Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A218/01

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

Unit 4: Ideas in Context
(Foundation Tier)

THURSDAY 4 JUNE 2009: Morning
DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper
A calculator may be used for this paper

OCR SUPPLIED MATERIALS:

Insert (inserted)

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SLM) OV90855 11364/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 40.**
- **A list of physics equations is printed on page three.**
- **The Periodic Table is printed on the back page.**
-  **Where you see this icon you will be awarded a mark for the quality of written communication in your answer.**

EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved by the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

ELECTRIC CIRCUITS

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

THE WAVE MODEL OF RADIATION

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Answer ALL the questions.

THIS QUESTION IS BASED ON THE ARTICLE 'ACIDS IN THE BODY'.

1 (a) The article talks about how excess acid can cause problems in the body.

Give TWO examples, taken from the article, of problems that acids cause in the body.

_____

_____ **[1]**

(b) Look at the results of the student's investigation.

(i) What happens to the rate of the reaction when the concentration changes?

_____

_____ **[1]**

(ii) Why is it important to measure the TEMPERATURE when the experiment is carried out?

_____

_____ **[1]**

(iii) Why is it important that the VOLUME OF ACID is kept the same when the experiment is carried out?

_____

_____ [1]

(c) Eve carries out an experiment to investigate how carbonates react with acid.
She adds some solid calcium carbonate to some acid in a beaker.

(i) Eve uses a pH meter to measure the pH of the acid at the start of the reaction.
It has a pH of 3.
What will happen to the pH of the acid as it is neutralised by the calcium carbonate?

_____ [1]

(ii) What else could Eve use, other than a pH meter, to measure pH?

_____ [1]

(iii) Eve writes a word and a symbol equation for the reaction.
Complete the equations by filling in the boxes.

