Name:		Form Class	Index	( No	Tead	ching	Grou	д	
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<b>SCIENCE (</b> Paper 1 Mu	PHYSICS, ( Iltiple Choice	CHEMIS e	STRY) 5086/01			2	8 Au	ıg 2( 1 ho	)24 our
Additional Mate	erials:	Multiple (	Choice Answer Sheet	ſ	MARKS			/4	10

## READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluids.

Write your Name, Form Class, Index Number and Teaching Group on the Question Paper and Answer Sheet in the spaces provided.

There are forty questions on this paper. Answer all questions. For each question there are four possible answers A, B, C and D.

Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

#### Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 15. A copy of the Periodic Table is printed on page 16.

The use of an approved scientific calculator is expected, where appropriate.

This paper consists of **16** printed pages, including this cover page.

[Turn over

- **1** Which quantity is a base quantity?
  - A speed
  - B energy
  - **C** force
  - D temperature
- 2 Which pair consists of two vector quantities?
  - A acceleration and weight
  - **B** density and velocity
  - **C** energy and force
  - **D** pressure and work done
- **3** A car takes 60 minutes to travel 100 km along a main road and then 30 minutes to travel 20 km along a side road.

	main road 100 km 60 minutes						
S	art						side road 20 km 30 minutes
Wh	at is the average s	peed	of the car for the v	vhole	ourney?		finish
Α	40 km/h	В	70 km/h	С	80 km/h	D	100 km/h

- 4 Which statement about a gravitational field is correct?
  - A gravitational field is a region in which an object experiences a force because it is magnetic.
  - **B** A gravitational field is a region in which an object experiences a force because of its mass.
  - **C** The gravitational field is the amount of force acting on a unit mass.
  - **D** The strength of the Moon's gravitational field is less than the Earth's because it has no atmosphere.

5 One side of a vertical garden fence has an area of 4.0 m<sup>2</sup>. A strong wind blows on one side of the fence and increases the pressure to 105 kPa. The pressure on the other side of the fence is 103 kPa.

What is the resultant force on the fence?

- **A** 500 N **B** 8 000 N **C** 16 000 N **D** 420 000 N
- **6** A 300 N force is applied to a box in the direction XY in order to move it up a ramp of the dimensions shown.



How much work is done when moving the box from X to Y?

- **A** 900 J **B** 1200 J **C** 1500 J **D** 3000 J
- 7 Four bars, all exactly the same size, are placed with one end in boiling water.

The times taken for the temperature of the other end to increase by 2 °C are measured.

material of bar	time for 2 °C rise/ s
aluminium	10
copper	5
cork	800
foam	1200

To make a large metal tank with the least heat loss, which materials should be used for the tank and its insulation?

	tank	insulation
Α	aluminium	cork
В	aluminium	foam
С	copper	cork
D	copper	foam

8 The diagram shows a crystal being heated in a beaker of water. The crystal releases a dye that shows how the water circulates around the beaker.



What is happening to cause the water above the crystal to rise?

- **A** The water contracts and its density decreases.
- **B** The water contracts and its density increases.
- **C** The water expands and its density decreases.
- **D** The water expands and its density increases.
- 9 The diagram shows a graph of wave motion.



Which quantities are shown by distances P and Q?

	Р	Q
Α	amplitude	period
В	amplitude	wavelength
С	half the amplitude	period
D	half the amplitude	wavelength

**10** An X-ray machine uses X-rays of wavelength  $10^{-10}$  m. They travel with a speed of  $3 \times 10^8$  m/s.

What is the frequency of these X-rays?

- **A** 0.3 x 10<sup>-18</sup> Hz
- **B** 3.0 x 10<sup>-2</sup> Hz
- **C**  $0.3 \times 10^2 \text{ Hz}$
- **D** 3.0 x 10<sup>18</sup> Hz
- 11 Radio waves, visible light and microwaves are all part of the electromagnetic spectrum.

