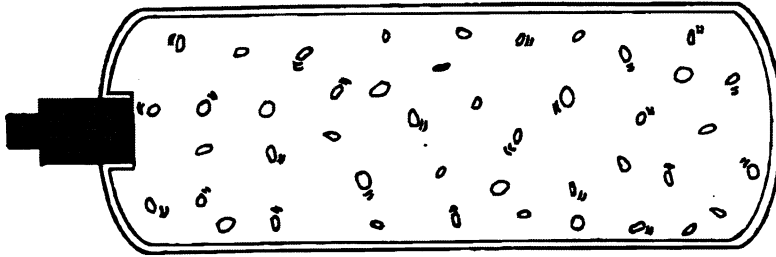
5. Electron beams are used in
- A calculators
 - B video recorders
 - C radios
 - D televisions

Use the following diagrams illustrating fission of uranium-235 to answer questions 6 and 7.



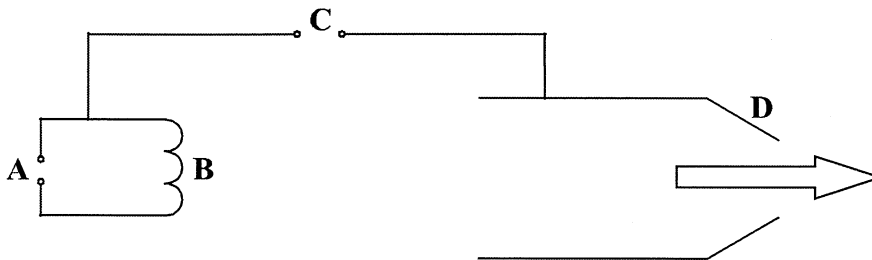
6. In nuclear fission
- A two small nuclei combined to become a large nucleus
 - B a large nucleus is split into two smaller nuclei
 - C neutrons are changed into protons
 - D protons are changed into neutrons
7. Nuclear fission releases energy in the form of
- A light
 - B sound
 - C kinetic energy
 - D gravitational potential energy
8. Which of these is a fundamental particle?
- A an atom
 - B an electron
 - C a proton
 - D a neutron

9. The diagram represents the particles in a cylinder of carbon dioxide.



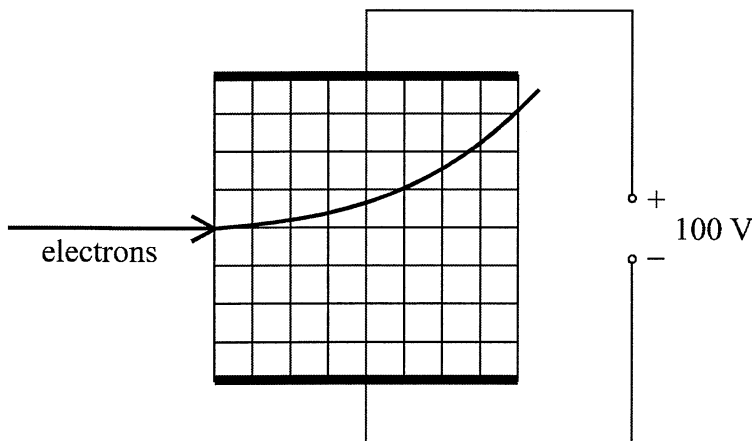
The particles exert pressure on the walls of the container due to

- A expansion of the particles when they collide with the container walls
 - B expansion of the particles when they collide with other particles
 - C collisions between the particles and the container walls
 - D collisions between the particles and other particles
10. The diagram represents an electron gun.



Which letter represents the accelerating anode?