calcium carbonate + hydrochloric acid → calcium chloride + ☐ + carbon dioxide

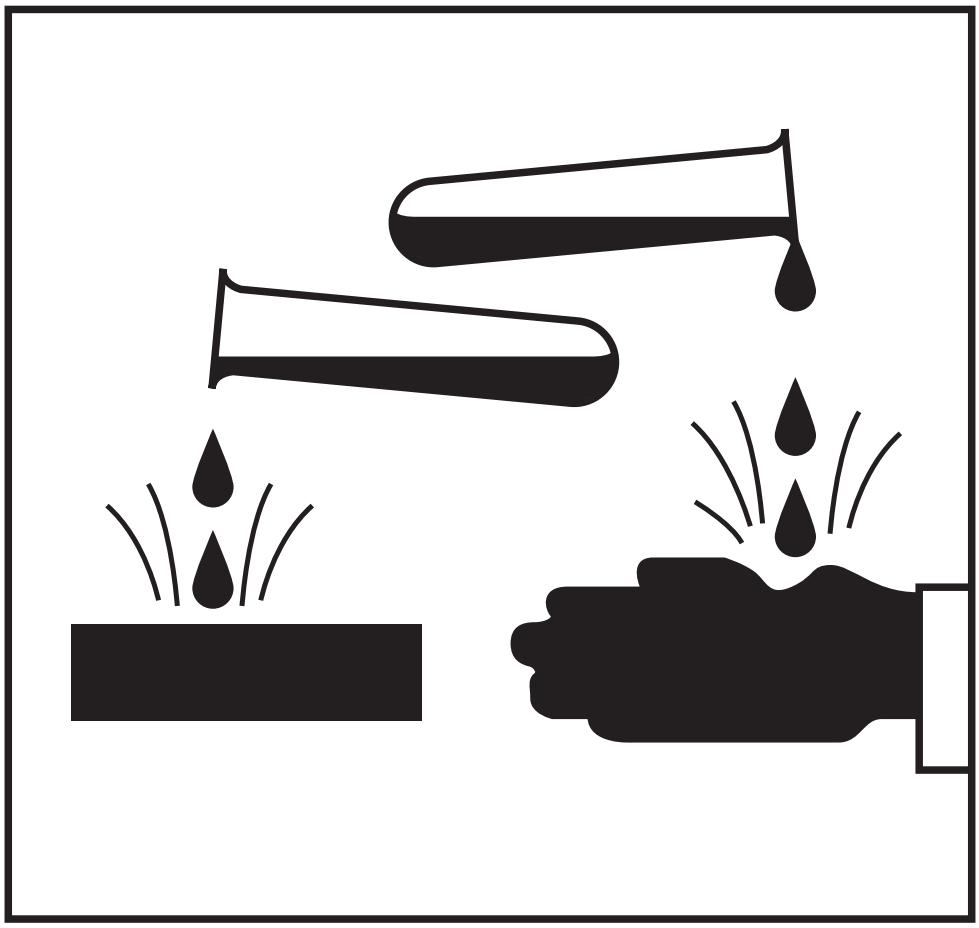
$CaCO_3$ + 2HCl → $CaCl_2$ + H_2O + ☐

[2]

(iv) Eve notices that bubbles form around the calcium carbonate.
Why do bubbles form?

_____ [1]

(d) Eve sees this hazard symbol on the container for the acid.



(i) What does this symbol mean?

_____ [1]

(ii) What precautions should Eve take when handling an acid?

_____

_____ [1]

(e) Calcium carbonate and sodium hydrogencarbonate are both used in medicines. Sodium hydrogencarbonate works much better than calcium carbonate at neutralising acids in the BLOOD.
Explain why.

_____

_____ **[2]**

[Total: 13]

THIS QUESTION IS BASED ON THE ARTICLE 'HELP FOR PATIENTS WITH KIDNEY FAILURE'.

2 (a) A healthy kidney balances water levels. This process is affected by ALCOHOL.

Name TWO other factors, from the article, that affect this process in healthy kidneys.

1 _____

2 _____ **[2]**

(b) Drinking ALCOHOL causes the body to produce a greater volume of urine.

The urine is more dilute than normal.

What effect does drinking alcohol have on the level of water in the body?

_____

_____ **[1]**

(c) (i) Small molecules, such as water, are filtered out of the blood plasma by the kidneys.

Name TWO other substances that kidneys filter OUT of the blood plasma.

1 _____

2 _____ **[2]**

(ii) Explain why red blood cells are NOT filtered out of the blood.

_____ [1]

(iii) Why is sugar NOT normally found in the urine produced by healthy kidneys?

_____

_____ [1]

(d) During dialysis, UREA passes out of the blood into the dialysis fluid by diffusion.

(i) Explain why urea diffuses out of the blood into the dialysis fluid.

In your answer you should write about

- what happens during diffusion
- the concentration of urea.

One mark will be for writing in sentences with correct spelling, punctuation and grammar.

_____

_____

_____

_____

_____ [2+1]

(ii) How does a PARTIALLY PERMEABLE MEMBRANE work?

_____

_____ [2]

(e) Look at the figures given in the section 'SOME MORE FACTS ABOUT DIALYSIS'.

Calculate the MAXIMUM NUMBER OF HOURS spent by a patient using the dialysis machine EACH WEEK.

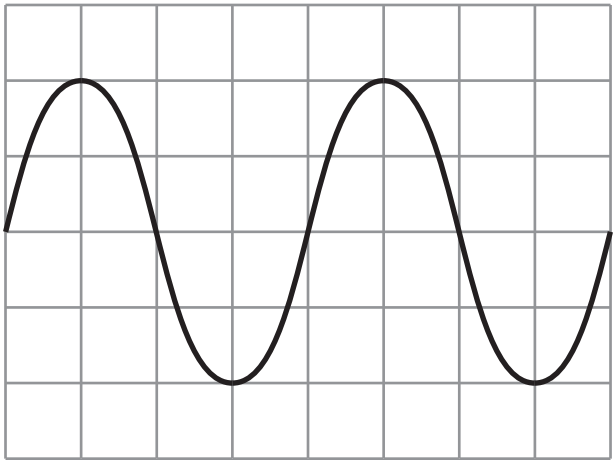
Show your calculations.

_____ hours per week [2]

[Total: 14]

THIS QUESTION IS BASED ON THE ARTICLE 'A TIME-LINE OF SCIENTIFIC DISCOVERIES ABOUT LIGHT'.