What is the correct order of increasing wavelength?

	shortest waveleng	th ———	longest wavelength
Α	visible light	microwaves	radio waves
В	visible light	radio waves	microwaves
С	microwaves	visible light	radio waves
D	radio waves	microwaves	visible light

**12** The diagram shows a ray of light striking a plane mirror.



What is the angle of incidence if the total angle between the incident and reflected rays is 80  $^\circ ?$ 

**A** 40° **B** 50° **C** 80° **D** 100°

- 13 Which statement about the image formed by a thin converging lens is correct?
  - A It is always real and upright.
  - **B** It is always real and inverted.
  - **C** It is always virtual and upright.
  - **D** It may be either virtual or real.
- 14 An electric lamp uses energy at the rate of 48 W with a 12 V supply.

How much charge passes through the lamp in 2.0 seconds?

**A** 0.25 C **B** 0.50 C **C** 2.0 C **D** 8.0 C

**15** The diagram shows a cell connected in series with an ammeter and three resistors (10  $\Omega$ , 20  $\Omega$ , 30  $\Omega$ ). The circuit can be completed by a moveable contact M.



When M is connected to X, the ammeter reads 0.6 A.

What is the ammeter reading when M is connected to Y?

- **A** 0.1 A **B** 0.2 A **C** 0.3 A **D** 0.6 A
- **16** The circuit diagram shows a 1  $\Omega$  resistor connected in series with a parallel arrangement of a 2  $\Omega$  resistor and a 5  $\Omega$  resistor. The current readings through the parallel arrangement are shown.



What is the reading on the voltmeter?

A 10 V B 12 V C 15 V D	17 V
------------------------	------

17 A person uses a 3 kW electric fire for 2 hours and a 2 kW heater for 4 hours.

What is the total cost if the price of electrical energy is \$0.25 per unit (kilowatt-hour)?

<b>A</b> \$3.50	<b>B</b> \$3.00	<b>C</b> \$2.00	<b>D</b> \$1.50
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**18** A plug is wrongly wired as shown. It is connected to an old vacuum cleaner which has a metal case.



What would be the effect of using the plug wired in this way?

- A The fuse in the plug would blow.
- **B** The metal case would be live.
- **C** The neutral wire would melt.
- **D** The vacuum cleaner would catch fire.
- **19** A wire carries a current and hangs vertically. The diagram shows the magnetic field around the wire, when viewed from above.



The poles of a magnet are placed either side of the wire.

What is the direction of the force on the wire caused by the magnet?



20 The equation represents actinium decaying to thorium.

$$^{227}_{89}\text{Ac} \rightarrow ^{227}_{90}\text{Th} + \text{Y}$$

Which particle does Y represent?

- A a helum nucleus
- B a neutron
- **C** an atom

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D an electron
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21 Silver chloride is insoluble in water.

Silver chloride is made by adding 20.0 cm<sup>3</sup> of aqueous silver nitrate to 20.0 cm<sup>3</sup> of dilute hydrochloric acid.

Which pieces of apparatus are needed to obtain solid silver chloride from aqueous silver nitrate and dilute hydrochloric acid?



- A 1, 2 and 4
- **B** 1, 4 and 5
- **C** 2, 3 and 4
- **D** 2, 4 and 5
- **22** A gas X has the following properties.
  - It is less dense than air.
  - It is insoluble in water.

Which of the following methods cannot be used to collect the gas?



- 23 Which of the following changes will result in the particles moving at a greater speed?
  - $\mathbf{A} \qquad \mathsf{I}_2\left(\mathsf{g}\right) \rightarrow \ \mathsf{I}_2\left(\mathsf{s}\right)$
  - **B**  $CO_2(s) \rightarrow CO_2(g)$
  - **C**  $H_2O(l) \rightarrow H_2O(s)$
  - $\mathbf{D} \qquad \mathsf{N}_2\left(\mathsf{g}\right) \rightarrow \mathsf{N}_2\left(\mathit{l}\right)$
- 24 The proton number and the nucleon number of an atom of P and an atom of Q are given.

	Р	Q
proton number	37	35
nucleon number	85	80

Which statement about P and Q is correct?

- A An atom of P has fewer electrons than an atom of Q.
- **B** An atom of P has more neutrons than an atom of Q.
- **C** P is above Q in the same group of the Periodic Table.
- **D** P is in the same period in the Periodic Table as Q.
- 25 The diagram shows the arrangement of electrons in a molecule of compound  $YZ_2$ .