11. The diagram shows an electron beam being deflected as it passes between two metal plates.



The deflection of the beam can be reversed by

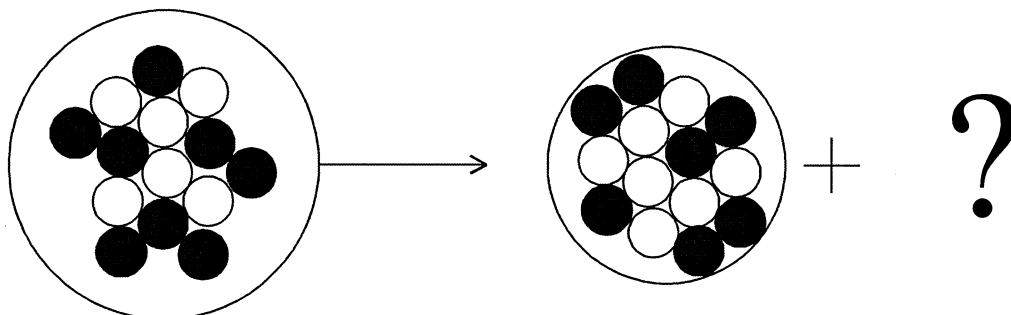
- A doubling the voltage between the plates
- B halving the voltage between the plates
- C removing the voltage between the plates
- D reversing the voltage between the plates

Use the diagram representing the decay of a nucleus of $^{14}_6\text{C}$ to answer questions 12 and 13.

key

○ proton

● neutron

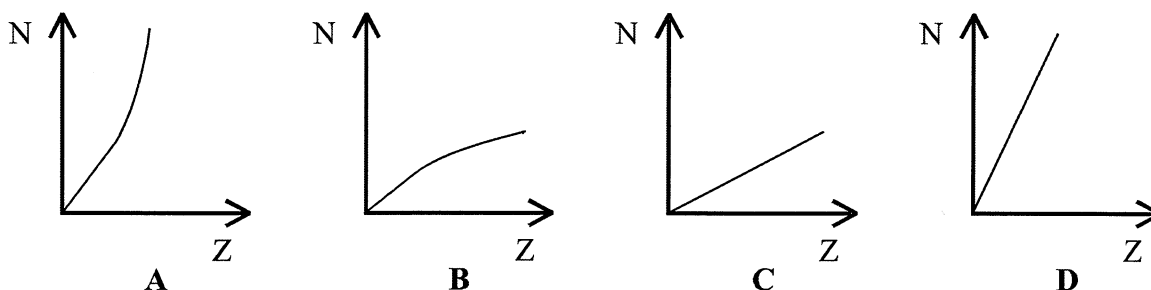


12. In this decay,
- A the number of neutrons increases by one and the number of protons decreases by one
 - B the number of neutrons stays the same and the number of protons increases by one
 - C the number of neutrons increases by one and the number of protons stays the same
 - D the number of neutrons decreases by one and the number of protons increases by one

13. The particle represented by ? on the right hand side of the diagram is

- A an electron
- B a neutron
- C a proton
- D an X-ray

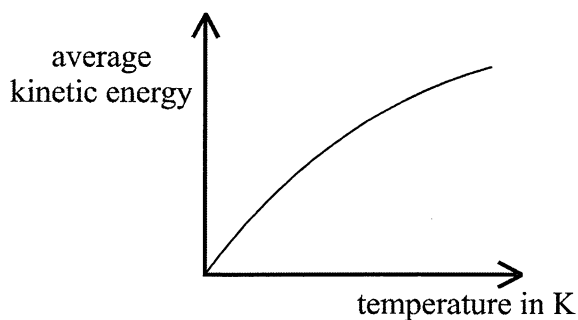
14. Which of these graphs shows the relationship between the numbers of neutrons (N) and protons (Z) for stable nuclei?