3 (a) In 1690 Christiaan Huygens described light as a wave.
The diagram shows the side view of a wave.



On the diagram, label the

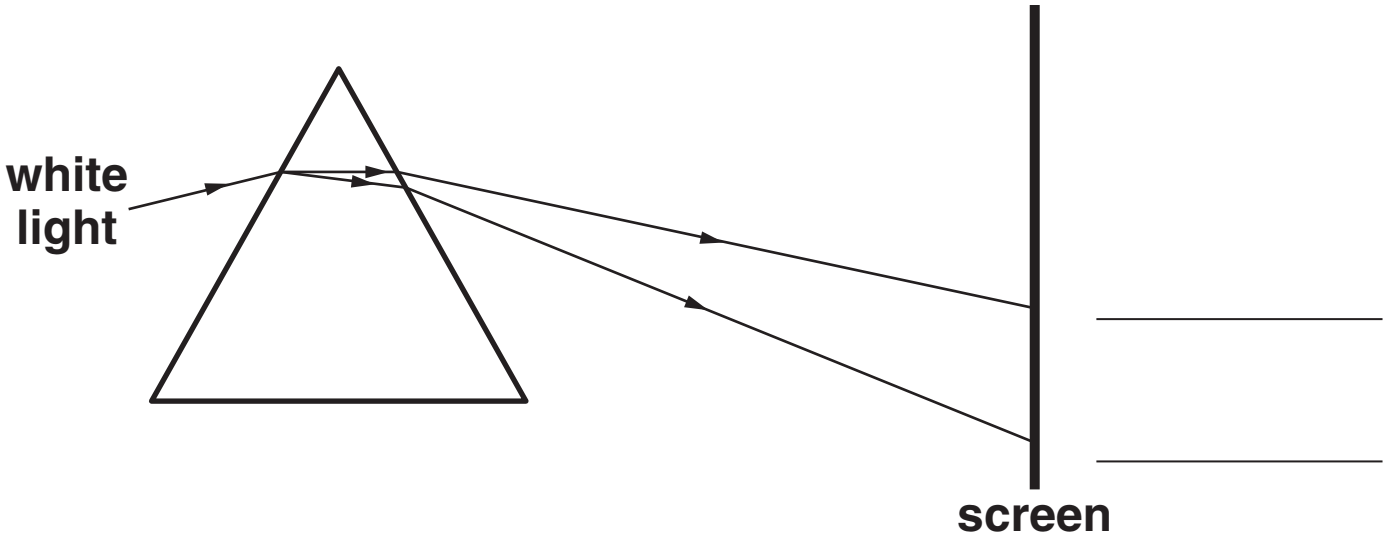
(i) amplitude

(ii) wavelength.

[2]

(b) Isaac Newton showed that white light is made of many colours by refracting it through a prism. Blue light is refracted more than red light.

(i) The diagram shows refraction through a prism. Label the diagram to show where these colours are on the screen.



[1]

(ii) What happens to the waves that makes them change direction as they enter the glass prism?

_____ [1]

(c) Newton and Huygens disagreed about whether light is made of particles or waves.

Which of the following could ONLY be explained by thinking about light as a wave?
Put a ring around the correct answer.

INTERFERENCE REFLECTION

REFRACTION ENERGY TRANSFER

[1]

(d) 240 years after Newton, Albert Einstein used the idea that all types of electromagnetic radiation could be packets of energy.

(i) What is the modern name for a packet of energy?

_____ [1]

(ii) What feature is the same for all types of electromagnetic radiation?

_____ [1]

(iii) Light is one type of electromagnetic radiation. Write down the names of TWO other types.

1 _____

2 _____ [2]

(e) In 1817, Thomas Young showed that light is a transverse wave.

Describe the differences between a transverse wave and a longitudinal wave.

Your answer should include

- **a labelled diagram of each type of wave**
- **the differences between them.**

_____

_____

_____ **[3]**

(f) In 1865, James Clerk Maxwell said that light is an electromagnetic wave.

State <u>TWO</u> ways in which electromagnetic waves are different from sound waves.

1 _____

2 _____ **[1]**

[Total: 13]

END OF QUESTION PAPER