What are elements Y and Z?

	Y	Z
Α	calcium	fluorine
В	carbon	sulfur
С	oxygen	hydrogen
D	sulfur	chlorine

**26** Element M has an electronic configuration of 2, 8, 8, 2. Element N has an electronic configuration of 2, 8, 7.

What is the formula of the compound formed between M and N?

- A MN
- B M<sub>2</sub>N
- C MN<sub>2</sub>
- **D** M<sub>2</sub>N<sub>3</sub>
- **27** 10 g of calcium carbonate just neutralises 100 cm<sup>3</sup> of dilute hydrochloric acid according to the following equation.

 $CaCO_3 \ + \ 2HC/ \ \rightarrow \ CaC/_2 \ + \ H_2O \ + \ CO_2$ 

What is the concentration of the dilute hydrochloric acid?

- A 0.2 mol/dm<sup>3</sup>
- **B** 0.5 mol/dm<sup>3</sup>
- **C** 1.0 mol/dm<sup>3</sup>
- **D** 2.0 mol/dm<sup>3</sup>
- **28** In a reaction, 25 cm<sup>3</sup> of ethene reacted with 100 cm<sup>3</sup> of oxygen as shown in the chemical equation below.

 $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ 

What is the total volume of gas remaining at the end of the reaction?

- **A** 50 cm<sup>3</sup>
- **B** 75 cm<sup>3</sup>
- **C** 100 cm<sup>3</sup>
- **D** 125 cm<sup>3</sup>
- **29** Which ionic equation represents the neutralisation of aqueous sodium hydroxide with dilute nitric acid?
  - $A \qquad H^+ + OH^- \rightarrow H_2O$
  - **B** Na<sup>+</sup> + NO<sub>3</sub><sup>-</sup>  $\rightarrow$  NaNO<sub>3</sub>
  - **C** Na<sup>+</sup> + HNO<sub>3</sub>  $\rightarrow$  NaNO<sub>3</sub> + H<sup>+</sup>
  - **D** NaOH +  $H^+ \rightarrow Na^+ + H_2O$

- **30** Four oxides listed below are added separately to aqueous sodium hydroxide.
  - 1 aluminium oxide
  - 2 carbon dioxide
  - 3 copper(II) oxide
  - 4 magnesium oxide

Which oxide(s) react(s) with aqueous sodium hydroxide?

- A 1 only
- **B** 1 and 2
- C 2 only
- **D** 3 and 4
- **31** A salt is dissolved in water. The results of two separate tests on the solution are shown in the table.

test	result
add aqueous ammonia	a white precipitate which dissolves when an excess aqueous ammonia is added
add dilute nitric acid then aqueous barium nitrate	a white precipitate

What is the salt?

- A aluminium chloride
- B aluminium sulfate
- **C** zinc chloride
- D zinc sulfate
- **32** An aqueous solution of compound X reacts with aqueous sodium hydroxide to form a green precipitate and then aluminium powder is added. The mixture is heated and a gas that turns damp red litmus paper blue is given off.

What is X?

- **A** ammonium nitrate
- **B** copper(II) chloride
- **C** iron(II) nitrate
- **D** iron(III) chloride

- **33** Which of the following statements describe the conversion of potassium atom, K, to a potassium ion, K<sup>+</sup>?
  - **A** The change is reduction; there is a loss of electron.
  - **B** The change is reduction; there is a gain of electron.
  - **C** The change is oxidation; there is a loss of electron.
  - **D** The change is oxidation; there is a gain of electron.
- **34** Astatine is at the bottom of Group 17 in the Periodic Table.

Which of the following is a property of astatine?

- A It forms a basic oxide.
- **B** It is a good conductor of electricity.
- **C** It forms a covalent compound of formula NaAt.
- **D** It is displaced by chlorine from aqueous potassium astatide.
- 35 The position of metal **M** in the reactivity series is as shown.