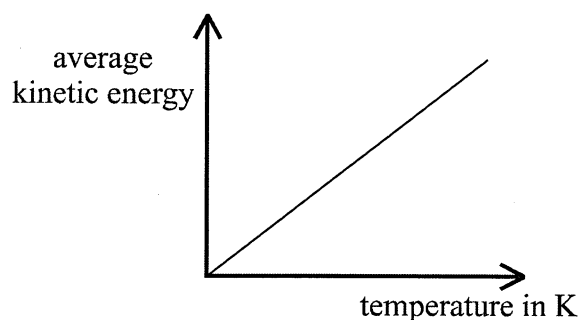
15. Some nuclear reactors are old and have been shut down. This does not solve the problem because

- A they may still explode
- B alpha and beta particles will continue to escape
- C the reactor materials will be radioactive for a long time
- D the local population will receive a large dose of radiation

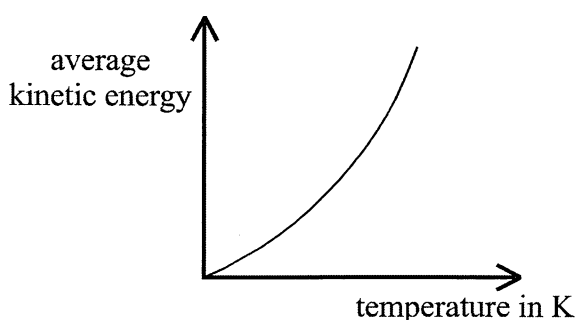
16. Which of these graphs shows how the average kinetic energy of gas particles varies with their temperature, in K?



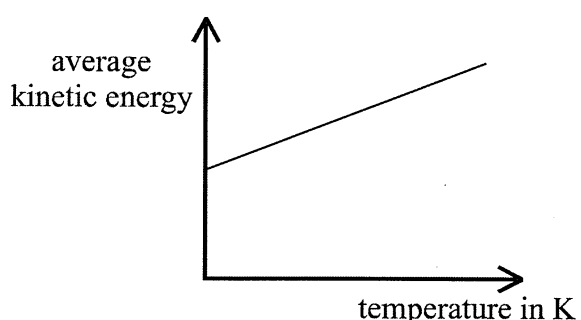
A



B



C



D

HIGH DEMAND

17. Which row of the table gives the correct description of a positron?

	mass	charge
A	same as a proton	+1
B	same as a proton	+2
C	same as an electron	+1
D	same as an electron	+2

18. When alpha particles are fired at thin gold foil, most pass through undeviated. This shows that

- A the charge of a gold atom is evenly distributed
- B the charge of a gold atom is concentrated in the middle
- C the mass of the gold atom is evenly distributed
- D most of the gold atom is empty space

19. Which row of the table shows the effect of β^+ decay on the atomic and mass numbers of a nucleus?

	effect on atomic number	effect on mass number
A	increases by one	unchanged
B	decreases by one	unchanged
C	unchanged	increases by one
D	unchanged	decreases by one

20. Quarks are found in

- A** protons and electrons
- B** protons and neutrons
- C** electrons and neutrons
- D** electrons, protons and neutrons

- 21.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

The pressure of a gas in a sealed container is 1.24×10^5 Pa when the temperature is 30°C .
The temperature of gas is increased to 60°C .
The new pressure is

- A** 0.62×10^5 Pa
- B** 1.13×10^5 Pa
- C** 1.36×10^5 Pa
- D** 2.48×10^5 Pa

- 22.

$$KE = e \times V$$

charge on an electron = 1.6×10^{-19} C

An electron is accelerated by a voltage of 200 V.
How much kinetic energy, in J, does it gain?

- A** 8.0×10^{-22}
- B** 3.2×10^{-21}
- C** 3.2×10^{-17}
- D** 8.0×10^{-16}

23. Here are two statements about electrons.

- 1 Electrons contain two quarks
- 2 A beam of electrons makes an electric current

Which statements are correct?

- A 1 only
- B 2 only
- C both 1 and 2
- D neither 1 nor 2

24. Here are two statements about the deflection of alpha particles by gold nuclei.

- 1 The maximum angle for deflection of alpha particles is 90°
- 2 The higher the speed of the alpha particles the greater the amount of deflection, provided everything else is constant

Which statements are correct?

- A 1 only
- B 2 only
- C both 1 and 2
- D neither 1 nor 2

END