### K, Na, Mg, Fe, (H), **M**

Which row correctly describes the reactions of metal **M** and its oxide?

	reaction of <b>M</b> with dilute hydrochloric acid	reaction of oxide of <b>M</b> with carbon
Α	hydrogen formed	oxide reduced
В	hydrogen formed	no reaction
С	no reaction	oxide reduced
D	no reaction	no reaction

36 Which of the following processes are exothermic?

$$I \qquad H_2(g) \rightarrow 2H(g)$$

- II  $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
- III  $NH_4C/(s) \rightarrow NH_3(g) + HC/(g)$
- IV  $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$
- A I and III
- B I and IV
- C II and III
- D II and IV
- **37** Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is 120 cm<sup>3</sup>.

What is the volume of dry air at the start of the reaction?

- **A** 99 cm<sup>3</sup>
- **B** 152 cm<sup>3</sup>
- **C** 180 cm<sup>3</sup>
- **D** 571 cm<sup>3</sup>
- **38** When petroleum is fractionally distilled, which compounds leave from the top of the fractionating column?
  - A the compounds that are the most flammable
  - **B** the compounds that are the most viscous
  - **C** the compounds with the highest relative molecular mass
  - **D** the compounds with the highest boiling points

**39** Which of the following formula represents the product obtained when propene reacts with bromine solution?



40 A polymer has the structure shown.



What is the molecular formula of the monomer?

- **A** C<sub>2</sub>H<sub>4</sub>
- **B** C<sub>3</sub>H<sub>6</sub>
- **C** C<sub>4</sub>H<sub>8</sub>
- **D** C<sub>4</sub>H<sub>12</sub>

**End of Paper** 

## **Data Sheet**

# **Colours of Some Common Metal Hydroxides**

aluminium hydroxide	white
calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
zinc hydroxide	white

#### The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
				Key			1 H hydrogen 1										2 He <sup>helium</sup> 4
3	4	]	proton (atomic) number					4				5	6	7	8	9	10
Li	Be		atomic symbol									В	С	Ν	0	F	Ne
lithium	beryllium		name									boron	carbon	nitrogen	oxygen	fluorine	neon
7	9	-	relative atomic mass									11	12	14	16	19	20
11	12											13	14	15	16	17	18
Na	Mg											Al	Si	P	S	Cl	Ar
sodium 23	magnesium 24	3	4	5	6	7	8	9	10	11	12	aluminium 27	silicon 28	phosphorus 31	sultur 32	chlorine 35.5	argon 40
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton
39	40	45	48	51	52	55	56	59	59	64	65	70	73	75	79	80	84
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Мо	Тс	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Те	Ι	Xe
rubidium	strontium	yttrium	zirconium	niobium	molybdenum	technetium	ruthenium	rhodium	palladium	silver	cadmium	indium	tin	antimony	tellurium	iodine	xenon
85	88	89	91	93	96	-	101	103	106	108	112	115	119	122	128	127	131
55	56 D-	57-71	12	73 T-	74	75 Da	76	// 	78	79 A	80	81 	82 Dh	83	84 Da	85	86 Dr
CS	Ba	antinanoius	HI	1a tontolum	VV	Re	US	If iridium	Pt	AU	Hg	l <i>l</i>	PD	BI	PO	At	RN
133	137		178	181	184	186	190	192	195	197	201	204	207	209		-	-
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Fr	Ra	actinoids	Rf	Db	Sa	Bh	Hs	Mt	Ds	Ra	Cn	Nh	F1	Mc	l v	Ts	Οa
francium	radium		rutherfordium	dubnium	seaborgium	bohrium	hassium	meitnerium	darmstadtium	roentgenium	copernicium	nihonium	flerovium	moscovium	livermorium	tennessine	oganesson
-	-		-	-	-	-	-	-	-	_	-	-	_	-	-	-	-
		•			•			•	•		•						
lanthanoids		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
		lanthanum	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbium	thulium	ytterbium	lutetium	
		139	140	141	144	-	150	152	157	159	163	165	167	169	173	175	
actinoids		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	
		actinium	thorium	protactinium	uranium 228	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	termium	mendelevium	nobelium	lawrencium	
			202	201	230	_	_		–	_		_	_	_	_	_	

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.). The Avogadro constant,  $L = 6.02 \times 10^{23} \text{ mol}^{-1}$